International Financial Market Fluctuations

Corporate Forecasting and Reporting Problems

Lars Oxelheim

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Lars Oxelheim
Scandinavian Institute for Foreign Exchange Research

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Preface

The turbulence on the international financial markets, which generates ever-increasing fluctuations in interest and exchange rates, has long called for an attempt to integrate the theory of open economies into the theory of the firm, especially into the theories of international finance and foreign exchange accounting. The aims of this book, which represents such an attempt, are to use empirical evaluation at a macroeconomic level in order to establish normative bases for corporate decision-making and reporting, and to indicate how such bases can be used to improve the company's way of coping with volatile market rates.

This book is one of the main parts of the project *Corporate decision-making under foreign exchange uncertainty*, which was initiated in 1977. Part of the research work was carried out while I was attached to the Industrial Institute for Economic and Social Research in Stockholm and I am grateful for the inspiration I received from colleagues there and for help with typing and other practical matters from Mrs Karin Zahir and other members of the secretarial staff. Mrs Nancy Adler has been my linguistic adviser, and I would like to thank her for her contribution, which has been so important to the production of this book. Finally I would like to address my thanks to Svenska Handelsbanken's Foundations for Social and Economic Research and to the Bank of Sweden Tercentenary Foundation for their generous financial support.

Stockholm, December 1984

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Chapter 1

Introduction

Of all the changes that have affected multinational corporations since the Second World War, none has had a more pervasive impact upon the risk profile of companies than the collapse in March 1973 of the international monetary system with its relatively stable exchange rates — first from 1944 until 1971 the Bretton Woods agreement, followed by the short-lived Smithsonian agreement from December 1971. The major reason for the demise of this system was the dollar crisis stemming from the US payments deficit. This had in turn been exacerbated by the Vietnam war. In the subsequent financial situation characterized by turbulent exchange rates, the financial executives of multinational companies are constantly searching for effective ways of protecting assets and cash flows against the adverse effects of fluctuating international currency values. Volatile exchange rates have been triggered by a variety of factors, including the adjustments necessitated by the long-term disequilibrium rates existing before the breakdown of the Bretton Woods system, the activities of OPEC, high inflation rates, the increasing variability of the inflation rates of different countries, and growing financial speculative flows.

This greater volatility in exchange rates has severely disrupted the even flow of the multinational corporations' foreign income streams. The way in which these problems have been handled in the accounting simply seems to have reinforced the volatility. Statement 8 and up to a point also Statement 52 from FASB (the Financial Accounting Standards Board) have further exacerbated this seemingly erratic earnings pattern by forcing upon the multinational corporations the regular disclosure of exchange gains and losses, although no cash flow may be involved. There is thus a significant information problem.

The interest rate explosion in the late 1970s, balancing the exchange rate explosion in the early 1970s, calls for attention. The growth in the volume of foreign loans with flexible interest rates in corporate portfolios over the past few years suggests that interest rate

fluctuations may become as serious a problem for companies in future as fluctuations in exchange rates. A broader view of risk in the individual company should lead to greater awareness of the equal importance of the two components in the capital cost — interest rate and exchange gain/loss — and, in the long run, to symmetrical treatment of the two in corporate planning and control.

The oil crisis generated a radical redistribution of the world's wealth. A pattern emerged in which a substantial current account surplus in the OPEC countries was matched by almost equivalent deficits in the OECD countries. These last encouraged companies at home to help to finance the deficits by borrowing abroad. The gross volume of new loans on the international capital market rose between 1973 and the end of the 1970s by more than 300 per cent, calculated at current prices. Given the highly fluctuating exchange rates, it is easy to see that companies which as a group are responsible for a large part of this increase will have very substantial exchange gains and losses on their foreign debts.

The distribution of these gains and losses is highly dependent on the monetary systems involved in each exchange relation. The great variety of exchange rate arrangements in these monetary systems is demonstrated in Appendix 1. The role of the exchange rate as a goal or a means in economic policy creates disturbances in corporate financial reports — a central-bank-generated disturbance resulting from the nature of the exchange rates as a *'controlled variable'*. At the end of 1984, according to the IMF International Financial Statistics, no country had a monetary system with an entirely clean floating exchange rate. In one way or another all their floating rates were 'dirty'. Furthermore random variation is another source of disturbance that has to be considered.

In order to protect exchange rates from daily or weekly fluctuations the central banks intervene according to the IMF (International Monetary Fund) rules. Another type of intervention of a long-term character may be needed, for example when one currency is pegged either to another currency or to a currency basket. If the central bank is defending an unrealistic exchange rate, such interventions will create a pattern of quite substantial deviation from exchange rate movement related to changes in basic economic variables such as inflation differentials. The question is whether these deviations should be allowed to encumber the corporate financial reports. This question may be especially crucial in companies aiming to stabilize market values in coping with financial market fluctuations.

When most currencies are pegged in one way or another, and when there are no clean floating rates, there is a serious *information problem*. This problem — in the context of foreign monetary items —

is largely concerned with the distinction between exchange rate movements and other financial costs and revenues. That is to say: can the actual interest rate be replaced by a better measure of the total financial cost or revenue? Another aspect of the problem, alongside the distinction between interest rates and differences in exchange rates, concerns the way in which these differences should be measured. How great a difference in the exchange rate should be allowed to encumber the profit and loss account in any one year? The application of the FASB Statement No. 8 accentuated this problem. In many quarters the demand was raised for amortization opportunities to cope with fluctuating accounting results, due in many cases to the political role of the closing rate and in other cases to what appeared to be random fluctuations.

In the context of foreign currency translation, FASB Statement No. 52, with its concept of 'functional currency', was drawn up in direct response to a specific charge: according to the existing standard the effects of the foreign exchange situation on corporate accounting were unreasonable and often unfair. After a long period of severe criticism from both multinational companies and analysts there seems to be a certain consensus today — except for the treatment of exchange differentials on foreign assets and liabilities, and one or two other points — in the latest statements from FASB, ASC (Accounting Standard Committee), IASC (International Accounting Standard Committee) and CICA (Canadian Institute of Chartered Accountants). However, there are still some drawbacks that call for further research. In the US, Statement No. 52 has been used for fiscal years beginning on or after 15 December 1982. Many companies still believe that Statement No. 52 fails to reflect financial results realistically, because it represents a continuation of the 'temporal' method recommended in the earlier Statement No. 8. From a theoretical point of view it has been criticized for eroding the clean-surplus concept, for instance, by allowing the translation adjustment to be presented in the equity section rather than being included in the determination of income.

With a view to overcoming the information problem, various ways of measuring and reporting costs on corporate financial loans will be proposed and evaluated below. For this purpose we will examine the empirical validity of some of the laws or relationships of economic theory. The empirical analysis of the alternative bases studied below will embrace 13 currencies in the Swedish 'basket'. It will be based on exchange rates, interest rates and rates of inflation, which have been registered on a weekly and monthly basis throughout the period 1974–84. The laws or relationships will be tested for their efficacy as a basis for designing accounting principles. The empirical analysis will also focus on the predictive power inherent in the different normative

bases — a point of crucial importance when accounting is viewed in the wider context of managing corporate total foreign risk.

In evaluating proposals for new accounting standards, the Swedish krona has been chosen below for purposes of illustration. Sweden is interesting since its economy belongs to those designated as 'small open economies', which means that its external balance is highly dependent on the price of its currency. High export and import elasticities make Sweden very sensitive to devaluation as a way of correcting external imbalances. When Sweden withdrew from the European currency snake in 1977, the Swedish krona was devalued by 10 per cent. It was devalued again by the same percentage in 1981. In 1982 it was devalued by 16 per cent.

The choice of the Swedish krona as our example will not reduce the general value or interest of the results. The accounting effects of the various proposals for new accounting standards, will all be evaluated and tested for most of the major currencies appearing in foreign loan transactions on the international capital market.

The absolute and relative importance of exchange gains and losses on loans can be illustrated in terms of the Swedish experience. The total net exchange loss in 1977 on international loans taken up by Swedish companies has been estimated to be of the order of SEK 6 billion.[1] Taken together with reported overall earnings before depreciation of approximately SEK 14 billion, this 'new' cost of capital is obviously considerable. Further, since interest rate differentials during the 1970s have tended to be insufficient to offset exchange rate movements, there have been 'excess costs', which make the choice of loan currency a matter of great importance to many companies. The devaluation in 1982 increased 'over night' the corporate foreign debt by about SEK 12 billion. For 1982 the companies on the Swedish stock market showed earnings after financial costs and revenues of about the same size. At the same time the total *reported* net exchange gains and losses of these companies (including translation gains and losses) were about SEK 4 billion. The procedure of deferring and amortizing exchange losses is widely used.

The information problem will be discussed and exemplified in terms of corporate financial loans, to underline the fact that the problem primarily concerns the medium-term and long-term distribution effects. However, the argument can easily be extended to apply to net foreign monetary items over the same time horizon. The empirical findings will also be applied to the wider problem of the translation of foreign currency financial statements.

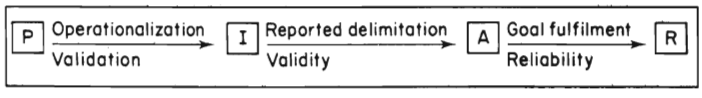
[1] 'Billion' = 10^9 throughout.

Chapter 2

The information problem — goals, delimitations and methods of study

2.1 INTRODUCTION

In schematic terms the research approach to be used in analysing the information problem, briefly outlined in Chapter 1, can be described as follows:



Here P represents the present problem, I the ideal aim and A the actual aim. R is the result achieved.

The frame of reference and the works of other writers which together have formed the basis of my own perception of the problems are presented in Section 2.2, and the final formulation of the problem is given in Section 2.3.

Ideal and actual aims are formulated in Section 2.4. The transition from P to I involves the transformation of the problem into an operationally defined issue. The difference between I and A then stems from the practical limitations of the situation, resulting in the delimitation of the study as reported in Section 2.5.

Some investigations and scientific reports which in certain essential respects border on the present study are reported in Section 2.6.

Section 2.7 is concerned with methodology and the inception of the study; the collection of data and the choice of study period are also discussed.

The disposition of the remaining chapters of the book is outlined in Section 2.8.

2.2. FRAME OF REFERENCE

The information problem regarding the impact of financial market fluctuations which will be discussed in this book, is a matter of external and internal accounting as a part of corporate decision-making and signalling. Accounting in business companies has to be considered from a systems viewpoint. Many studies (e.g. Evans, Folks and Jilling, 1978; Shank, Dillard and Murdoch, 1979; Jilling, 1978) have confirmed that important aspects of the interaction between accounting and decision-making, for example, would be missed if this approach were not applied. McDonald (1972) stresses that accounting should be seen

> as an interactive aspect of complex decision systems. A modern systems view of accounting, which considers prediction models, decision models and measures of outcomes as a feedback loop casts new insights on the entire process.

The systems view applied here is based on the ideas of several theorists and concludes that a system can be defined 'as a collection of parts which are mutually dependent on one another and which together constitute a whole'. The systems approach provides us with a simplified picture of reality which facilitates the analysis of the system in question. To make a systems analysis we first have to choose an appropriate level of abstraction and, since one of the fundamental aims of this approach is to facilitate an overview of complex relationships, it is extremely important that the choice of abstraction level does not automatically exclude any major relationships from the analysis (cf. Alexander, 1970).

A variety of schools have emerged — in business administration we can distinguish between the information theory approach, the organization theory approach and the decision theory approach — depending on the particular emphasis in the systems conception. The present book has its roots in the school of information theory and uses the systems approach to describe the control of organizations through the systematization of the information flow. This approach with its focus on informational aspects seems the most appropriate to an analysis of accounting principles. The goals of the organization and of its stakeholders provide the point of departure for this analysis; the identification of relevant data, the form of the decision base, and the method of controlling outcomes — all are determined by these goals.

One overriding problem is that the goals which are to steer the choice of relevant information do not immediately permit a formulation in operational terms, since it is difficult to aggregate the goals of

the different stakeholder groups. This naturally affects the content of the information, or as Emery (1969) puts it:

> The goals assigned to a planner are normally multidimensional ... compression of several incommensurable goals into a single one reduces their information content ... Multiple goals are also created as an approximation for a single 'real'-goal that cannot be measured in practice. Business profit is a case in point. (p. 115)

Whose goals should be considered in the accounting? At this point we can usefully distinguish between external and internal accounting. *External accounting* is controlled by regulations prescribing a certain minimum of information. The relevant legislation conforms to social and technological developments rather than making any attempt to steer them: general stipulations are made about good accounting practice, general accounting bases, etc. and these are then interpreted by leading companies of good standing; generally accepted practices are thus gradually established. We can assume that one paramount goal which is accepted by all classes of stakeholders concerns the survival of the company. Information is required so that people can assess the possibilities in this respect. The aim of the accounting is to answer this need by providing information relevant to an evaluation of the company's development potential.

Do the various national regulations guarantee that this information requirement will be fulfilled by the company's external financial statements? Those who receive information from this source are the company's creditors, its shareholders, its employees and various authorities. Creditors and shareholders have much the same requirements when it comes to the substance of the information provided: their main interest is in future cash flows. The chief difference between the two categories of stakeholder is that the shareholder may accept for a time the continual retention of cash for reinvestment in the business, the loan creditor is more concerned with the ability of the company to generate and pay out cash while still growing.

However, this is only a very slight variation in what is basically a similar concern. The basic information used by creditors and shareholders consists of the profit and loss account, the balance sheet, and the directors' report. As far as the company's employees are concerned, the economic development of the business is of decisive importance to job security, and wage claims are not uncommonly based on reported profit. Thus a company's financial statement may well provide the basis for local wage negotiations. For this group of stakeholders a new channel of information has now appeared in Sweden, namely the

co-determination councils. The employer is bound to provide the council with 'regular forward-looking information such that the council can form a good idea of the company's economic situation and future prospects'. The Swedish Co-determination Act confirms the right of the employee organizations to very extensive information about the company. Among other things the employer should:

> Keep the employee organization to which he is bound by collective agreement continuously informed about developments in his operations on both the production and economic sides, and about the general lines of his personnel policy. The employer shall further provide the employee organization with the opportunity to check books, accounts and other documents touching on operations, to the extent required by the organization's safeguarding of its members' common interests *vis-à-vis* the employer. (Our translation)

These rules can serve as a reminder of the form in which the information should be provided. The requirements are different in this respect when decisions are no longer made by a small group of people enjoying a common language and sharing very similar frames of reference.

Tax authorities base their assessments on the company's financial statements and income tax returns. Some of this information can also provide a basis for the decisions of other authorities, concerned perhaps with questions of an economic and/or political nature.

The *internal accounting* supplies the information which management needs for planning corporate operations and dealing with the internal problem of control. The increasingly complex structure of companies today, involving divisionalization, internationalization and so on, has resulted in more frequent measurements at a growing number of measuring points. At the same time measurement becomes more complicated owing to internal pricing problems, etc. In internal accounting and budgeting, the problems of measurement predominate. There is good reason to allow here for a certain amount of tactical thinking, for instance in establishing the budget norms to be achieved.

Emery (1969) emphasizes the importance of taking a systems view in internal accounting as a part of the company's planning process:

> In order to understand the planning process one must understand the concept of system. Planning exists within the organization and the organization itself constitutes a system. (p. v)

Management needs information as a basis for plans intended to indicate a certain path or a certain type of behaviour which should

lead to a desired outcome; management's plans are also supposed to serve as an instrument of coordination.

We have already seen that for shareholders and creditors the future cash flow can be regarded as the main focus of interest. Management shares this interest. Since steering concerns future conditions, retrospective internal accounting is not enough, however detailed it may be. Accounting is becoming increasingly forward-looking; the shift is from historical accounting to budgeting, in the internal accounting as well as in the external it is called for a detailed separation into spatial and temporal dimensions with consequent opportunities for comparing plans with outcomes and for analysing any reported deviations.

The survival aspect as a guideline is also included in Chambers's definition, according to which the normative goal of accounting is to provide

> a method of retrospective and monetary calculation, the purpose of which is to provide a continuous source of financial information as a guide to future action in markets. (Chambers, 1966)

We can perhaps summarize this discussion of goals by saying that all stakeholders need 'good' information, i.e. *information with predictive value*. The accounting procedures should be designed to serve that need. Figure 2.1 illustrates the possible links between decision and prediction models.

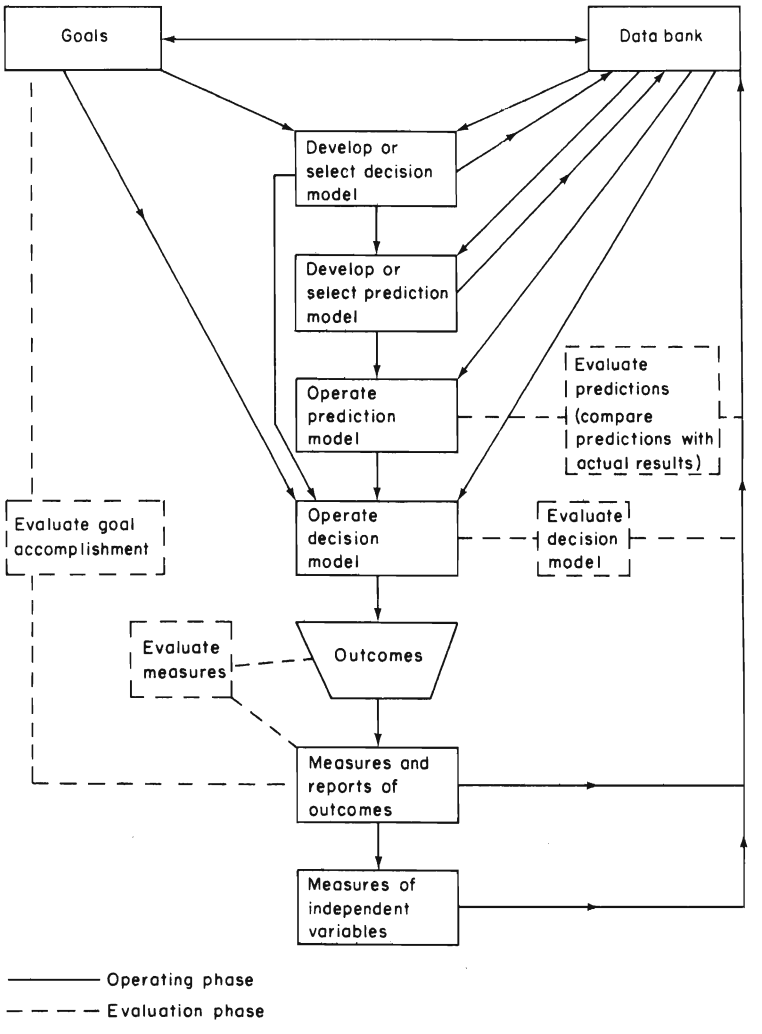
One among many definitions of accounting is that provided by the American Accounting Association (1966):

> ...the process of identifying, measuring and communicating economic information to permit informed judgements and decisions by users of the information.

This definition provides a useful identification of important components in the accounting process. In these terms — identifying, measuring and communicating — we are now concerned here with the need for information relevant to an assessment of the company's future prospects.

What data reflects the company's future possibilities? What information should be transmitted? Accounting is not, nor has it ever been, a static discipline. It provides information for a wide variety of users who apply the information in many ways, some of which may not be foreseen by the accountants who prepare the information. Requirements are continually changing. Users change; the uses they make of information change; the economic and business environment changes. Thus by the very nature of things the accounting discipline is a dynamically changing one.

Figure 2.1 Prediction and decision models



Source: American Accounting Association (1971): Report of Committee on Theory Construction and Verification, *The Accounting Review*, **46** Supplement, p. 65. Reprinted with permission.

With this in mind, information about the company's future prospects must somehow be formulated in terms of periodically recurring measurements of wealth (capital) and/or results (profit and loss).

Roughly speaking there are two ways of measuring results. Either revenues and costs can be measured by evaluating performance and the related consumption of resources; assets and liabilities are then derived from these. Or, assets and liabilities can be measured at the

beginning and end of the accounting period and the result calculated on a basis of the adjusted change (e.g. dividends) in their value. The two methods correspond to two concepts of balance, the dynamic and the static.

It is here that measurement problems can arise. The measurements underlying the different balance conceptions are based on the assumption of a uniform measuring instrument, namely the monetary unit. Even when this condition is fulfilled, it may still be difficult to calculate depreciation due to obsolescence etc.

Such problems must be discussed if there is to be any meaningful exchange of information. The problems of measurement must be made explicit so that worthwhile comparison is possible. MacDonald (1974) sees it as an urgent problem in communications:

> Similarly within accounting itself, communication is not only of significance with regard to external reporting: it is equally important for internal reporting. Whenever there is transmission of information from the informed to the uninformed there is the problem of communication. Central to the problem is the difficulty of conveying meaning, for this requires that both parties to any message understand the language. (p. 30)

Since the figures in the annual accounts often have to convey their own message outside the company without any further communication between informer and informed, it is also imperative according to MacDonald,

> that there is some prearranged code, some common understanding of the significance of the symbols used in the statements.

The following principles are widely accepted, constituting something in the nature of MacDonald's 'prearranged code' on the next page.

The profit concept implicit in the following discussion of communication and language rules, agrees with that adopted by the Sandilands Committee (1975). (Compare also Hicks, 1946.)

> Profit for the year ... may usefully be defined as the amount of the total gains arising in the year that may prudently be regarded as distributable ... The practical purpose of the concept of profit is to ensure that a company does not prejudice its future by distributing too much of the gains arising during the year. (p. 28)

The substance of this definition was frequently repeated during the 1970s when inflation accounting was the subject of much debate (see,

1 *The principle of continuity*
This implies an assumption of the company as a going concern and it is reflected in the periodical reporting. The company's life is divided into a number of accounting periods, each complete in itself.
2 *The principle of realization*
Implies that profit should not be reported until it has been realized.
3 *The principle of objectivity*
Refers to the reporting of verifiable events. This provides the basis for any discussion of the reliability and validity of the measurements.
4 *The principle of consistency*
Refers to periodically recurring reports which consistently measure results over time, in accounting units.
5 *The principle of prudence*
Implies that losses are anticipated — profits are reported only after they have been realized.

for example, Accounting Standard Committee, *Guidance Manual on Current Cost Accounting including the Exposure Draft 18*, 1976).

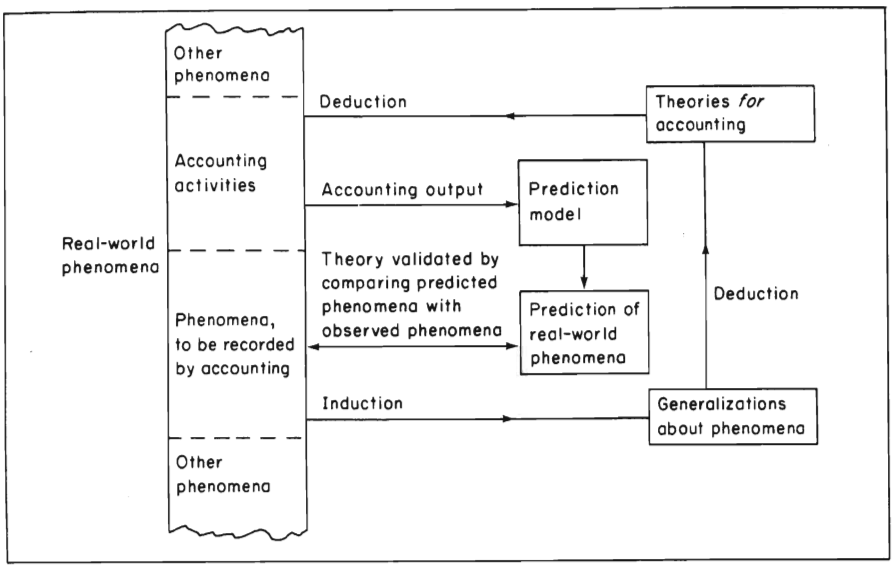
Our intention to discuss all the different aspects involved in the information problem provides an apt occasion for recalling the important difference between descriptive and normative accounting theory.

Normative accounting theory (theory *for* accounting) provides guidelines for the way accounting ought to be carried out. This may involve calling in question the fundamental accounting conventions presented above. Following repeated testings of existing rule systems and paradigms, a coherent norm system based on a few axioms can be constructed. From this norm system detailed rules can then be derived. Normative accounting theories, from a systems viewpoint, are illustrated in Figure 2.2.

The purpose of descriptive accounting theory (theory *of* accounting) is to describe the *de facto* structure and rule network of accounting.

The different elements or levels in the theory-building are illustrated in Figure 2.3. Object level refers to the level where the studied phenomena are to be found; abstraction level is where scientific presentation takes place, starting with the description of the phenomenon. Symbols (e.g. letters or figures) are needed for the description, which is based on certain schemata. The symbolical representation and schemata should fulfil the requirements of *consensus* and

Figure 2.2 Normative accounting theory from a systems viewpoint



Source: Daniel McDonald, © 1972 *Comparative accounting theory*, Reading, Massachusetts, Addison-Wesley, p. 29, Fig 3.3. Reprinted with permission.

Figure 2.3 Levels of abstraction

	THEORY LEVEL	confirmed models
ABSTRACTION LEVEL	MODEL LEVEL	transformation rules
	DESCRIPTION LEVEL	schemata
OBJECT LEVEL		

uniqueness. In translation from object level to description level and back again the original message can obviously become badly distorted. Imagine the following sequence for example:

Event → financial reporter → reader → reader's comprehension of the event

If the reader's comprehension of the event differs greatly from what actually happened, then the communication has failed.

At the modern level rules are required for combining the symbolic descriptions. These are known as transformation rules. They must be

carefully defined and they should result in directly observable constructions, ideas and concepts. The reported profit of a company is an example of a construction created with the help of such transformation rules.

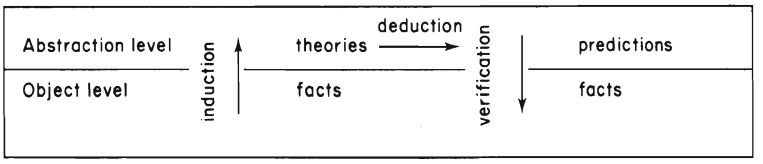
Normative accounting theories are concerned with the way in which schemata and transformation rules should be designed, and descriptive accounting with the way they are designed in existing accounting systems.

According to McDonald (1972) most theorizing on the normative plane has arisen because of

> dissatisfaction with the existing state of accounting as practised. The dissatisfaction sometimes arose from a failure in accounting to recognize new changes in the environment. (p. 68)

The way existing accounting models handle the recent change in volatility in exchange rates and interest rates, constitutes a serious argument for proceeding on the normative plane.

Returning to Figure 2.2, we have now reached the stage at which the real-world economic event has been translated into, or described as, an accounting activity. In other words the outer track of the model has been completed. Since the idea is to generate information with predictive value, outcomes are analysed for purposes of validation, and the inner track in the model is thus completed. The whole process can be described in concentrated form as follows:



According to Figure 2.2 accounting output (mapping economic activities) is included as input in a prediction model. Depending on the character of the reported information or the desire to influence it by the design of the schemata and the transformation rules, different prediction models can be used. These can be classified according to the information requirements of different stakeholder groups.

As a simplified example of varying information needs and method requirements let us take the case of driving a car, and study the relationship between pressure on the accelerator, *A*, and the speed of the vehicle, *B*. Information requirements can be described as follows:

Actor, information-consumer	*Necessary knowledge; method*
Driver	Input-outcome model (prediction model or black-box model)
Mechanic	Insight model (process model) Knowledge of the way the different components hang together
Designer	Knowledge of the 'setting' of the problem Questioning of inputs, outcomes and components Knowledge of design

When this is translated into interaction terms and information design we get:

Interaction aim		*Model/Knowledge/Method*
Prediction when: 1 influence is impossible	← 'Legitimate' pairs of goals and methods →	Input-outcome model
2 there is no ambition to change the structure of the system		
Intervention and maintenance of existing system (without changing its structure)	←	Insight (process) model
Questioning and changing a system's structure	←	Design: development of concepts and language

If validation reveals marked systematic differences (forecasting errors or biased view of company future prospects), the outcome analysis will be directed mainly towards possible deviations connected with the forecasting method and/or the supply of information. As a result of this analysis normative accounting research acquires grounds for developing and improving the schemata and transformation rules.

The predictions of all the stakeholder groups are concerned with the company's future prospects, and the different categories need their forecasts for different purposes. If we include those who are interested in the external accounting in our list, we could probably claim that most stakeholder categories would be well served by an insight model, although this would presuppose an understanding of the rule system which generated the information — the real world mapped in the financial statements. Employees, for example, would find it easier to understand the link between their own wage demands and reported future profit. Society as a whole, needs a model which allows for the

questioning and possibly the alteration of the structure of the system.

Finally, note should be taken of the continual shifts in emphasis. There is no constant development in any one direction, but certain problems appear to recur periodically and aspects which seem of particular importance at one time are less relevant at another. It is important to be aware of this in the process of theory-building.

2.3 FORMULATION OF THE PROBLEM

In light of the methodological frame of reference described above, we can now formulate the central problem to be addressed in the following pages.

Since the mid-1970s the economic situation of business companies has been changing in many respects. Turbulence on the foreign exchange market meant that companies faced considerable risk on their affairs in foreign currencies. Claims and debts in foreign currencies became a major component of this risk surface. If a company did not want to speculate in exchange fluctuations, it had to begin thinking in terms of a net exchange balance. Many companies probably regarded access to a growing international loan market as a welcome opportunity for netting any large positive assets in foreign currencies which they held at the time. Other companies, for whom the borrowing meant a negative net balance in the loan currency, covered themselves perhaps by forward buying in the currency concerned. Changes in exchange rates resulted in exchange gains and losses which had to be reported in the financial statements, thus constituting part of the data on which the company and its stakeholders would base their various decisions.

2.3.1 Financial market fluctuations and the cost of foreign loans

On an efficient foreign exchange market the currency in which a loan is denominated should be a matter of indifference from the point of view of cost. During the 1970s, however, this did not hold. There proved to be a considerable time lag before the effect of the widely diverging rates of exchange on expectations worked their way through so that the relative strength of the different currencies also had an impact on interest levels. In Sweden the shipbuilding yards, for example, felt the effect of this. During the first part of the 1970s they contracted large loans in CHF, at what seemed at the time to be attractive interest rates, and invoiced in USD. However, in light of the later development of the Swiss franc against the Swedish krona, these interest rates proved too high. During the 1970s interest differentials

have not fully compensated for changes in exchange rates. Thus new factors came to affect the cost of the loan: as well as interest costs there were also exchange differentials and hedging costs, both of which were to prove quite substantial.

It has already been intimated that during the 1970s the cost of borrowing varied very much, depending on the currency in which the loan was contracted. In view of the accounting principles applying in many countries with regard to reporting the cost of capital, the apportionment between interest payments and exchange rate differentials becomes important and should be considered in accounting contexts. Under current national and international systems the apportionment of capital costs over time and their evaluation in the accounting differs as between loans in 'strong' currencies and those in 'weak' currencies. ('Strong' currencies are characterized by rising prices *vis-à-vis* the domestic currency and are accompanied by low interest rates in the countries concerned; in Swedish terms this means CHF, DEM, JPY. 'Weak' currencies are distinguished by falling prices *vis-à-vis* the domestic currency and are accompanied by high rates of interest — in this case GBP and, for the 1970s, the US dollar.)

Even if the basic cost of borrowing during the studied period turns out to be the same for loans (carrying equal financial risk, see Fisher's Open Relationship, Section 4.2.3) in USD, DEM and SEK, for example, differences can nevertheless arise in the accounting. If, for example, the interest rate on loans in SEK is 10 per cent, in USD 14 per cent, and in DEM 7 per cent, then for a Swedish borrower the annual cost of the loan in USD is reported at 14 per cent, while the loan in DEM is reported at 7 per cent plus any exchange differentials, which can be apportioned (that means deferred and amortized) to different periods. The possible exchange gain on the loan in USD is reported first when the loan is liquidated, and can be expected to be of the order of 4 per cent ($r_{SWE} - r_{USA}$). Likewise the exchange loss on the loan in DEM can be expected to be around 3 per cent per annum.

As a result of all this, anyone trying to assess a company's financial position is going to find it very difficult to interpret the accounting information provided. Much more detail is needed if the differences in reported results which can arise from this treatment of capital costs are to be allowed for. The problem is connected to some extent with the distinction between exchange differentials and other financial costs and revenues. For example, *can the actual interest rate on foreign loans be replaced by some better measure of the total financial cost?* A possible alternative which will be described in greater detail below, is to apply the theoretical approach already mentioned whereby the difference between two countries' Euro-interest rates is assumed to reflect the expected movement in exchange rates over a given period.

Let us suppose that a businessman takes up a loan in CHF at a 3 per cent annual rate of interest, with the alternative — often, perhaps, a hypothetical one — of an equivalent loan in his home currency (say, SEK) at an annual interest rate of 10 per cent. In concrete terms this means that for the borrower the whole of this second rate is reported as a financial cost. The 7 per cent difference corresponds to the expected depreciation of the home currency during the year in question. This method of gauging the cost also provides a basis for evaluating a company's overall foreign exchange dispositions in terms of opportunity cost.

Apart from the distinction between interest costs and exchange differentials, the problem is also connected with the evaluation of these exchange differentials. *How much should be charged to any one year's result?* The problem has become more acute as new types of currency system have evolved in the wake of the breakdown of the Bretton Woods agreement.

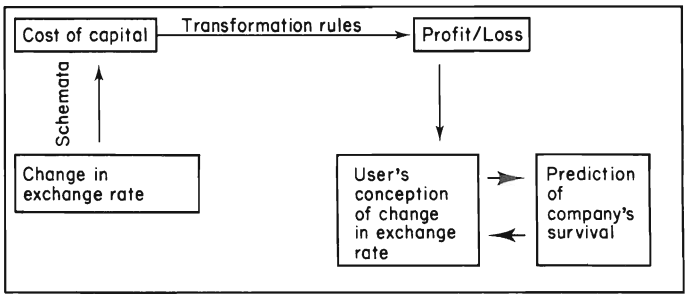
In these systems (see Appendix 1) one currency is often pegged to another which is commercially important to the country concerned and which belongs to a country with an 'acceptable' rate of inflation. A currency can also be pegged to a basket or aggregate of other currencies. The idea of these systems is to suppress systematic differentials in certain important factors by means of monetary measures, in the hope of achieving a balance. However, experience suggests that this damming-up of systematic deviations generally resolves itself in some kind of major intervention on the part of the country's central bank (see Black, 1980).

In 1977 the accounting problem was further aggravated in Sweden as a result of the devaluations of the Swedish krona. Were the effects of the devaluations to be attributed to the results for 1977? Or were they to be regarded as an accumulated imbalance in Sweden's rate of inflation *vis-à-vis* the rest of the world? Had the control exerted by the Swedish central bank by means of currency reserves, international credits and other weapons of monetary policy thus led to a resolution in the shape of a devaluation rather than a successive adjustment in exchange rates as motivated by the demands of competitiveness and parity in purchasing power?

If the full impact of the change in exchange rates is allowed to fall on the results for the year in which devaluation has occurred, then the measures imposed by the central bank will greatly distort the picture of the company's results for the year in question and, consequently, the decisions which are a function of the reported results. Given a concept of profit such as that adopted by the Sandilands Committee, the effects are particularly unfortunate. In the case of strong loan currencies the reported results may encourage an excessive distribution of profits and

even a mistaken view over several years of the scope available for wage increases. For the year in which the intervention has occurred the company is then encumbered with disastrously heavy capital costs. The real problem lies in the inability to account for the deterioration in results at an earlier stage.

The problem is thus to design schemata and transformation rules such that exchange trends are 'correctly' mapped in the company's accounting output, i.e. anyone studying the accounts will get an idea of the effects of the change in exchange rate that does not differ significantly from the *de facto* change. This is illustrated in the accompanying box.



The problem is to find schemata for translating changes in exchange rate into period costs and revenues, which should perhaps be charged to the company's result. The transformation rules indicate how these costs or revenues should be allowed to affect results. The development of these schemata must be based on *an understanding of exchange rate movements and the factors affecting them*. This knowledge can be derived from various prediction models and from their empirical verification.

In the example of the loan in CHF quoted above, reporting only the direct 3 per cent interest cost as the financial cost of the loan up to the moment of liquidation, would be to mislead the reader of the financial statements. On the other hand, taking up the entire change in exchange rate when it arises, and assigning it to the results for the year in question, presents a sharply distorted picture of the company's profit potential. The change in exchange rate may have been motivated for a long time, but for various reasons of monetary policy and because of the pegged nature of the exchange rates, it becomes manifest first in a single major adjustment involving devaluation.

There are no generally applicable principles in this area of accounting in Sweden. In the light of international experience the Accountancy Board has hitherto recommended the consistent use of the closing

rate when reporting the foreign assets and debts of Swedish companies. A possible change in the Accountancy Act was postponed, however, pending the appearance in the USA of the revised version of FASB 8, the contents of which were very similar to the Swedish recommendations. Evaluations of the new version, FASB 52, are now being awaited with interest.

In view of the international interest in FASB 8, this seems an appropriate place to examine the criticism which the method aroused and which eventually resulted in its revision. The main points raised were the following (see Peat, Marwick and Mitchell & Co., 1980):

1 Unnecessary fluctuations are reported in income.
2 Accounting exchange gains or losses can be reported where the reverse has occurred from an economic standpoint.
3 Financial statement relationships are restated from those reflected in the foreign currency operations.

Thus, if possible the new models should hinder any reinforcement of these fluctuations as a result of the evaluation of debts in foreign currencies. The short-term fluctuations that trigger off variations in results can arise, for example, from movements in the accumulated OPEC surplus, which is largely denominated in USD, although this situation is specific to USD. In the case of SEK there are no similarly dominating factors. Instead relatively minor factors can have quite a substantial impact on the rate of exchange because of the limited extent of the market for kronor.

What, then, are the basic alternatives? They should first and foremost provide an answer to two questions: how existing or expected exchange differentials should be distributed over the duration of the loan and how they should be allowed to affect the result, and if and where in the profit and loss account the exchange differentials should be reported. The impact of the fluctuations and of any intervention then becomes a question of the way the exchange differentials have been allocated over time.

We have already mentioned the alternative whereby the entire exchange differential originating in a particular year is allowed to affect the result of the year in question. Alternatively, in accordance with the principle of realization, the exchange differential should be deferred until the loan is liquidated. In the case of minor changes in exchange rates such as those that occurred during the 1950s and 1960s, this was probably both a practical and a convenient procedure. During the 1970s and 1980s, however, it would have meant that the effect on results would have differed depending on whether the loan was in a strong or a weak currency.

Another alternative of a rather extreme kind is to try to anticipate the exchange loss over the whole period of the loan, and to charge it to the profit and loss account during the first year. Even in this case the impact of the capital cost on results will vary. Another disadvantage is that the estimated loss is based on expectations with all their attendant uncertainty. The advantage of the system is that in most borrowing countries the companies will probably obtain an interest-free tax credit.

These two extreme alternatives serve to underline the different structure that the capital cost assumes in different currencies. The fundamental idea is that the capital cost of a loan can be expected to be independent of the currency in which it is denominated. The expected cost corresponds to the interest cost on an equivalent loan in the home currency. This interest cost is nominally unchanged throughout the period of the loan (changes in conditions can occur but are disregarded here). Thus, at least in light of the company's aim of market value stabilization, the accounting procedures should not prevent the capital cost from being distributed evenly over the period of the loan, even under other alternative systems. The justification of this approach is that it avoids large one-off accounting losses. Short-term fluctuations can also be eliminated.

Aliber and Stickney (1975) point out that all assets and liabilities in foreign currencies are exposed to exchange risk in the short run. They claim that in the long term the Purchasing Power Parity theory should hold for nonmonetary assets and liabilities and Fisher's Open Relationship for monetary items. The two extreme alternatives mentioned above are not compatible with this approach.

The solution lies in some form of apportionment over several periods. The use of the closing rate is an example of a possible solution. Other alternatives can be envisaged, based on amortization (the apportionment of book costs or revenues) or on anticipation (the anticipation of a cost or revenue, possibly followed by its redistribution).

If amortization is applied exchange differentials can *de facto* be distributed over several periods. The choice is generally between

(1) retrospective distribution
(2) apportionment over the remaining term of the loan
(3) apportionment over the total term of the loan.

Apportioning exchange losses arbitrarily over several years may result in an over/undervaluation of the debt in the company's balance sheet, and a consequent distortion of the company's credit status. However, the 'correct' value of the debt could be given in a note to the balance sheet.

A decision on possible apportionment involves a decision between profit-and-loss-account and balance-sheet considerations. The traditional notion that the accounting system should result in congruence between balance sheet and profit and loss account thus has to be abandoned.

The great attraction of anticipation lies in the hope of avoiding the dramatic effects on results which large, one-off losses can have. One argument against this method stems from the currently accepted norms regarding the verifiability of accounting data. The argument behind anticipation may have been, for example, that when a country's price and cost relationship with the rest of the world changes in some fundamental way, its rate of exchange is, in the long run, also expected to change. However, this is not 'verifiable' in the sense currently obtaining. We are here touching upon an important question, namely to what extent it is possible to predict changes in foreign exchange rates. We shall devote a large part of Chapter 4 to the analysis of the ability of different prediction models to produce fairly accurate forecasts.

In both the anticipation and/or the amortization systems an adjustment will be made when the loan is finally liquidated. If relatively large sums have to be included in the profit and loss account on this occasion, then we can probably say that the chosen alternative has not worked satisfactorily, on the same grounds as when the entire exchange differential is reported on liquidation.

2.4 AIMS

The relation $P \rightarrow I$, i.e. the transition from problem to ideal aims, involves an operationalization of the problem under investigation. The planning of the investigation then constitutes the transition from ideal to actual aims, i.e. $I \rightarrow A$. The difference between I and A represents the delimitation which will be described in Section 2.5.

2.4.1 Ideal aims

The overriding goal of the present study, which is subject to a systems view of the company and its stakeholders, is to examine the communications between the different parts of the system in connection with the company's financial statements and the effects of financial market fluctuations. We note in particular the need for information as a basis for decisions in different parts of the system. Starting from normative decision theory, the chief aim is to develop models for the translation of changes in exchange and interest rates and transformation rules whereby these translations can be combined to provide a

basis for the decisions of the internal control system and the external stakeholders. We will first chart the various internal decisions that are affected by uncertainty on the international financial market, and this will help us to establish the kind of information that seems desirable. On a basis of these requirements and those of the external stakeholders, a norm system will be evolved in light of the methodological frame of reference described above.

In order to elucidate the full range of the problem, as part of the ideal aims, the implications of financial market fluctuations for the goal of corporate survival will be the subject of an empirical investigation.

2.4.2 Actual aims

On a basis of economic theory the concrete aim of the investigation is to recommend and empirically evaluate alternative principles for the reporting of the capital cost of medium- and long-term loans in foreign currencies. How to treat financial market fluctuations? Special attention will be paid to that part of the cost which arises from exchange rate fluctuations. The kernel of the study is embodied in the notion of cost as an outlay apportioned to different periods. It is my hope that the model for distributing the cost over the total period of the loan, which will be described below, will make a useful contribution to normative accounting theory.

To provide a basis for examining different accounting principles we can first examine some features of the spot and forward markets. The norm system which will subsequently emerge will have its base in the theoretical and empirical regularities to be found in these markets. The empirical part of this examination refers to the period 1974–84. At the same time the cost of borrowing in different currencies during this period will also be studied. The cost will be divided into an interest cost and an exchange-related cost.

The alternatives described will be evaluated by comparison with prevailing international principles. They will be judged in light of how they would have operated during the period 1974–84.

Although the models refer to the evaluation of foreign loans only, a real understanding of the interactions between the various internal decisions calls for an overall framework. For this reason a systems overview will be evolved.

Ambitions regarding the precision of the various measures are naturally affected by the large arbitrary element that is always to be found in accounting. According to the Swedish regulations, for example, depreciation should be planned by

> assessing the economic life of the assets and the appropriate distribution of the costs to different periods of the future.

And the recommendations in other countries are equally vague.

There is thus every reason to call for *simple, manageable measuring rules — schemata* — rather than for sophisticated and complicated methods that have to be adapted and modified to suit any particular case, even if methods of this kind can lead to more accurate results. Many writers (e.g. Ijiri, 1975) have emphasized the importance of hard data when there is a risk of conflicting interests.

An accounting method — a given set of schemata and transformation rules — should be judged on the following grounds: first, does it *help* people who study the accounts to understand and evaluate the company's results and status, and secondly, does it result in appropriate allocations which will *'reserve'* funds for future use in case of major one-shot changes in exchange rates such as those connected with a devaluation?

The first point refers to the *predictive* function, and answers a need of both internal and external users. The second is an extension of the first, and is of interest internally. It refers to the maintenance of *payment capacity*. A third attribute which can be required of an accounting method refers to the *control* of the company's financial allocations. For this purpose it is important that any difference between actual capital cost and the cost estimated when the loan was contracted should be clearly visible in the financial statements.

The predictive function is fulfilled if the information provided by the company allows the users to form an idea of the company's ability to make future profits (i.e. to fulfil its survival goal).

The maintenance of payment capacity calls for the reservation of funds by means of successive allocations, a need which arises from the assumption that at any given time, as a result of the nature of the currency system, the exchange rate contains accumulated systematic imbalances. For example, if loans are evaluated at the closing rate, excessively 'high' profits could be reported over a number of years. If as a result of the above-mentioned imbalances some intervention then occurs, a reserve will be needed to cover the costs which, as a result of the nature of the currency system, will appear at too 'low' an evaluation.

Thus it should be possible, in a simple way, to discover the 'correct' cost of the loan that should be charged to the results of the relevant period and the size of the remaining debt.

But how can the cost be 'correctly' distributed? The corporate aim of 'market value stabilization' motivates a *uniform* distribution of the cost over the term of the loan, which is also justified on practical grounds.

However, these annual instalments can only be accurately assessed in retrospect, so that if they are based on sums at current prices it would be necessary to know not only the nominal interest on the loan but also the exchange rate movements during the whole term of the loan. If on the other hand the instalments are expressed in sums at fixed prices, yet another piece of information would be necessary, namely the rate of inflation during the term of the loan. The real rate of interest can also be recorded as the nominal interest on the loan minus the rate of inflation in the country of the denomination currency. Thus Swedish inflation is not expected to affect the real rate of interest on a loan in DEM, for example, since the real value loss caused by inflation in Sweden is expected to be counteracted by an appreciation of the German mark. Whichever version of the annual instalment solution is chosen, estimates of exchange rate movements and/or inflation rates during the period of the loan will be needed. What opportunity does the economic theory and empirical evidence provide us with to redistribute the effects of financial market fluctuations in a 'market value stabilization' way?

An advantage of distributing the cost on the instalment system is that it shows explicitly the interest computed by the company when the loan was first made. In other words it satisfies the third criterion by which we have suggested that an accounting method should be judged.

What requirements on the quantitative side should be made of an accounting method? Here we adopt the view that the method should allow for an *even* distribution of the capital cost over the period of the loan, and for a *small reserve* that has to be dissolved when the loan is finally liquidated — in other words there should be a slight difference only between the estimated and the *de facto* rate of exchange.

There are many other potential requirements that could be formulated. The basic idea is here to eliminate from the company's financial reports short-term fluctuations due to systematic or random disturbances in exchange rates in order to improve the assessment of the company's future profitability. Besides this forecasting requirement, a more even distribution will also improve the company's payment capacity. Behind the requirement of an even cost distribution we find a corporate demand for 'market value stabilization'. Accounting procedures creating random variations in the profit and loss account are expected to counteract this stabilization and, for instance, to contribute to higher future financial costs.

A totally even distribution cannot be attained without knowing the change in exchange rate during the loan period. In our quantitative analysis we will be interested in a 'more even' distribution, which means a smoother distribution than that obtained from an evaluation

based on the closing rate in a system of pegged exchange rates, for example. Naturally the distribution of the capital cost cannot become more even than the development of the normative basis used in the apportionment of the cost.

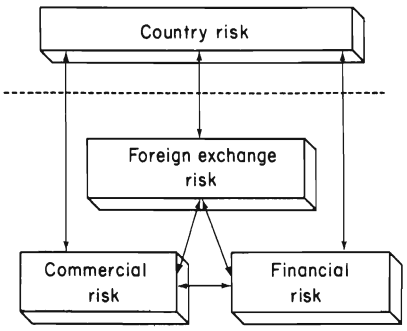
Our distinction between an internal accounting goal connected with control and an external goal contingent on various legal requirements, is motivated by the probability that different methods will prove appropriate to the two cases. Thus the control function would be well served by an assessment of alternative loans and a possibility of subsequent checking against actual outcomes. This allows for an evaluation in terms of opportunity costs such as is rarely possible in the external accounting, where the different decision alternatives are not considered. Such possibilities will have increasing importance with the trend for corporate finance becoming separate profit centres.

2.5 DELIMITATION OF THE STUDY

In the following pages we shall be discussing the reporting of the capital costs of medium-term and long-term loans, i.e. of debts voluntarily assumed as a result of corporate financial decisions. Debts of this kind call for negotiations with the creditors about interest rates and amortization conditions. In making its decisions the company will be guided by, among other things, its experience of previous financial decisions of a similar kind. The systems view adopted here should help companies to understand the implications of their own earlier decisions. With the same purpose in mind we shall also touch upon the concept of risk, mentioning in particular the importance of assets abroad and claims in foreign currencies.

Bearing in mind a corporate risk surface according to Figure 2.4 with a trade off between risks as all being different expressions of the

Figure 2.4 The company's risk



same macroeconomic imbalance, we will concentrate here on effects of exchange rate and interest rate fluctuations.

Differences that arise in translating the annual accounts of foreign subsidiaries will be briefly examined and reference will be made in particular to current discussions on this issue. The reporting of foreign subsidiaries' loans in a third currency will also be touched upon.

The foreign exchange risk with adjacent gains and losses can also be classified in terms of its source. It can be seen from Table 2.1 that the

Table 2.1 Sources of exchange risk

	Type of company			
Source of risk	Multi-national company	Domestic company with export and import	Domestic company with all operations in Sweden but with loans in foreign currencies	Strictly home-based companies—no trans-actions in foreign currencies
Monetary and negotiable securities in foreign subsidiaries	X			
Real assets in foreign subsidiaries	X			
Present and future gains in foreign subsidiaries	X			
Stocks	X	X		
Export and import	X	X		
Claims and debts in foreign currencies	X	X	X	

sources are different for different types of companies. The table also includes the strictly home-based company, in view of its indirect effect on the exchange risk by way of the financial and commercial risks.

In this study we concentrate mainly on domestic companies, i.e. companies operating exclusively in their home countries, here often exemplified by Sweden, which have, however, taken loans in foreign currencies. But the models developed below, together with the systems approach to exchange risk which is presented in Chapter 3, should be applicable far beyond this apparently narrow range.

The study includes an empirical analysis of the spot and forward markets, i.e. an analysis of hard data. No primary data will be collected on such questions as the relation between manufacturing parent companies and their subsidiaries with respect to currency problems in internal pricing etc. Empirical findings from such an investigation of Swedish multinational companies can be found in Oxelheim (1984d).

We shall not address the general question of increasing debt-incurrence, i.e. the utilization of the financial leverage effect and its implications for the financial risks.

2.6 RELATED STUDIES

Since 1975 the emphasis in the accounting debate has again veered towards the reporting of exchange differentials and the closely related subject of inflation accounting.

Since the whole subject is currently under the spotlight, Chapter 6 will be devoted to describing contemporary international developments in foreign exchange accounting. In the present section I shall mention some earlier writers who have discussed certain important aspects of particular interest to us here, namely:

(1) Goal perceptions in connection with the profit concept
(2) Concept of balance
(3) Conception of measurement theory.

As regards the conception of profit, the accounting of exchange rate differences has much in common with inflation accounting — for example, the problem of distributing spurious profits to dividends and as a basis for taxation.

The general debate on inflation accounting has thrown up many interesting ideas about the meaning of profit. In the UK the Inflation Accounting Committee was set up to examine various models of inflation accounting and their effect on corporate investment and efficiency. The rate of inflation had been rising continuously in the UK

ever since the beginning of the 1960s, and innumerable British companies were facing a liquidity crisis. The general impression at the time was that the companies had got themselves into this situation as a result of misleading information about their own results which had encouraged high dividends and excessive wage increases. The Committee's search for a way of providing 'true and fair' annual statements of the taxable and distributable gains, which would also allow for the financial consequences of inflation, resulted in the profit concept which is previously mentioned and which has guided my own approach:

> Profit for the year ... may usefully be defined as the amount of the total gains arising in the year that may prudently be regarded as distributable.

The concept of financial status stressed in this book, with its focus on the profit and loss account, agrees with the 'dynamic' approach developed in Schmalenbach (1962), where the calculation of the period result is of central interest. The idea is to provide comparable results from one period to the next, and so on. The balance sheet is regarded as investigatory, and is subordinated to the profit and loss account. According to Schmalenbach correct periodization and continuity regarding the calculation rules are necessary but not sufficient requirements. In calculation under uncertainty he recommends choosing the approach to evaluation which has the closest connection with the real world, thus giving priority to the acquisition value over the current value as a basis for evaluation. Changes in the value of money should be taken into account if they are substantial. According to the dynamic balance theory the interesting question is whether any value added has arisen in the company and, if so, how it has developed. The national economy is to be regarded as an aggregate of all the individual companies, and is thus dependent on these companies being steered towards success (cf. Friedman, 1962).

Mattessich (1964) advocates a normative approach and he emphasizes the advantages of quantitative accounting methods. The main function of accounting in his view is to classify and to measure. Three measuring situations can be distinguished:

(a)	fundamental measurement	—	based on laws of nature
(b)	derived measurement	—	based on laws relating the property under investigation to other properties

(c)	measurement by fiat (ad hoc measurement)	—	based on rather vague and arbitrarily selected relations between the property under investigation and other properties.

The emphasis has shifted from verifiability to providing a base for decisions in the company and for assessments of management performance, i.e. from stewardship to steering/control.

Rieger (1928) represents a step in the same direction. He sees the annual financial statements as a provisional settlement required to meet certain important practical ends. They are intended to indicate any profit that may have arisen. Stakeholders cannot be expected to wait for liquidation or some other definitive resolution; instead they must base their judgements on calculations of probabilities. Rieger discusses the problems of amortization. His search for a theoretical, accurate basis for evaluation leads him to the concept of present value, which resembles the concept of capitalized income in economic theory. In this way he heralds the school which seeks agreement between accounting theory and economic theory.

Ijiri's (1975) emphasis on hard data makes him interesting from our point of view. Ijiri puts his view as follows:

> Accounting is viewed as a system for communicating quantitative information about the economic events of an entity.
>
> ...
>
> A measurement scheme must be carefully designed in the light of the known real relation among the attributes and the objects.

These works, all of which address accounting as measurement theory, can be said to provide the point of departure below. The focus adopted here in the field of measurement theory stems from the constellation Schmalenbach – Ijiri – Mattessich – Rieger and concerns the *effects on the profit and loss account determined on a basis of hard data from known relationships in economic theory*.

When it comes to principles for reporting exchange differentials, FASB 8 has been the subject of widespread international debate. FASB 8, and the revised version, FASB 52, will be discussed in Chapter 6.

The main departure from FASB 8 is that according to FASB 52 firms may now translate all assets and liabilities in current, rather than historical, exchange rates. To avoid the distortion in earnings that often showed up in the past as a result of including gains or losses in the net income sections of balance sheets, these can under FASB 52 be reported as a separate item in the company's equity statement.

The provision defining a functional currency, however, may continue to create problems in the eyes of many corporate officers attempting to measure the results of operations in hyperinflationary countries. Many corporate leaders believe this still fails to reflect financial results realistically because it simply continues the old FASB 8 'temporal' system.

Many studies have been made of corporate attitudes to FASB 8 and of the way market rates have reacted to the change in accounting procedures which its introduction involved. See, for example, Dukes (1978), Evans, Folks and Jilling (1978), and (with more recent data from 1977) Jilling (1978). These three works have helped to crystallize the objections to FASB 8 and have led to various suggestions. The main criticism concerns the variation in results which is caused by repeated translation at current exchange rates which cannot be justified on grounds of any corresponding variation in cash flows.

Dukes came to the conclusion that FASB 8 had had no impact on the development of share prices, assuming constant risk, although he regarded this result as preliminary only. He reports on the many limitations in his study. We should also remember in interpreting these results that fluctuating exchange rates and the new accounting standards were studied for the period 1975–76 only.

Another study of the economic effect of FASB 8 is reported in Peat, Marwick, and Mitchell & Co. (1978). It had been found that, in the companies studied, exchange hedging increased both in frequency and size after the introduction of FASB 8. However, the authors conclude that FASB 8 led to only slight changes in the main operative procedure, but that a great many companies had significantly altered their methods of financing foreign operations. Later the same team of authors compared FASB 8 and its revised version (Peat, Marwick, and Mitchell & Co., 1980), relating the new recommendation to the criticism of the earlier version. The criticism will be analysed in Chapter 6 below.

A summary of the effects of FASB 8 and of the articles in which it is discussed can be found in Shank, Dillard and Murdoch (1979), where a short survey of more recent articles on the development of accounting principles for exchange rate differences is included.

The importance of the link between decision-making and accounting routines has already been mentioned. A good deal of what has been written applies to American companies; but two works should be mentioned in which other currencies have provided most of the material. The first of these is Scharrer, Gehrmann and Wetter (1978), which discusses currency risk cover in German import and export companies. The investigation is based on a study of 755 companies and is entirely descriptive. The second report (Nars, 1979) discusses

an investigation based on a sample of 32 Finnish export and import companies. This study is also descriptive, examining behaviour in terms of certain endogenous and exogenous variables connected with exchange strategy. The study referred *ex post* to the period 1970–77.

Great attention has been paid to the foreign exchange accounting problems, but almost no research has been devoted to efforts to eliminate drawbacks in existing accounting methods by linking, in a consistent manner, the theory of open economies to the theory of foreign exchange accounting.

2.7 METHODOLOGY

Two main methods can be used in registering developments in a company: the measurement of activities or the measurement of consequences. The secondary aims of this book can to a great extent be formulated in terms of these categories.

For the main purpose — the development of normative schemata — it would be interesting to measure and chart information requirements at every level in the internal decision process and among external stakeholders. 'Good information', if we are to seek a common standard at least for this second category, has been defined above as information with predictive value. Nonetheless there is also good reason to look into information requirements in somewhat greater detail, and, with this in mind, a systems view of the company and its stakeholders will be introduced in Chapter 3. That special standards are created for the internal accounting, for purposes of follow-up and control, should not then give rise to any objections on principle.

The various principles recommended will be judged by measuring their consequences. The methods will be tested for the major loan currencies for the period 1974–84. The models are based ultimately on macroeconomic theory. The focus is on explanatory information, and the search for regularities is therefore of pivotal importance. In the case of exchange rates and interest rates three types of model can be useful in this search, namely *structural models, time series models* and *arbitrage models*. The structural models help us to express the relationship between the entity to be explained — the rate of exchange — and a number of explanatory variables. The pure time series models (no variables other than time and the explanatory variable) are formulated in terms of the studied variable's historical development. The arbitrage models express direct market relationships. In order to verify the regularities in different rates of exchange, a statistical analysis of exchange rates between 1974 and 1984 has been performed using these models. The analysis was based on a data file, for which the content is listed in Appendix 2.

A secondary aim has been to investigate the apportionment of the loan cost between interest payments and exchange rate changes for various currencies and to compare this with the case of an equivalent loan in SEK (although the analysis can of course equally well be used for comparisons between other currencies). In Chapter 5 these costs will be discussed in light of an analysis of the consequences as measured in terms of the additional or saved cost to the company resulting from the choice of one currency rather than another (SEK or other). The need for relevant information on which to base the choice of loan currency and the subsequent follow-up and control of decisions on foreign borrowing will emerge very clearly from this part of the study. The results presented in Chapter 5 will stress how different ways of apportioning the loan cost, given the closing rate alternative, can lead to differences in the reported capital cost.

The following presentation of the alternative normative bases which can be derived from macroeconomic theory will be accompanied by an empirical analysis intended to illustrate the persistence of these bases during the period of the study and the extent to which they can provide a basis for model-building. This part of the study, as well as the evaluation of the different methods recommended in this book, is based on a measurement of the relevant consequences.

2.7.1 Choice of period to be studied

The study is retrospective and based on charted exchange rate patterns — spot and forward rates — in the major loan currencies in the international capital market and on an analysis of the capital cost of loans in these currencies. In view of developments on the foreign exchange market after the breakdown of the Bretton Woods system, the period 1974–84 appeared to be a reasonable choice. As our interest is in the cost of medium-term and long-term loans, a longer period of study might have seemed desirable. The implications of the time limits will be discussed in connection with the evaluation of results.

During the period in question Sweden changed its currency system: it left the European currency snake in 1977 and subsequently pegged the Swedish krona to a basket of 15 other currencies. The effect of this on the results of the analysis will also be discussed below. The two systems resemble one another in that the Swedish krona is tied in both of them to the movements of some other currency or combination of currencies. Consequently devaluation or revaluation may become necessary as a result of accumulating differences between these currencies in various fundamental respects.

Some shorter periods within the period 1974–84 evince certain special characteristics of their own and have therefore been subjected to a separate additional analysis. The sub-periods under investigation are 1974–76 and 1978–84.

In many ways the years 1974–84 represent a period of 'transition'. This may mean that some expectations about various aspects of the future may still have been in a state of flux at the time. Since many of the economic relationships are formulated in terms of these expectations, there may be certain initial problems in applying the models which are based on the normative bases proposed below.

2.7.2 Data collection

The data base which constitutes the basis for the empirical analysis contains series for exchange rates, interest rates, consumer, wholesale and producer price indices. The currencies for which data has been collected are:

British pound (GBP)
US dollar (USD)
West German mark (DEM)
French franc (FRF)
Belgian franc (BEC)
Swiss franc (CHF)
Swedish krona (SEK)
Dutch guilder (NLG)
Danish krona (DKK)
Norwegian krona (NOK)
Italian lira (ITL)
Austrian schilling (ATS)
Japanese yen (JPY)
Finnish mark (FIM)

The exchange quotations refer to the price of a currency for delivery within two days (spot rate) and the price of a currency for delivery in three months' time (three-month forward rate). Quotations are given for the period from the second week in 1974 until the middle of 1984 (subsequently referred to as 7402–8426) and refer to the exchange rates quoted every Tuesday during this period. If Tuesday coincided with a public holiday, the quotations for the next working weekday were registered instead.

Time series with weekly data for the Euro-interest on three-month deposits have been reconstructed on a basis of the Tuesday quotations in the *Financial Times* for the period concerned. These quotations refer to GBP, USD, DEM, CHF and NLG only. The Euro-interest on SEK has been calculated from the Euro-interest on USD and the premium/discount for SEK/USD for three-month loans.

Series for interest levels on long-term loans in different currencies and as annual averages have been put together with the help of lists and analyses of successive interest reports in *Euromoney*. The terms of

issue for long-term bond loans in Sweden have been taken from data published by the Swedish Central Bank.

When interest rates are used as the basis for various kinds of economic comparison, it is generally assumed that they correspond to the same financial risk for loans and investments. For purposes of comparison several series for short-term interest rates of this kind have been reconstructed from figures published in *World Financial Markets*. Comments on any differences in loan conditions are included in Appendix 2.

Time series for inflation rates have mainly been reconstructed from the consumer price index and the producer price index in the *UN Monthly Bulletin of Statistics* and *OECD Main Economic Indicators*. The different definitions used in the indices in the various countries are specified in Appendix 2.

2.7.3 Choice of analytical method

The present investigation is an exploratory study of movements in exchange and interest rates, and as such it is intended as a contribution to normative accounting theory. However, certain hypotheses about the normative bases are tested.

The accounting methods discussed below are judged on their empirical success in fulfilling certain quantitative requirements during the period of the study. The requirements are first formulated as statistical measures which are then examined in relation to the particular effects which may be connected with the choice of a certain period. At this point we will also discuss the applicability of the various accounting principles in a broader context, and comparisons will be made with the demands of current accounting conventions (e.g. the demand for verifiability).

2.8 PLAN OF THE FOLLOWING CHAPTERS

Chapter 3 is theoretical in its approach and is concerned with information requirements, inside and outside the company, which are related to financial market fluctuations. This question has already been touched upon, but will now be subjected to a systems view. The concepts of foreign exchange risk and foreign exchange strategy will also be discussed here.

Before we can develop schemata we must know something about the regularities in exchange movements and the explanatory variables connected with them. Chapter 4 is devoted to analyses of potential normative bases. An introductory theoretical section is followed by an

empirical analysis of the value of the Swedish krona against other currencies. Different forecasting possibilities will also be discussed here, and three types of prediction model introduced, namely structural, time series and arbitrage models.

In Chapter 5 the reader can follow an empirical analysis of the capital cost of foreign borrowing for the period 1974–84. Movements in interest rates are plotted and together with the exchange rate movements described in Chapter 4 these provide the point of departure for the analysis. From these movements we derive measures of the costs connected with loans in different currencies. By illustrating the great variations in these costs I hope to convince the reader of the vital need for information on which the choice of loan currency can be based, and by demonstrating the striking differences in the apportioning of the cost between interest rates and exchange rate changes I hope to spotlight the need for new evaluation principles.

Chapter 6 presents an overview of the current debate in the area of foreign exchange accounting, thus providing an introduction to the following chapter. The most important international principles are described, as well as some of the objections which they have engendered.

In Chapter 7 our search for schemata and translation rules finds expression in recommendations regarding evaluation principles for loans in foreign currencies. Three possible evaluation procedures are presented. Section 7.7.1 is devoted to an empirical evaluation based on figures showing the hypothetical performance of the proposed methods used in the period 1974–84.

The main conclusions together with implementation aspects are presented in Chapter 8.

Chapter 3

Foreign borrowing in corporate operations — a systems view

3.1 INTRODUCTION

This chapter will be concerned with foreign borrowing as part of a company's total operations. Offensive and defensive motives for corporate borrowing in foreign currencies, and various other aspects of these loans, will be considered. The chapter is intended to provide a systems view of the major informational aspects of financial market fluctuations.

Section 3.2 contains a systems picture of corporate decisions under conditions of foreign exchange uncertainty. In the present book we concentrate on the reporting and evaluation phase, but the systems approach will indicate the many links with other phases.

Section 3.3 will be concerned with capital maintenance and capital requirements in the company, and the various offensive and defensive motives are discussed. If capital is needed to finance transactions, we can say that we have an offensive motive for borrowing abroad. If the foreign loan is seen as a way of reducing the risk of exchange losses and hedging the net of assets and debts in a particular currency, then the motive for the loan can be described as defensive. In this section we also discuss some of the decisions connected with borrowing on the international capital market. The concept of exchange risk is treated in Section 3.4. The problems involved in determining the size of the risk and deciding what measures may be taken to affect it are briefly discussed, and some of the more common methods of determining risk are described.

Section 3.5 is concerned with corporate exchange strategies as a whole. How far can companies influence their exchange risks? In a company whose only foreign transactions consist of borrowing abroad, hedging on the forward market generally offers the only chance of minimizing the risk. If a major change in exchange rates is obviously imminent, the company can of course liquidate a loan before it has run its full term, but present legislation in many countries

severely limits the use of this solution. An exchange reserve can provide an internal hedging alternative, and the possibility of building up a reserve of this kind is discussed in Section 3.6.

3.2 SYSTEMS PICTURE OF CORPORATE DECISIONS UNDER FOREIGN EXCHANGE UNCERTAINTY

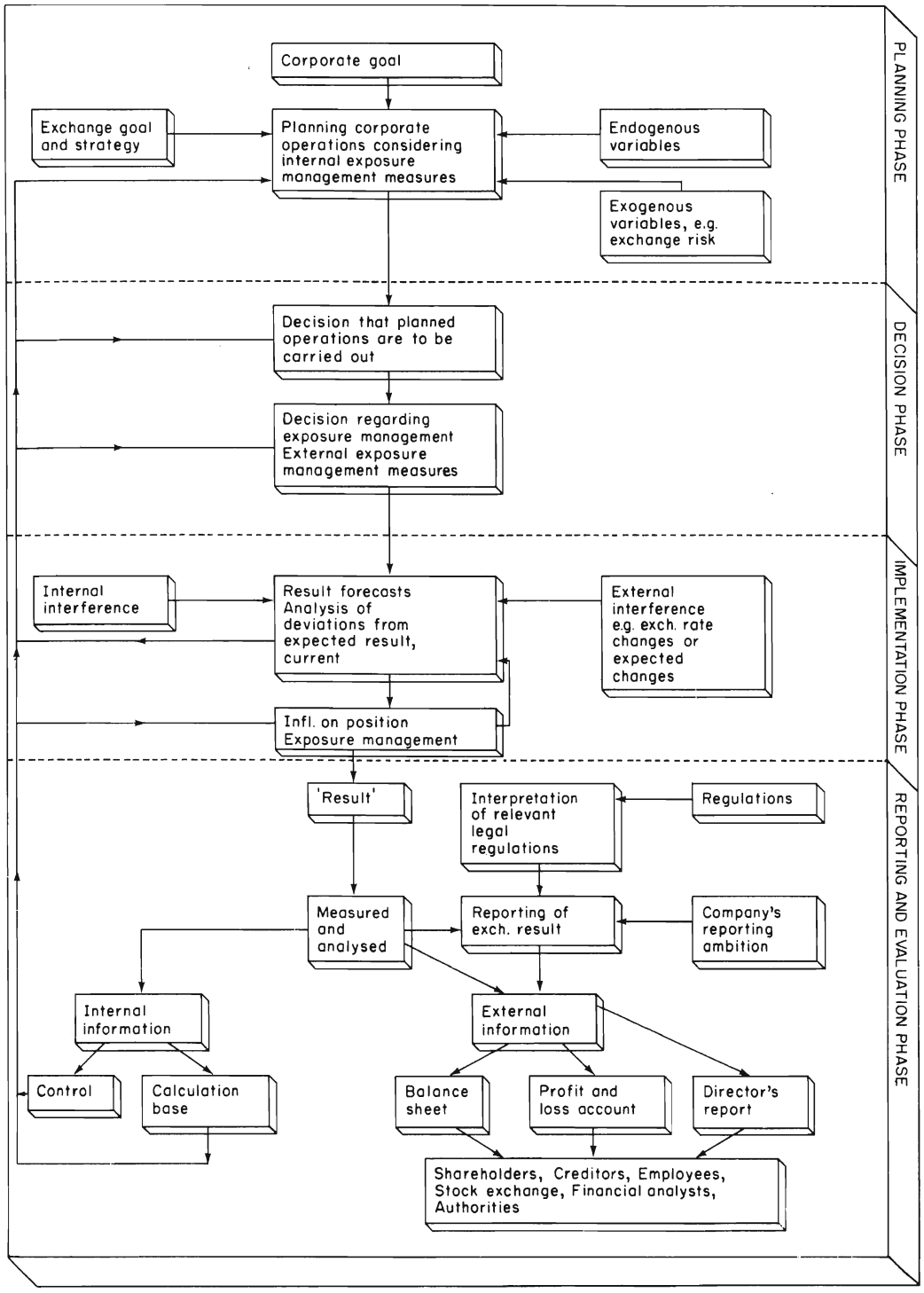
The company is exposed to many risks. One of its main tasks is to handle these risks. 'Risk' refers to uncertainty about the future value of the company. This value is affected by changes in interest rates, inflation rates and exchange rates from a macro perspective, but also by changes in prices and volumes on the company level. All these five variables are sources of unfavourable changes in the company's future economic value. They are interdependent and should be analysed simultaneously in order to obtain an assessment of their aggregated effect.

A broader approach to the company's specifically international risk exposure is needed — e.g. the linking of foreign exchange risks to financial risks — because of the substitutability at the central bank level, where action may take the shape of a change in interest rate or an intervention on the foreign exchange market. The growth in the volume of foreign loans with flexible interest rates in corporate portfolios over the past few years suggests, as was previously stressed, that interest rate fluctuations may become as serious a problem for companies in the future as fluctuations in exchange rates.

Let us take the foreign exchange risk as our point of departure and examine the links to the commercial, financial and country risks when it is called for. The substitutability between risks will be analysed in Chapter 4 (see Figure 4.1).

Survival has been cited above as the paramount corporate goal. However, the goals of various stakeholder groups can also exert a certain amount of influence — exactly how much depends on the occasion and on the group's ability to make its influence felt (cf. Marris, 1964). To this it should be added that management's needs and wishes can be expected to steer corporate behaviour. Operations as a whole and the general orientation of activities are affected by various financial decisions. The decisions that have to be made will be based mainly on the output of the company's internal information and accounting systems. A key concept in decisions under exchange uncertainty is that of *foreign exchange risk exposure*. This provides a measure of the extent to which the company is exposed to exchange uncertainty and indicates its net assets in a given currency. The problems of defining this concept will be discussed in Section 3.4. Figure 3.1 provides a systems picture of corporate decision-making under foreign exchange uncertainty.

Figure 3.1 Corporate decision-making under foreign exchange uncertainty



In the management of exchange risk the goal is often formulated in terms of risk minimization. Basing the view on a study of American companies Rodriguez (1980) claims that:

> The dominant objective of managing exchange risks for the managers interviewed is to minimize risk, not to maximize profits.

Oxelheim (1984d) reports a similar opinion among Swedish multinational companies. Figure 3.1 shows clearly that information is not only important to creditors, shareholders etc.; it is also a matter of feedback, it provides a basis for corporate control. In this context control embraces planning and follow-up, and planning can usefully be divided hierarchically into strategic, administrative and operational planning (Ansoff, 1971) as in Figure 3.2.

The company's strategic planning determines both investment planning (concerned with the use of capital) and financial planning (the acquisition of capital). At this level frameworks are fixed for the size of total capital, for capital requirements and capital maintenance, and here too many policy decisions are made, among other things about foreign loans. At the lower levels financial planning is mainly concerned with cash management and profitability and the yardstick of its efficiency is the success of this liquidity control, which is thus to be regarded as the key element.

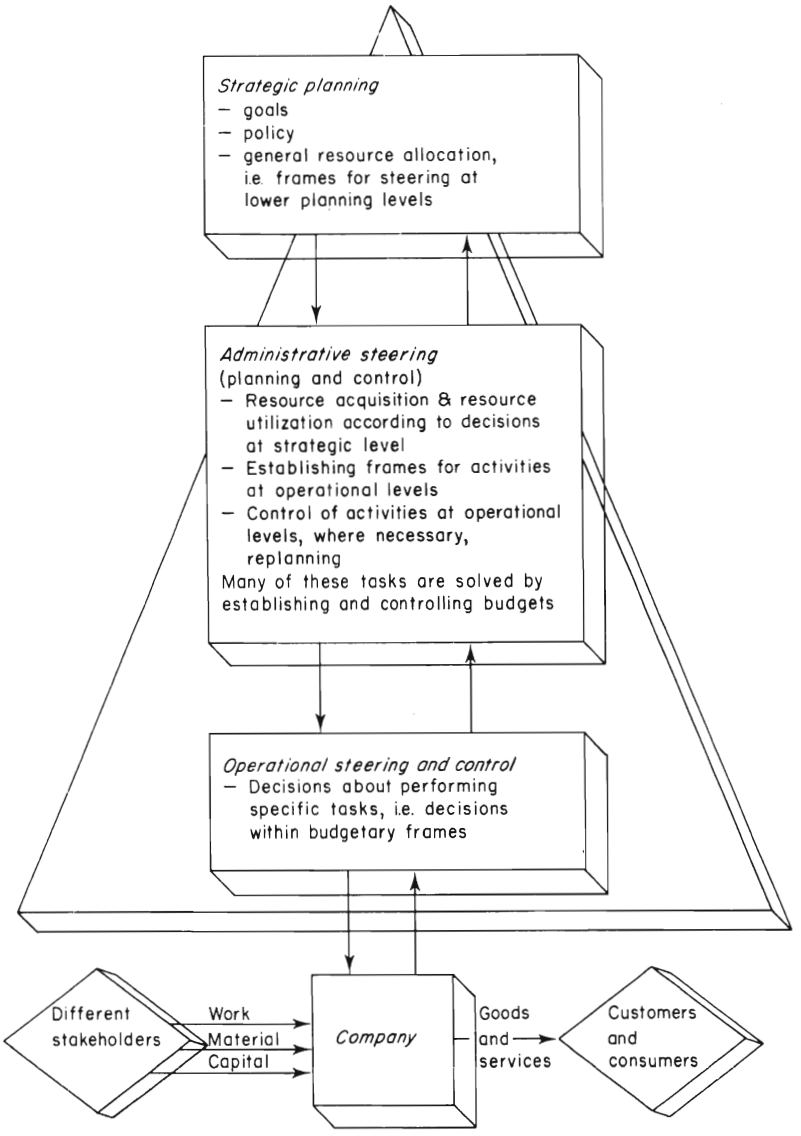
3.3 CAPITAL MAINTENANCE

Financial planning represents an important part of a company's long-range planning and it cuts right across the hierarchical planning system described in Figure 3.2. Companies need capital for expansion, for investment and for current operations. Capital requirements are steered in part by the funds for whose use the company has planned and in part by the framework of the financial environment.

The interesting aspect here is how the company satisfies its capital requirement, i.e. how it achieves capital maintenance. The company's capital requirement consists of the varying funds which will be tied up in the assets needed for the running of operations (use of capital), while capital maintenance refers to the method of financing this requirement (source of capital). The aim of the financial planning is to see that capital maintenance is received by having a capital structure that, as closely as possible, matches capital requirements.

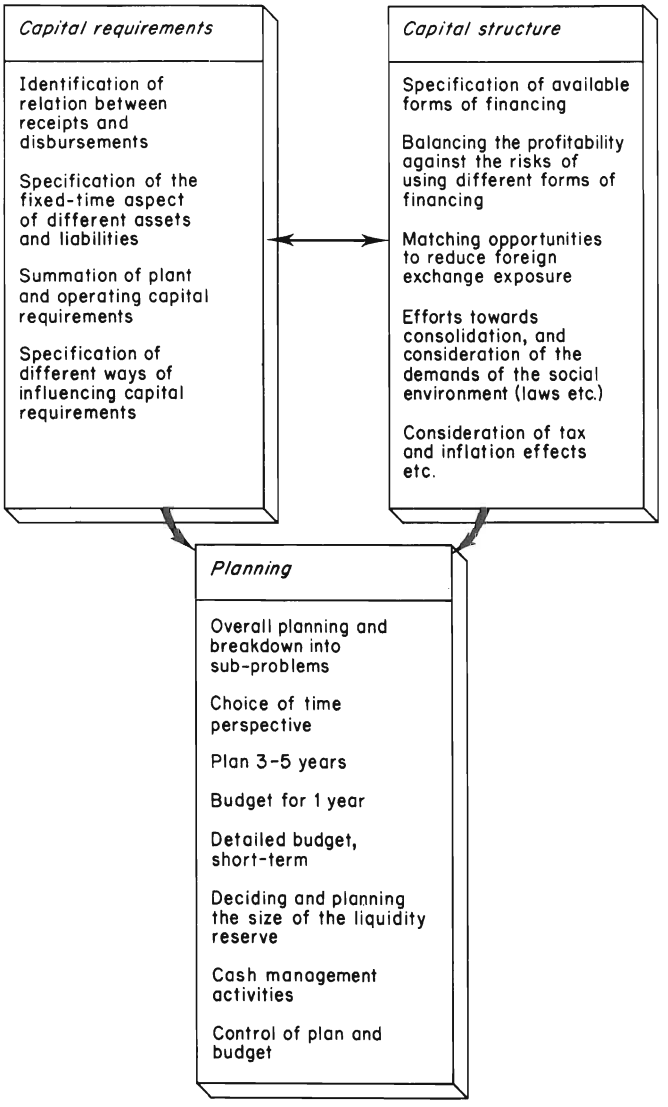
Financial planning can be described in accordance with Figure 3.3. This figure highlights the need for an investigation of different forms of financing, one of which consists of medium- and long-term borrowing

Figure 3.2 Corporate planning levels



on the international capital market. Access to foreign markets varies as a result of economic and political controls, and exchange risk is included as a major component in balancing profitability against the risk involved in the different forms of financing. The expected yield on borrowed capital, for example, can be compared with the sum of the interest cost and the forward hedging cost.

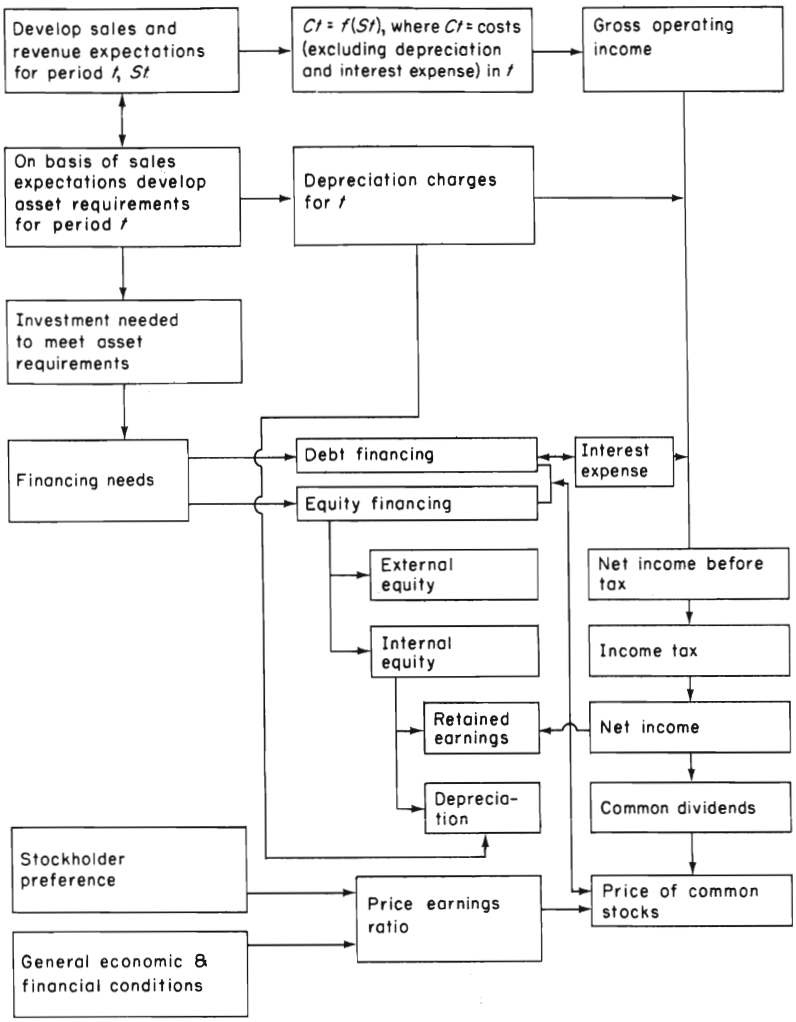
Figure 3.3 Elements of financial planning



The different ways of influencing capital requirements referred to in the figure can include measures which are really a form of hedging against exchange risks. The loan itself may represent one way of neutralizing an exchange risk, in the shape of net assets in a particular currency. It could also represent a way of speeding up the repatriation of the profits (remittance of dividends) of a foreign subsidiary.

Figure 3.4 illustrates a simplified financial planning model, showing alternative ways of acquiring capital. Particularly interesting to our present argument is the use of foreign markets: in many countries financing abroad by the issue of shares is not normally allowed, which leaves borrowing on the international capital market as the main alternative. In the box 'Interest expense' we then have to allow for costs arising as a result of fluctuations in exchange rates.

Figure 3.4 Flow chart for a simplified financial planning model



Source: Steiner, G. (1969): *Top Management Planning*, Macmillan, New York, p. 622. Reprinted with permission.

The company's external accounting documents are important as a basis for financial planning. The assessment of a company by other people, particularly investors and creditors, is often based on information about results derived from the profit and loss account; about the size, composition and stability of funds acquired and used derived from financing analyses; and about the structure of assets and capital derived from the balance sheet. Cash management measurements, profitability measurements and other performance measurements are also based on information from these various documents. There seems to be a clear tradeoff between fluctuations in profit and loss figures and the company's market value on the one hand and the credit terms the company will obtain on the other. It thus seems obvious that planning models in the company should be designed in such a way that the consequences of possible measures can be adequately assessed and evaluated.

But there are certain important differences between external and internal accounting. External information is shaped by legal regulations or analogy interpretations of legal enactments. Internal information can be fashioned so as to allow for argument in terms of opportunity costs, based on a freer interpretation of financial events. It is possible here to use other information, such as discounted effects, which are not included in the external accounting.

According to Donaldson (1969) financial planning should provide protection against unexpected capital requirements, such as might arise from forecasting failures or unfulfilled plans. Donaldson introduces the concept of 'financial mobility', which is closely related to the maintenance of an ability to pay (payment capacity) which we discussed above in Section 2.4.2. Donaldson puts it as follows:

> The capacity to influence the rate of change of economic resources from one form into another and hence to determine the mix of resources at a point in time, will be referred to in this study as financial mobility. The ultimate aim of financial mobility is to achieve a state of equilibrium in funds and flows consistent with essential corporate objectives.

Further to achieve this freedom of action, a number of measures are required. These are:

(a) For that future period for which precise forecasting is meaningful, develop a funds flow projection for the most probable combination of external events and internal responses.

(b) Develop an 'early warning' information network to identify possible causes of deviation from projected flows, and to maintain an up-to-date estimate of probability of occurrence.

Thus Donaldson emphasizes the importance of the design of the information for internal control, an important feature being the system of *warning signals*. The signal can be derived from an evaluation of the company's financial dispositions and can be expressed as a deviation between, for example, the calculated and the actual cost of the foreign loan.

The financial freedom of action needed to meet an unexpected need for capital calls for a detailed analysis of all the company's possible financial reserves. According to Donaldson such reserves can be obtained by:

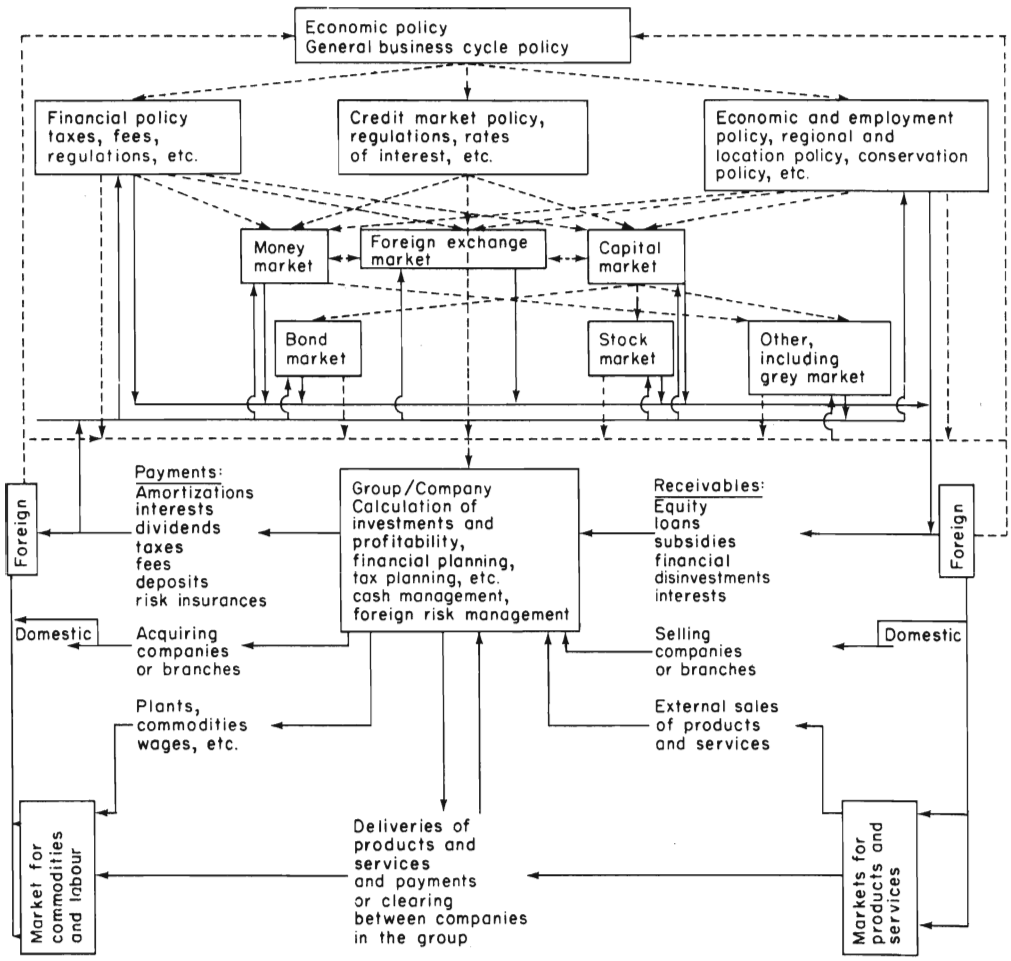
- utilization of existing surplus
- utilization of credits granted up to a prescribed limit
- increased bank loans and long-term borrowing
- new issue of shares (cash issue)
- reduced disbursements perhaps by temporary limitations on productions (with sales partly from stocks)
- reduced marketing, research development and administrative costs
- postponement of investment costs
- reduction or abandonment of dividends
- conversion of real assets or claims into cash.

The first four of these could be described as passive reserves, since all they do is to increase the flow of cash into the company. The others are active, since they begin by improving efficiency or influencing real assets etc., after which they generate financial consequences.

To the reserves listed by Donaldson we have to add reserves created for our group/company by external leads and lags, including the opportunity to take a loan as a means of speeding up a payment from a foreign customer.

In the present book we are thus concerned with the information aspects of increasing medium-term and long-term borrowing in *foreign currencies*. Economic and/or political controls may be such that companies have to turn to the international capital market to acquire the necessary capital. The company's interaction with its financial environment, and the effects on its methods for acquiring capital, are illustrated in Figure 3.5. Here we will emphasize the provision of capital by means of foreign loans and 'currency controls' among the regulations mentioned.

Figure 3.5 Influence from financial environment, and payments to and from a company



Source: Adapted from Gandemo (1976, p. 110).

3.3.1 Decision aspects of the foreign loan

A company is about to take a loan in a foreign currency. What determines the choice of currency? If some form of exposure thinking is applied, this will affect the choice. If there is no such thinking, and there is no positive exposure to foreign exchange risk, then the decision will be made on a basis of the *availability* of credit and an evaluation of the related conditions.

A multinational company which plans to solve its financing problems with the help of foreign borrowing has to decide:

(1) which company in the group is to take the loan
(2) what currency should the loan be made in
(3) what ultimate maturity date should be chosen.

There used to be two main alternatives in situations like this. Either the parent company borrowed its own currency centrally for use throughout the group, or each subsidiary satisfied its own capital requirement by borrowing locally. Now, in the mid-1980s, many other combinations are possible, for instance different types of swaps involving many companies in the group. In deciding which company in the group is to take the loan, it is important to consider *taxation aspects*. Global tax planning becomes a key word. We will now discuss some factors that affect corporate loans in foreign currencies — factors which must be analysed before any decision can be made on the three points mentioned above.

3.3.1.1 Terms of the loan

The choice of loan currency should be based on an evaluation of the loan terms in the various available currencies. But what determines these terms? What theories are available on the subject? In any such evaluation the interest rate on borrowing will be a key component. According to Fisher's Closed Relationship (see Section 4.2.3) the nominal interest level reflects expected real interest rate level and the expected rate of change in the price level, or

$$r_i^N = r_i^{R*} + \hat{P}_i^* \tag{1}$$

where r_i^N = nominal interest rate level in country i
r_i^{R*} = expected real rate of interest in country i
$\hat{P}_i^*$ = expected rate of change in price level in country i.

A lender who expects the price level to rise at a rate of 3 per cent per year, demands a nominal interest rate exceeding the expected real interest rate level by this amount.

On a complete, perfect and unified international capital market, the following obtains according to Fisher's Open Relationship:

$$r_1^N - r_2^N = \hat{S}_{12}^* \tag{2}$$

where $\hat{S}_{12}^*$ = expected relative rate of change in exchange rates (currency in country 1/currency in country 2).

Thus Fisher's Open Relationship implies that on an efficient non-controlled capital market and in the long run it can be expected that the currency chosen for a deposit or a loan—which are equally risky except for the foreign exchange risk—will be a matter of indifference. According to economic theory the choice of a particular currency becomes relevant as soon as the above equation is not expected to apply.

According to the Purchasing Power Parity theory (see Section 4.2.1) the change in exchange rate can be estimated on a basis of the expected inflation rates:

$$\hat{S}^*_{12} = \hat{P}^*_1 - \hat{P}^*_2 \tag{3}$$

Assuming risk neutrality, purchasing power parity, homogeneous expectations and immediate response to change incentive, the real interest rates can be *expected* to be the same, i.e.

$$r^N_1 - \hat{P}^*_1 = r^N_2 - \hat{P}^*_1 \tag{4}$$

However, on many national capital markets during the 1960s and 1970s interest rates have been fixed largely by central controls, which has been a contributory cause of deviations from the above relation.

The loan cost for a Swedish company borrowing for example in DEM is nominally:

$$r^N_{Swe} = R^N_{WGer} + \hat{S}_{Swe,WGer} \tag{5}$$

where r^N_{WGer} = nominal interest rate on the loan in DEM
$\hat{S}_{Swe,WGer}$ = relative rate of change in the exchange rate.

The real rate of interest in its simplest form can be written, on a basis of (5):

$$r^R_{Swe} = r^N_{WGer} + \hat{S}_{Swe,WGer} - \hat{P}_{Swe} \tag{6}$$

where $\hat{P}_{Swe}$ = rate of inflation in Sweden

Providing the Purchasing Power Parity theory holds, (6) can be written as:

$$r^R_{Swe} = r^N_{WGer} - \hat{P}_{WGer} \tag{7}$$

where $\hat{P}_{WGer}$ = rate of inflation in West Germany.

Assuming that the Purchasing Power Parity theory holds, it can thus be expected that inflation in Sweden will not affect the real rate of

interest for the loan in DEM, since the deterioration in the real value caused by inflation in Sweden is counteracted by an appreciation of the German mark.

Let us look at a short example of how the market can be expected to function, in order to elucidate the link between the actors' expectations and the incentive to arbitrage.

Assume that the nominal borrowing interest rates on an annual basis are 10 per cent for the Euro-dollar and 8 per cent for the Euro-mark. An expected change in the exchange rate USD/DEM corresponding to the interest rate differential, means that costs can be expected to be equal at the time the loan is contracted. If the market is in imbalance and the appreciation of the Euro-mark is expected to be less than the interest differential, there will be a rise in demand for the Euro-mark as a loan currency. Depositors, on the other hand, will transfer their investments to dollars. These movements will push up the interest rate on the Euro-mark. At the same time the sale of marks in order to acquire dollars on the part of both borrowers and investors will depress the USD/DEM exchange rate. The argument in favour of the Euro-mark as loan currency disappears when the interest rate on Euro-marks is forced up and the USD/DEM exchange rate is depressed to a point at which the Euro-mark interest rate plus the expected appreciation of DEM are approximately the same as the interest rate on the Euro-dollar.

However, some important reservations should be made. For example, because of the transaction costs that occur, the state of equilibrium should be represented not by a single point but by an interval, within which there are no arguments for arbitrage. If the relation is to hold, it is also very important that immediate adjustments take place.

How, then, are interest rates fixed in practice? The long-term Euro-market offers, as well as bond loans and private placements, ordinary bank loans. Bond loans and private placements are contracted at a fixed rate of interest, and during the late 1970s the hard currencies, in a global sense, predominated for such loans. Bank loans, on the other hand, generally run at flexible interest rates which can be changed, usually every six months, and which are derived from the London Interbank Offered Rate (LIBOR). Companies and other borrowers have to pay interest at rates exceeding LIBOR by various percentage points, while the banks borrow at the Offered Rate, the rate on the market for trade in credits between banks. An empirical analysis of interest rate patterns on several markets and in different currencies for the period 1974–84 is reported in Chapter 5.

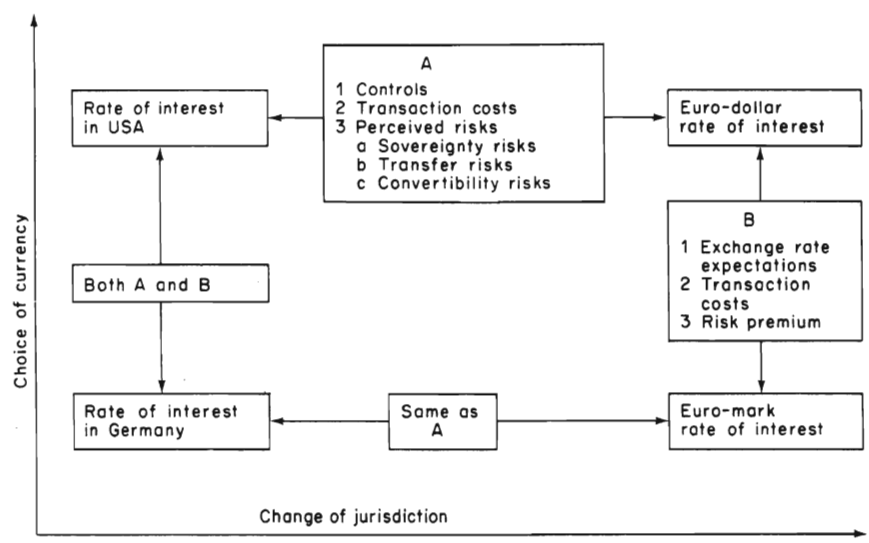
However, we should note here the relations of the different markets to one another. For instance, the Euro-market generally offers more favourable conditions than the national loan markets. The favourable

interest terms offered on the Euro-market to both borrowers and investors can be explained by the fact that the central banks of the countries concerned cannot influence the level of interest rates on that market, for example by calling for non-interest-bearing reserves.

Interest rates on the Euro-market have smaller spreads than interest rates on the national markets, given equal risk for default. This can be regarded as a measure of the real and the perceived barriers affecting the flow of currency over national boundaries. The links between the different markets are shown in Figure 3.6. Box A contains the risks and special costs linked with borrowing on the national market or on the Euro-market. Not all the currency areas on the Euro-market are free; in the case of the currencies that are not free box A contains fewer elements denoting differences between the national and the Euro-market than are listed here. The Euro-dollar is a free Euro-currency and can be used to exemplify all the differences that seem likely. Box B contains the factors which must be taken into account, together with differences in interest rate, in choosing between two Euro-currencies.

For a company which is forced to use the international capital market and has to face various kinds of controls the cost and/or the risk of foreign financing may increase compared with domestic borrowing. Thus when the loan is contracted the foreign interest rates may be less advantageous, or expectations regarding exchange rates may not be as favourable. If the possibility of acquiring equity abroad is also

Figure 3.6 Euro-rates and national rates of interest



restricted, a company will have to accept a non-optimal inflation risk. It may find itself compelled to raise capital on the home market under unfavourable conditions, in order to maintain an acceptable ratio between debts and equity. Other regulations governing foreign loans, such as limitations on their maturity, may also increase the cost, since they limit the company's choice of loan currency.

One way of calculating the cost of foreign borrowing is to include the cost of hedging on the forward exchange market, although the absence of forward rates for a sufficiently long-term market is a problem in many countries.

3.3.1.2 The forward market

For a loan decision from a defensive point of view the forward market offers an alternative to a foreign loan. However, in many countries this choice does not exist. According to one comprehensive theory, the borrowing, lending and hedging decisions of companies and banks guarantee approximate equality between the interest differential, the forward premium/discount and the expected change in exchange rate (see Figure 4.1). All these quantities are expressed in terms of an annual percentage. The relations refer to the Euro-market. The Interest Rate Parity theory links the forward exchange rates to the interest rate differences for similar assets in different currencies. Interest arbitrage can be regarded as providing the link between the spot and the forward markets. According to Tsiang (1959) the flow of arbitrage funds helps to achieve equilibrium between the two markets.

As early as 1923 Keynes had demonstrated the importance of interest rate arbitrage in determining the link between the forward premium and the domestic and foreign interest rates respectively for a given level of financial risk. The *Interest Rate Parity theory* gives us the following equilibrium premium on the forward market:

$$p_t = \frac{F_t - S_t}{S_t} = \frac{r_d - r_f}{1 + r_f} \tag{8}$$

where p_t = forward premium/discount in relative terms
F_t = forward rate in absolute terms
S_t = spot rate in absolute terms
r_d = domestic interest rate
r_f = foreign interest rate.

The interest rates refer to assets or debts identical in all respects except denomination currency. All the rates are registered at time t. Equilib-

rium is stable in the sense that all points which do not satisfy the relation will activate market forces resulting in a return to equilibrium. Disequilibrium means opportunities for risk-less profits on covered interest arbitrage.

The following table provides an example of transactions with concomitant costs, with covered interest arbitrage for a Swedish borrower:

Transaction	Partial adjustment	Transaction cost
Contracting loan	$r_f \uparrow$	T
Purchase SEK spot	$S_t \uparrow$	T_S
Lend in SEK	$r_d \downarrow$	T^*
Sell SEK forward	$F_t \downarrow$	T_F

Interest arbitrage generates the following costs and revenues for the above operations, given a borrowed sum of Y foreign currency units:

$$\text{Cost} = Y \cdot (1 + r_f) \tag{9}$$

$$\text{Revenue} = Y \cdot (1 + r_d) \cdot \frac{S_t}{F_t} \cdot Z \tag{10}$$

where $Z = (1 - T)(1 - T_S)(1 - T^*)(1 - T_F)$ is an expression of the total transaction costs of arbitrage. If the marginal cost is equated with the marginal revenue, the upper limit on the forward premium will be obtained, $\bar{p} = (F_t - S_t)/S_t$, at which the interest arbitrage is profitable:

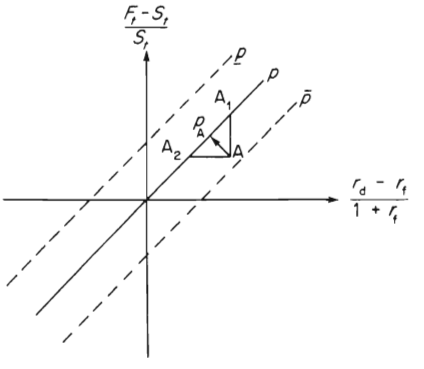
$$\bar{p} = \frac{Z \cdot (1 + r_d) - (1 + r_f)}{1 + r_f} \tag{11}$$

If there are no transaction costs, equilibrium will be as in (8) above. The lower limit for interest arbitrage ($\underline{p}$) can be similarly calculated for the outflow of capital.

Thus, according to the Interest Rate Parity theory and regarding the transaction cost, equilibrium should be represented by an interval rather than a single point; it can then be expressed as in Figure 3.7.

In the figure, A represents the point at which, in the absence of transaction costs, interest arbitrage according to the above can be

Figure 3.7 Arbitrage argument — deviations from interest rate parity



profitable. The four operations in the borrowing process and the four factors for partial adjustment from the above table lead to equilibrium for the forward premium of capital at $A_1 < p_A < A_2$. If there are transaction costs which set the upper limit for profitable arbitrage at $\bar{p}$, then A represents a situation in which arbitrage is not profitable.

On the national markets central bank controls can put the market forces out of action, so that arbitrage appears motivated. An empirical analysis of deviations from interest rate parity during the period 1974–84 will be presented in Chapter 4.

In analysing the deviations from the Interest Rate Parity the *transaction cost* is of vital interest. This cost can be derived from the difference between the purchasing and selling rates, or it can be determined by triangular arbitrage.

In the first case it may be difficult to decide how much of the difference can be designated as a pure transaction cost for the actual currency transaction, since it really measures two transactions, namely the bank's cost for buying immediately and for selling subsequently. Taking this into account, the transaction cost should be written:

$$T = 0.5 \cdot (S_t^{\text{sell}} - S_t^{\text{buy}})/S_t^{\text{sell}} \tag{12}$$

This calculation presumably underestimates the total transaction cost, since it takes no account of administrative costs or the cost of information search.

The triangular arbitrage method does allow for the above-mentioned costs. Levich (1979) found that this method always gave higher values than calculations based on buying and selling rates.

Levich (1979), McCormick (1975) and others who have studied the margin between the buying and selling rates in spot and forward

transactions have consistently found the margin to be greatest on the forward market, and to be not inconsiderable for currencies with a small volume of transactions. Fieleke (1975) and others have found that the transaction cost and the margin between the buying and selling rates on the exchange market can both be regarded as inversely related to the transaction volume, and as directly related to market restrictions and exchange uncertainty.

If the actual exchange rate movements are compared with the corresponding signals or estimates from interest differentials and forward premiums/discounts respectively, then the prediction potential of the different quantities will emerge. During the period 1974–84 there were fairly great differences for SEK between these quantities and actual exchange rate movements, which will be shown in Chapter 4. To all appearances, however, for most currencies the deviations seem to be random, which could be taken as a justification of the view whereby the forward rate and the interest differential are regarded as a correct assessment, in terms of mathematical expectation, of the future spot rate. If this is the case, then empirically even the Fisher's Open Relationship theory does hold. An analysis of the tenability of this relation for the period 1974–84 will be reported in Chapter 4.

The mathematical expectation provides no guarantees for the outcome of individual decisions. The oscillations in market rates have been such that a single forward covering of the rate could prove extremely expensive. It could be even more expensive if the comparison were to include the exchange gains which the hedging company has forgone. For example, the devaluation of the Swedish krona in August 1977 had long threatened. When it finally occurred, exchange hedging turned out to have been a cheap alternative for those who had been able to use it.

Exchange rates are adjusted retrospectively to any imbalances that arise. The timing and the form of the adjustment depend on the currency regime in question. For Sweden an imbalance in competitive strength *vis-à-vis* the rest of the world appeared in 1975 and increased in 1976; it was not until 1977 that it became manifest in substantial changes in exchange rates. Owing to the peg of the Swedish krona the forward premium/discount, which is based on *expectations*, tends to react more quickly to such imbalances. A new period of competitive imbalances started 1979 and ended with new corrections/devaluations in 1981 and 1982.

Recent investigations of the relation between forward rates for DEM and CHF against USD on the one hand and the actual spot rate on the other pinpoint a significant negative autocorrelation. The forward premium tends to overcompensate for an earlier underestimation. Similar trends for different krona rates are discussed in Chapter 4.

A businessman intending to take a foreign loan in order to finance an investment in Sweden can base his calculations on the forward rates, but the problem may be to find rates matching the economic life of the investment. If such rates are available, then the cost of the foreign loan can be assessed ex ante. In the literature on this subject it is often claimed that the actual hedging cost can only be calculated ex post by comparing the spot rate at the end of the term with the forward rate. An empirical analysis of ex ante and ex post costs in forward hedging between 1974 and 1984 is reported in Chapter 4.

3.3.1.3 Risk premium

The forward hedging alternative may show a certain systematic deviation from interest rate parity due to a risk premium. A forward rate used for budget purposes, as well as the rate we shall use in a later methodological example as an estimated extra cost, should be free of any risk premium.

Some American studies (e.g. Rodriguez, 1979b) show an unrealistic bias against increased hedging transactions for fear of possible losses. This exaggerated risk aversion has certain implications for the international monetary system. Insofar as companies pay a higher hedging cost than the average anticipated depreciation, fluctuations in exchange rates may be greater than general economic conditions would have called forth. However, this should be regarded as a response to the pressures of the environment and not as an institutional attempt to destabilize the exchange market. The following remark made by a company finance manager reflects the unbalanced nature of these pressures:

> If I generate exchange gains, I am only doing my job; but if I have to report exchange losses, the roof falls in.

In such a world any attempt to minimize exchange losses must be seen as a rational action, even if there is a price to pay. This unbalanced view of risk can have a considerable impact if the forward premium/discount is used in estimates and accounting. On the estimating side it would mean that companies set aside (reserve) more than necessary to cover future losses.

Disregarding the risk premium and equating the forward rate with a forecast of future exchange movements can lead to systematic errors. The systematic deviation over and above the transaction cost, which many ascribe to faulty forecasting, is actually the equilibrium amount which one party to a future contract pays to the other party, in order to counteract the risk attaching to the currency which he is selling against

the currency he is buying. This is quite compatible with an assumption of identical expectations regarding the future exchange rate.

3.3.1.4 New forms of borrowing

Long-term loans at fixed rates of interest are not compatible with theories of prompt cost-equalizing movements on the capital market in response to changes (Einzig, 1973). Long-term interest rates are based on inflation and exchange-rate expectations extending far into the future. Because of the great uncertainty about long-term inflation trends, both borrowers and lenders on the international capital market have become interested in finding new forms of borrowing.

In the wake of the floating exchange rates, various new expressions have come into being: 'roll-over' or 'revolving' credits, term loans, multicurrency loans and basket constructions. The first of these can be compared with the overdraft facilities on a current account. A credit-granting bank usually makes available a fixed minimum sum for a period of up to five years. The borrower then has to pay interest, generally LIBOR, plus a pre-arranged margin determined in light of his credit viability among other things. There will also be an additional cost corresponding to a certain proportion of the non-utilized part of the granted sum.

Term loans differ from revolving credits in that there is no variable element. In this case the interest rate is generally fixed for six months at a time, and an amortization plan is linked to the loan. The loan can generally be recalled if notice is given at an agreed time before the date when the interest is settled. Term loans can even take the shape of traditional domestic loans, i.e. with a fixed rate of interest and no amortization obligations for a fixed number of years.

Loans of this kind can be expanded into what is known as multicurrency loans. In this case the borrower has the right, as expiry date approaches, to change to another loan currency. Repayment is made in the original currency. Interest is also paid in the currency to which the interest rate refers.

Corporate financial loans can also consist of currency basket loans, i.e. loans contracted in a currency mix in order to achieve a well-balanced spread against the exchange risk. The interest rate for this type of loan is flexible and is generally fixed for each successive rolling six-month interest period. The lending rate is composed of the bank's borrowing cost plus an agreed margin.

From a more technical viewpoint innovative capacity has been devoted to develop different swap solutions.

3.3.1.5 Choice of loan currency

Medium-term and long-term corporate borrowing is often subject to controls determined by economic policy. For this reason many companies may have limited access to the domestic loan market. This situation — or perhaps the limited size of the domestic market — may mean that companies are forced to a great extent to use the international capital market. They then have to choose between different foreign currencies. However, assuming a perfect capital market, it would be possible to use the interest rate for a corresponding loan in the domestic currency in making the relevant estimates.

For a company with open positions the choice of currency will involve the weighing of costs against risks. A loan in USD may yield apparently better conditions than a loan in DEM, even allowing for the expected changes in exchange rates. Against this stands the fact that the company has a covered position in DEM, for example, and a positive position in USD corresponding to the size of the loan. In this simple example it is possible to determine the extra cost of exchange-risk reduction. The company's attitude to risk (see Section 3.5.1) will decide the choice.

The choice will also be affected by any link between possible loan currencies and the home currency, perhaps in some bilateral or multilateral currency arrangement. The choice of currency can also be based on a study of the correlation between expected exchange-rate changes. Portfolio theory is based on such an approach: the total risk of the portfolio should, under certain specifiable conditions, be lower than that of its components. Thus, if the expected changes in two currencies exhibit a perfect negative correlation, then the currencies can be combined in such a way as to eliminate any possible risk.

To illustrate the situation in which expected cost determines the choice of loan currency, we can return to the company which, at a particular moment, can take either a loan in Euro-dollars at an interest rate of 6 per cent per annum or a loan in Euro-marks at 4 per cent. Before the oil crisis denomination decisions were often based mainly on interest rate comparisons, and at the time this was quite justified and our company would have made its loan in Euro-marks. But as a result of the turbulence on the foreign exchange market since 1974, changes in exchange rates have become an extremely important factor that must be taken into account. Also, apart from deciding on the denomination currency, multinational companies have to decide which company in the group should do the borrowing.

There are many alternative ways of calculating the cost of foreign currency loans. In a study of American multinational companies,

Table 3.1 Methods of calculating cost in dollars of foreign currency loans

Current practice at US multinational corporations fall 1977	Respondent firms	
	Number	Per cent
Interest paid to the lender (Method 1)	17	10.9
Interest charges adjusted for exchange rate changes (Method 2)	76	48.7
Interest cost + hedging costs (Method 3)	31	19.9
Methods 1 and 3	3	1.9
Methods 2 and 3	17	10.9
Methods 1, 2 and 3	4	2.6
Other	5	3.2
No response	3	1.9
Total	156	100.0

Evans, Folks and Jilling (1978) found that the cost in dollars for loans in foreign currencies was calculated as in Table 3.1.

Most of the companies in the table try to estimate the size of the change in exchange rate in calculating the loan cost. In a corresponding study of Swedish Multinationals (Oxelheim, 1984d) *all* companies try to estimate the exchange rate element in the loan cost. The higher relative number reflects the greater market turbulences. For decision-making, the break-even point must be identified.

Thus, in our example the size of a possible appreciation of the Euro-mark against the Euro-dollar greatly affects the choice. The appreciation which would give the same loan cost in the two alternatives can easily be determined. In the simplest case, in which the loan has no special clauses, the value can be obtained from the following:

$$L \cdot (1 + r_{WGer})^n = L \cdot (1 + r_{USA})^n \cdot \frac{S_1}{S_2} \qquad (13)$$

where L = the loan sum in DEM
r_{USA} = the interest rate on loan in Euro-dollars
r_{WGer} = interest rate on loan in Euro-marks
S_1 = spot rate (USD/DEM) on the first day of the loan
S_2 = spot rate (USD/DEM) when loan and interest are repaid
n = term of loan.

From this equation we obtain the appreciation which would make the two alternatives equal:

$$\frac{S_2}{S_1} - 1 = \frac{(1 + r_{USA})^n}{(1 + r_{WGer})^n} - 1$$

If it is assumed that the term of the loan is 6 months, and the other figures in the example hold, then equal loan costs will be obtained when

$$\left[\frac{(1 + r_{USA})^n}{(1 + r_{WGer})^n} - 1\right] \cdot 100 =$$

$$= \left[\frac{(1 + 0.06)^{1/2}}{(1 + 0.04)^{1/2}} - 1\right] \cdot 100 = 0.96\%$$

If the decision-makers in the company expect appreciation to be less than 0.96 per cent during the relevant period, the loan will be made in DEM, otherwise it will be made in USD. The argument presupposes that the borrower is risk-neutral, or that the currencies are deemed to be equal in this respect. This discussion will be elaborated in Appendix 3.

3.3.1.6 Taxation aspects

By and large there are two aspects of taxation that affect the choice of currency, of company and of maturity date, namely:

(1) the fiscal treatment of the interest paid, and
(2) the fiscal treatment of the gains or losses arising as a result of fluctuations in exchange rates.

As regards the first of these, it is mainly a question of identifying the best opportunities for tax deductions. This is not only a matter of tax rates. A company which has the greater part of its operations abroad, for example, may have taxable profits at 'parent company level' which are far too low in relation to its main loans. Or it may be a case of a new project in a new country which cannot be expected to generate taxable income for several years. The problem is still more complicated if the investing company enjoys tax relief, or if it can win from depreciation. It then has to be decided whether the parent company should be responsible for the loan, or whether, for instance, one of the subsidiaries should take it on.

In Sweden, interest is deductible on capital borrowed at home or abroad for the acquisition of foreign assets. Sweden differs here from

several other industrialized countries. In some countries, for example, the interest on capital borrowed specifically for the acquisition of foreign assets is not deductible from tax.

The second alternative mentioned above was that a subsidiary should take the loan, probably with the parent company as guarantor. This means that the interest expense is balanced against the profits from operations in the subsidiary. Thus this company may have very little stockholders' equity; a large part of its capital is in the form of interest-bearing debts. However, this alternative is worthwhile only if the subsidiary in question has, or soon will have, taxable profits sufficiently large to offset the interest deductions. Interest costs on the other hand, must be deductible in the country concerned.

Some countries restrict the right to deduct interest costs if the ratio between debts and stockholders' equity is too great (thin capitalization). In Switzerland, for example, an upper limit is set on this ratio. It lies somewhere between 3 and 6, depending on various circumstances.

In the US, the tax administration has been authorized since 1969 to issue regulations regarding thin capitalization. The authorization specifies several points or criteria which the regulation should include, such as:

- the total debt–equity ratio
- the debt–equity ratio per shareholder
- whether the debts of shareholders, as compared with other debts, have a preferred status
- the consequences of having debts which are convertible into shares.

On 29 December 1980 the Secretary of the Treasury issued regulations to come into effect from 30 April 1981. This date was first postponed to 31 December 1981 and later to 1 July 1982. However, the date has now been postponed again to give the tax authorities more time to implement the proposed modifications. The effective date of the final regulations will be 90 days after their publication in the Federal Register.

Some of the highlights of the proposed thin capitalization rules are:

- cash contributions by a foreign shareholder are considered as equity unless they do not exceed US$ 25,000 and are repaid within 120 days after the end of the taxable year
- loans granted by a shareholder to the company will be regarded as equity if the debt–equity ratio exceeds 3:1, unless the shareholder proves the ratio to be reasonable (arm's length principle)

- it may be possible to have a debt–equity ratio of 10:1 if the loans are made by a third party, but such loans, if guaranteed by shareholders, may be treated in accordance with the 3:1 debt–equity ratio.

It should be noted that the proposed regulations are still being subjected to critical examination.

The fiscal treatment of interest costs gives cause for reflection. What effect, then, will the fiscal treatment of exchange rate differentials have on the choice of loan currency, of company, and of maturity date? The key question is whether or not exchange losses are deductible. And beyond this, of course, is the question of how financing decisions are affected by the answer to this first question.

We have already noted that the costs of loans in strong and weak currencies are treated differently in the accounting. If interest costs and exchange differentials are also given different fiscal treatment, then the effects of their different treatment in the accounting will be reinforced. In Sweden the fiscal treatment of the two costs is the same but with a time lag, in that loan interest and possible exchange losses are deductible in the year in which they occur, while exchange gains are not taxed until the loan is finally liquidated. In the UK the fiscal treatment is different, i.e. the interest on a financing loan is deductible but an exchange loss is not. British companies thus try to borrow in weak currencies.

3.4 EXCHANGE RISK

Foreign exchange risk is the risk of a change (gain or loss) in the company's future economic value resulting from a change in exchange rates. For a company with overseas commitments there are, in principle, two ways in which these losses or gains can arise, assuming in both cases that there is a 'base' accounting currency. One of the risks is connected with the company's cash flows in different currencies, and can be described as *active risk*: a change in exchange rates has an immediate effect on the value in the base currency of funds to be converted from one currency to another (exchange differentials arise). When, for example, a company's export is invoiced in the currency of the home country of the receiving company, such a risk will exist between the time of invoicing and the time when payment is received. If this risk is not covered, it may lead to a gain or a loss in the base currency on the particular exchange item. These gains and losses will affect the amount of cash available to the company.

The other risk category, *latent risk*, refers to the company's stocks (assets/debts) and it belongs in the short perspective to the accounting

sphere. In the long run even this risk will become active in the sense that subsidiaries are sold. It arises, for example, in the course of consolidating a group with overseas subsidiaries (translation differentials arise). This risk, which is related to the corporate balance sheet, does not necessarily result in a gain or loss calculated in the base currency. Thus the latent risk implies that a change in exchange rate may affect the value in the base currency of non-transferable assets and debts in an overseas subsidiary.

Exchange risk measured in terms of changes in balance-sheet items could be expected to agree with the exchange risk on the cash flows during the period corresponding to the change in the balance sheet. But because of the variety of measuring methods used, this agreement is seldom a practical reality. This creates problems when the measurement, reporting and control systems are being designed.

In textbooks the foreign exchange risk is generally measured in terms of the increased variability in the company's consolidated yield, which can be regarded as caused by unexpected fluctuations in exchange rates. In modern capital market theory, where the exchange risk is defined as the systematic risk connected with costs and revenues in foreign currencies, the risk is measured in terms of the covariance between the exchange rate and the domestic yield.

For practical reasons the textbook way of measuring foreign exchange risk is not always followed. The point of departure in practice is the *currency position*, i.e. the company's net claims or net debts in a given currency expressed in its own base currency. But the position only expresses the size of the risk exposure. In order to obtain a complete picture, the risk should be linked to the pattern of fluctuation in the relevant exchange rate. However, even working solely with the currency position does give a first indication of the risk dimension in the company, as the position can be compared with such quantities as total corporate foreign exchange flows, turnover, export and import.

The currency position as a useful and practical approximation of the exchange risk must be used with discrimination. In practice there are rarely any variance calculations; instead, the exchange risk is expressed as the risk of the company suffering exchange losses of a certain size. Although symmetry would require it, exchange opportunities are rarely used as a measure of possible exchange gains. Foreign exchange risk, as referred to in everyday speech, generally reflects the likelihood that a particular exchange rate movement will occur, leading to a loss of a certain size. The risk can be formulated for example as follows: 'There is a 20 per cent probability of losing SEK 1 million on our contract with Y International'.

There is an element of surprise built into the term 'risk' — a deviation from the *estimates*. We have already mentioned that there is a certain degree of substitutability between the risks to which a

company is exposed. In assessing the exchange risk the regularities which largely underlie this substitutability can indicate what may be regarded as estimated exchange losses, beyond which the exchange risk assumes a value greater than 0 (probability greater than 0). The equilibrium relationships in Figure 4.2 in Chapter 4 should show where the boundary goes between exchange rate movements that can be estimated and those that cannot. The market actors guarantee reasonable validity in these relationships (see Oxelheim, 1981 and 1983b).

In principle the change in exchange rates (exchange or translation differential) can generate two kinds of gain or loss, related to *transactions* or *translations* (cf. the concepts of *transaction exposure* and *translation exposure* in Ankrom, 1974). Transaction gains or losses arise as soon as inter-currency financial payment takes place at an exchange rate deviating from that applying on the date of contract. Translation gains or losses arise when a financial report from a foreign subsidiary is to be translated into the parent company's currency, when a change in the exchange rate has previously affected the value of the foreign subsidiary's local currency in terms of the parent company's currency.

The size of the risk will depend on the method of calculation. We noted above that in practice the exchange position is often regarded as an approximation of the exchange risk. The size of the position is a measure of the company's *exposure* to exchange risk. The existence of open positions, i.e. positions deviating from 0, shows that exchange management is called for.

The risk exposure of the strictly home-based company which contracts a loan on the international capital market is easily understood. Similarly, the importing Swedish company is exposed to exchange risk, when it is invoiced in the supplier's currency; or a Swedish exporter is exposed when a delivery is paid for at a later date in a currency other than SEK. In all three cases we know which party is exposed to risk, and the strength and duration of the exposure can be measured fairly easily.

It is more difficult to determine the risk to a company which has extensive international operations, or which over and above its export and import activities also possesses overseas assets not normally intended to be transferred and debts whose value is expressed in currencies other than its own. Thus the multinational company has an additional risk to consider apart from the risk facing domestic companies whose international activities are limited to export and import. The exchange risk can attach to different items in the overseas operations, as we have seen in Table 2.1, and it can be calculated on a basis of the size of the company's flows or its net worth.

Three different exposure concepts can be used as the basis for the

corporate risk calculus. For a more detailed discussion of these concepts, see for example Oxelheim (1981). The three concepts can be described in terms of their focus, and in terms of the items which are considered and which are thus regarded as exposed to risk. The choice of time horizon in the risk calculus also affects which items will be included. Table 3.2 summarizes some important characteristics of the concepts.

The calculations have different goals. In calculating translation exposure the idea is to establish the book value of the company. The choice of exchange rate for translation will not be easy, since the financial reports which are to be translated have been produced in a period of fluctuating exchange rates. The problem resolves itself into a

Table 3.2 Characteristics of foreign exchange exposure

Characteristics \ Type	Translation exposure	Transaction exposure	Economic exposure
Character	Latent Static	Active Static	Active Dynamic
Goal orientation	Book value	Economic/ book value	Economic value
Focus	Assets/debts	Cash flow	Cash flow
Period	Limited	Limited	Unlimited
Data base	Book items plus size of estimated items in forecast	Book items plus size of estimated items in forecast	Book items plus size of estimated items

choice between the closing rate or the historical rate. Various combinations of these will be described in Section 3.4.2.

In calculating transaction exposure, interest focuses on cash flow aspects: how will the exchange rate fluctuations affect the final cash profit? It is obvious that the borrower's cash flow will be affected by a change in exchange rates, when he converts his home currency into the lender's currency at a new rate. With this measure of exposure we are interested in the cash flow of the company, without taking into account the dynamics of future economic events by looking at the present value of future cash flows.

The comparison in Table 3.3 is taken from Rodriguez (1980), and it illustrates the advantages and disadvantages of the two traditional methods.

Table 3.3 Evaluation of traditional exchange exposure measurement methods

Advantages	Disadvantages
Translation exposure	
Consistent from company to company and over time.	Inflexible. Does not make allowances for different situations.
Objective. Based on historical records. Does not require subjective evaluation in its computation.	Historical records may be irrelevant to current conditions. Management's analysis of current situation is ignored.
Consistent with traditional computations of book value.	Ignores economic value which may differ greatly from book value.
Transaction exposure	
Based on future cash flows, the variable relevant to economic value.	Ignores future cash flows which do not involve exchange transaction but which create economic value.
Objective. Concentrates on known future exchange transactions.	Management's evaluation of the impact of exchange fluctuations on operations is ignored.

The third way to measure exposure is the *economic exposure* and it reflects the fact that as well as affecting the value in the home currency of exposed assets and liabilities, a change in the exchange rate of a subsidiary's local currency also affects the whole economic climate in the subsidiary's country. This in turn may mean a change in the subsidiary's future cash flow. Thus a change in exchange rate can increase future gains in the local currency unit by more than is required to offset the immediate drop in the value of the subsidiary's present gains and other exposed net assets measured in the parent company's currency. According to this argument the final effect of a devaluation, for example, cannot be estimated until the expected cost and revenue flows have been adjusted, by applying the new exchange rate to the predicted profit in the local currency. The connection between economic exposure and transaction exposure is shown in Table 3.4.

A risk assessment of this extensive but decision-influencing kind is recommended by Prindl (1976a), and he pinpoints that traditional accounting exposure

> however prevalent in shaping companies' attitudes to exchange exposure, is insufficient for total understanding of exchange

Table 3.4 Corporate cash flows and exchange risk exposure

Character of the cash flow / Currency of the cash flow	Financial			
	Operational	To creditors	To shareholders	Total
Foreign currency, i.e. parent company's or any other currency except the subsidiary's	Import or export	Payments on debts in foreign currencies	Dividends	*Transaction exposure*
Local currency, i.e. currency in the country where the subsidiary operates	Local sales and costs	Payments on debts in local currency	Reinvested cash	
Total	Profit on current operations	Financial costs	Equity/cash flow or *economic exposure*	

Source: Rodriguez (1979b), Measuring and controlling multinationals' exchange risk, *Financial Analysts Journal*, November–December.

> exposure. Accounting information does not show all of the effects which currency rate changes have on a company, but only those which change current period income in measuring the value of its assets and liabilities and its income statement components. Exposure management based on accounting considerations is by necessity static and historically oriented. By definition, it does not look to the future effects of parity changes which have occurred or may possibly occur in the future. These effects may be seen in the short term on a company's structure and profits. The whole range of such risks is defined as economic exposure.

Transaction exposure, which refers to the effect of a change in exchange rate on the real cash flow, can be regarded as a subset of economic exposure.

Economic exposure is a comprehensive concept. In her study of American multinational companies, Rodriguez (1980) concluded that:

> Economic exposure has come to mean different things to different people. However, the term is usually identifed as a measure

reflecting the 'true impact' of exchange fluctuations, in contrast to the 'paper impact' of translation exposure.

Rodriguez discovered that 86 per cent of the companies studied found translation exposure to be the most relevant measure of exposure, although it was often extended to include additional variables. Oxelheim (1984d) reports that almost all companies in his study gave priority to the transaction exposure.

As one ingredient in the handling of total risk (exchange risk plus operational and financial risks) it may be useful to study currency positions (the net value of different currencies). The uncertainty or risk expressed in a position can be divided into three parts:

(1) Size of asset and liability items, according to some specified definition
(2) Countervalue of the item determined according to (1), calculated in the currency of the home country
(3) Time at which evaluation and translation occurs.

In the case of transaction and translation exposure the company starts from items in the accounting, and extremely rarely incorporates items not registered there, for example activities planned but not accounted for.

If defensive action is to be taken in case of economic exposure — measures influencing the position, for example — it will be necessary to estimate balance-sheet and profit-and-loss-account items at given times in the future, i.e. times beyond the period considered in cases of transaction exposure. There will then be uncertainty on two counts:

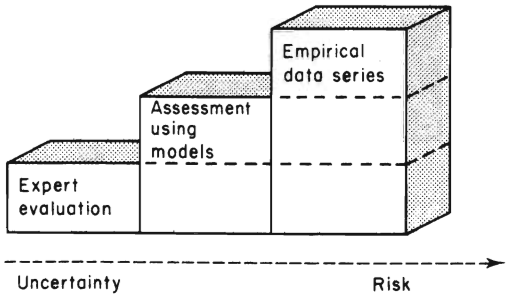
(1) the future scale of the asset or debt position concerned (commercial or financial uncertainty)
(2) the equivalent value in the domestic currency of the item calculated under (1) (exchange uncertainty).

Thus economic exposure is derived to a great extent from forecasts. The difficulties which this involves may explain why so few of the companies included in Rodriguez' and Oxelheim's studies used this method of calculating risk.

From the accounting point of view, operational uncertainty can be referred to the active component in the balance sheet and financial uncertainty to the passive component, whereas exchange uncertainty is connected with both. The analysis in the present book will concentrate on aspects connected with uncertainty due to financial market fluctuations.

In decision theory a distinction is generally made between decisions under *uncertainty* and those under *risk*. The difference is that in the second case the decision-maker is expected to have some knowledge of the probability distribution of outcomes in the studied variables. In the present text the two terms are used synonymously. Those making a distinction stress the escalated knowledge required in going from uncertainty to risk as illustrated in Figure 3.8.

Figure 3.8 Uncertainty versus risk



Risk in the shape of a variation in results can be measured and compared for different financing alternatives, given a certain capital requirement and profitability r_T. The exchange risk for a medium-term and a long-term foreign loan can then be formulated in terms of the variation in return on stockholders' equity which can be ascribed to the exchange rate component in $r_{D_{na}}$ as follows:

Rate of return on equity	Rate of return on total capital	'Leverage effect'		
r_E	$= r_T$	$+ (r_T - r_{D_a}) \frac{D_a}{E}$	$+ (r_T - 0) \frac{D_{tax}}{E}$	$+ (r_T - r_{D_{na}}) \frac{D_{na}}{E}$ (14)
		effect of automatic debts (D_a) excl. tax credits. Rate of interest = r_{D_a}	effect of tax credits (D_{tax}) Rate of interest = 0	effect of non-automatic debts (D_{na}). Rate of interest = $r_{D_{na}}$

Thus for financial decision-making the probability distribution for $r_{D_{na}}$ must be found. The handling of the financial risk is complicated by the fact that the total capital requirement and r_T change over time and that payment takes place in many different currencies. The quantitative range of potential exchange loss is more easily expressed if the risk is given in terms of positions.

From the practical point of view companies may find it convenient to measure exchange uncertainty in terms of positions, thus avoiding the more complicated business of establishing the variance component in the company's result which can be ascribed to exchange rate fluctuations.

3.4.1 Currency risk versus country risk

The existence of both national markets and Euro-markets calls for an overbridging separation of currency risks from country risks (cf. Prindl, 1976a; Wihlborg, 1977a).

Through the Euro-markets it is possible to make investments in dollars in Paris, Rome, London and elsewhere. Currency risks are connected exclusively with the investment currency and are independent of the country in which the investment is made. Country risks can be said to depend to some extent on the currency regime. And as the currency regime also has influence to some extent over the currency risk there is a rather unclear limit between those two types of risk.

Currency risk can then be subdivided if necessary into inflation risk, exchange risk and a relative price risk.

The Purchasing Power Parity theory will be discussed in greater detail in Chapter 4; at the present stage and for the purpose of the following argument we can simply postulate that according to this theory the change in an exchange rate can be expected to correspond to differences in the rates of inflation in the countries in question.

Inflation risk, in accordance with our earlier argument, can be measured in terms of variances. This risk then consists of the variance component in the exchange rate arising from variations in the relative inflation rate. Inflation risk affects investors in all countries. The longer the planning horizon, the stronger the relation between the exchange rate change and the relative inflation rate. Thus, in view of the uncertainty surrounding inflation rates, and because of the correlation between these rates in different countries, medium- and long-term debts should be spread over a number of currencies.

Exchange risk can be defined as the variance component in the exchange rate which is not reflected in a change in the relative inflation rate (i.e. the variance in the deviations from purchasing power parity). This risk, which stems from temporary disturbances on

the foreign exchange market, grows less important as the planning horizon is extended.

Relative price risk arises when exchange rate changes are correlated with relative changes in the prices of commodities produced at home and abroad. It is caused by the variance in relative prices, and is therefore contingent on the consumption pattern of the investor and not on his home location. In practice this distinction between the risk connected with investments in various currencies which are independent of consumption patterns, and risks connected solely with these patterns, is difficult to maintain. In the long run the correlation between relative prices and exchange rates is usually low, which means that this risk can be described as a short-term risk. The short-term correlation may have arisen because of price controls, because of contracts agreed at fixed prices etc.

The terms *currency risk* and *exchange risk* are often used synonymously, as they are in the present text. But the distinction between inflation risk and exchange risk is of more interest to the following argument and should be noted.

Country risks can also be subdivided into political risks, the risk of suspended payment, and risks related to economic developments in the investment country. These risks are most likely to occur when the borrowed capital is invested in a third country.

The possibility of changes in legislation which can affect the return on an investment, the risk of socialization or the possibility of currency controls — all these are included under the heading of *political risk*. Generally speaking political risk involves some uncertainty about ownership rights in a particular country. Currency controls can be regarded as a crucial link between the uncertainty and currency regimes. Whether or not the changeover to more flexible exchange rates has led to a reduction in currency controls has not yet been established. It is possible that central banks may consider short-run fluctuations during a regime of flexible exchange rates to be just as serious as fluctuations in the balance of payments under a regime of fixed exchange rates, for instance. Thus there may be as strong a desire to control the flow of capital under both types of regime.

The *risk of suspended payments* originates in decisions at the level of the currency regime in a particular country; thus there is a difference between this risk and the financial risk of bankruptcy, as when the Herstatt Bank and the Franklin National Bank failed as a result of certain unfortunate currency transactions and had to suspend payments. The risk affects the corporate cash flow.

If a central bank is declared bankrupt it means that insufficient resources are being generated within the country to buy the foreign currency necessary to repay a debt. This is naturally an extreme case, and it is much more likely that the central bank refuses to fulfil its

obligations long before this stage has been reached. Since the beginning of the 1980s several countries have been compelled to suspend payment of instalments or interest on their foreign loans. Ultimately it is the country's real capacity that determines the possibility of repaying a debt. There is no convincing proof that the behaviour of a currency regime can have a lasting impact on the productive capacity of an economy.

The currency regime is also interesting from another angle. In a currency regime with fixed exchange rates it is impossible for inflation to reduce the debt. In this way the regime determines whether the creditor runs an exchange risk or a country risk, when there is some doubt about the productive capacity of a country's economy.

The real capital risk can be defined in terms of uncertainty about general economic developments in a country, that is to say about the average capital yield or profit level. This risk is particularly interesting, for instance, in the case of an investment in assets with a flexible nominal yield. Insofar as there is a short-term adjustment between inflation and profit levels (i.e. nominal wages are fixed), then it will be difficult to distinguish this risk from an inflation risk. The relation between inflation risk, exchange risk and the currency regime can to some extent evolve into, and be formulated in terms of, real capital risk.

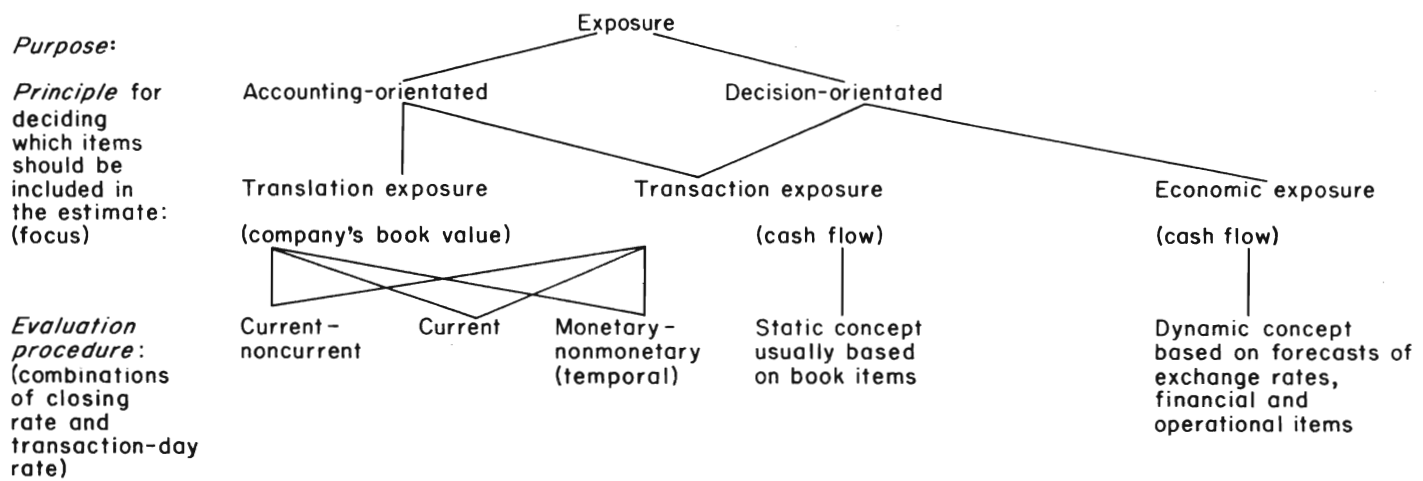
3.4.2 Accounting risk and economic risk

The following compilation introduces various measurement concepts of exposure and their meaning. Here there is naturally some uncertainty about what to include; nor is it always easy to decide what evaluation criteria to apply. Figure 3.9 indicates five basic alternatives, to which must be added a number of hybrid forms.

Exposure can also be defined in the light of amortizations and allowing for taxation effects. Examples of transactions which give some idea of the company's economic position but which are not registered in the bookkeeping are:

- orders received, expressed in a foreign currency
- purchase planned from a supplier, but not yet ordered
- goods ordered from a supplier, but not yet invoiced
- rent or leasing charges payable or receivable, not yet registered in the books
- management fees payable or receivable, but not yet in the books
- royalties receivable or payable, but not yet in the books
- license fees receivable or payable, but not yet in the books
- tenders given in foreign currencies.

Figure 3.9 Principles for estimating corporate foreign exchange exposure



In Figure 3.9 the translation procedures which are in use internationally are found, but it is not easy to evaluate them separately and yet consistently. There are conflicting elements in the analysis. Perhaps exposure cannot be determined satisfactorily by *one* method; a combination of methods may be needed, or at least a method adapted to the particular country. Developments in accounting seem to be moving in that direction. Perhaps it is even time to question the validity of the whole idea of 'consolidated' accounts and of their purpose, as formulated in the following definitions for instance:

> The purpose of consolidated statements is to present, primarily for the benefit of the shareholders and creditors of the parent company, the results of operations and the financial position of the parent company and its subsidiaries essentially as if the group were a single company with one or more branches or divisions. (*Accounting Research Bulletin*, No. 51, Financial Accounting Standards Board, 1975)

The most common translation methods in use internationally are the monetary–nonmonetary method, the current method, and the current–noncurrent method.

In the *monetary–nonmonetary method* the monetary balance-sheet items (cash, bankholdings, most claims and debts etc.) are translated at the rate pertaining on the closing date. Nonmonetary balance-sheet items (stocks, machines, real estate) are translated at the historical rate, for example the rate applying when the investment was made. The capital put up by the owners is translated at the historical rate, while the retained profit is translated at the rate applying in the year of accrual. In the monetary–nonmonetary method, earnings items are translated at the rate of the transaction date. The average rate for the year can be used as an approximation. For depreciation the same rate is used for the translation as for the asset in question. This method can be regarded as compatible with accounting based on the historical cost concept. The method is also known as the historical rate method.

In the USA, in line with the recommendation of FASB 8, the *temporal method* was used until 1982 and is still in use under certain circumstances. Under current accounting principles this coincides in the main with the monetary–nonmonetary method as far as the results are concerned. Differences arise, however, if nonmonetary balance-sheet items are measured at prices other than those applying at the date of acquisition, for example at the replacement price. According to this method cash, current assets, short-term debts, fixed assets and long-term debts carried forward at current or future prices are translated at the closing rate, while assets and debts carried forward at historical prices are translated at the corresponding historical rates.

The temporal method, like the monetary–nonmonetary method, has been criticized for the possibility of error that arises because real estate and stocks are evaluated at historical rates, while other items such as the long-term debts contracted in order to finance these acquisitions are translated at the closing rate.

According to the monetary–nonmonetary method only monetary items are regarded as subject to exchange exposure. According to the *current method*, on the other hand, all net assets are so regarded. According to this method, which is sometimes referred to as the closing-rate method, all assets and stocks in the balance sheets of foreign subsidiaries are translated at the rate pertaining at the closing of the accounts. The current method can be regarded as incompatible with their acquisition value method, since after translation the non-monetary balance-sheet items such as real estate, stocks, fixtures and fittings, etc. will not be reported at the acquisition value with deductions for depreciation, in parent company terms. During the 1970s the current method has been the most common translation method in the UK, where companies are able to choose which translation method they prefer. However, since 1967 companies must make quite clear in their bookkeeping which method has been used, and since 1977 the choice was limited by law to the current method or the monetary–nonmonetary methods only. The most recent recommendation in the UK, which is presented in Chapter 6, is close to FASB 52. In accordance with these recommendations, companies now have to translate all assets and liabilities in current, rather than historical, rates. This is a net investment approach.

According to the third method, *current–noncurrent method*, current assets and short-term debts in the balance sheets of foreign subsidiaries are translated at the closing rate, while fixed assets and long-term debts are translated at the historical rate. The fact that long-term claims and debts are not translated at the closing rate has given rise to a good deal of criticism, since these items are subject to exchange exposure just as much as short-term claims and debts. The method is sometimes referred to as the working-capital method.

The implications of the evaluation principles for the balance sheet's five main components, excluding share capital, in terms of translation at the closing rate (C) or at the historical rate (H) are shown in Table 3.5. By the historical rate is meant here the rate of exchange at the transaction date.

Long-term debts are evaluated at the closing rate in the case of three of the four principles described here. An example of the different results and the exposure differences to which the various methods lead, will be found in Appendix 4.

It can be noted that the monetary–nonmonetary method always yields a more positive result than the current method in any year

Table 3.5 Balance sheet translation rules

	A Current–noncurrent	B All-current (closing)	C Monetary–nonmonetary	D Temporal
Asset:				
Cash	C	C	C	C
Securities				
—cost	C	C	C	H
—market	C	C	C	C
Receivables				
—current	C	C	C	C
—long-term	H	C	C	C
Inventory				
—cost	C	C	H	H
—market	C	C	H	C
Fixed assets	H	C	H	H
Liabilities:				
Current payables	C	C	C	C
Long-term debt	H	C	C	C
Equity[a]	Residual	Residual	Residual	Residual

C. Translated at current exchange rate.
H. Translated at historical exchange rate.
[a] Adjusted for the translation gain or loss.

during which the foreign currency has been revalued. In the years immediately following, the reverse will apply, since the methods only affect the distribution over time, and the total effect over time is the same regardless of which method is used.

In many countries the evaluation at the closing rate of all claims and debts in foreign currencies in the parent company is often recommended, and exchange gains and losses are allowed to be deferred and amortized. This method is an answer to some of the criticism of FASB 8 that evaluation at the closing rate without any possibility of apportionment to different periods can give rise to unacceptable fluctuations in results from year to year, which in turn can give the company's stakeholders an incorrect picture of the real trends. Here, FASB 52 has opened up new possibilities, which we will see in Chapter 6.

3.5 EXCHANGE RISK IN CORPORATE OPERATIONS

It is important to be able to identify *where* in a company's operations the exchange risks arise, *what* type they are, how they are *measured* and, finally, how they can be *mitigated*. In the previous section we discussed the first three of these aspects, and can now turn to the

importance of the exchange risk at different planning levels in a company, and ways in which the company can handle its risk situation.

'Risk' refers to uncertainty about the future value of the company. On a theoretical level 'market value stabilization' is often given as the objective of corporate risk management. The foreign exchange risk exposure can be defined as the sensitivity of the domestic real market value of the company's equity to a change in the foreign exchange rate. In view of this objective the company has to consider how the market arrives at an assessment of its (i.e. the company's) value.

To avoid the problem of assessing market expectations in this respect, the goal of risk management is often formulated in terms of the company's economic value (flows) or book value (stocks) instead of its market value. In practical risk management, companies try to avoid the problems involved in market value objectives by relying on accounting numbers.

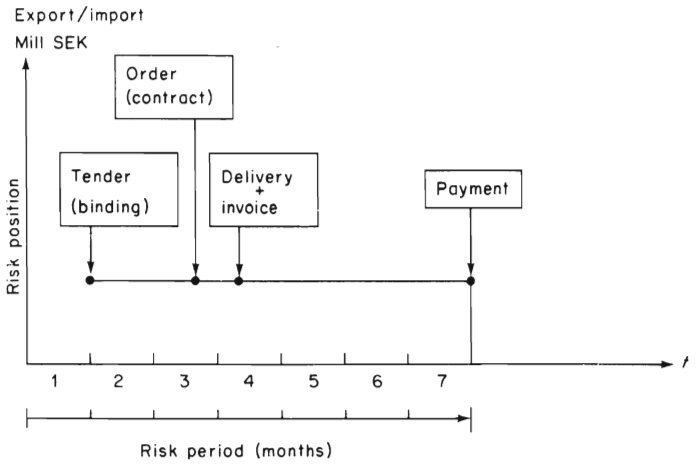
Figure 3.1 provides a summary in diagram form of a company's operations divided into different phases. In the planning phase, attitudes to risk come into the picture. The risk is often determined on practical grounds as a currency position, which can be described as the company's net claims or net debts in different currencies expressed in its own reporting currency. A position in which claims exceed debts is generally described as a *long* or positive position, while the reverse position is described as a *short* or negative position, in both cases as opposed to a *covered* position in which claims and debts balance one another. Thus total corporate risk, measured in terms of currency positions, will be zero if all its positions are covered. The existence of open positions provides the basis for a corporate exchange strategy.

This may seem simple in theory but it is extremely intricate in practice. Any consideration of positions is complicated by their changeableness over time, which makes frequent updating necessary. The time aspect is illustrated in Figure 3.10. Over and above this there is also the problem of definition.

We have already seen that differences in the definition of transaction position and economic position, for example, can affect the choice of foreign exchange risk strategy. A multinational company which expects the devaluation of a subsidiary's local currency may conclude from the calculation of a transaction position that there is a threat of heavy losses and that expensive defensive measures are called for. A calculation of the economic position, on the other hand, may indicate an increase in expected future profits which motivates additional investment, i.e. offensive action is called for.

Sometimes companies have to make decisions under exchange uncertainty; at other times they have to make them *because of*

Figure 3.10 The time aspect of the currency position



exchange uncertainty. In Figure 3.1 we can see that during the decision phase decisions are made about corporate operations; allowance is made for exchange uncertainty and perhaps, depending on the company's attitude to risk, measures may be taken to promote an internal equalization of the exposure.

During the planning phase, different exchange risks are evaluated in terms of positions. At this stage decisions, possibly derived from portfolio theory, may be made about which country to place an order in or to buy a machine from. If it is a question of taking a loan, consideration of interest rates will be supplemented by an analysis of expected changes in exchange rates. Thus during this phase *internal measures* for adjusting positions against one another are planned; in other words positions are handled basically without recourse to external financial markets, mainly by manipulating the currency and payment structure of the company's debts and/or claims, and their distribution over time.

The company's *external measures* for adjusting positions, on the other hand, are directly linked to the financial markets, and in this case the cost can generally be determined in advance. Despite the internal action which may have been taken, an open position which seems 'dangerous' may still remain. To handle this *residual risk*, action can be taken with the help of external capital markets. For example, a company which takes a loan on the international capital market to invest in expansion at home, and which has no other foreign commitments, faces the question of purchasing part or all of the loan sum on the forward exchange market. The company has presumably

already considered the exchange risk during the planning stage, when it had to choose a currency for the loan, but when it had no opportunities of matching. The need for external action may have arisen as a result of disturbances outside the company which have affected exchange rates, and which have caused a deviation from expected results ('result forecasts' in Figure 3.1). These result forecasts, which are generated in a continuous process, are broadly formulated to include all the changes attendant on the type of position that provided the basis for the planning. The continual revision of expected results is described by the loop in Figure 3.1.

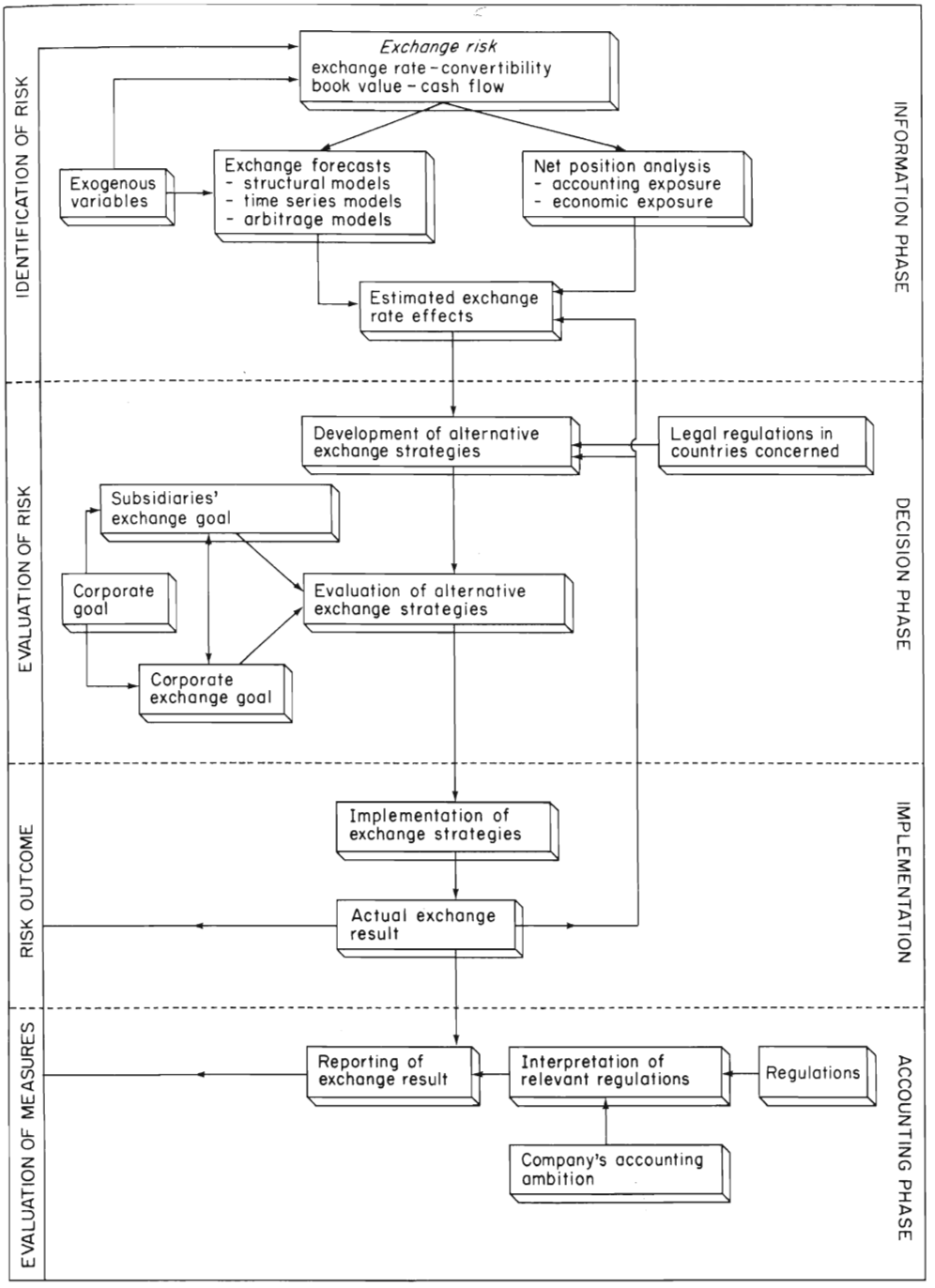
The common way of reducing exchange uncertainty is by taking defensive action. But exposure management can also involve offensive action — a type of speculation. Speculation in its strictest form must mean making a short position shorter or a long position longer. For instance, steps may be taken to increase assets in a currency whose value is expected to rise against the company's own reporting currency. A model of the decision process connected with exposure management is presented in Figure 3.11.

We have already noted that exchange risk is generally defined in terms of the increased variability in a group's consolidated yield which can be assumed to stem from unexpected fluctuations in exchange rates. It is also generally implied that this often considerable variation can be partly or entirely eliminated, at a certain *cost*. The cost of exchange risk management is often the price the company is willing to pay in order to show an even yield from period to period, and thus to increase its ability to acquire the necessary capital, for example, at reasonable cost.

The concept of the cost of risk management is often the subject of some confusion, partly because many companies look at the actual cost effect on the cash flow, while other companies argue in terms of an opportunity cost. There is a clear tradeoff between costs and risks.

To illustrate the difference, let us take the simple case of buying currency on the forward market, which will be exemplified with figures in Chapter 4. For the first type of company the forward premium/discount then represents the actual cost, while the second group regards the difference between the forward exchange rate and the spot rate at the delivery date as the relevant cost figure. Both cost concepts are justified. The small company often wants to avoid uncertainty about exchange rate movements at a certain pre-fixed price; the opportunity cost is of little interest to them. But the large company may have good reason to look into the costs on an opportunity cost basis, in order to reveal any systematic additional costs in their recurrent hedging operations. The large company often has some freedom of choice in its hedging procedures, allowing scope

Figure 3.11 Decision process in exposure management



for selective hedging — something which is denied the small company. As a result of hedging the market expectations of exchange rate movements are 'built in' as a realized component. With the help of new instruments and constructions such as currency options, this built-in element can be limited to one direction only.

3.5.1 Risk preferences

According to Rodriguez (1980, pp. 51–54) the most common objective of exchange risk managers in US multinationals is to reduce the risk to an acceptable level, within certain cost limits. What is meant by an 'acceptable' level will depend on the company's attitude to risk. We can identify three main categories of attitudes:

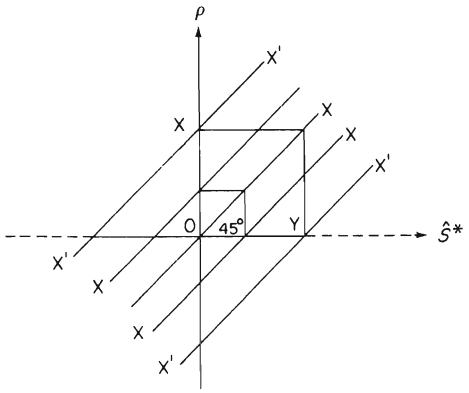
(1) *Risk-neutral*
For this category the risk is a direct function of the tradeoff between a possibly lower yield from a project as a result of exposure and a possible increase in the cost of covering the exposure which the project has generated. Corporate policy is governed by the existence of inefficiencies on the financial markets.

(2) *Risk-paranoid*
This category strives to reduce the company's exposure regardless of the cost involved. If the financial markets are efficient, the cost to the company of this policy will consist of the transaction cost.

(3) *Risk-asymmetrical*
This category strives to minimize the risk, but only at a certain cost. The asymmetry arises because management regards the disadvantage of reporting an exchange loss to be greater than the benefit of reporting an equivalent gain.

The tie-in between yield and risk can be seen in Figure 3.12. In the figure ρ is the difference between the foreign and the domestic rates of interest as an annual percentage, referring to assets carrying equal risks. $\hat{S}^*$ reflects the expected relative change in the exchange rate as an annual percentage. Above origo the foreign interest rates exceed the domestic. To the left of origo the company expects a depreciation in its own currency and to the right of it an appreciation. Along the 45° line the interest differential and the expected change in exchange rate are the same. To this must be added the company's risk preference, which can be expressed in terms of the limits to its indifference to having an open position or to covering the risk. These limits are represented by lines (e.g. X′ – X′) parallel to the 45° line through origo. The

Figure 3.12 Yield and risk



company's risk aversion is reflected in the bands formed by these lines. The greater the risk aversion, the broader the band.

If foreign interest rates exceed domestic rates by OX, for example, and the expected depreciation of the foreign currency is less than OY, then the risk-neutral company assumes a long position in that currency. If, on the other hand, the write-down in the currency is expected to be greater than OY, the company will assume a short position. The company's risk aversion expresses the differential that is necessary before the company will assume an open position. The greater the risk aversion, the greater the necessary differential.

The company's *perception of market efficiency* is related to its attitude to risk. By an efficient market is meant a market on which the price reflects in full all the available information (cf. Fama, 1970). Fama distinguishes between three levels of efficiency. *Strong* efficiency implies that all information is reflected in the exchange rates. *Semi-strong* efficiency means that only official information affects exchange rates. The difference between these two degrees of efficiency is that the semi-efficient exchange market provides opportunities for profit from the exploitation of inside information. *Weak* efficiency implies no direct assumptions about the information that is used in pricing the currency. It expects the spot rate of today to be the 'best' estimator of the future spot rate, in a statistical sense, and thus not necessarily unbiased.

We can assume that national borrowers and lenders will collect all the information that is publicly available before assessing the terms of a loan. The contract is subscribed so that the terms continually match this information. Any temporary chances of profit are presumably promptly eliminated if the transfer of information is operating satisfactorily.

Levich (1979) tested the following hypothesis regarding the efficient market:

> Unusual speculative profits should not be earned by investors who used exchange rate forecasts based on publicly available information.

His investigation was carried out on the international capital market and his conclusion was:

> Market efficiency suggests that publicly available forecasts of the future spot rate should not lead to unusual profits in forward speculation.

The efficiency of different SEK markets is analysed in Chapter 4.

3.5.2 Exposure management

An *exchange strategy* involves the systematic monitoring of currency positions, which in turn indicates whether the positions should be maintained, increased or reduced. We have already seen that different definitions of position can lead to different strategies. In Table 3.6 an attempt is made to collocate various categories of decision which affect the company's currency positions with different decision levels. The most difficult part, as far as definition is concerned, is that described in the table as 'decision and resource distribution' — a part which does not affect exclusively home-based companies. This part is mainly tied to the economic exposure concept.

Before surveying the ways in which a company can affect its positions, we should note that there are certain opportunities for eliminating or reducing exchange risks in direct currency transactions such as export invoicing, prepayment of foreign loans etc. Thus, still aware of the fact that every means may have a cost, the company should investigate the possibility of:

(1) writing a contract in its own reporting currency, or
(2) if the contract is agreed in a foreign currency introducing a clause about the rate of exchange, or
(3) agreeing about the division of possible exchange gains or losses on the contracted date.

After this, the various means available for managing currency positions can be divided into internal and external means (see Table 3.6, and

Prindl, 1976a). A list of the most common corporate tools in risk management is found in Appendix 5.

In the first category, the company's existing and future positions are handled basically without recourse to external markets, by means of changes in the currency and payments structure of the company's foreign commitments and the temporal pattern attaching to this. The second category, external measures, is directly linked to the financial markets, in which case it is usually quite a simple matter to determine the cost.

There will always be a certain time-lag, varying in length, in any hedging action. Examples of the duration of risk covered by a selection of actions appear in Figure 3.13.

The various actions listed in Table 3.6, perhaps need some clarification. At the policy level there are three main strategies for handling currency positions:

(1) selective hedging
(2) covered positions
(3) *laissez-faire* policy.

In a strategy of selective hedging it is assumed that the interest differential does not accurately reflect exchange rate expectations. When the exchange risk can be regarded as underpriced in relation to the interest differential, positions are kept as short (negative) as possible; it is felt that the interest differential underestimates the foreign currency against one's own. Substantial long (positive) positions are maintained when foreign exchange rates are expected to fall less than is indicated by the higher level of foreign *vis-à-vis* domestic interest rates.

For a foreign loan in which the only (albeit sometimes limited) hedging possibility consists of forward hedging, the position-handling decision will depend on whether the forward rate underestimates or overestimates the expected future spot rate. For this kind of selective hedging some sort of forecast is thus required, although it may be of the simplest kind.

The other two strategies require no forecasts. Total position cover is the answer to total risk aversion (the paranoid attitude). The company assumes that the costs of neutralizing risk can be kept down and that interest rate parity will hold in the long run. One motivation for maintaining total cover of the exposure on an efficient market may be a desire to eliminate the fluctuations in results that are caused by changes in exchange rates.

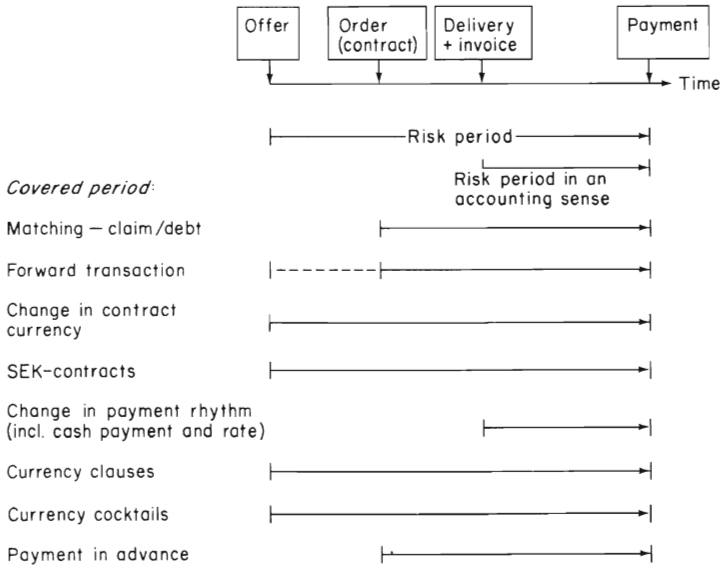
In a *laissez-faire* strategy all positions are left open and no action is taken, in view of interest rate parities and because it is assumed that on

Table 3.6 Categories of decisions affecting corporate exchange positions

Decision levels	Policy issues	Commercial issues		Financial issues		Allocation of decisions and resources
Strategic or administrative decisions	Avoiding business with countries with obvious currency problems, and where, for example, the country's economic capacity suggests payment problems in the near future (cf. Country risk).	Decisions about commercial relations with certain foreign parties. Decisions to increase sales efforts on particular markets. Decisions to establish foreign sales companies in a particular country. Decisions on manufacturing in particular countries.		Loans to and from other countries in connection, for example, with building up capacity at home or abroad or for financing foreign subsidiaries. Issue of bond loans in foreign currencies. Decisions regarding which part of a multinational group should take up the loan.		Decisions regarding allocation between parent company and subsidiaries with respect to monetary items, securities and real assets. Decisions affecting present and future profits in foreign subsidiaries. Decisions regarding settlement procedures in evaluating the procedures of foreign subsidiaries or combinations of subsidiaries.
Operational decisions		Decisions on settlement principles. Decisions on product-related bargaining objects.		Decisions on credit terms, rates of interest, rate of amortization and other financial conditions.		Decisions about delegating scope for national exchange exposure in foreign subsidiaries, and the limits for this.
		Internal means	*External means*	*Internal means*	*External means*	
Decisions on exposure management	Decisions on (1) selective position influence (2) covered positions	—changes in contract currency	—export-credit arrangements	—matching (exchange balance	—forward market transactions	Depending on the relations between parent company/subsidiaries (sales company, manufacturing company, financing company, etc.)

(3) *laissez-faire* policy	—changes in rhythm of payments *vis-à-vis* outsiders (incoming/outgoing) —changes in balance of payments (parent companies/foreign subsidiary) —changes in financing exports (e.g. financing companies) —affecting via correlated currency	—factoring —forward market transactions	between claims/debts) —currency cocktails —structural debt/claims changes, currency-wise (weak/strong) —exchange rate reserve	—foreign loans —discounting of currency —loan/deposit arrangements in two currencies (swaps) —leasing	all measures suggested under commercial and financial questions may occur.

Figure 3.13 Length of risk period covered with different means



an average hedging cost will reflect the exchange rate changes. With this strategy the decision-maker is insensitive to the effects of the exchange rate fluctuations.

Table 3.7 illustrates the relation between exposure strategies on the one hand and the company's attitude to risk and its perception of market efficiency on the other. According to Rodriguez (1980) a company's actions are 'consistent' in that its decisions are the result of its goals (management's risk attitudes) and its expectations (management's perception of markets). Companies with a neutral or asymmetric attitude to risk all apply some form of selective hedging strategy.

Of the measures listed in Table 3.6, the concept of matching perhaps needs some further clarification. Matching refers to the currency-related balancing of claims and debts or inflow versus outflow, whereby a company's total currency commitment is adjusted so as to minimize exchange risk. The adjustment can be effected within the different currencies or between currencies by exploiting possible correlations between them, for example according to the MARP technique (Management of Accounts Receivable and Payable). See also Makin (1978).

Two types of matching procedure can be distinguished:

(1) *Structural matching*

This kind of matching extends over a longer time period and involves successive structural adaptions of the company's currency inflows and

Table 3.7 Company's expected exposure at different combinations of risk attitudes and ideas about the efficiency of the market

	Management's perception of markets		
	Market inefficiencies suggesting a position which is:		
Management's risk attitude	Efficient markets	Long in high-interest (depreciating) currencies; short in low-interest (appreciating) currencies	Long in low-interest (appreciating) currencies; short in high-interest (depreciating) currencies
Risk-paranoid	0	0	0
Risk-neutral	Random	Long in high-interest (depreciating) currencies; short in low-interest (appreciating) currencies	Long in low-interest (appreciating) currencies; short in high-interest (depreciating) currencies
Risk-asymmetrical	0	As above, subject to maximum exchange loss constraint	As above, subject to maximum exchange loss constraint

outflows. The adjustment may be effected in the currency in companies operating on international markets, or by switching trade partners. This form of matching will be included in the company's strategic planning. This form of matching is primarily translation orientated.

(2) *Financial or operational matching*
In this case matching is effected in a company's financial or operational commitment. For example, a short-term debt in a particular currency can be balanced by means of a currency deposition in the same currency. This form of matching is primarily connected with transaction operations and belongs to an administrative planning level.

Sometimes there is a conflict between the two kinds of matching, that has to be solved by giving priority to one of them. Opportunities for matching depend largely on the company's structure and on the volume and temporal pattern of its currency flows, and they can be assessed in various ways. A simple and practical indicator is often recommended, namely the tradeoffs between export flow and currency claims, between import flow and currency debts. However, this only gives us an idea of the general scope of the opportunities. The picture may be complicated by differentials between outgoing and incoming currencies, often manifest in a low or negative correlation

between the two. However, double counting in the consideration of both flows and balances (e.g. export and short-term debts) is a drawback to this indicator. But if calculations were based on the year-end balance only, the picture of the opportunities for matching in the course of the year would be one-sided. On the other hand, consideration of export and import flows only, would mean disregarding the important financing debts.

Companies which are able to match by manipulating currencies will find their opportunities largely determined by their market position, i.e. their position *vis-à-vis* their foreign trading partners. The general state of the market is also important.

Matching is accompanied by costs. Contract-currency matching can be compared with price negotiations, when the parties concerned have much the same idea about present and future trends in the contract currency. Export prices and import prices measured in one's own currency will presumably be affected by a change in invoicing currency.

Another kind of structural matching involves altering the pattern of foreign trade by changing to trading partners located in another country. Here some of the costs may be difficult to assess, and these have to be weighed against the resulting risk-reduction. If we consider the example of a company which has to choose between long-term agreements with suppliers in Austria or Portugal and which chooses the former, despite a higher price, on the grounds that it has large positive assets in DEM — a currency whose movements it has found to exhibit a strong positive correlation with ATS — then the complexity of the economic evaluation emerges pretty clearly. Previously, bilateral currency agreements would guarantee the success of cross-currency matching. Possible correlation patterns of a stationary kind probably stem in many cases from the similarity between the currency regimes and the general economic state of the countries concerned. The correlation between exchange rate movements for different currencies during 1974–84 will be studied in Chapter 4.

Financial matching has come increasingly to the fore, particularly since the appearance of roll-over financial loans with multicurrency clauses. Companies with foreign subsidiaries have the best opportunities for financial matching. The purpose of a foreign loan as an expression of financial matching is to balance a positive position in a currency X, or in a currency strongly correlated with X.

Matching also has an important organizational aspect. Thus, in financial matching, the buying and selling organizations and the company's financing function should all be involved and should all feel strongly motivated to promote the matching efforts.

The finance department should provide continual information and recommendations for or against particular contract currencies. These preferences can then find expression in an increase in invoicing in the company's deficit currencies and an increase in purchasing in its excess currencies.

3.5.3 Foreign loans and hedging opportunities

If a loan has been taken for offensive purposes, perhaps because capital is needed for some kind of transaction, hedging may be relevant if the loan results in a negative position.

In some countries, access to the forward market is limited. In Sweden, for instance, companies wishing to hedge loans in foreign currencies on the forward market are severely restricted by present currency controls. Thus it is only permitted to hedge a foreign-currency loan required for purposes of financial transactions, with a contract covering at most the six last months of the loan term. The forward transaction must refer to the purchase and sale of foreign currencies against Swedish kronor.

Since the mid-1980s it has been possible for Swedish companies contracting loans in foreign currencies to buy the loan currency on the forward market against another optional currency. For this type of multilateral forward transaction, no restriction is set on the term of the loan. As a result of this procedure, which does not affect the Swedish krona, Swedish companies exposed to exchange risk due to their foreign loans, are able to transfer the risk to another foreign currency where their position can be more readily handled.

For the strictly home-based company, however, the only opportunities for hedging are those provided by the limited access to the Swedish forward market. If a company has no other foreign transactions apart from the loan, the multilateral forward transaction becomes a purely speculative venture, thus providing no hedging opportunity in the true sense of the term.

3.5.3.1 Decision to hedge on the forward market

Assuming a company which has taken loans in foreign currencies, and given the possibility of forward hedging as described above, we can draw the decision matrix in Table 3.8, which allows for expectations of an appreciation in the loan currency.

If a company has adopted a strategy of selective hedging, then some kind of forecast is needed. A decision about the forward purchase of the loan currency will be based on a comparison between the hedging

Table 3.8 Hedging decisions

Decision	Actual exchange movements	
	Considerable appreciation	Slight appreciation
Hedge/increase position by forward buying	Right	Wrong—cost of position handling
No hedging/no increase in position	Wrong—exchange loss	Right

cost, including the transaction cost, and a forecast of exchange rate movements. If the forecast suggests that appreciation will far exceed the cost of the forward hedging, then the loan currency will be hedged. Then if there is a depreciation, the company will have exchanged a potential exchange gain for a hedging cost.

A variety of rules exists to prescribe when forward hedging should be affected. The following is an example of a rule based on some kind of mathematical expectation (see Shulman, 1970). According to this rule a position should be hedged when:

$$Y \cdot P \cdot E \cdot R > C \tag{15}$$

where Y = the most likely percentage change in exchange rate during the term of the loan, e.g. 20 per cent appreciation

P = estimated probability that change Y will occur during the term of the loan, e.g. $P = 0.90$

E = estimated reliability of earlier exchange rate forecasts. E.g. $E = 1.30$ will mean that earlier forecasts have been deemed to have had an average error of 30 per cent

R = the company's risk aversion. E.g. $R = 1.40$ means that the company wants a 40 per cent security margin

C = cost of a forward contract. To cover loans in foreign currencies it is a question of contracts for purchases in future.

With the figures in the example we get:

$$0.20 \cdot 0.90 \cdot 1.30 \cdot 1.40 = 0.328$$

If $C < 0.328$, the position should be hedged according to Shulman's rule; otherwise it should not.

The timing of the hedging is important. One way of determining this is to take a *Y*-value corresponding to potential exchange rate movements, based on the Purchasing Power Parity theory and measured from a point of equilibrium. With this value, and *P* and *E* in Shulman's model equal to 1, the result can suggest a good basis for the timing of the hedging.

To make the timing less crucial it is possible to buy forward with options regarding the time span of the delivery. Other instruments based on forward operations are financial futures and currency options. The difference between a contract for a traditional forward market transaction and a contract with currency option is that according to the former contract the customer is obliged to fulfil the transaction, while in the case of the currency option he can take such gains as arise but need only pay an insurance fee if the transaction goes wrong.

3.5.4 Exchange rate reserve

Reserves and exchange hedging serve the same end from the point of view of the profit and loss account: to smooth out fluctuations in exchange rates. External exchange rate hedging is effected in the market place; the company simply pays someone else to bear the exchange risks. Reserves, on the other hand, represent an internal protective system. The company is protected from paying for over-hedged currency positions.

A reserve provides a certain freedom of action, so that risks can be wholly balanced against costs and a good basis for a selective hedging strategy can be found. The reserve system is also interesting to use here, since it should produce much the same kind of effects as the recommendation presented in Chapter 7 below.

Most companies today have some idea of the extent of their net global exposure, which should help them to decide how much to transfer to an exchange reserve.

A simple way of settling the size of the transfers is based on the classical ruin problem. First, average fluctuations in exchange rates over the last five years are analysed. For a currency exhibiting a certain annual appreciation rate, a reserve is built up to cover a net negative currency exposure. The size of the transfers could perhaps be calculated as the product of the average monthly exchange rate change over the last five years and global net exposure at the end of the month. If translation gains have accrued on a particular currency during the previous month, these can be added to the reserve, together with the ordinary monthly transfer. Thus a reserve accumulates until it reaches a level which should be determined by the company's transaction

exposure and the relevant currency's historical pattern of exchange rate movements.

There are many other ways, too, of settling the size of these transfers. One alternative is to calculate the percentage as the difference between the interest rate differential and the actual exchange rate movements over a certain period.

The size of the reserve could perhaps be such that in any given month it should be able to absorb the loss arising in, say 95 per cent of all cases.

The standard deviation (s) in exchange rate fluctuations can be used in calculating an interval. If the fluctuations are distributed more or less normally then a transfer will be required such that the reserve amounts to $1.64 \cdot s$ of the net exposure.

We can take the percentage monthly fluctuations in SEK/DEM during 1980–84 as an example. The standard deviation was 2.87 per cent. Transfers such that the reserve amounted to 4.7 per cent of the net exposure could have been expected to cover the appreciation effects in 95 per cent of the months in the period. If we assume the cover to exist in 84 per cent and further assume a more or less normal distribution in the fluctuations, the ceiling of the reserve will be 2.87 per cent of the exposure. The willingness to accept risk determines the size of the reserve.

Big one-off adjustments are not captured by this protective net, which could thus be supplemented by selective hedging or by some currency clause about additional risks.

This alternative is based on historical events. Another alternative is to analyse the error distribution in the forward rate and to use this in creating a reserve. The absence for some currencies of a sufficiently long forward market, however, can make this alternative difficult to implement.

The problem is to establish sufficiently objective grounds for the creation of exchange reserves, so as to fulfil the requirements of good accounting practice.

3.5.5 Risk management — the organizational aspect

For its exchange decisions the company must rely on internal information channels which feed back the various exchange results; these then provide a check on earlier decisions as well as a basis for present calculations.

In order to oversee its total currency situation, the company needs answers to the following questions:

(1) Whereabouts in its operations and at what management level do currencies other than the local currency make an impact?

(2) What is the relative importance of exchange transactions in the company as a whole and in its various units?
(3) What resources — qualified staff, for instance — are needed to guarantee that the management of exchange problems is appropriate to the importance and complexity of these problems?
(4) How can the handling of exchange problems best be integrated into the company's overall activities?

The handling of exchange issues is often regarded as something that takes place outside the company's walls, but this is a misconception. An awareness of the importance of exchange-rate movements should exist at all levels inside the company, and it should become explicit in capital budgeting decisions, project evaluations, the planning of business undertakings, and so on.

Table 3.9 shows organizational distribution of exchange decisions in multinational companies in the USA. The figures are part of the findings reported in Evans, Folks and Jilling (1978) and are based on a study of 156 companies.

The system for coping with foreign risks can be described in two main dimensions: how it is to function in terms of the centralization of decisions, and the type of influence the risk management can have. By centralization is meant that explicit steering and coordination is effected centrally in the group. Four combinations are identified in Table 3.10.

The *centralization* or *decentralization* of corporate risk management is a key issue. Centralization allows for comprehensive matching, with a view to reducing the company's or the group's total risk exposure. Control of this kind cannot be achieved under decentralized risk management. Centralization brings scale advantages on the capital and foreign exchange markets, and opportunities for concentrating the knowledge potential to one department, so that the synergy advantages attaching to multinational enterprise can be utilized to the best advantage. Thus centralization offers the possibility of global tax and cash-flow planning. Centralization opens the way for cash management systems with clearing and netting centres, thus reducing transfer costs in the shape of transaction costs as well as floats (periods when capital is floating without interest).

The main objection to the centralization of risk management is the great demands it makes on information: a centralized system is only as good as the reporting propensity in the subordinate units allows it to be. And the willingness to report among unit managers will depend on their motivation, when they are denied the opportunity to influence the exchange risk directly within their own units. The force of this objection to centralization varies, depending on the risk measure applied in the company. The information aspect and its related costs,

Table 3.9 Organizational unit at which specific exchange risk management subtasks are performed: current practice at US multinational corporations, autumn 1977

	Percent of respondent firms[b]							
	Individual responsibility				Shared responsibility			No response
Exchange risk management subtasks	Treasury	Controller	General finance	Other	Treasury and general finance	Treasury and controller	Other	
Preparation of exposure estimates and forecasts of exposure levels	51.4	16.0	3.2	4.4	0.0	15.4	1.3	8.3
Aggregation of exposure estimates	64.7	15.4	1.3	3.2	0.0	7.1	0.0	8.3
Preparation of exchange rate forecasts	70.6	1.3	1.3	5.7	0.0	5.1	6.4	9.6
Analysis of the potential impact of forecasted or anticipated exchange rate movements on the performance of the firm	53.9	9.0	2.6	3.8	0.6	17.9	2.6	9.6
Development of proposals for adjusting the financing patterns or asset/liability position of a subsidiary to alter exchange risk characteristics	75.7	1.9	2.6	1.9	0.6	4.5	3.8	9.0
Development of proposals for forward market operations to alter exchange risk characteristics	80.8	0.6	1.9	2.6	1.3	1.3	1.9	9.6

Integration of tax factors into exchange risk management proposals	57.7	7.1	1.9	4.5	1.9	8.3	9.0	9.6
Review and approval of proposals for altering exchange risk characteristics	74.4	0.0	3.8	3.8	3.2	3.2	2.6	9.0
Planning for investment of subsidiary liquid funds	74.4	0.6	1.9	4.4	2.6	4.5	2.6	9.0
Determination of appropriate type and volume of short-term funding by individual subsidiaries	75.7	0.6	1.3	4.4	2.6	3.8	2.6	9.0
Determination of timing and amount of local subsidiary dividend payments	62.3	3.2	1.9	5.1	3.8	7.1	8.3	8.3

[a] Evans, Folks jr and Jilling (1978): *The Impact of Statement of Financial Accounting Standards No. 8 on the Foreign Risk Management Practices of American Multinationals*, University of South Carolina, FASB, Stamford, pp. 140–141.
[b] Based on an investigation of 156 companies.

Table 3.10 Risk influence and the distribution of decision-making

Risk influence via	Organization or distribution of decision-making	
	Centralization	Decentralization
Internal measures	Comprehensive matching possible	Comprehensive matching not possible
External measures	Financial scale effects to the company, in influencing the residual risk	Financial scale effects to the bank, in influencing the company's residual risk

both direct and opportunity costs, will be a decisive factor in choosing the degree of centralization in a company.

The advantage of centralized risk management depends on the prevailing pattern of physical management of products and factors in the group. The most complex models of physical management include both production and sales units abroad, with any buying and selling between these both within a country and between different countries or to and from a third market. A graphic illustration of the physical or material flows in such a group looks like a spider's web. The simplest model would show production located in the home country, with flows to overseas sales units selling only within their own particular country. The difference between these two extreme types as regards what can be achieved by centralizing risk and cash flow management, is obvious.

We can identify many administrative solutions. In the simplest of these cases centralization of the exchange risk is effected by invoicing the foreign subsidiaries in their own local currency and by letting these companies borrow in their own currency. If the foreign subsidiaries have no purchases in foreign currencies apart from their imports from the parent company, and no sales to a third market, then the parent company has succeeded in removing the exchange risk from the subsidiary company and locating it in the parent company or in some central corporate unit.

A special form of this type of centralization is based on a system of reinvoicing. It is particularly applicable to groups with foreign subsidiaries selling to one another, but it can also be used with advantage when foreign subsidiaries have external business on a third market. If

an English subsidiary sells to a French subsidiary within the group, for example, the product is sent directly to the French company but the invoice, in GBP, is sent to a reinvoicing centre. This centre takes the exchange risk, and sends a new invoice in FRF to the purchasing French subsidiary. The creation of a reinvoicing centre is mainly an internal measure for centralizing the risk, but it can also have implications for cash-flow management.

When home-based subsidiaries export to foreign subsidiaries and have to invoice them in the local currency, settlement can often be a sensitive business. In a reinvoicing system this problem is solved, in that an invoice in the domestic currency is made out to the reinvoicing centre. Otherwise we can find all kinds of ways of dividing responsibility between the domestic subsidiaries and the central financial unit — ranging from the central unit taking the risk at the tendering stage to the central unit assuming no risk at any time. In between, there are various internal hedging procedures. In the distribution of risk discussed here, there is an obvious source of conflict. Choosing internal forward rates and invoicing rates will be a sensitive business in the central finance unit. Centralization thus generates a need for 'keys' to use in allocating within a group any exchange gains or losses that arise.

Chapter 4

Analysis of the foreign exchange market, 1974–84

4.1 INTRODUCTION

The analysis covers the period 1974–84 and it has a dual purpose: first, to show how far different relationships or laws, based on economic theory, have held during the period of the study and how far they can be used in corporate decision-making and more narrowly how far they can be taken as a reasonable basis for schemata in evaluating corporate foreign loans; secondly, to illustrate different ways of forecasting exchange rates and to examine the precision of some of the methods as it was revealed during this period.

In this chapter we will focus the analysis on foreign exchange fluctuations and how these are linked to different variables with potential explanatory power, like interest rates, inflation rates, etc. To make the analysis of financial market fluctuations complete, the next chapter is devoted to analysis of patterns in interest rate movements.

In this chapter we start with a discussion about the existence of a 'super' model for exchange rate behaviour. As such a model is hard to find we continue with an empirical analysis of the equilibrium relationships on which most of the structural models under discussion are based. Many of these equilibrium relationships are to be labelled as arbitrage models. The last step of the analysis concerns pure time series analysis. We simply look for patterns, like trends, correlation, autocorrelation, etc. in historical time series.

In Section 4.2 we start with a discussion about structural models. Then the theory underlying three important equilibrium relationships is described, and the validity of the relationships during the period 1974–84 is analysed. The relationships discussed are the Purchasing Power Parity theory, the Interest Rate Parity theory and Fisher's Open Relationship. When exchange rate movements are related to financial items, the presence of transaction costs can generate systematic deviations from equilibrium. Section 4.2 includes estimates of transaction costs, which play an important part in the subsequent analysis.

In Section 4.3 price determination on the spot market is analysed. Do we have trends in the exchange rate movements, for instance, to consider in a discussion about different ways of amortizing exchange losses? Can we identify any sort of recurrent pattern here, perhaps a relation between successive changes in exchange rates, which could be useful in the corporate decision-making? To be able to answer this question, a Box–Jenkins analysis of weekly movements in the major loan currencies is carried out. As a basis for decisions according to portfolio theory, the relation in terms of correlation coefficients between exchange movements in different currencies is analysed.

In Section 4.4 we examine price determination on the forward market, with particular attention to three-month futures. Here, too, the relation between successive exchange rate movements is studied with the help of Box–Jenkins models. In this section the relations between spot and forward rates will also be analysed, and we will try to discover how far the two rates express the same information.

How far are we justified in basing forecasts on an analysis of the laws or relationships under consideration here? Section 4.5 is intended to provide an answer to this question. Long-term forecasting utilizing the kind of long-term equilibrium relationships described in Section 4.2 and short-term forecasting are considered. In the case of short-term forecasts, the section is concentrated on market-based forecasting, i.e. forecasts available from the financial market without cost, in the shape of interest differentials or forward hedging costs. In comparing different forecasts of this kind, we will include the random-walk model. The success of the different forecasting methods during the period 1974–84 is described in terms of average values and standard deviations in the forecasting errors. The possibility of correlation between successive errors is also mentioned. Finally, in Section 4.5.3, the value of the market-based forecasts in corporate planning is discussed.

4.2 MODELS AND EQUILIBRIUM RELATIONSHIPS

At the central bank level we can identify three major models for managing the value of a currency. These models are the balance of payment model, the asset-market model and the Purchasing Power Parity model (PPP) (Artus, 1978). The first two models require many estimates of different elasticities and are based upon many assumptions about which variables are to be regarded as exogenous and which as endogenous. The multiplicity of assumptions provides us with an almost infinite number of permutations of the two models. The third model is easier to handle in practice, but it must be remembered that it provides only a very rough indicator of the long-term equilib-

rium exchange rate for a currency (Oxelheim, 1983a). However, it could still become an important factor in corporate decision-making. We will devote much interest to this model in the following pages.

There is no consensus, either theoretically or empirically, concerning the 'super' model for determining the foreign exchange rate. This will naturally aggravate the problem of forecasting the rate, as well as reinforcing the problem of information about the effect of volatile exchange rates.

More advanced econometric models have proved inferior to rather simple partial equilibrium models (see, for example, Meese and Rogoff, 1983). So, given our interest in finding normative bases which are easy to apply, there seems every justification for further analysis of these equilibrium models/relationships.

From the 'asset' models we can subsume three important models, which have been subjected to extensive testing, in the following general specification:

$$S = a_0 + a_1(m - m^*) + a_2(y - y^*) + a_3(r_s - r_s^*) + \\ + a_4(\Pi^e - \Pi^{*e}) + a_5\,\overline{TB} + a_6\,\overline{TB}^* + u \qquad (16)$$

where, in the case of the Swedish krona,

S	= the logarithm of the price of foreign currency in Swedish kronor
$m-m^*$	= the logarithm of the ratio of the Swedish money supply to the foreign money supply
$y-y^*$	= the logarithm of the ratio of Swedish to foreign real income
$r_s-r_s^*$	= the short-term interest rate differential
$\Pi^e-\Pi^{*e}$	= the expected long-run inflation differential
$\overline{TB}$	= the cumulated Swedish trade balances
$\overline{TB}^*$	= the cumulated foreign trade balances
u	= a disturbance term.

The Frenkel–Bilson model is one of the three models that posit that the exchange rate exhibits first-degree homogeneity in the relative money supply, or $a_1 = 1$. This model assumes purchasing power parity and the constraints $a_4 = a_5 = a_6 = 0$. The second model commonly referred to is the Hooper–Morton model. This model allows for changes in the long-run real exchange rate, and is an extension of the Dornbusch–Frankel model, the third model to be mentioned. The Hooper–Morton model has no constraints regarding a

zero value for the coefficients in equation (16). Slow domestic price adjustment and consequent deviations from purchasing power parity are allowed for in the Dornbusch–Frankel model, where $a_5 = a_6 = 0$.

Without going into details Meese and Rogoff (1983) reported that for the period November 1976 to June 1981 and horizons of one to twelve months, the above models failed to improve the random-walk model, in spite of the fact that their forecasts are based on realized values of the explanatory variables.

The failure of the structural models to out-perform the random-walk model, for instance, can be attributed to sampling error or other data-related factors. However, structural instability due to oil price shocks and changes in national economic policy or currency regimes, as well as the failure of the models to incorporate other real disturbances adequately, may be very important.

The Meese–Rogoff (1983) investigation was carried out in such a way as to avoid any problems arising from Jensen's inequality (see, for example, Siegel, 1972, or McCulloch, 1975), according to which the best predictor of the level of the SEK/USD rate might not be the best predictor of the USD/SEK rate. Our use of the Swedish krona as base changes nothing in this respect.

Given our purpose, the problem of data quality and misspecification, and of modelling expectations of the explanatory variables, only confirms the need to look for a normative decision and accounting basis among equilibrium relationships, which are easy to handle and which hold for empirical testing.

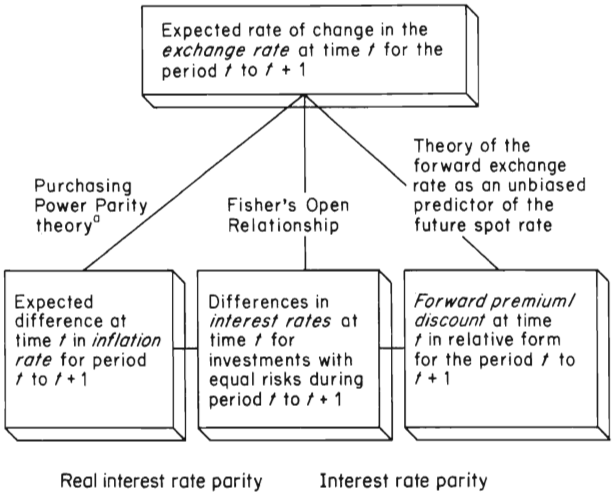
Three equilibrium relationships will be presented here in their pure form; potential sources of disturbance will also be indicated.

According to a fundamental postulate of monetary theory, the price of a currency is ultimately a function of the supply and demand for the currency in question. Thus, growing demand for a particular currency in combination with a constant supply will lead to a rise in the price of that currency; inflation will fall and the exchange rate will rise in relation to other currencies. On the other hand, if demand is constant while the outstanding stock of money increases, there will be a fall in price; inflation will increase and the exchange rate will drop in relation to other currencies. The outstanding stock of money consists of coins, notes, customers' credit-granting potential and the currency reserve (see Heywood, 1978, among others). In monetary theory it is generally assumed that the demand for a currency is constant in the short run, i.e. over a period of less than one year, and that for this period the price of the currency will be a direct function of the stock of money. An increase in this amount will mean higher inflation and a drop in the exchange rate, while a reduction will reduce inflation and lead to an increase in the exchange rate. In the longer term, the

problem is a complex one. It is a question of identifying factors that affect the demand for a currency, i.e. the 'demand motives' of individual people and companies.

Figure 4.1 illustrates the equilibrium relationships between inflation differentials, interest differentials, and expected movements in exchange rates. The expected movements in exchange rates are related to inflation differentials between two countries in terms of the *Purchasing Power Parity theory* (see Section 4.2.1). According to this theory the real value is constant for all currencies which are allowed to move freely. In the simplified monetary model described above the Purchasing Power Parity theory can explain the following course of events for

Figure 4.1 Equilibrium relations between exchange rate movements, inflation rates and interest differentials



[a] The Purchasing Power Parity theory is generally formulated in terms of differences in inflation rates and the rate of change in the exchange rate.

an economy which has full employment and zero growth. Given constant interest rates and a constant demand for money, an increase in the stock of money (due perhaps to foreign loans or a government budget deficit) will mean a drop in the price of the country's currency. Inflation will thus rise and, still according to the Purchasing Power Parity theory, the currency will either depreciate (given floating exchange rates), or there will be a balance of payments problem (given pegged exchange rates). In the latter case, and if the problem persists, the country's central bank will have to adjust the exchange rate by devaluating. However, this way of correcting an external imbalance is only one of many alternatives.

Deviations from this simple model are caused by different kinds of shocks, monetary or real. Currency speculations, perhaps based on

the expectation that exchange rates will not fully adjust to relative inflation rates and interest rate levels, are responsible for further deviations. The problem is aggravated if a big deficit in the balance of payments leads people to expect a devaluation. Speculation is then based on the hope that in the short run a major exchange rate adjustment (in relation to the interest differential for the period) will mean a big exchange gain. In a system with a bilateral pegged rate there is little risk in the corporate decision-making, since adjustments in exchange rates rarely go in the wrong direction. The element of 'betting' is thus really all on one side.

Naturally this kind of speculation can seriously affect a country's economic policy. In Sweden the currency regulations are justified on the grounds that such capital movements as could threaten the foreign exchange reserves and, consequently, the exchange rate, must be held in check. One aim, which has an indirect effect on the exchange rate, is to protect the domestic credit market and interest rates from external influence. As a result, a certain independence in monetary policy can be expected *vis-à-vis* the rest of the world. The future of the Swedish currency regulations is at present under debate.

It is difficult to evaluate the effects on the exchange rate of the various speculative activities, since the individual expectations and attitudes to risk on which speculation is based do not lend themselves to any kind of aggregated assessment. This subject is discussed in some detail in Rubinstein (1974).

Fisher's Open Relationship is based on interest differentials. Thus, together with the Interest Rate Parity theory, it is an example of a financial equilibrium relationship. According to Fisher's Open Relationship one unit of a currency can be expected on an average to yield the same rate of return, whatever currency it is invested in. The theory can be formulated in terms of Euro-interest rates to eliminate the disturbances engendered by national currency controls. In the case of the major Euro-currencies, empirical investigations have confirmed the validity of the theory (see Giddy, 1976b, and others).

The relationships in Figure 4.1 are not always compatible. Thus, an increase in the supply of money leads to an increase in inflation and, according to the Purchasing Power Parity theory, to a depreciation of the currency in the country in question. On the other hand, if inflation forces up domestic interest rates and leads to a greater inflow of international capital, then Fisher's Open Relationship speaks for an appreciation of the currency. It can be expected that the demand for the local currency generated by this greater inflow will more than compensate for those effects on the exchange rate which can be ascribed to the increase in the stock of money.

When it comes to the relation between interest differentials and exchange rate movements, there are two schools of thought. The Keynesian school subscribes to the view propounded above. It is assumed that, in the short run at least, prices may be sticky, and that as a result nominal interest rates will reflect changes in the tightness of the prevailing monetary policy (see Dornbusch, 1976b). An appreciation as described above will lead to a drop in the price of the foreign currency, and this school thus proclaims a *negative* relationship between exchange rate movements and nominal interest differentials.

The Chicago school represented by Friedman, and others, assumes instead that prices are entirely flexible (see Bilson, 1978) and that changes in the nominal interest rate reflect shifting expectations as regards future inflation. Thus when a domestic interest rate rises against rates in the rest of the world, this can be said to follow from expectations of a drop in the value of the currency as a result of inflation and depreciation. The demand for the domestic currency falls off in relation to the demand for other currencies, and the local currency is depreciated with immediate effect. This course of events reflects a *positive* relationship between exchange rate movements and nominal interest differentials.

The two arguments are based on different price assumptions, and they represent different approaches to the role of the exchange rate as equilibrating the international demand for monetary assets and the demand for goods. According to Frankel (1979b) the Chicago school provides a realistic description when the variation in the inflation differential is large, as for example in the German inflation of the 1920s. The Keynesian description is realistic when this variation is small. The problem, according to Frankel, is to develop a model that provides a realistic description when the variation in the inflation differential is moderate, as it was in most industrialized countries during the 1970s. Frankel combines the two schools in a 'real interest differential model' and shows that the exchange rate can be regarded as negatively related to the nominal interest differential and positively related to the expected long-term inflation differential.

From a policy-making point of view the monetarist and the Keynesian approaches lead to seemingly inconsistent effects in most cases. However, according to Ahtiala (1984) and others, they are not inconsistent. In fact, the former approach and the Keynesian neutral monetary policy version of the latter approach are independent: they are dichotomous parts of the general model. The monetarist approach concentrates on the policy effects on the asset market, leaving out the goods market, whereas the Keynesian approach concentrates on the goods market, leaving out the monetary effects. Discussing response to

disturbances in an economy, it is crucial to consider differences in the policy regimes based on the two approaches. The Keynesian approach takes the case of full monetary sterilization by the central bank (Keynesian neutral monetary policy) and the monetarist approach focuses on the capital flows. In the latter approach capital flows automatically finance all trade balance disequilibria and only the money demand adjustment remains. In the Keynesian approach, the central bank accommodates both adjustments, and only the trade balance disequilibria show on the exchange market.

A theory of exchange rates should be based on a model considering both goods and asset markets, and not on either of them alone, although the parameter values may sometimes turn out to be such as to produce either of the special cases. Looking at equilibrium conditions in this context, we find that an appropriate choice depends on the time span studied, and on the speed of price adjustments on the asset market as opposed to the goods market.

Achievement of equilibrium according to the different parity conditions will be greatly affected by *political* factors. In a small open economy the political side is extremely important in considering the effects on the price of the currency from different shocks such as real, monetary and foreign shocks. (See, for example, Frenkel and Aizenman, 1982.) There are many ways of bringing external and internal balance into line with one another. A country can achieve external balance by various means apart from direct adjustments in the exchange rate. A strict monetary policy can be an alternative to devaluation, and an expansive monetary policy an alternative to revaluation. The achievement of external balance, particularly in the short run, is therefore to a great extent a political question. Thus the evaluation of a currency calls not only for an economic analysis but also for an analysis of political developments. Deviations from the exchange rate motivated by the Purchasing Power Parity theory may be an expression of such political considerations and speculation effects.

One political explanation of a bad forecasting performance of structural models in a short-term perspective, could be in the different effects of exchange rate intervention on the month-to-month and year-to-year changes in exchange rates. High unexplained variance in exchange rates from month to month is probably due to interventions, while over a year interventions are neutral. Incorporating exchange rate interventions into the model of short-term exchange rate behaviour would probably reduce the unexplained variance considerably.

The intervention behaviour is normally symmetric and could be classified as 'leaning against the wind', which means purchasing foreign currency (selling domestic currency) when the domestic

currency is appreciating and purchasing the domestic currency when it is depreciating.

Evidence for 'asymmetric' leaning against the wind as a policy is given by Hutchison (1984). His empirical evidence suggests that official Japanese interventions are more aggressive in attempting to slow down a yen appreciation than they are in attempting to slow down a yen depreciation. For a given per cent appreciation of the yen, the Bank of Japan sells roughly twice as many yen as it will purchase in response to a comparable per cent depreciation. This must be an important factor to incorporate in any evaluation of the speed of adjustment of the yen to different disturbances, and also in the discussion of the yen as an 'almost systematically' undervalued currency. (See, for example, Bergsten, 1982.)

How, then, can the validity of different equilibrium relationships be measured? Perhaps this is the right moment to say something about the difference between mathematical expectation and market expectation. The first of these concepts, which will be used in our analysis of the validity of different equilibrium relationships, implies that we can expect the average of all deviations measured over a large number of points in time to be zero. There are thus no systematic deviations. In analysing Fisher's Open Relationship, however, there can be some conceptual confusion, as this theorem is formulated in terms of market expectations, which may be correct in themselves, and yet for a variety of reasons may deviate from actual outcomes. When the expression 'unbiased' is used in connection with Fisher's Open Relationship, it means that there are no systematic differences between market expectations and actual outcomes. Thus, this is not a direct measure of the validity of the theorem, but merely a measure of its usefulness, that is to say usefulness in forecasting or as a basis for schemata for accounting purposes.

What does a potential validity of the relationships mean to the company? If the Purchasing Power Parity theory and Fisher's Open Relationship hold, the mathematical expectation of a consistent hedging procedure, for instance, will be negative and equal to the transaction costs. And still the problems generated by the fluctuations remain. In Chapter 3 we discussed a variety of hedging procedures. Teck (1970) emphasizes that the cost aspect must not be neglected:

> ...there must be a constant effort to compare the cost of reducing exposure with the value of achieving the improvement.

Oxelheim (1984d) reports that no systematic effort to evaluate the ex post performance of the different hedging measures used in Swedish multinationals is yet being devoted.

The validity of the different equilibrium relationships is of vital interest to any decision about hedging, and it will be analysed in some detail in Sections 4.2.1–4.2.4. It is also interesting in light of our discussion in Chapter 2. Can the equilibrium relationships be used in the accounting according to the guidelines outlined there? Wyman (1976) states that

> if Purchasing Power Parity is valid, then it can serve as a standard for analysing gains and losses from translation of foreign monetary items.

According to Aliber and Stickney (1975), the validity of the Purchasing Power Parity theory is an empirical question and they conclude by criticizing the traditional view of assets and liabilities in determining the size of currency exposure. Instead of assessing exposure by monetary/nonmonetary or current/noncurrent methods, for example, these authors recommend classifying exposed/nonexposed items according to the length of the planning horizon:

> Over relative short horizons (or three years) all assets and liabilities tend to be exposed. Over longer periods, the increased validity of the Purchasing Power Parity and Fisher theories indicates that most assets and liabilities are not exposed to exchange gains and losses.

This suggests that Fisher's Open Relationship can be useful in evaluating long-term monetary items or, in terms of our present purpose, in evaluating corporate foreign loans.

Together with the Purchasing Power Parity theory, Fisher's Open Relationship represents a contribution to prediction theory, and does not indicate any 'safe' profits on financial investments. Individual currency transactions can involve big risks, even if the equilibrium relationships do hold. Systematic deviations from equilibrium can arise as a result of imperfections on the market, such as interest regulations and liquidity requirements or as a result of transaction costs.

According to the *Interest Rate Parity theory*, the forward premium/discount should be the same as the difference between the interest rates on investments with equal financial risks in different currencies. The mark of an efficient market is the absence of risk-free opportunities for gain. For instance, there should be no systematic opportunities for profit on covered interest arbitrage. On a market that is efficient from the point of view of interest rate parity, this risk-free opportunity does not arise. A special type of interest arbitrage is geared to utilizing the

differences between national interest rates and the corresponding Euro-interest rates. This kind of arbitrage deviates from the traditional type in that the interest rates reflect different risks, as we have discussed in Chapter 3.

Figure 4.1 shows the Interest Rate Parity theory in relation to other equilibrium relationships, and we can thus see how it ties up with Fisher's Open Relationship. When the market is efficient in terms of interest rate parity, the relative forward premium/discount constitutes a special case of Fisher's Open Relationship. The expected rate of movement in exchange rates is then equal to the relative forward cost.

In Chapter 3 we found that, given interest rate parity, the 'point' of equilibrium should really be described as an interval rather than a point. This interval expresses the area within which there is no incentive to arbitrage because of the transaction cost. In order to examine the efficiency of the market in terms of the Interest Rate Parity theorem and Fisher's Open Relationship, we therefore need an estimate of the *transaction cost*. In this context most writers start from the margin between the buying and selling price on a given section of the financial market. When the spot rates are fixed in Sweden, the Central Bank prescribes an interval for every currency, within which the difference between buying and selling prices should lie. In the case of more substantial exchange transactions, however, it is often more a question of 'bargaining' and the fixed exchange rates are not followed; the banks' margin may thus be considerably reduced. On the forward market in Sweden no upper limits are imposed on the margin.

The margin has been estimated as assuming the following shape:

$$d = \frac{\text{selling price} - \text{buying price}}{\text{buying price}} \cdot 1000 \qquad (17)$$

By selling price is meant the banks' price for selling a currency, while the buying price is the banks' price for purchasing currency.

For most of the currencies in the study there is no nominal change in the margin during the period studied (JPY is an exception, with two nominal changes in 1974–75), but the margin does change in relative terms due to movements in exchange rates. There are various ways of determining the transaction cost on a basis of the margin, and these were discussed in Chapter 3. Since the buying–selling differential actually reflects the banks' compensation for two transactions, the cost for *one* transaction can be written:

$$\text{transaction cost} = 1/2 \cdot \text{margin} \qquad (18)$$

By halving the margin we get an assessment of the transaction cost for spot and forward dealings. By allowing for this potential source of systematic deviation, a better analysis of the efficiency of the market can be achieved. In order to ascribe to this cost its correct importance, all the estimated rates of change will refer to the extent of the period in question and not necessarily to annual rates. An assessment of the transaction cost based on the buying–selling margin is likely to be on the conservative side, since it does not include administrative costs or those costs which are linked to the actual collection of information.

4.2.1 The Purchasing Power Parity theory

The concept of Purchasing Power Parity (PPP) has long held a central position in economic theory. Einzig (1962), for example, traced it back to the Spanish economists of the Salamanca school in the sixteenth century. According to the Purchasing Power Parity theory, equilibrium between the prices for traded goods in different countries is maintained by variations in exchange rates, while the prices in themselves are determined internally. However, it is difficult to determine when price changes and exchange rate movements together contribute to the attainment of equilibrium. Much of the *controversy* concerning the usefulness of the PPP doctrine is according to Frenkel (1981) due to the fact that it does not specify the precise mechanism by which exchange rates are linked to prices nor does it specify the precise conditions that must be satisfied for the doctrine to be correct. Rather the PPP doctrine may be viewed as a short-cut; it specifies a relationship between two variables without providing the details of the process which brings about a relationship and, still according to Frenkel, it should not be viewed as a theory of exchange rate determination.

More positive is Officer (1982, p. 289) in his extensive work about the PPP theory when he concludes:

> ...the PPP theory has three interrelated properties that put it in the forefront of exchange-rate theories and makes it the most useful and used of all such theories. First, it is a simple and intuitively appealing theory. Second, there is an inherent concreteness to the PPP approach. The ingredients of the theory are minimal and basic: price levels and exchange rates (for absolute PPP), inflation and exchange-rate changes (for relative PPP). Third, *whether or not the strict PPP theory holds*, that theory is of interest. It is useful to know *to what extent* the PPP theory is valid, for example, what proportion of relative-price changes between countries is likely to be offset by exchange-rate changes.

As mentioned in the quotation, the theory or the doctrine exists in two forms, one relative and one absolute. As a special case we also have a third version, the law of one price. In its *absolute* version, as described by Boyd (1801), for example, the exchange rate is in equilibrium when a buyer at a random point in time receives the same amount of goods for his money, regardless of which country he buys them from. This can be written:

$$S_{12} = \frac{P_1}{P_2} \tag{19}$$

where S_{12} = spot rate (currency in country 1/currency in country 2)
P_1 = price level in country 1
P_2 = price level in country 2

The revival of interest in this theory during the twentieth century has generally been ascribed to Gustav Cassel. According to Cassel (1922) the Purchasing Power Parity theory means that:

> When two currencies have undergone inflation ... the normal rate of exchange will be equal to the old rate multiplied by the quotient of the degree of inflation in the one country and in the other.

Keynes (1923) made comparisons for the period 1919–21 and found that the method functioned satisfactorily, but his definition differed slightly from Cassel's. In his view the Purchasing Power Parity theory tells us that

> the movements in the rate of exchange between two countries tend, subject to adjustments in the 'equation of exchange', to correspond pretty closely to movements in the internal price levels of the two countries, each expressed in their own currencies.

Keynes's version of the Purchasing Power Parity is *relative* where Cassel's is absolute. In Keynes's version, movements in internal price levels correspond to movements in the exchange rate. Cassel's version refers to equilibrium between the ratio of the price levels in two countries and the rate of exchange for their currencies. The relative version can be written:

$$\hat{S}_{12} = \hat{P}_1 - \hat{P}_2 \tag{20}$$

According to this version the rate of change in the equilibrium exchange rate ($\hat{S}_{12}$) is proportional to the difference between the rate of change in the price levels ($\hat{P}_1 - \hat{P}_2$) in the two countries concerned. The principle is simply that if goods or services of the same kind do not cost the same in all countries after adjustment for taxes, transport costs and transaction costs, there will be a flow of products and production factors which will force prices back to a state of equilibrium. Starting from a base year when the exchange rate between two countries reflects prices and costs correctly, this means that if the prices of traded goods rise *x* per cent faster in country 1 than in country 2, country 1's exchange rate can be expected to be depreciated by *x* per cent (floating exchange rates) or to have a potential for devaluation of *x* per cent (pegged exchange rates).

This theory holds in the short run, provided buying incentives based on the exchange rate are geared to an immediate response. In the long run it holds even without this condition, and it can then be regarded as a general attribute of the equilibrium in trade between two countries with money economies.

But does the theory also hold for countries with high inflation? Aliber and Stickney (1975) have reported results which suggest that it does. Between 1961 and 1971 the countries of South America showed an average annual percentage deviation from purchasing power parity corresponding in size to that shown by the European countries. Huang (1984) concludes that even for an exchange rate between two countries with hyperinflation (Germany and Poland during 1920s hyperinflationary periods) and subjected to predominantly monetary shocks, purchasing power parity holds as expected.

Those who criticize the Purchasing Power Parity theory in its relative form do so mainly because purchasing power and exchange rates are measured at different points in time. If the theory is to hold, according to these critics, all the important real economic factors such as real income, productivity, growth, etc., should remain constant during the period in question. Opponents of this criticism claim that the Purchasing Power Parity theory is an essential ingredient in the analysis of long-term exchange rates. As Dornbusch and Krugman (1976) put it:

> Under the skin of any international economist lies a deep-seated belief in some variant of the Purchasing Power Parity theory of the exchange rate.

Before embarking on an empirical study of the Purchasing Power Parity theory, three fundamental technical problems have to be solved:

- choice of index for describing relative price movements
- choice of base period
- choice between bilateral and multilateral measurement.

4.2.1.1 Choice of index

A problem that has long occupied economists concerns the choice of an index to describe changes in relative inflation. A summary of the various arguments can be found in Thygesen (1977).

The index numbers should be easily accessible, they should be frequently reported, and they should measure the relative movements in inflation for goods and services in foreign trade. The problem is complicated by the variety of consumption patterns. It would be possible to get round this using an intrinsically simple weighting method, but this would require so much information about price movements in numerous sub-areas that it would probably be impracticable. Choosing an index can be regarded as a problem of representativeness in the statistical sense. Concerning the choice of an appropriate index, it should be noted that there is no index which is perfect for the purpose of PPP. But when the structure of internal relative prices is stable — which is a reasonable assumption at least when the shocks are monetary — the choice among price indexes seems to be less important. Internal relative prices — as measured by the relationship between the cost of living and the wholesale price indices — have not changed much in the US and the UK according to Frenkel (1981). It has changed dramatically for France, however, which may account for problems with the PPP-equation for the French franc.

The choice lay here between the GNP deflator index, the consumer price index, the wholesale price index, the producer price index, the export price index and the index for relative unit labour costs. The choice of index will also depend on the intended use of the PPP-result. The requirements are different when the PPP-relation is used in managing the exchange rate compared, for instance, to a situation when it is used for comparisons of different living standards.

The GNP deflator is recommended by many as providing the broadest coverage of goods and services. But it is difficult to obtain figures more frequently than once a year and this implicit index does also contain a high proportion of non-traded goods.

The wholesale price index has a broad coverage, and the OPTICA group used it in their calculations for the major OECD countries (OPTICA, 1977), pointing out that empirically it had proved to be a

good compromise choice. However, comparisons were complicated by statistical problems, since national index numbers differed in coverage and in the weights applied. And Sweden, for instance, does not report a wholesale price index in its official statistics; the closest equivalent is the producer price index.

The export price index is criticized mainly on the grounds that it excludes the prices of imported goods. The OPTICA group rejected it on both statistical and conceptual grounds, claiming that it covered a limited range of goods and services and lacked direct information about prices. The picture generated by this index can also be misleading in that the prices could be adapted for the purpose of acquiring market shares.

Compared with the wholesale price index *the consumer price index* includes many more goods and services which do not form part of the trade between countries. This can cause a productivity bias, if the index numbers are used to measure purchasing power parity (see Balassa, 1964). On the other hand these index numbers are more readily available than any of the others.

The *index of unit labour cost* is less suited to international comparisons, since the variables included in the calculations, such as assurance fees and payroll taxes, are often defined very differently in different countries.

The *producer price index* seems to have the advantage of a better structure of the coverage than the consumer price index and fewer conceptual problems than the index of unit labour cost.

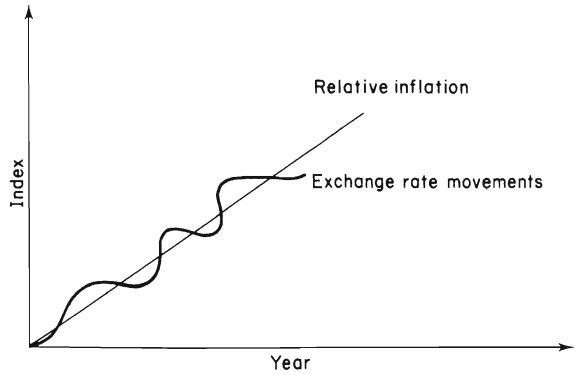
There is little general agreement in the literature when it comes to recommending any one of these index categories. The choice is dependent on the intended use and has to be made on an ad hoc basis, as the OPTICA group pointed out. As a basis for the analysis in our present context, different types have been tried. However, the differences proved to be very small when the validity of the PPP-theory was tested for the different indexes.

Table 4.1 shows the purchasing power parity index based on producer price indexes for the loan currencies most important to Swedish companies during the 1970s. We can see that the devaluation potential which Sweden acquired, partly as a result of the wage agreements of 1975 and 1976, is clearly reflected in steep declines in the purchasing power parity index for those years. Thus, we can assume here that there may be good grounds for using an exchange rate based on the Purchasing Power Parity theory in calculating debt and capital costs in any given year, and that a translation at the closing rate, for example, would not reflect these quantities as satisfactorily.

Table 4.1 gives us the impression that in the long run the exchange risk can be seen to have two parts: one is a function of the relative

inflation trend, and this can be described in terms of the Purchasing Power Parity theory (cf. inflation risk), while the other should be regarded as a random variable with a mathematical expectation in the long run of zero (cf. exchange risk). The exchange rate can thus be expected to oscillate around the relative inflation path, as in Figure 4.2. However, real shocks can create systematic deviations, which must be kept in mind.

Figure 4.2 Relative inflation and exchange rate movements



4.2.1.2 Choice of base period

In order to provide a meaningful picture of developments, it is of course important to *find an appropriate base period* when the exchange rates are in balance, satisfactorily reflecting the relative competitive positions of the two countries. Generally speaking the collapse of the fixed exchange rates in 1973 heralded an outbreak of turbulence the following year. Judging from the figure, the relation SEK/DEM seems to have become stabilized towards the end of 1973, which can be explained by Sweden's joining the European currency snake. The Swedish krona was pegged to the European currency snake between 1973 and 1977. Since autumn 1977 a basket exchange rate arrangement has applied. The currencies in the Swedish 'basket', ranked according to their weights in the end of 1984, are: USD, DEM, GBP, NOK, DKK, FIM, FRF, NLG, BEC, ITL, JPY, CHF, ATS, ESP and CAD. The starting point or the equilibrium point is to be identified by analysing the behaviour of Swedish competitiveness, the Swedish trade balance and the exchange market. Competitiveness is measured in terms of international relative market shares. A guiding hypothesis is that when the exchange rate is in equilibrium the country will gain or

Table 4.1 Purchasing power parity index, 1974–84 (yearly data)

USA

Accounting date	Index closing rate SEK/USD (1)	Index equilibrium rate[a] SEK/USD (2)	Purchasing power parity index (1:2)
1973/74	100	100	100
1974/75	89.0	105.2	84.6
1975/76	95.6	106.8	89.5
1976/77	90.0	112.1	80.3
1977/78	101.8	116.5	87.4
1978/79	93.7	114.3	82.0
1979/80	91.2	115.7	78.8
1980/81	96.5	115.6	83.5
1981/82	122.2	123.1	99.3
1982/83	159.6	137.1	116.4
1983/84	176.8	147.1	120.2

West Germany

Accounting date	Index closing rate SEK/DEM (1)	Index equilibrium rate[a] SEK/DEM (2)	Purchasing power parity index (1:2)
1973/74	100	100	100
1974/75	99.7	104.4	95.5
1975/76	98.5	107.1	92.0
1976/77	102.9	111.7	92.1
1977/78	130.7	123.4	105.9
1978/79	138.4	128.7	107.5
1979/80	142.3	138.3	102.9
1980/81	132.3	146.0	90.6
1981/82	145.8	156.4	93.2
1982/83	181.6	173.3	104.8
1983/84	172.9	183.6	94.2

lose no international market shares. (See Figure 4.8.) After careful analysis the point of equilibrium has been set at the beginning of 1974. Although there are many logical grounds for this choice, it is difficult to say whether it is a 'good' one. An evaluation of foreign debts at an exchange rate calculated on a basis of the Purchasing Power Parity theory would, for instance, have shown a high payment capacity on

Table 4.1 (cont'd)

Switzerland

Accounting date	Index closing rate SEK/CHF (1)	Index equilibrium rate[a] SEK/CHF (2)	Purchasing power parity index (1:2)
1973/74	100	100	100
1974/75	113.6	109.0	104.2
1975/76	118.4	120.3	98.4
1976/77	119.0	129.1	92.2
1977/78	165.1	147.8	111.7
1978/79	187.5	160.9	116.5
1979/80	186.1	174.4	106.7
1980/81	175.5	186.7	94.0
1981/82	219.4	200.0	109.7
1982/83	260.2	227.8	114.2
1983/84	262.1	241.6	108.5

Japan

Accounting date	Index closing rate SEK/JPY (1)	Index equilibrium rate[a] SEK/JPY (2)	Purchasing power parity index (1:2)
1973/74	100	100	100
1974/75	82.8	101.0	82.0
1975/76	87.7	108.2	81.0
1976/77	86.0	110.3	78.0
1977/78	118.7	123.6	96.0
1978/79	134.7	136.8	98.5
1979/80	106.8	136.6	78.2
1980/81	130.2	139.7	93.2
1981/82	156.2	154.6	101.0
1982/83	190.7	177.9	107.2
1983/84	212.5	194.6	109.2

[a] The equilibrium rate is calculated on the development of the relative producer price index from an equilibrium point. The index is based on realized inflation.

the part of companies with loans in DEM, owing to the build-up of an interest-free reserve during 1974–76 which could then be utilized during 1977–78. In this case the equation works out, i.e. there would have been an almost negligible reserve to report if the loan had been finally liquidated around the end of 1979.

4.2.1.3 *Bilateral or multilateral measurement*

A multilateral calculation of relative purchasing power calls for further weighting. Theoretically there are three ways of doing this. Here we have chosen to use the weighted averages of the various bilateral purchasing power parity indexes for the countries in the Swedish currency basket. The weights are some bilateral trade weights from the basket construction. Tests with multilateral weights allowing for export and import price elasticities have been shown to give the same results, but require much more work on analyses and estimations. (See, for example, Artus and McGuirk, 1982).

Bilateral and multilateral measures are both interesting in their own way. Thus if we want to assess the likelihood of a devaluation in the near future, it could be a good idea to analyse changes in the purchasing power parity index for the whole currency basket or as a real effective index, obviously allowing for the political priority given to external or internal balance, among other things. If on the other hand we are trying to find schemata to use in evaluating claims and debts in various currencies, we will need to make bilateral comparisons, this time allowing for the different kinds of currency arrangements in the countries concerned and the deviations from equilibrium in purchasing power parity which these can cause. One central question with many pros and cons concerns the multiplicity of starting-points in the weighted multilateral measurement. In the measurements below, January 1974 will be used as a common starting-point.

4.2.1.4 *Analysis of the purchasing power parity index, 1974–84*

Owing to the Swedish exchange arrangements, extensive regression analysis of the relation between exchange rates and relative inflation did not provide encouraging results. So, in view of our present purpose, we had better look at the purchasing power parity index, month by month, for the major loan currencies. The Swedish measurements are based on the producer price index; equivalent indexes have been used for the other countries (see Appendix 3). The base period is January 1974.

Figures 4.3–4.7 describe bilateral purchasing power parity indexes. The index value 100 is the equilibrium value. The figures show the pattern of the deviations quite clearly. Thus it is possible on this basis to assess even the short-run validity of the theorem. Values under 100 mean that SEK is overvalued in relation to the relevant currency. The deviation can be described as a potential for depreciation in SEK.

Figure 4.3 Purchasing power parity index SEK/GBP
Monthly data

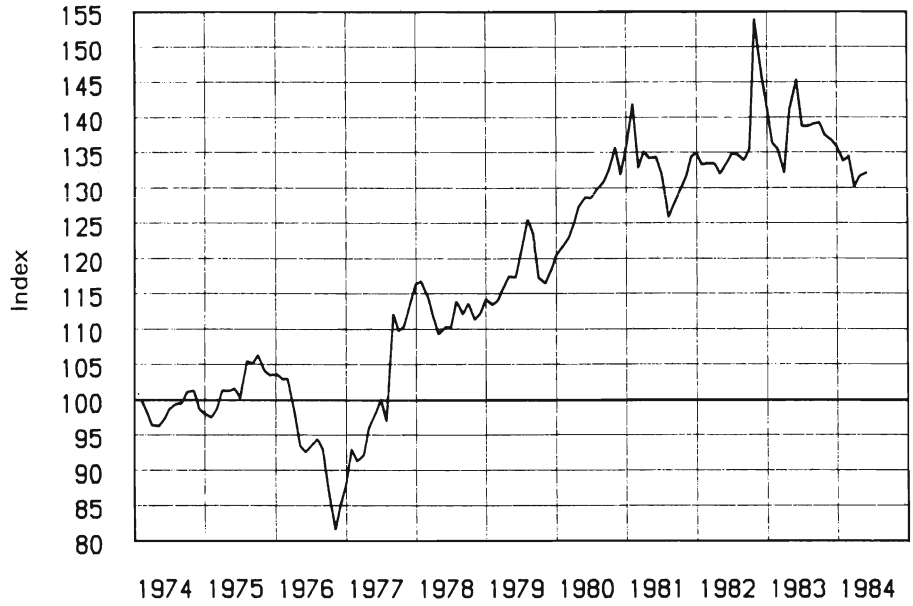


Figure 4.4 Purchasing power parity index SEK/USD
Monthly data

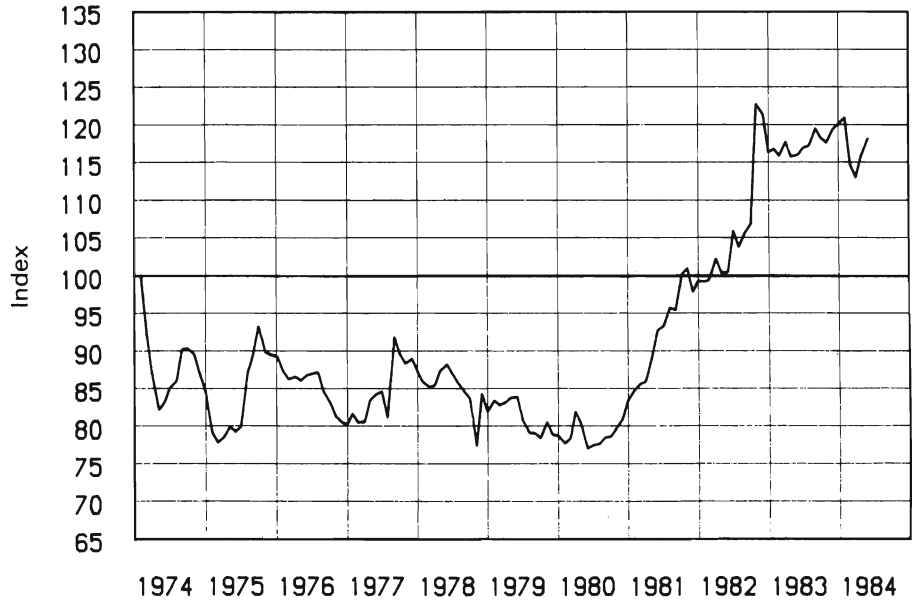


Figure 4.5 Purchasing power parity index SEK/DEM
Monthly data

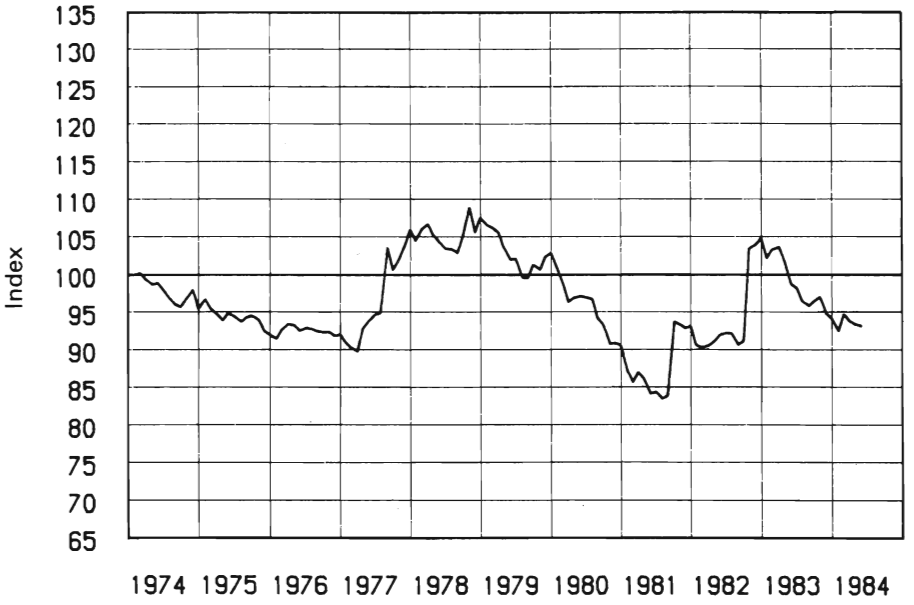


Figure 4.6 Purchasing power parity index SEK/CHF
Monthly data

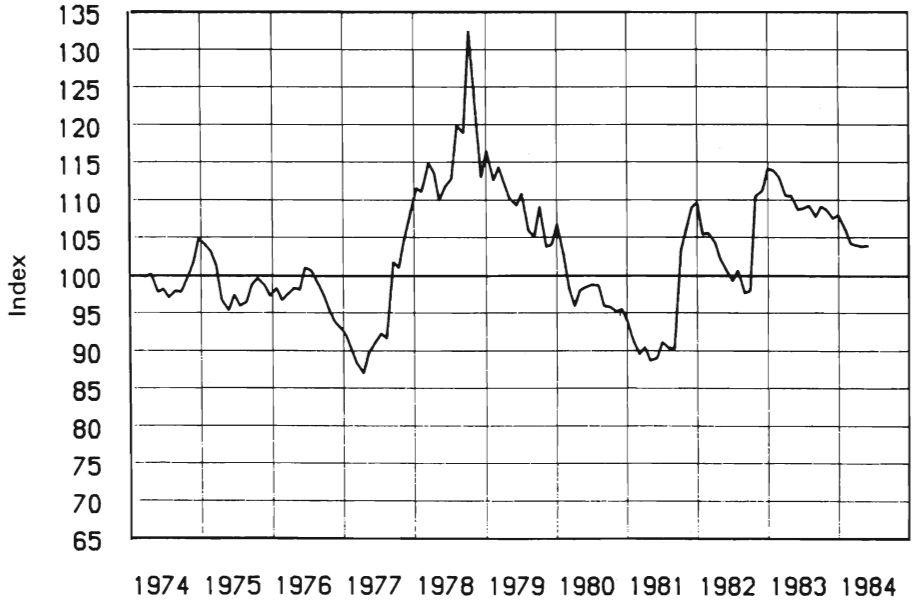
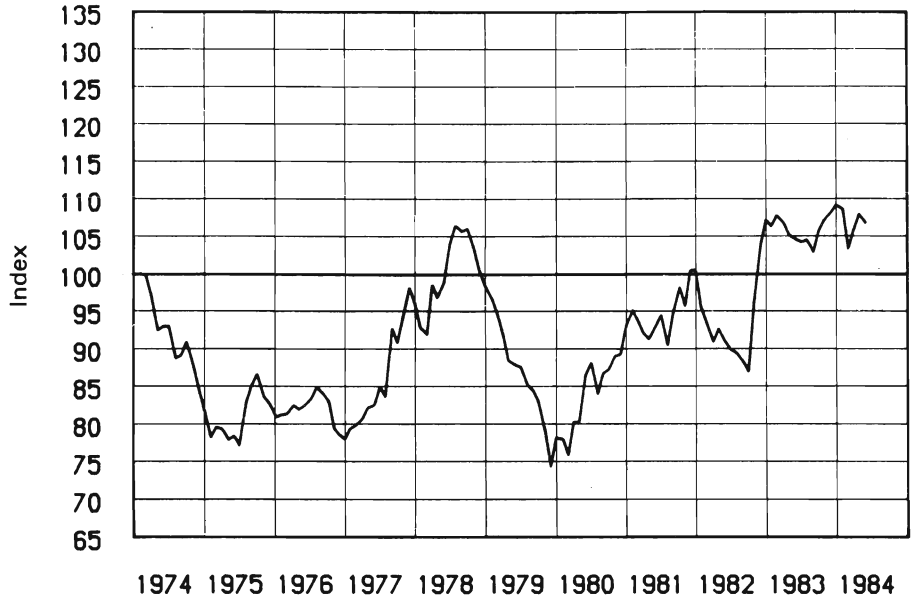


Figure 4.7 Purchasing power parity index SEK/JPY
Monthly data



Similarly deviations of over 100 can be regarded as a potential for appreciation.

The figure with respect to DEM shows that the two devaluations in 1977 caused a steep rise in the index. The pegging of DEM and SEK is also reflected in the almost consistent decline in the index up to the devaluation of April 1977. The 3 per cent devaluation in October 1976 against the German mark, on the other hand, is not reflected in any movement towards the equilibrium value, 100.

From 1976 the purchasing power parity index shows a powerful rise for GBP. From its lowest value just above 80, the index had reached 125 by 1979. Thygesen (1977) noted this tendency for the period up to 1977 and commented:

> The sterling and lira depreciations in 1976 are the most obvious examples that exchange rates may move quite a bit further than observation of past and current inflation differentials would suggest. Temporary departures from PPP will tend to justify themselves, as depreciation feeds into domestic costs and prices. It is possible to check some of these defects by a subsequent tightening of policy, only at considerable short-run cost in terms of employment.

The sharp turn in the index in December 1976 was the result of a change in policy; in December 1976 the British government was granted a loan of 3.9 billion USD from the International Monetary Fund, and undertook at the same time to introduce a more restrictive economic policy. The sharp swing can be ascribed to expectations in connection with the new policy and the prospects of North Sea oil, and need not necessarily mean a permanent shift in the long-term equilibrium situation.

The US dollar has a special role in the world economy, which can explain why the behaviour of this currency deviates from that of other currencies in the study. Thus, since the Second World War USD has been the reserve currency and has therefore been affected by factors which Stern (1973) has called 'the adjustment problem', 'the liquidity problem' and 'the confidence problem'. And other factors also arise which can be ascribed to the US dollar's role as price maker. The long period of deviation from equilibrium for USD can to a large extent be explained by the fact that the real rate of interest on dollar deposits has been lower than the real interest rate on deposits in the other block currency, DEM, for almost the whole of the 1970s. Another major explanation for the long period of deviation is the low degree of openness to international trade in the US economy.

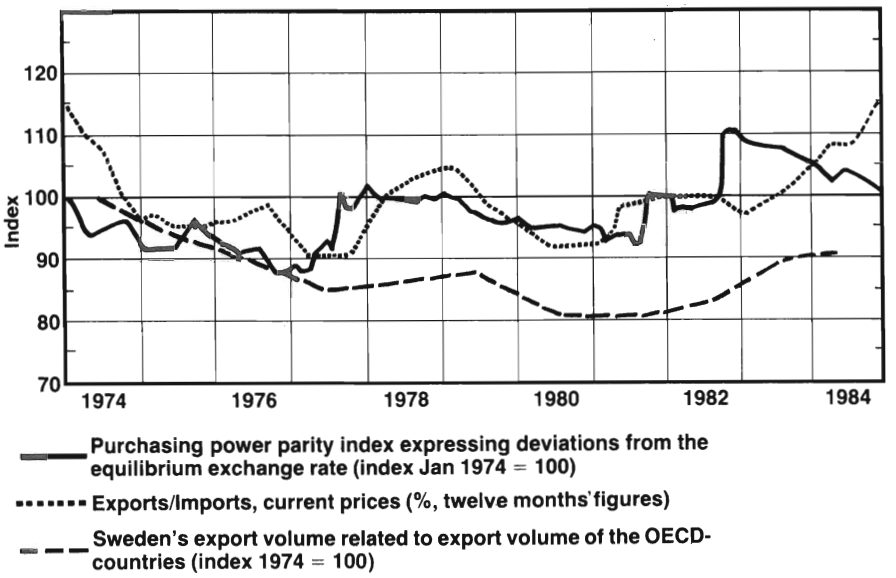
The index for CHF (Figure 4.6) seems to oscillate round a state of equilibrium, with a dramatic peak in late 1978. A fast return to equilibrium was effected with the help of negative interest rates on deposits from foreigners in a currency perspective.

The purchasing power parity index for SEK against the other currencies in the basket can be seen in Figure 4.8. The choice of base period appears to be the right one. With the exchange rate in 'equilibrium' the market shares are almost unchanged. According to this figure the devaluation in August 1977 put Sweden back to the January 1974 level. This figure can be used to assess the size of the deviation from equilibrium, and this in turn gives us a basis for evaluating the probability of action on the part of the central bank. The figure also shows the big drop in international relative market shares in 1974–76, due primarily to an overvalued Swedish krona.

The Purchasing Power Parity theory is a theory for the long term. Figures 4.3–4.8 cover almost eleven years, and the analysis could have been extended over a longer period. But the information value of including the Bretton Woods period is small. Because of the variety of currency arrangements that emerged after the breakdown of the Bretton Woods system, it seems sensible to limit ourselves to the period 1974–84.

The theory seems to command greater validity as the length of the period increases. Big deviations can persist over periods of several

Figure 4.8 Purchasing power parity index SEK/basket currencies
Monthly data



years as a result of political measures and interventions. We have noticed substantial deviations in a short-term perspective. In interpreting those differences the distinction between commodity prices and asset prices is fundamental. A key characteristic of the price of an asset is its strong dependence on expectations concerning the future. The fact that exchange rates adjust faster than commodity prices reflects the known phenomenon that the asset market clears relatively quickly. Here we have restricted ourselves to the major loan currencies; the theory would hold under a more stringent test. Thus, in the case of the dollar *vis-à-vis* 48 countries representing different currency systems, Aliber declared that

> the PPP theory held despite different exchange histories ... countries with positive deviations (average annual deviations) are developed industrialized countries for the most part, while countries with negative deviations are primarily developing countries. (Aliber and Stickney, 1975)

The picture that emerges from Figures 4.3–4.8 thus seems to provide us with empirical grounds for supporting Thygesen (1977) when he disagrees with Balassa (1964)

and others who have argued that indexes or relative cost and prices are notoriously unreliable as possible quantitative indicators for exchange-rate adjustments.

This conclusion was also supported by the analysis which was performed, based on existing data bases for the rest of the countries in the Swedish currency basket, using bilateral purchasing power parity indexes. Our empirical tests have provided us with some knowledge of the *deviation pattern*.

The value and importance of the Purchasing Power Parity theory as a normative basis depend to a large extent on the *length* of the time period between the times when the exchange rate is at or close to its equilibrium value according to PPP. If the periods are too long, the practical value will be slight. The higher the degree of openness to international trade, the shorter the periods are likely to be. Trends in the degree of openness in the major OECD countries are shown in Table 4.2. It appears from the table that all countries, except Japan, display growing openness between 1958 and 1978. Germany and most of its important trading partners exhibit a relatively high degree of openness. The United States has a comparatively low but increasing degree of openness, which goes a long way towards explaining the long periods of undervaluation of the US dollar during the 1970s. The historic pattern for countries like Germany indicates an average length of about 3–5 years between those times when the exchange rate is at its equilibrium level.

Table 4.2 Openness to international trade

Country	Average of exports plus imports of goods and services as a percentage of national product		
	1958	1968	1978
Belgium	31	39	51
Canada	18	21	25
France	13	14	20
Germany	20	21	26
Italy	12	16	24
Japan	11	10	10
Netherlands	47	44	47
Sweden	23	22	28
Switzerland	27	30	34
United Kingdom	20	21	29
United States	5	5	10

Source: Bank for International Settlements, *Annual Report*, 1980, Basel.

Despite an increasing degree of openness, the United States is still far from being heavily dependent on the exchange rate for its well-being. Nevertheless, increasing interdependence has greatly increased the importance to the United States of the international value of its currency. The future will probably show shorter periods between the occasions of restored parity for USD.

The value of the Purchasing Power Parity theory as a normative basis is also dependent upon the *amplitudes* in the deviations from PPP. There has been a tendency towards greater swings since the end of the 1970s, which might increase the value of the theory in this respect.

4.2.2 The Interest Rate Parity theory

The theoretical content of the Interest Rate Parity theory has already been described in Chapter 3. Briefly, using formula (8), the relationship of the forward market can be denoted:

$$\frac{F_t - S_t}{S_t} = \frac{r_d - r_f}{1 + r_f}$$

where F_t = forward rate in absolute numbers
S_t = spot rate in absolute numbers
r_d = domestic interest rate
r_f = foreign interest rate.

The interest rates should refer to financial investments identical in all respects except their currency. Euro-interest rates can be used, to avoid the disturbances of national controls, interest rate regulations, etc. Levich (1979) made this recommendation:

> Securities issued in the Euro-currency market appear to be more nearly comparable in terms of risk than those issued in domestic markets.

He then went on to say:

> ...that the international capital market is efficient in that there are few unexploited opportunities for risk-free profit in covered interest arbitrage.

Thus the forward market for the major world currencies can be regarded as efficient. What, then, can be said of the Swedish forward market which is 'thin' and strictly controlled? There is no Euro-interest

rate for the whole period under investigation for the Swedish krona, and some other interest rate or rates that allows comparison with respect to risk therefore have to be chosen.

4.2.2.1 Analysis of the Interest Rate Parity theory, 1974–84

Here we come up against the problem of choosing our financial investment. Aliber (1973) suggests that traditional investment pairs, such as treasury bills, are not always genuinely comparable. The political risk attaching to treasury bills, for instance, can vary very much. He also points out that ideally the comparison should include investments on external markets and not on national markets, which means that Euro-interest rates are needed. However, since there is no Euro-interest rate for the Swedish krona, our comparison here is based on investments on national markets. In order to study the deviations from interest rate parity we will use three-month treasury bills and prime rates, i.e. the commercial banks' interest rates on loans to first-class-risk borrowers. For this class of investments the political risk differential between Sweden and the countries of the major loan currencies should be sufficiently small to guarantee comparability with respect to returns on investment. Comparability is also assumed concerning the default risk, as part of the financial risk, which is expressed in what is meant by prime borrower.

Figures 4.9–4.17 show the movements in interest rate differentials and forward costs expressed as percentages. The difference between

Figure 4.9 Deviations from interest rate parity, SEK/GBP
Monthly data, per cent/quarter
——— Three month forward rates
-------- Differences in treasury bill rates (three-month)

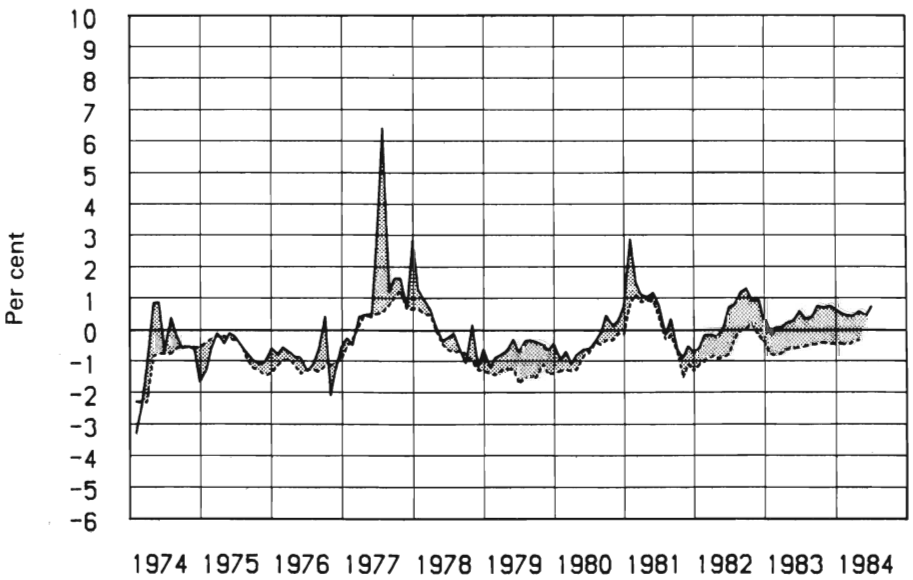
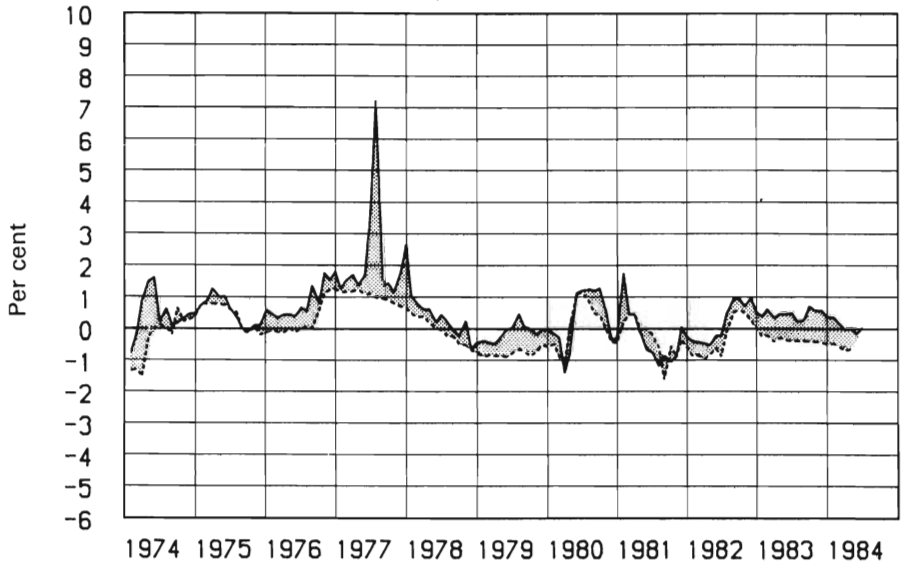
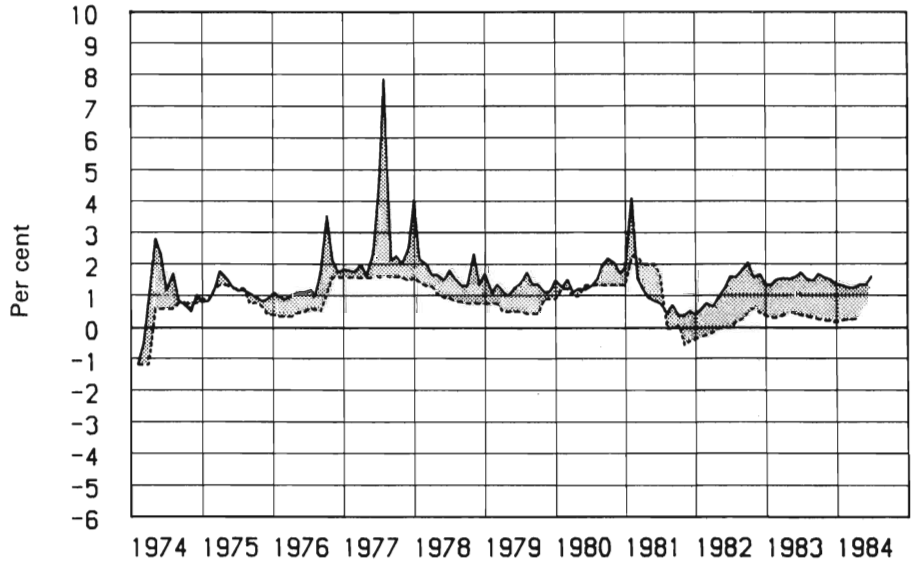


Figure 4.10 Deviations from interest rate parity, SEK/USD
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in treasury bill rates (three-month)



the unbroken and the broken curves represents the deviation from interest rate parity. Accounting in the figures takes place at time *t*, and refers to the period *t* to *t* + three months. In broad outline the figures indicate the opportunities available for profits on covered interest

Figure 4.11 Deviations from interest rate parity, SEK/DEM
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in treasury bill rates (three-month)
(Frankfurt-rate the most recent period)

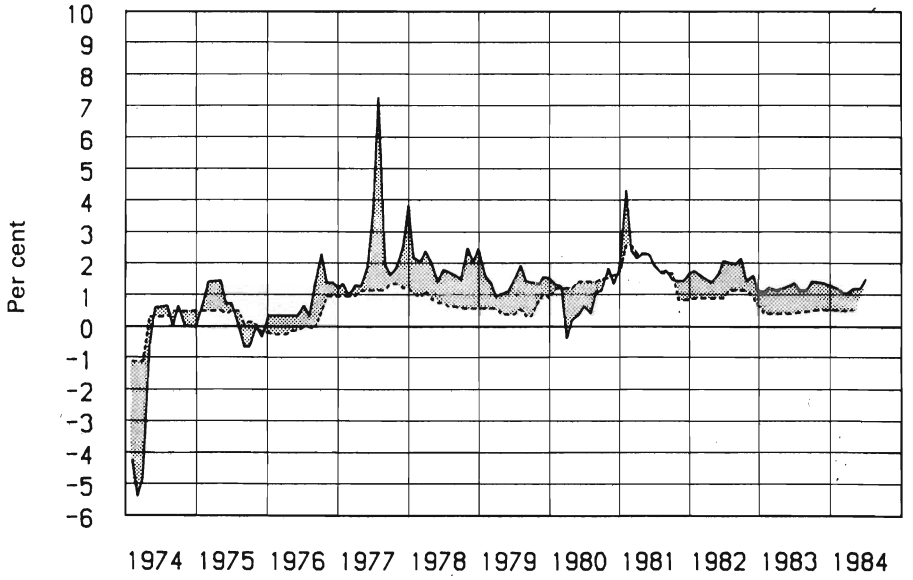


arbitrage during the period 1974–84. The deviations from interest rate parity are calculated on a three-monthly basis and according to the following formula:

$$\text{Deviation} = d_{rp} = \left[\left(\frac{F_t}{S_t} - 1\right) - \frac{r_{Swe} - r_{for}}{1 + r_{for}}\right] \cdot 100 \qquad (21)$$

The interest rate r is divided by 4 to give a quarterly figure. When using the Swedish treasury bill rate there is a correction made, due to the new situation which appeared in July 1982, when the rate was converted from an administrative rate to a market generated rate. The analysis is then performed in terms of average deviations for different periods. The sub-periods chosen are 1974–76, when the Swedish krona was in the European currency snake, and 1978–84, when the Swedish krona was pegged to the currency basket. Thus the major exchange rate movements connected with the devaluations of 1977 have been eliminated. The objective of this analysis is to demonstrate the extent of the systematic deviations from parity during these two periods. As an indicator of systematic deviation the average vale ($\bar{d}_{rp}$) has been used. To test the deviation, the standard deviation (s) is also needed in d_{rp}. These values are given in Tables 4.3–4.4. An analysis of

Figure 4.12 Deviations from interest rate parity, SEK/JPY
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in treasury bill rates (three-month)



occasional profit opportunities can best be made on a basis of Figures 4.9–4.17.

Tests have been performed for the different combinations of currencies and periods, to reveal the systematic component in the deviations. It must be emphasized here that we are not discussing Euro-rates, because of the lack of such a rate on formal basis in Sweden during the period under investigation. In a test on the 5 per cent level, the values marked with a dagger revealed a significant deviation from zero. To judge from the figures in Tables 4.3–4.4, there are demonstrable deviations from interest rate parity for many of the combinations. A closer examination reveals a striking pattern in the forward rate, with a systematic deviation from the interest differential. Is this deviation simply an expression of the transaction cost, or does it contain something else — a risk premium, for example? To answer this question, we need to have some idea of the size of the transaction cost.

In calculating the transaction cost, we start with cash, and we then get:

$$(1 - t_S) \cdot (1 - t_F) \tag{22}$$

Thus, only the costs for pure exchange transactions have been taken into account. The estimate is conservative, since the transaction costs for the financial investments have not been included, and the total is therefore probably slightly lower than it should be.

Table 4.3 Mean ($\bar{d}_{rp}$) and standard deviation (s) in the deviation from interest rate parity based on three-month treasury bill rates[a]
Monthly data, per cent/quarter

	1974–84		1974–76		1978–84	
Currency	$\bar{d}_{rp}$	s	$\bar{d}_{rp}$	s	$\bar{d}_{rp}$	s
GBP	0.57†	0.74	0.22†	0.65	0.67†	0.40
USD	0.53†	0.72	0.48†	0.56	0.45†	0.42
DEM	0.73†	0.82	0.54†	0.65	0.72†	0.59
JPY	0.46†	1.06	0.08	1.25	0.57†	0.65
Number of observations	126		36		78	

[a] Treasury bills are not available in Switzerland. For the most recent period Frankfurter rate has been used for Germany, and the Swedish rate becoming an open market rate has been considered.

† Significant deviation from interest rate parity on a 5 per cent level. $H_o : \mu_{d_{rp}} = 0$ is rejected.

Table 4.4 Mean ($\bar{d}_{rp}$) and standard deviation (s) in the deviation from interest rate parity based on three-month commercial bank prime lending rates
Monthly data, per cent/quarter

	1974–84		1974–76		1978–84	
Currency	$\bar{d}_{rp}$	s	$\bar{d}_{rp}$	s	$\bar{d}_{rp}$	s
GBP	0.50†	0.89	−0.09	0.76	0.46†	0.64
USD	0.75†	0.77	0.41†	0.57	0.64†	0.55
DEM	1.19†	0.94	1.09†	0.81	0.96†	0.70
CHF	1.22†	1.08	1.10†	0.92	0.94†	0.87
JPY	0.63†	1.31	−0.04	1.49	0.61†	1.05
Number of observations	126		36		78	

† Significant deviation from zero when analysed at 5 per cent level. $H_0 : \mu_{d_{fo}} = 0$ is rejected.

Are the deviations from interest rate parity still significant, when we have allowed for the estimated arbitrage cost? In the case of JPY it should be noted here that the estimate was affected by the obvious change in level in 1974. Negative deviations provide an incentive to

Figure 4.13 Deviations from interest rate parity, SEK/GBP
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in commercial bank prime lending rates (three-month)

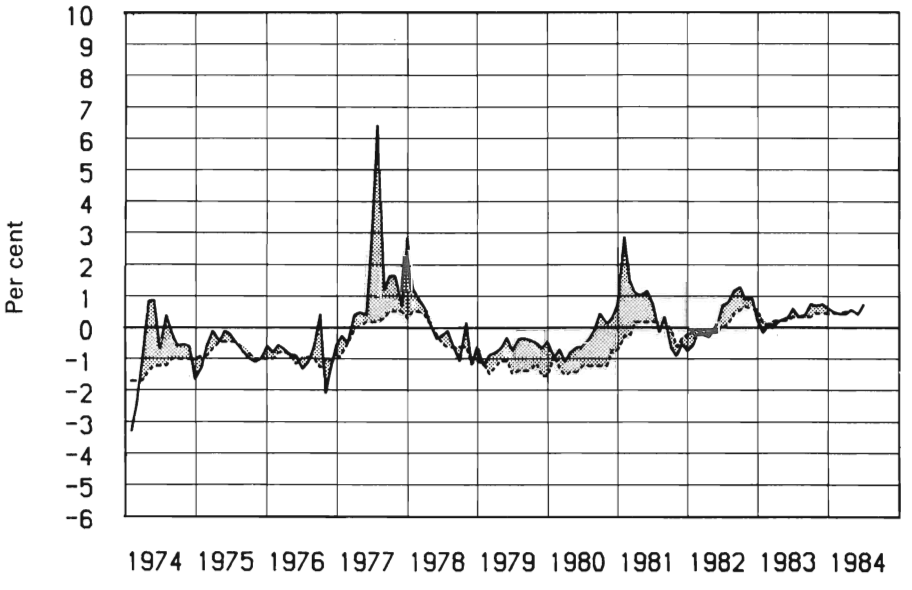
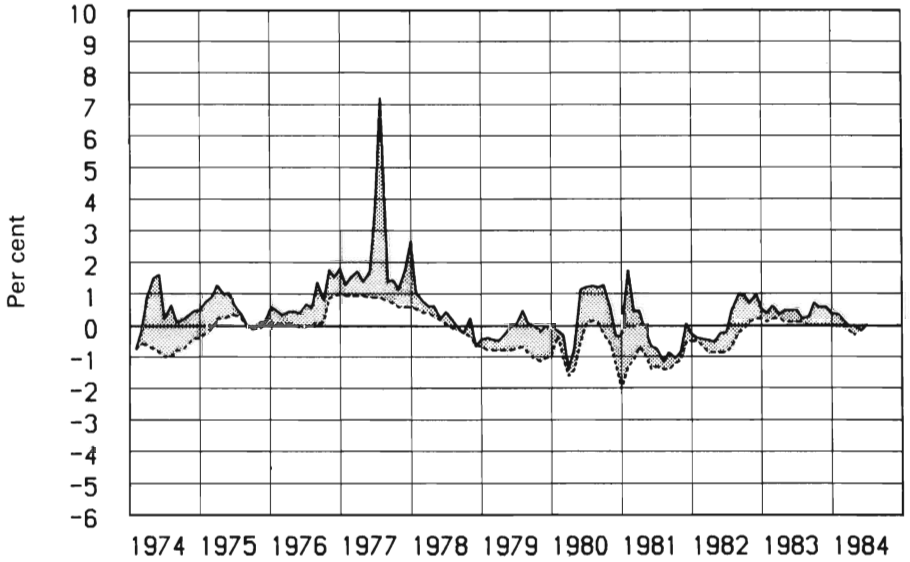


Figure 4.14 Deviations from interest rate parity, SEK/USD
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in commercial bank prime lending rates (three-month)



move capital out of Sweden, while positive deviations should motivate the opposite. Tests of the significance in the deviations, after allowing for arbitrage costs, reveal frequent exchange gains opportunities in capital movements as indicated in Table 4.5.

The significant deviations that occurred during the period were positive, which motivated an outflow of capital, i.e. it was profitable

Table 4.5 Covered interest arbitrage profit opportunities

Currency	1974–84	1974–76	1978–84
Profit opportunities from treasury bills, covered interest arbitrage			
GBP	—	—	—
USD	Outflow	—	Outflow
DEM	Outflow	—	Outflow
JPY	—	—	—
Profit opportunities on loans to first-class-risk borrowers, covered interest arbitrage			
GBP	—	—	—
USD	Outflow	—	Outflow
DEM	Outflow	—	Outflow
CHF	Outflow	Outflow	Outflow
JPY	—	—	—

to invest money in foreign treasury bills, for example, for a sum sold on the forward market against SEK.

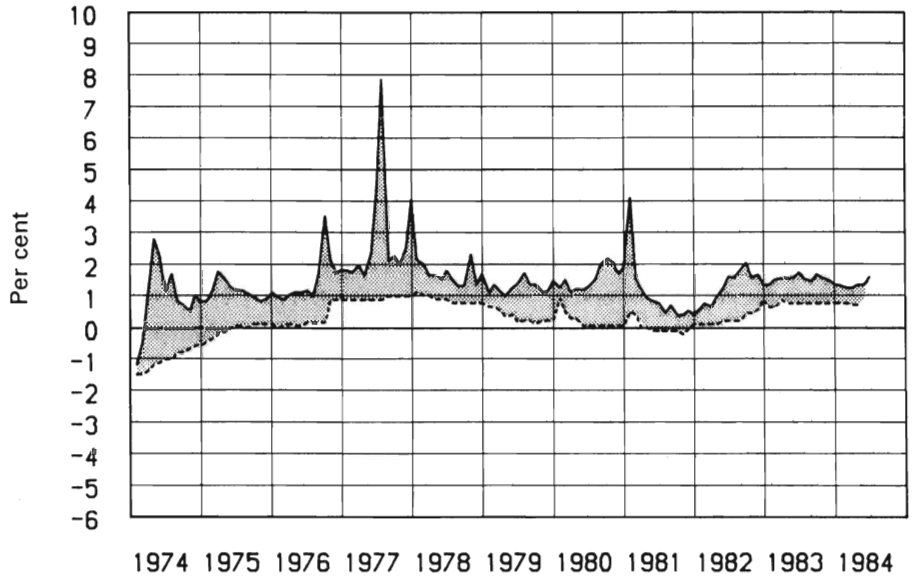
How many opportunities have there been for making a profit, i.e. on how many occasions would it have been possible? The number of occasions, shown in Table 4.6, is considerable for some currencies/periods. This may be because the arbitrage cost estimate is on the low side. Levich (1979) noted similar deviations for USD, and suggested that they were probably due to a time lag between the transmission of information and the actual transaction. Once information indicating a risk-free profit as a result of covered interest arbitrage is available, four transactions have to be performed. The fact that an ex post analysis reveals risk-free opportunities, does not necessarily mean that a potential investor possessed rules ex ante for the exploitation of the opportunities. An efficient market presupposes rational investors, i.e. investors who immediately translate information into transactions. If there is a time lag between receipt of the information and the chance of utilizing it, the profit opportunity may have disappeared. It would therefore be interesting to see whether these opportunities persist for a while, i.e. whether the transaction occurs first at $t+1$. To be able to establish this with any certainty, we would have to have made observations of days and hours, rather than of weeks and months as we have done here. Figures 4.9–4.17 allow for follow-up on a monthly basis only; and we can see that it is very unusual for a major deviation from interest rate parity to persist until the occasion of the next measurement. By 'major' is meant a deviation of such a magnitude that it seems unlikely to stem only from any form of arbitrage cost.

Table 4.6 Number of individual observations outside the 'economic interest parity interval' for different currencies and for the period 1974–84
Monthly data

	Three-month treasury bills			Commercial bank prime lending rates		
Currency	1974–84	1974–76	1978–84	1974–84	1974–76	1978–84
GBP	15	6	8	11	6	3
USD	16	7	8	16	5	5
DEM	29	7	20[a]	70	20	19
CHF	—	—	—	59	31	26
JPY	4	2	2	6	3	2
Number of observations	126	36	78	126	36	78

[a] Partly based on Frankfurter three-month rate.

Figure 4.15 Deviations from interest rate parity, SEK/DEM
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in commercial bank prime lending rates (three-month)



Large *temporary* deviations belong to the nature of the Swedish forward market; a thin forward market (i.e. with inelastic supply and demand curves) engenders deviations of this kind. In the Swedish case it seemed most appropriate to analyse the three-month market, which is the most frequent choice, but a comparison of different settlement periods (three- and six-month forward rates and interest rates are compared) showed that the deviation from interest rate parity tended to increase with the length of the period. Levich (1979) noted the same tendency on the USD forward market and concluded that the arbitrage cost rises with the length of the period.

Branson (1969) sees no reason to claim any systematic deviation from interest rate parity or market efficiency. Frenkel and Levich (1981) are of the same opinion and conclude that 'in most cases transaction costs account for the deviations from parity'. Thus, arbitrage costs can be estimated as the average value of the absolute deviation, once the values for any periods of speculation have been eliminated. However, in interpreting the results we must remember that the forward markets in the USA and in Europe are very different, not only in size but also in the opportunities they provide for different categories to use them. What Branson claims may be true for the Euro-market, but certainly not always as between national interest rates.

McCormick (1979), using the same methodology as Frenkel and Levich but with another data base, concluded that transaction costs in foreign exchange markets are considerably lower than those estimated by Frenkel and Levich. McCormick throws doubt on the Frenkel-Levich conclusion regarding the fulfilment of interest parity.

The exploitation of interest differentials on the national markets versus the Euro-market represents a variation of the interest arbitrage case. Essentially, however, it is a question of differences in the risk attached to the various financial instruments. The generally lower lending rates on the Euro-market afford slightly more scope for profit than the corresponding national rates. For instance, the covered arbitrage is maintained on exchange into SEK and in lending on the Swedish capital market. The loan sum, and consequently the profit, is hedged on the forward market.

In conclusion it should be noted that in Sweden the opportunities for exploiting the forward market for speculative financial transactions of the kind described here are severely restricted by currency regulations. This may explain the systematic deviation from interest rate parity that is shown, for example, by the combination SEK–CHF. This is in agreement with the first part of the conclusions in Isard (1978):

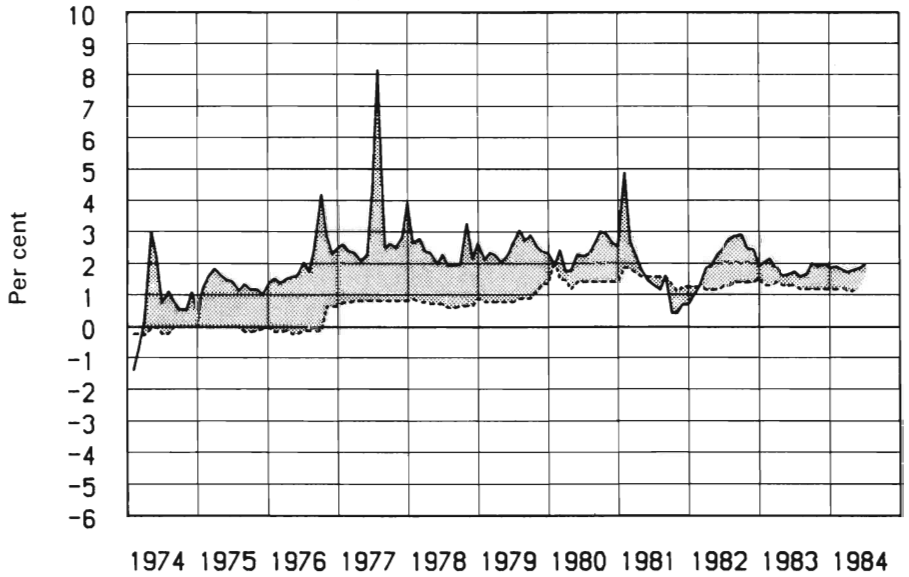
> ...it is now accepted that observed deviations from interest parity reflect either the influence of capital control, which alters the incentives or opportunities faced by interest arbitrageurs or the fact that empirical data on interest rates do not refer to sufficiently comparable foreign and domestic rates.

One important observation regarding market efficiency is that the variations in deviations from interest parity seem to have diminished in size during the early 1980s, and to have become less economically significant from an exploitation point of view.

There is still no consensus about the particular factors that are responsible for observed deviations from strict interest parity — in other words, no explanation that is consistent with equilibrium and the absence of exploitable opportunities for safe profit from covered arbitrage. Besides the transaction cost, explanations have been stated in terms of institutional constraints in Einzig (1961), in terms of the link between interest rates and volume of arbitrage in Frenkel (1973), political risk in Aliber (1973), Dooley and Isard (1980), and default risk in Stoll (1972). Other potential explanations, not explicitly mentioned here, concern the expectations of market participators, lack of convertibility, and the fact that the supply and demand schedules of domestic and foreign securities and foreign exchange are less than infinite.

In evaluating the Interest Rate Parity theory as a potential normative basis it would have been interesting to study forward rates correspond-

Figure 4.16 Deviations from interest rate parity, SEK/CHF
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in commercial bank prime lending rates (three-month)



ing to the time horizon of the medium-term and long-term loans, but such long forward markets do not exist in Sweden, and for this reason the analysis has been applied to short-term forward rates only. We have now found, using short-term rates, that we have had temporary 'economically' exploitable deviations which exhibit a trend to diminish in size. In a monthly perspective they seldom persist from period to period, which may be interpreted as a sign of long-term validity.

In this section we have discussed interest rate parity and the opportunities for profits on covered arbitrage, i.e. profits whose size can be determined in advance, and involving no direct exchange risk. There will still be some uncertainty connected with political risks. In the following section we shall see how the Interest Rate Parity theory, when applicable, can contribute to a forecasting theory in which the forward exchange rate is used as a forecast of the future spot rate.

4.2.3 Fisher's Open Relationship

Fisher's Open Relationship refers to the equilibrium in international interest rates after adjustment for expected exchange rate movements, and it represents the equivalent of the Purchasing Power Parity theory on the financial market. The relationship, which is also known as

Fisher's International Effect (after Irving Fisher, whose results were published in 1896 in an essay entitled 'Appreciation and interest') can be written:

$$\frac{S^*_{t+n} - S_t}{S_t} = \frac{r_d - r_f}{1 + r_f} \tag{23}$$

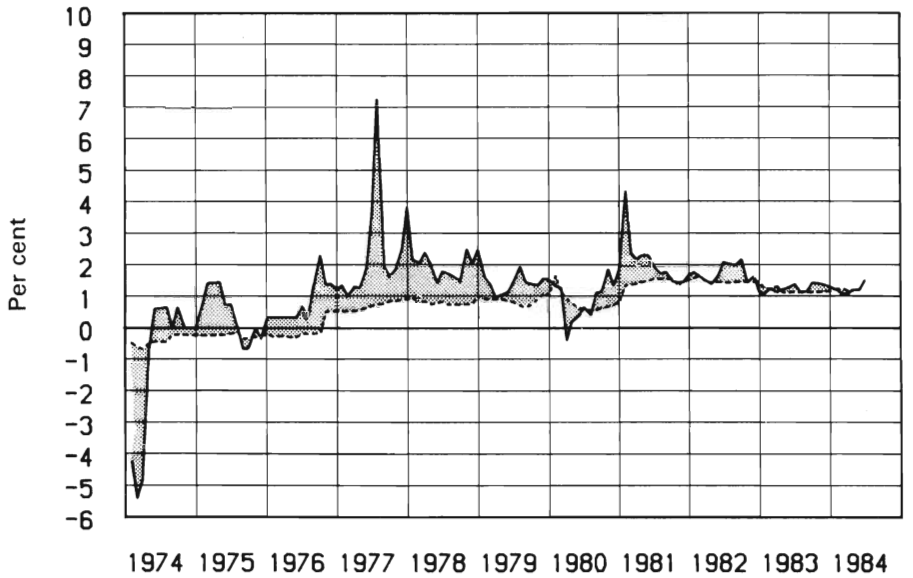
where S_t = spot rate at time t
S^*_{t+n} = market expectations at time t regarding future spot rate at time $t + n$
r_d = domestic interest rate for n months' financial allocations
r_f = foreign interest rate for n months' financial allocations.

According to Fisher's Open Relationship the future exchange rate is a function of the current rate and the relative interest differential for assets under equal financial risk in two countries. The interest rates can then be regarded as a function of real growth and expected inflation. The systematic component in the exchange rates can be estimated on a basis of the interest differential. The nature of the random component is such that over the total lifetime of the loan it can be expected to amount to zero.

Exhaustive tests for the period 1953–71 in the USA (Fama, 1975) indicated that the rate of change in inflation is positively correlated with the nominal interest rate, which suggests that this last reflects the expected value of future inflation. (Cf. also Section 4.2 above.) Fama concluded that interest rates set in US financial markets are informationally efficient. His work highlighted the two separate (although not always distinguishable) elements in the Fisher *domestic* hypothesis: (1) the effect of expected inflation on the expected real rate and (2) the question of whether or not the nominal rate reflects a rational forecast of inflation. Kane, Rosenthal and Ljung (1983) have continued along this line and found that Euro-rates include informationally efficient forecasts of inflation. Even with a stronger test of efficiency, looking at the time series behaviour of independently generated residuals, the results are still favourable as regards efficiency. The results from Fama and Gibbons (1984) improve on Fama (1975) and lead to the conclusion that nominal interest rates are efficient. These results together with the results of Kane and co-workers provide reasonable, although not completely conclusive, support for the concept of nominal interest rates adjusting to expected inflation.

This means that, over the longer term, the real rate of interest is approximately constant, being determined largely by time preference,

Figure 4.17 Deviations from interest rate parity, SEK/JPY
Monthly data, per cent/quarter
——— Three-month forward rates
-------- Differences in commercial bank prime lending rates (three-month)



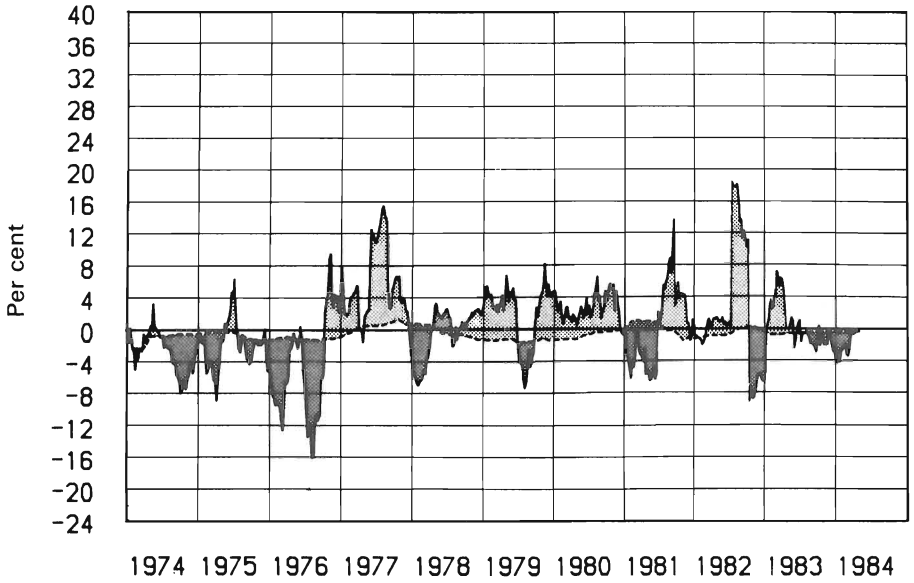
with movements in the nominal interest rate reflecting movements in the rate of inflation one for one.

However, many researchers have found empirical evidence that appears to be inconsistent with the hypothesis, at least in its strictest form. This is referred to as the paradox of the Fisher domestic hypothesis. Tables and figures in Section 5.3 reveal big variations in real interest rate.

Carmichael and Stebbing (1983) argue that one explanation of that paradox is to be found in the fact that while Fisher's hypothesis involves a proposition about real capital, empirical tests of the hypothesis have used data about financial assets. Taking into account different margins of substitution between money and financial assets on the one hand and financial assets and capital on the other, they suggest that, as far as financial markets are concerned, the impact of inflation has been most marked on real rates of return and slight on nominal interest rates, regardless of the time horizon. While this evidence provides one explanation of Fisher's paradox, it leaves open the possibility that Fisher's hypothesis may still hold for real assets such as capital.

Let us now proceed to analyse the Fisher *international* effect including foreign exchange rates and interest rates. What interest rate

Figure 4.18 Deviations from Fisher's Open Relationship SEK/GBP
Weekly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in Euro-rates (three-month)



should be used? Euro-rates are generally most appropriate, since they are free of the effects of the various national controls.

4.2.3.1 Analysis of Fisher's Open Relationship for the period 1974–84

With the help of the empirical analysis we hope to discover whether there is any systematic difference between predicted and observed exchange rate movements, where the difference cannot be ascribed to institutional factors such as transaction costs. Currency preferences represent one such systematic factor: an investor may choose a particular currency, for instance, because it is expected to fluctuate less than others. As was previously mentioned, to make it possible to analyse the appropriateness of the relationship as a basis for developing accounting standards and for forecasting purposes, the market expectation of the future spot rate is replaced in the ex post analysis by the actual future spot rate.

As there is no Euro-interest rate for the Swedish krona, the analysis is geared to interest rates on treasury bills and prime lending rates. Despite our equal-risk criterion, margins may differ between countries. But as these differences do not change very quickly, they are unlikely to affect the analysis. We are applying the same kind of

approach here as in our analysis of deviations from interest rate parity above.

In an attempt to illustrate movements and market sensitivity on a weekly basis, a Euro-krona three-month interest rate is estimated, based on the Euro-dollar rate and the forward premium/discount. This has then been used in Fisher's Open Relationship together with the Euro-mark rate and others. The results can be seen in Figures 4.18–4.20. We can wait to study the sitution for USD until we have discussed the forecasting properties of the forward cost in Section 4.5.2.1, because with the interest rate construction used here, the comparison in the case of USD will be exactly the same as when the forward cost is compared with the observed outcome for this currency. From Figures 4.21–4.29 we can see how well Fisher's Open Relationship predicted the movements of the major loan currencies for three-month periods. However, the analysis applies to all the currencies in the currency basket for which the relevant interest rates were available, as reported in Appendix 2. Observations were made once a week.

The figures show big short-term deviations from Fisher's Open Relationship. Forecasts based on interest differentials are indicated by broken lines, and observed outcomes by unbroken lines. As was

Figure 4.19 Deviations from Fisher's Open Relationship SEK/DEM
Weekly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in Euro-rates (three-month)

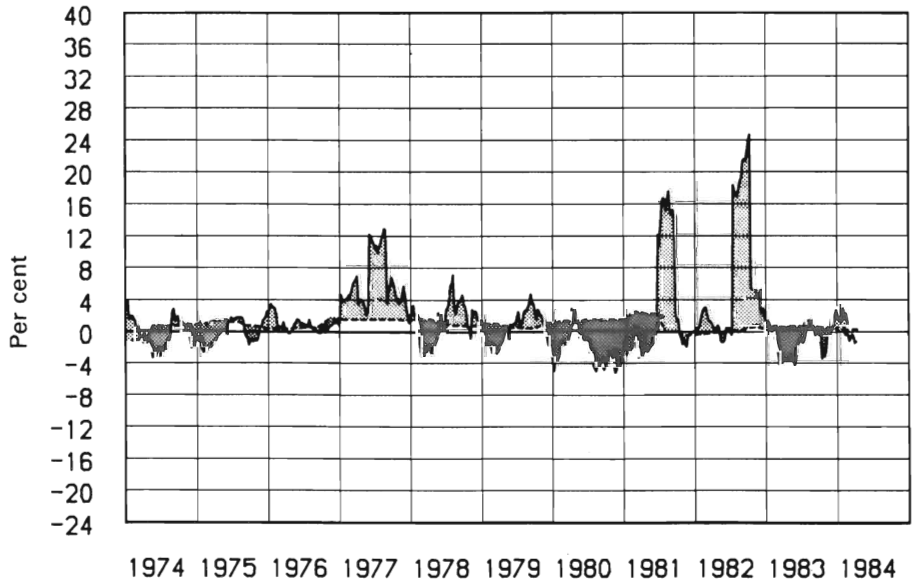
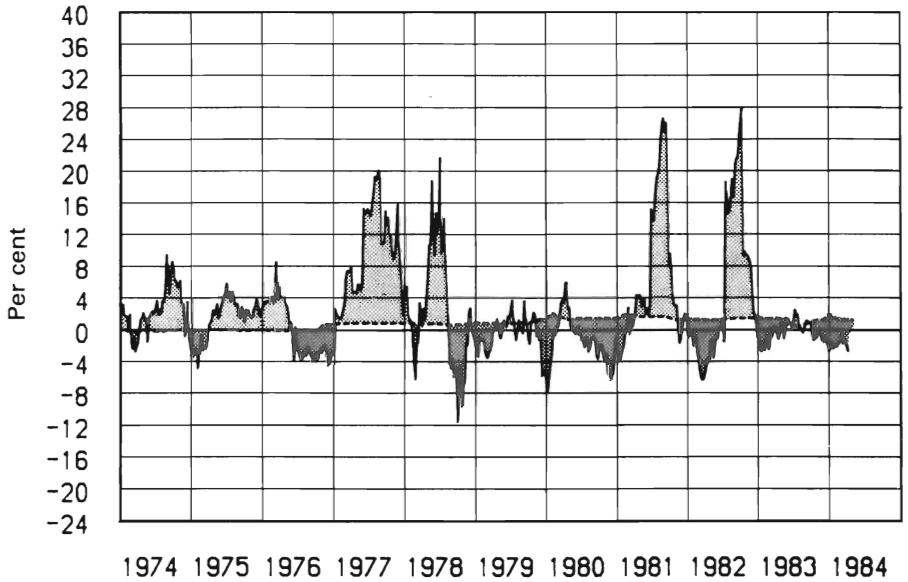


Figure 4.20 Deviations from Fisher's Open Relationship SEK/CHF
Weekly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in Euro-rates (three-month)



mentioned before, the difference between the lines is a mark of the difference between market expectations and observed outcomes. In the present case these differences are interpreted as deviations from Fisher's Open Relationship (d_{fo}). The deviations are reported at time t and refer to observed changes in exchange rate as a percentage for the period t to $t + 3$ months, less the change in exchange rate that was predicted by Fisher's Open Relationship at time t for the same period, or:

$$d_{fo} = \frac{S_{t+3} - S_t}{S_t} = \frac{r_{Swe} - r_f}{1 + r_f} \tag{24}$$

An examination of the appearance of these deviations supports the hypothesis that they are distributed randomly around the equilibrium relationship. The deviations may be regarded as exchange outcomes resulting from transactions steered by expectations. Tables 4.7–4.8 show the average value ($\bar{d}_{fo}$) and the standard deviation (s) is the deviation from Fisher's Open Relationship.

By using Fisher's Open Relationship based on the more volatile Euro-rates, and a Swedish rate according to the definition mentioned above, we will get figures close to those shown in Table 4.8. So let us

Table 4.7 Mean ($\bar{d}_{fo}$) and standard deviation (s) in the deviation from Fisher's Open Relationship based on three-month treasury bill rates
Monthly data, per cent/quarter

	1974–84		1974–76		1978–84	
Currency	$\bar{d}_{fo}$	s	$\bar{d}_{fo}$	s	$\bar{d}_{fo}$	s
GBP	0.79	5.26	−2.03†	4.78	1.51†	4.81
USD	1.63†	5.43	−0.82	5.07	2.85†	5.19
DEM	0.62	4.72	−0.49	1.61	0.50	5.53
CHF	—	—	—	—	—	—
JPY	1.24	6.60	−0.77	4.75	1.44	7.13
Number of observations	123		36		75	

† Significant deviation from zero when analysed at 5 per cent level. $H_0 : \mu_{d_{fo}} = 0$ is rejected.

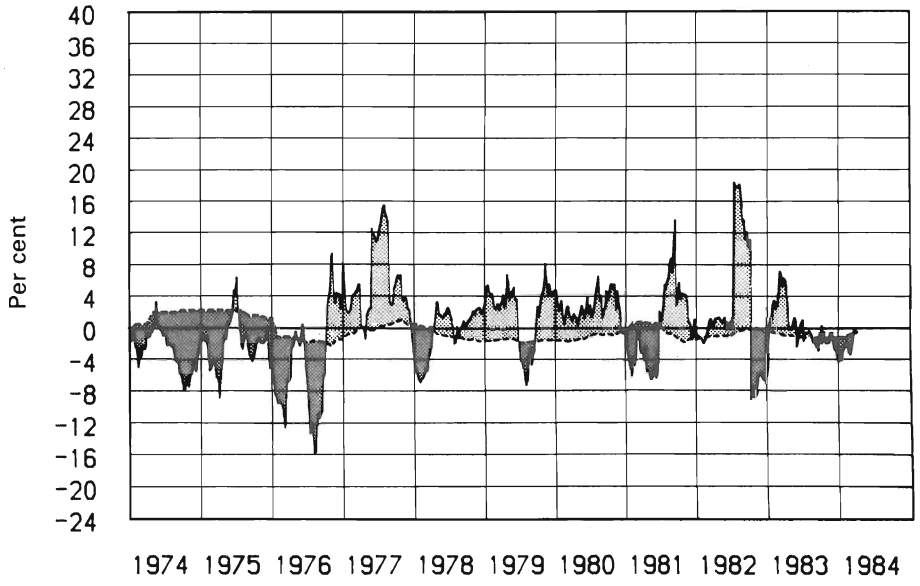
Table 4.8 Mean ($\bar{d}_{fo}$) and standard deviation (s) in the deviation from Fisher's Open Relationship based on three-month commercial bank prime lending rates
Monthly data, per cent/quarter

	1974–84		1974–76		1978–84	
Currency	$\bar{d}_{fo}$	s	$\bar{d}_{fo}$	s	$\bar{d}_{fo}$	s
GBP	0.82	5.26	−2.35†	4.81	1.49†	4.75
USD	1.78†	5.51	−0.89	5.09	2.94†	5.35
DEM	1.14†	4.59	0.07	1.39	0.83	5.39
CHF	1.58†	6.46	0.72	3.56	0.67	6.99
JPY	1.52†	6.75	−0.73	4.73	1.63	7.35
Number of observations	123		36		75	

† Significant deviation from zero when analysed at 5 per cent level. $H_0 : \mu_{d_{fo}} = 0$ is rejected.

see what support for Fisher's Open Relationship the figures in Tables 4.7–4.8 can give us. Those combinations of periods/currencies where the average deviation differs significantly from zero in an analysis at the 5 per cent level, have been marked with a dagger. For *treasury bill rates*, four significant deviations appear in Table 4.7, two of which refer to GBP. One is for the period 1974–76. Deviations for the same currency/period can also be found in Table 4.8. Figures 4.21 and 4.25

Figure 4.21 Deviations from Fisher's Open Relationship SEK/GBP
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in treasury bill rates (three-month)



show an almost consistently negative deviation during the same period, probably owing to speculation in the weak GBP and to a general lack of confidence in that currency. The underlying cause was probably that the effects on interest rates of the expansive and inflationary policy in the UK during this period were difficult to assess. For the treasury bill rate parity, only USD show a significant deviation for the whole period investigated. But, working at a lower level of significance, say 0.1 per cent, even this deviation will be insignificant. Breaking down the period 1978–84 into sub-periods will show that the significant deviations for the longer period and for USD and GBP have been created after 1980.

The results in Table 4.7 indicate long-term validity — in the sense of no systematic deviation from parity — for Fisher's Open Relationship based on treasury bill rates. However, we must pay attention to the behaviour of the relationship for USD. For that currency we have a deviation which could be called systematic when analysed at a 5 per cent level but not when analysed at a 0.1 per cent level.

As regards short-term validity, Figures 4.21–4.24 provide us with evidence for substantial instantaneous deviations. However, with the division into sub-periods as shown in Table 4.7, only the deviations for USD for the period 1978–84 are significant at a 0.1 per cent level. At higher levels we will find significant deviations for GBP for both sub-periods.

Figure 4.22 Deviations from Fisher's Open Relationship SEK/USD
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in treasury bill rates (three-month)

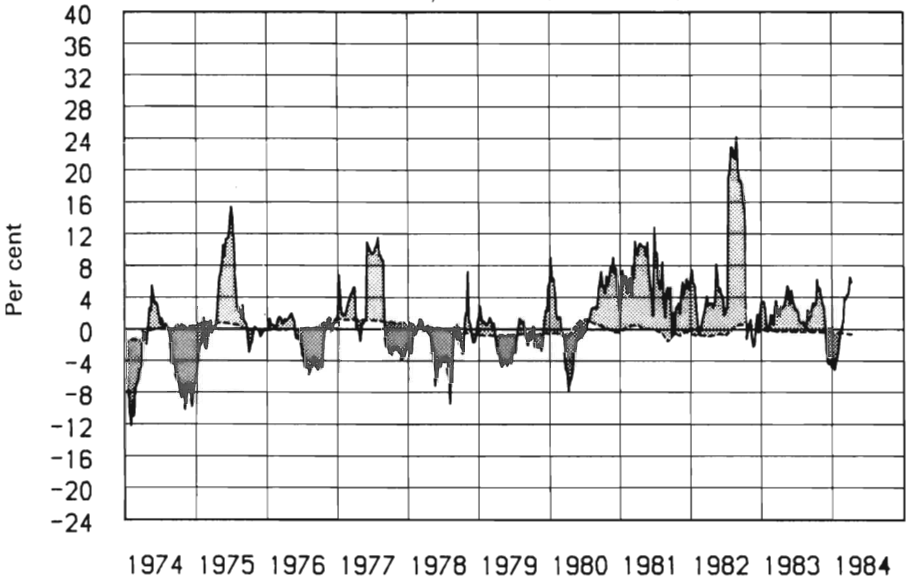


Figure 4.23 Deviations from Fisher's Open Relationship SEK/DEM
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in treasury bill (Frankfurt) rates (three-month)

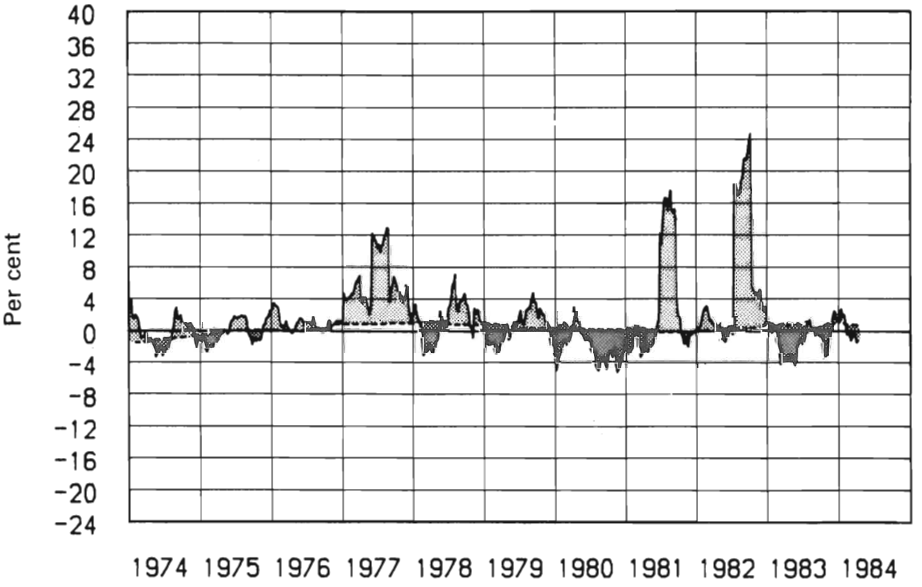


Figure 4.24 Deviations from Fisher's Open Relationship SEK/JPY
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in treasury bill rates (three-month)

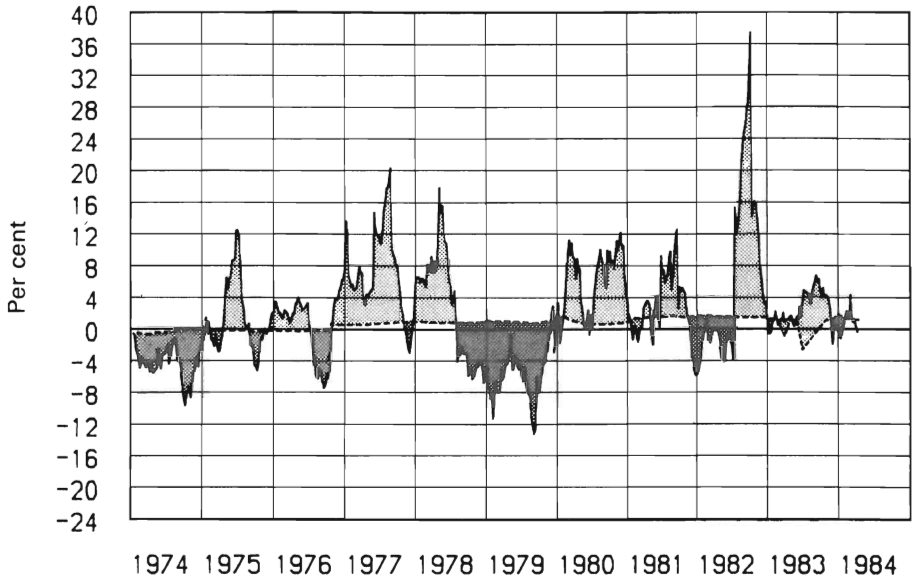


Figure 4.25 Deviations from Fisher's Open Relationship SEK/GBP
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in prime lending rate (three-month)

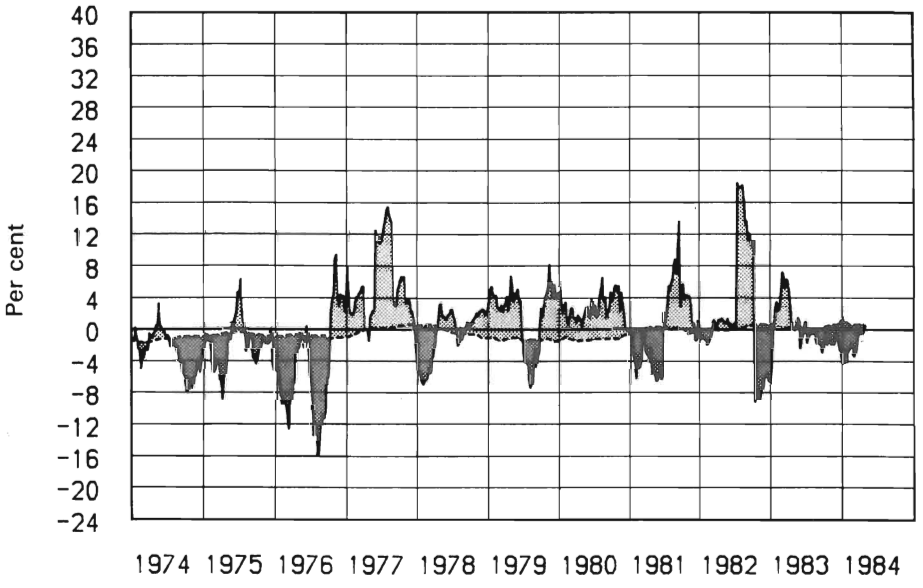
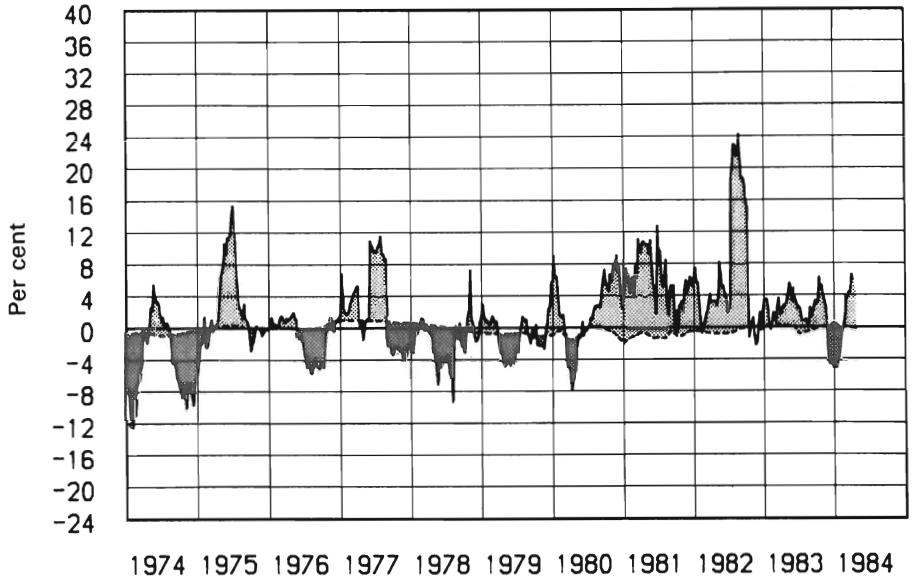


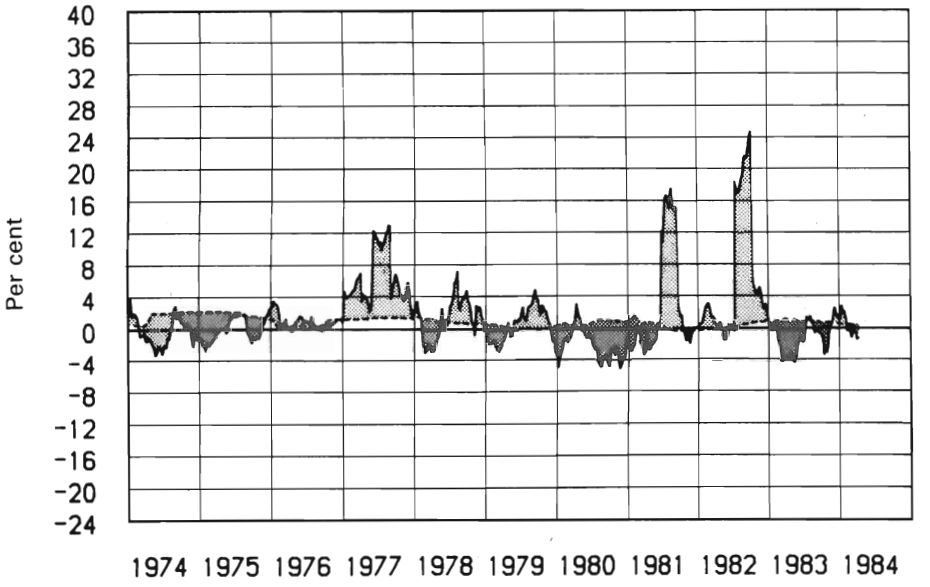
Figure 4.26 Deviations from Fisher's Open Relationship SEK/USD
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in prime lending rate (three-month)



At a first glance the pattern for *commercial bank prime lending rates* shown in Table 4.8 seems different from that in Table 4.7. The difference consists of more currencies in Table 4.8 with systematic deviations for the whole period of investigation. However, if we were analysing at a 0.1 per cent level, we would have got exactly the same results as in Table 4.7.

If we break the total period into more sub-periods than those included in Table 4.8, we will find that much of the weak significant deviation in DEM, CHF and JPY arose in 1977. This is also visually confirmed in Figures 4.27–4.29. The explanation of these deviations lies in the marked preference shown primarily for DEM and CHF during the speculation connected with the depreciation of the Swedish krona in 1977. As a result of the pegged exchange rates and the systematic differences in inflation rates, the greatest potential for devaluation at this time was against these two currencies. The fact that interest rates reflect expected inflation during a future period, means that the interest differential cannot be used to forecast exchange rate movements that are due to speculation about an exchange rate adjustment based on large accumulated inflation differentials. When the devaluations occurred in 1977, they resulted in large deviations from Fisher's Open Relationship, although not large enough to be able to explain on their own the significance of the DEM and CHF deviations throughout the period 1974–84. In this context speculation

Figure 4.27 Deviations from Fisher's Open Relationship SEK/DEM
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in prime lending rate (three-month)



is very important. Given a rapid adjustment of interest rates to 'new' inflation levels, there will be no deviations. Time lags in inflation expectations, and the accompanying effects on the interest rate, can result in big temporary deviations. The maximum deviations, positive and negative respectively, are shown in Tables 4.9 and 4.10. Such extreme values are often linked to some form of major intervention by the central bank of one of the countries involved.

Analysing the deviations for Fisher's Open Relationship based on commercial bank prime lending rates will provide us with the same result as we got when analysing the relationship based on treasury bill rates, that is a fairly good *long-term* validity with large *short-term* deviations. One interesting result is that both USD and GBP exhibit systematic deviations for the period 1978–84, while the other currencies in the investigation do not. This is interesting because these two currencies represent countries with the monetary approach, while the others represent countries with approaches more like the Keynesian.

Another way of illustrating the validity (according to our definition) of Fisher's Open Relationship during the period 1974–84 will be presented in the next chapter, in which we use an index of additional cost. Our present observations regarding significant deviations at a 5 per cent level can thus be formulated such that loans in USD, DEM,

Figure 4.28 Deviations from Fisher's Open Relationship SEK/CHF
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in prime lending rate (three-month)

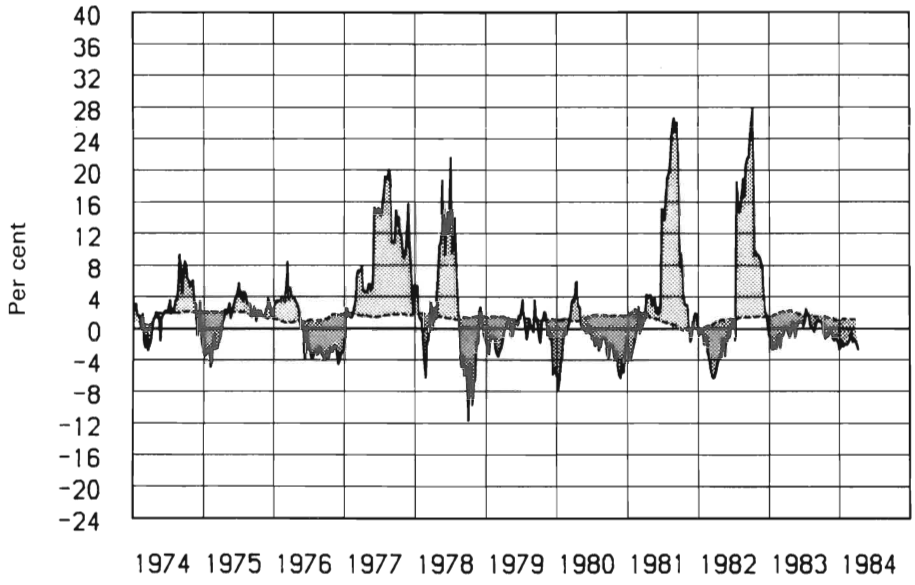


Figure 4.29 Deviations from Fisher's Open Relationship SEK/JPY
Monthly data, per cent/quarter
——— Actual changes in exchange rate, per cent/quarter
-------- Differences in prime lending rate (three-month)

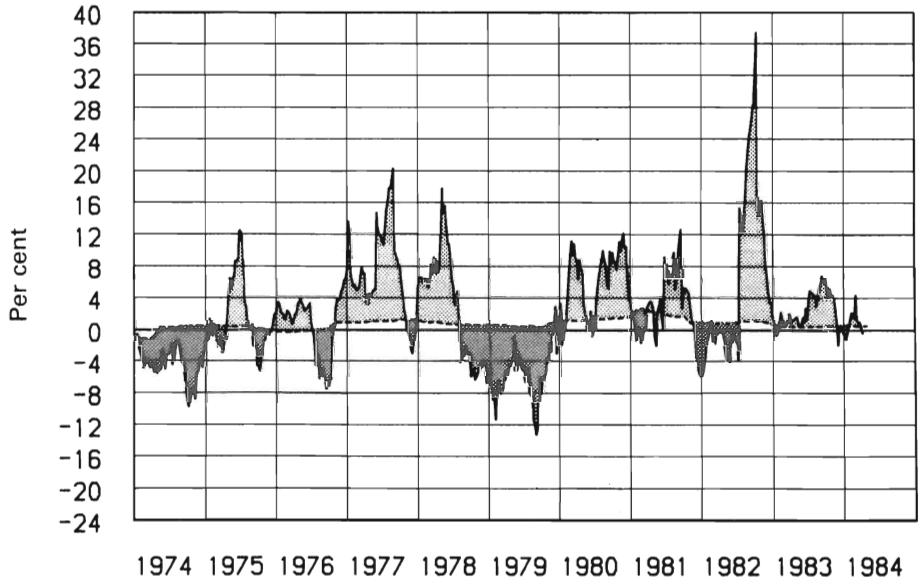


Table 4.9 Greatest positive and negative deviations from Fisher's Open Relationship, based on treasury bill rates during the period 1974–84
Monthly data, per cent/quarter

Currency	Max. positive	Max. negative
GBP	18.23	−14.72
USD	23.07	−10.81
DEM	23.48	−6.01
CHF	—	—
JPY	31.21	−13.54
Number of observations	123	

Table 4.10 Greatest positive and negative deviations from Fisher's Open Relationship, based on commercial bank prime lending rates during the period 1974–84
Monthly data, per cent/quarter

Currency	Max. positive	Max. negative
GBP	17.82	−15.03
USD	23.63	−11.40
DEM	23.51	−4.74
CHF	24.73	−12.29
JPY	30.90	−13.86
Number of observations	123	

CHF and JPY for the period 1974–84 were *significantly more costly* than corresponding loans in SEK.

In Appendix 6 the gains from systematic speculation on the spot and forward markets are listed. On an efficient market the average yield from speculation should be negative, because of transaction costs. An analysis of the data presented in Appendix 6 suggests that extremely few combinations of periods/currencies offered a positive average return on speculation. For the period 1978–84, for example, only spot speculation in DEM would have given a positive result, and even this is within the margin of error. The weekly negative average returns on spot speculation can be taken as an indication of the validity of Fisher's Open Relationship. The spot speculation has been calculated at an

interest rate on treasury bills and confirms the results of the earlier analysis in this section.

In contrast to the evaluation of the Purchasing Power Parity theory the analysis of the Fisher's Open Relationship has been conducted only in a rolling short-term perspective, based on interest rates for that shorter time horizon. It would have been interesting to have made the evaluation for long-term interest rates, but these rates were very close to each other in the Euro-market in the middle of the 1970s — the main loan currencies were all within a range of two per cent. Evaluating Fisher's Open Relationship from these interest rates would have given a misleading picture. As mentioned above, the interest rate explosion at the end of the 1970s provided a gap between interest rates — better reflecting the differences in inflation rates or expectations about these rates, based on the 'new' inflation pattern — which ought to have increased both the short-term and long-term validity of Fisher's Open Relationship.

4.2.4 Some concluding comments on the equilibrium relationships

Our analysis suggests that the various equilibrium relationships hold satisfactorily over fairly long time horizons, but that rather large deviations can arise in the short run.

This has some important direct implications for corporate accounting and *decision-making*. There are also indirect implications, since these two aspects of the company are interdependent. The internationally most common *accounting* method for translating the status of subsidiaries in the group accounts has long been the monetary–nonmonetary (or temporal) method. (Today there is a trend towards the use of the closing rate for all items.) We have already seen in Chapter 3 that according to this method monetary items are evaluated at the closing rate, while nonmonetary items are evaluated at the historical rate. In this there is an implicit acceptance of the validity of the Purchasing Power Parity theory — regardless of whether it is a question of short-term or long-term nonmonetary items. On the other hand, the translation of the monetary items at the closing rate implies a rejection of Fisher's Open Relationship as an evaluation tool. Theoretically speaking this is inconsistent. As at least the long-term validity of Fisher's Open Relationship has been demonstrated empirically, this inconsistency has also been empirically confirmed. We also have all empirical evidence for substantial short-term deviations from both these equilibrium relationships, but with long-term validity. Thus using PPP in all time perspectives is also inconsistent.

In what context, then, is it inconsistent, theoretically speaking, to

apply the Purchasing Power Parity theorem but not Fisher's Open Relationship? If prices are stable in the countries concerned, money interest rates in these countries will be approximately equal as a result of arbitrage. According to monetary relationships which we have already described, the currency in a country which has adopted an inflationary expansive monetary policy will be depreciated in proportion to the relative price increase *vis-à-vis* other countries. Interest rates on investments in these currencies will rise (according to the argument in Section 4.2, there can be a certain time lag here), and will reflect the expected adjustment in the exchange rate. If the gap between expectations and reality is not too great, the increase in the relative price level and the interest level will thus be equal in percentage terms to the expected adjustment in the exchange rate.

As we have seen from the figures illustrating Purchasing Power Parity, Interest Rate Parity and Fisher's Open Relationship, these equilibrium relationships do not always hold at any one time; some deviation can occur. Thus political decisions, for example, may delay an adjustment in exchange rates in a system of pegged rates, and this can generate quite substantial deviations from the equilibrium relationship. The figures illustrating the purchasing power parity indexes provide examples of this kind of delay and of the resulting time lag between changes in the relative price level and adjustment in the exchange rate. This also means that the multinational company may face a substantial foreign exchange risk in a short-term perspective. For a company with any degree of risk aversion the long-term validity provides no consolation from a risk perspective. For such a company risks are induced by the foreign exchange fluctuations *in se* and the fear concerns not only actual losses but also the redistributions of income which are created by these fluctuations.

The empirical results in this chapter also have important implications for the measurement of the company's exchange *exposure*. If both Fisher's Open Relationship and the Purchasing Power Parity theorem are valid, exchange gains will be random and the average result of consistent hedging will be negative. The variances are naturally of interest mainly to the risk-averse, who wants to eliminate his exposure anyhow. According to Wyman (1976) the company with a selective hedging philosophy should adopt hedging procedures

> only when they have reasons to believe the Fisher Effect will not hold.

If Fisher's Open Relationship does hold, it means that monetary items are not exposed to exchange rate movements. The accumulated return on an investment over its whole lifetime will then include an amount

compensating for exchange rate movements during the same period. Full compensation means that the effective foreign interest rate is equal to the domestic rate. This means in turn that the cost will be the same as the interest on a corresponding loan in SEK, regardless of the currency in which the investment has been made.

For instance, in Sweden virtually the only opportunity for external hedging of the foreign loan is by way of the forward market. In the short run it may be important to the company to assure itself of this protection against deviations from the equilibrium relationship. In general terms, if the Interest Rate Parity theorem is valid in combination with Fisher's Open Relationship (with our modification), then the forward exchange rate will provide an unbiased estimate of the future spot rate, i.e.

$$F_t(n) = S_{t+n} + \epsilon_t \tag{25}$$

where $E(\epsilon_t) = 0$.

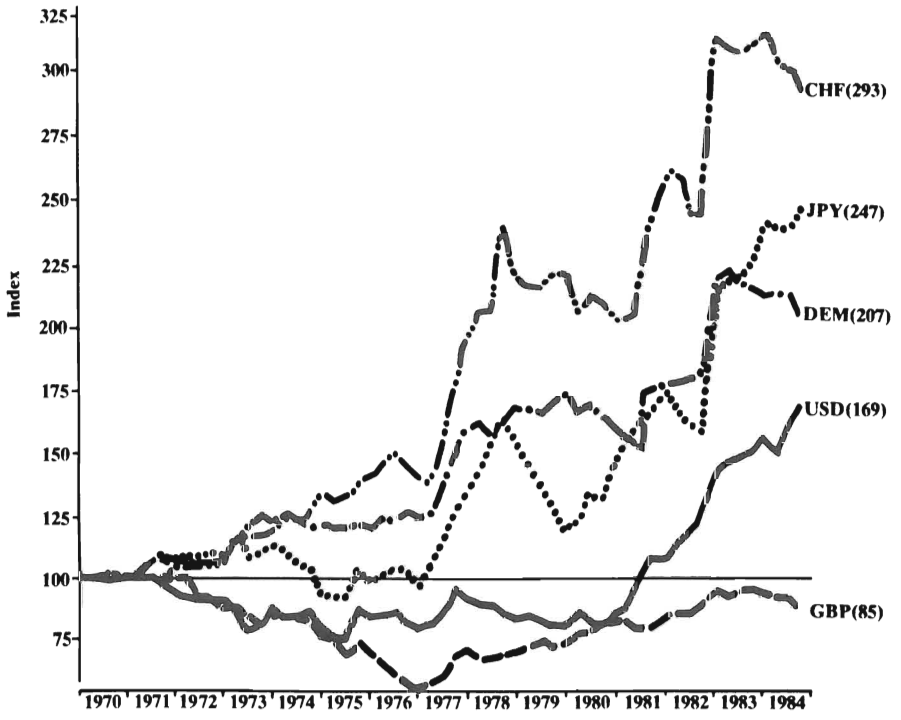
Under the above conditions, consistent hedging will on an average yield a negative result corresponding to the transaction cost. Against this cost, however, an advantage can also be gained from the hedging procedure, if the standard deviation in the forward rate turns out to be less than the equivalent for the spot rate. The hedging operation then means that there will be less random exchange-based variation in the corporate results. In Sections 4.3 and 4.4 we shall see how far it is possible to attain this benefit.

And what can be said at this stage about reporting loans in foreign currencies, assuming that the equilibrium relationships hold? If the loans are reported at the closing rate, for example, all the random variations in profits which were discussed above, and which can be seen to be the result of temporary deviations, will find expression in the profit and loss account. The long-run validity of the various equilibrium relationships provides the point of departure for the schemata recommended in Chapter 7 below, in evaluating foreign corporate loans.

4.3 ANALYSIS OF THE SPOT MARKET

In the previous section we surveyed some equilibrium relationships or laws, and examined their empirical validity. The long-term efficiency of the market is reflected in the validity of these laws. It is the exchange rate movements over this longer time horizon which are of the greatest interest to a study of medium-term and long-term loans. The existence

Figure 4.30 Exchange rate index SEK/foreign currency
Nominal end of the period, quarterly data
1969/70 = 100



of potential trends in foreign exchange rate movements are demonstrated in Figure 4.30. With a semilog scale, not shown, the impression of trends will be further enforced. The long-run efficiency of the market is not affected by individual short-term fluctuations, but these can nevertheless have pretty drastic economic effects both in accounting and further also in decision-making. In the present section we will therefore look at the spot market and will examine the short-run fluctuations in exchange rates, which to a great extent may reflect the speculative operations of the exchange market. Short-run exchange rate movements are also very important to companies whose only international transaction has been to contract medium-term or long-term foreign loans. Because a company expects a particular short-run pattern of movement, it may decide on advance amortization or may perhaps change to another foreign loan currency by way of multilateral forward market transactions.

If a company only occasionally undertakes any foreign transactions,

the short-term fluctuations in exchange rates can cause such big losses as to put the entire operation at risk. When the risk involved is on this scale, the lack of bias is no comfort. If the estimated variance in the difference between the forward rate and the actual spot rate at the end of the loan period is substantial, and if the risk ceiling is close, use of the forward market is justified. In the following analysis of short-term exchange rate movements we will look for possible regularities, i.e. correlations between successive adjustments in exchange rates (auto-correlation) and correlation between exchange rate movements for different currencies — these last as grounds for decisions based on portfolio theory.

Figures 4.31–4.35 show us something of the short-term nature of exchange rate movements by registering the weekly changes ($\hat{S}$). Average values ($\hat{S}$) and the standard deviations (s) for exchange rate movements as a weekly percentage are shown in Table 4.11. We can see that the standard deviation increased for all the five currencies between the period 1974–76 and the period 1978–84. In view of the construction of the basket one would have expected a reduction for all currencies — the advantage of the basket is the avoidance of extreme exchange rate movements. The observed increase should instead be

Figure 4.31 Weekly percentage change in spot rate SEK/GBP

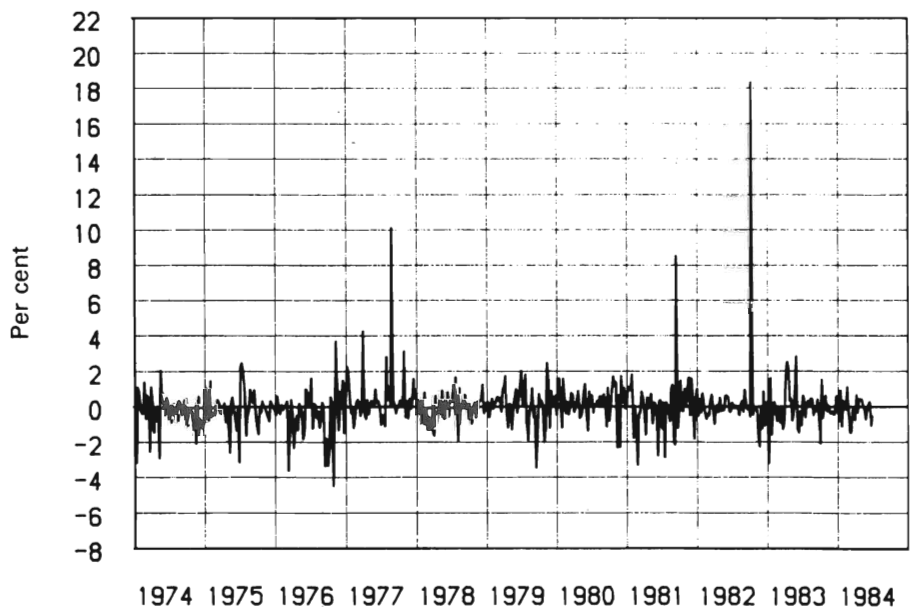


Figure 4.32 Weekly percentage change in spot rate SEK/USD

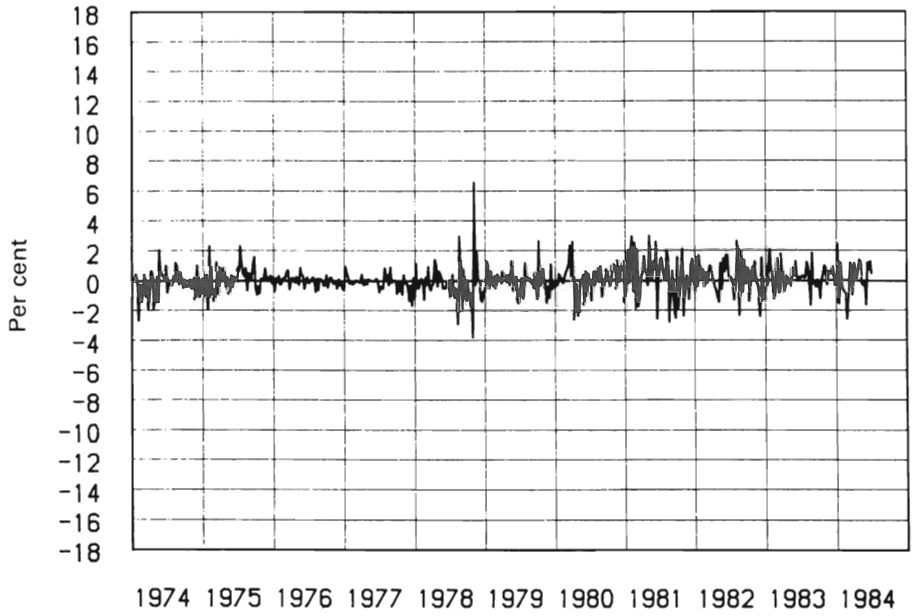


Figure 4.33 Weekly percentage change in spot rate SEK/DEM

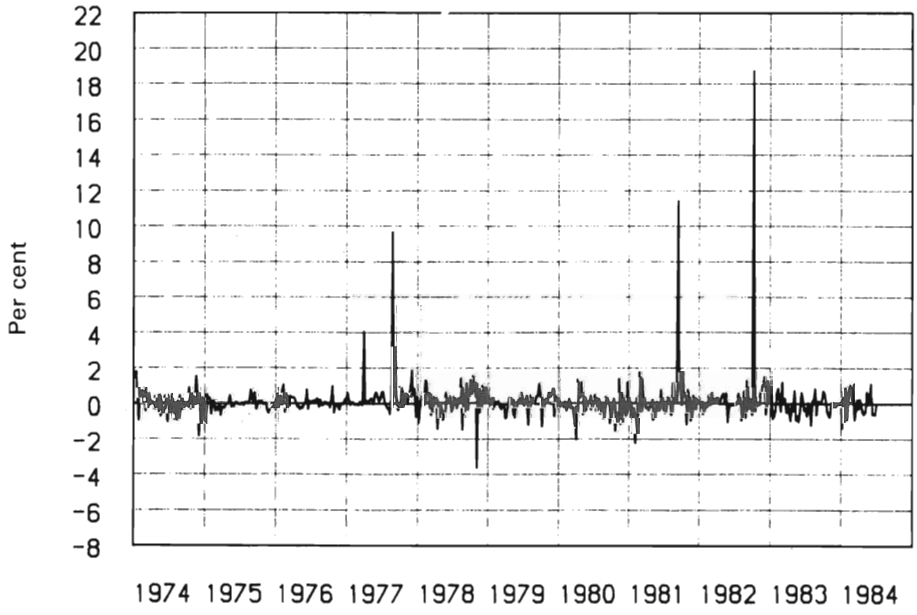


Figure 4.34 Weekly percentage change in spot rate SEK/CHF

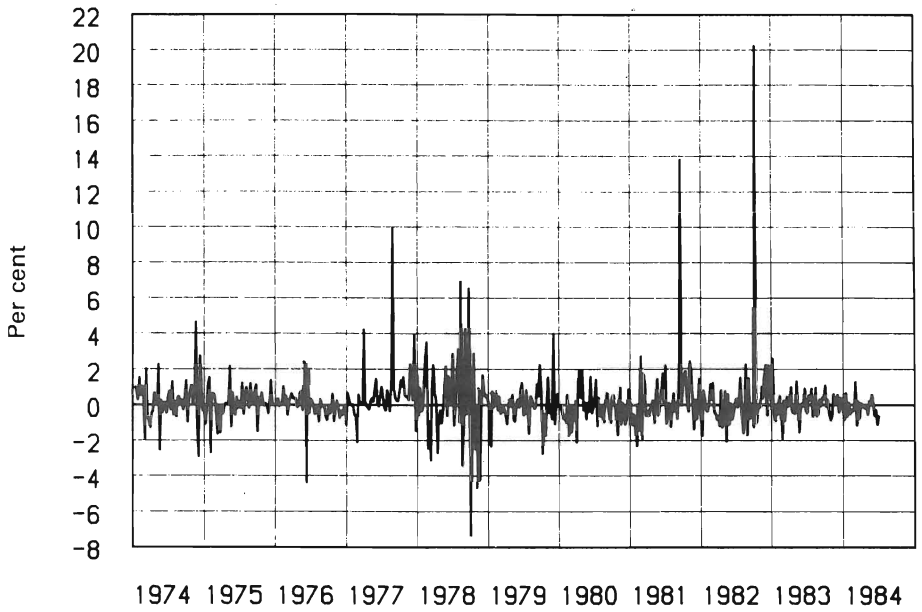


Figure 4.35 Weekly percentage change in spot rate SEK/JPY

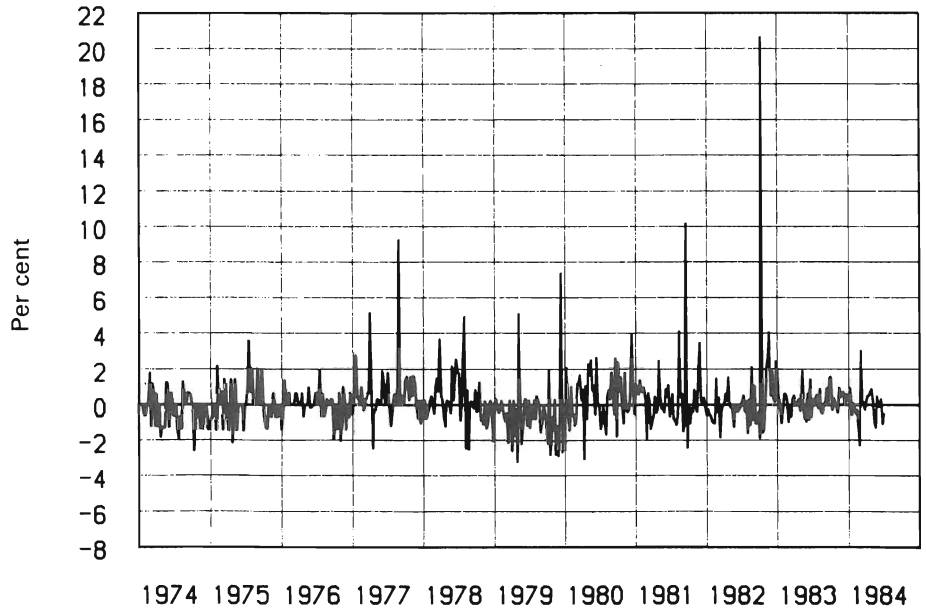


Table 4.11 Mean ($\bar{\hat{S}}$) and standard deviation (s) in weekly percentage change in spot rate

	1974–84		1974–76		1978–84	
Currency	$\bar{\hat{S}}$	s	$\bar{\hat{S}}$	s	$\bar{\hat{S}}$	s
GBP	0.12	1.41	−0.28	1.15	0.07	1.44
USD	0.11	1.38	−0.10	1.01	0.18	1.47
DEM	0.11	1.20	−0.03	0.45	0.09	1.37
CHF	0.18	1.66	0.12	1.03	0.13	1.87
JPY	0.15	1.59	−0.09	0.96	0.18	1.79
Number of observations	546		155		339	

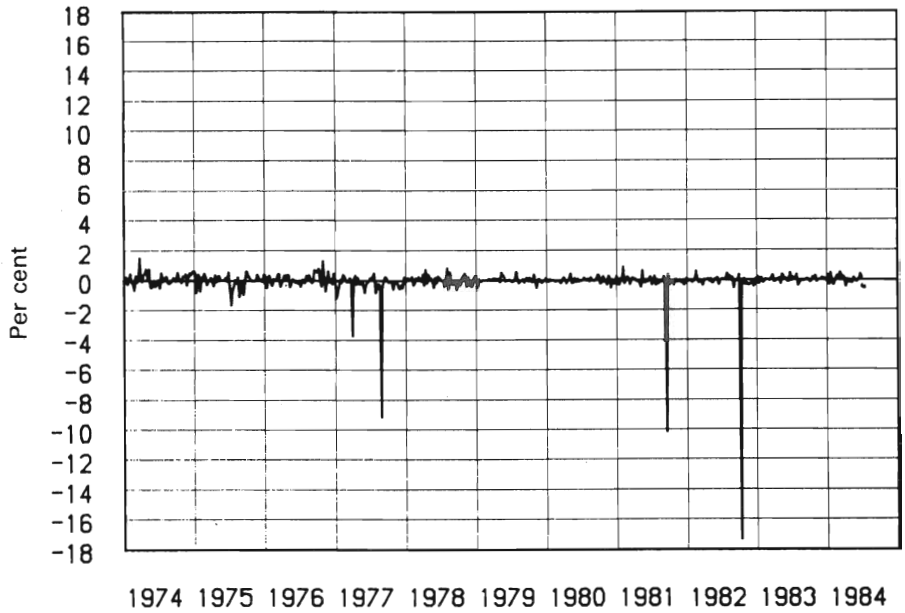
Table 4.12 Greatest positive and negative weekly percentage change in spot rate during the period 1974–84

Currency	Max. positive	Year+week	Max. negative	Year+week
GBP	18.4	8240	−4.5	7643
USD	16.0	8240	−4.1	7843
DEM	18.8	8240	−3.6	7844
CHF	20.3	8240	−7.3	7839
JPY	20.7	8240	−3.2	7917
Number of observations	546		546	

ascribed to the corresponding increase in variation in relative inflation rates as between Sweden and other countries.

Several notable peaks and troughs can be seen in Figures 4.31–4.35, all of which are the result of diverse interventions by the central bank in Sweden or in the other country in question. By reason of their very nature, interventions of this kind are difficult to predict; it is difficult to locate them correctly in time or to predict their size. In Table 4.12 these extreme values are shown, together with the time at which they occurred. The effect of a weekly change of 10 per cent in the rate of exchange on a short-term foreign loan, for example, is easily envisaged. Tables 4.11 and 4.12 should be regarded with caution, as always in the case of percentage figures. The data in Table 4.11 affords a basis for calculating risk, provided successive changes

Figure 4.36 Weekly percentage change in the spot price of SEK *vis-à-vis* the Swedish currency basket

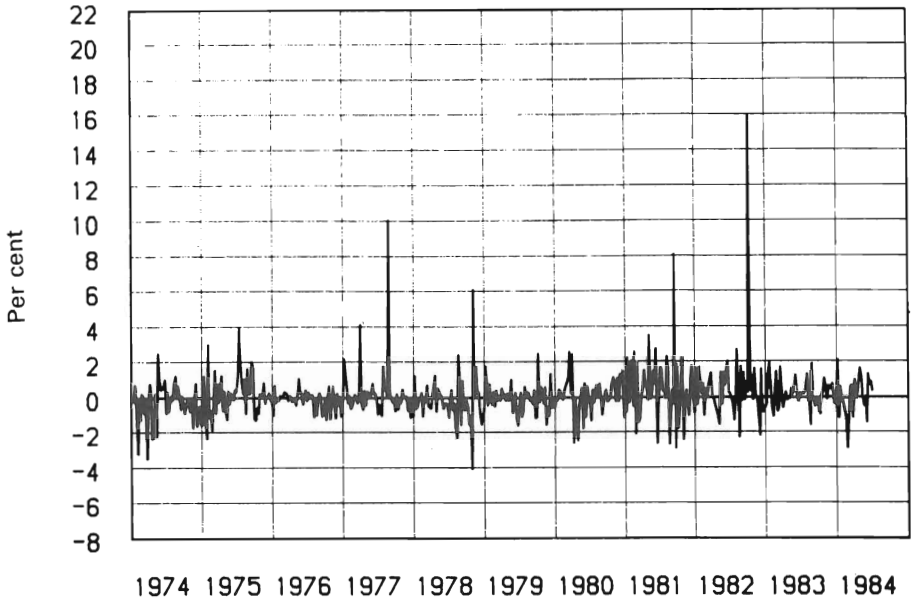


can be regarded as mutually independent. With access to the standard deviation it is then possible to assign a confidence interval to the coming week's spot rate. The average percentage weekly growth is positive for all currencies. This may seem strange, since the currency indexes reported above showed that, taking the period as a whole, GBP depreciated. However, the positive average values derive from the fact that to balance an appreciation of 50 per cent, for example, requires a depreciation of only 33 per cent; the currency has then reverted to the initial state.

The weekly percentage change in an exchange rate can be separated into two parts in order to demonstrate the effects of using the basket for stabilizing purposes. One part concerns the value of the Swedish krona versus the basket and is demonstrated in Figure 4.36. The other part concerns the value of the second currency involved in an exchange relation versus the basket construction, here exemplified in Figure 4.37 with the US dollar.

The extreme positive values recorded in Table 4.12 all stem from the Swedish devaluation in October 1982, recorded here at time 8240 (1982 week 40). Underlying causes of the extreme negative values can be traced to speculations based on the expectation of various regimes'

Figure 4.37 Weekly percentage change in the spot price of USD *vis-à-vis* the Swedish currency basket



exchange behaviour or on their actual exchange behaviour. Some action may have been initiated by Sweden with a view to strengthening the value of the krona, and some by the other country in question.

An example of a Swedish initiative which could explain a reported extreme negative value (i.e. a strengthening of the Swedish krona), could be the change in the exchange rate against the German mark. This change can probably be explained largely by certain effects of the economic–political package presented by the Swedish government in week 7844. But because of the effects of the turbulence on the US market, it is not easy to say, considering the Swedish basket construction, exactly what produced the observed appreciation of the Swedish krona compared to the German mark. The hypothesis that it may have depended mainly on Sweden's own actions is supported by observation of the same pattern for SEK against other basket currencies as well as the major loan currencies included here (Oxelheim, 1980).

An example of a foreign initiative which served to strengthen SEK was the Swiss package intended to tone down exchange rate movements in CHF and to put this currency on a better level from the commercial point of view. This package included negative interest rates for deposits from non-residents. The big negative movement in the USD exchange rate was a reaction to the package presented by the

American administration during the autumn of 1978, which included guidelines for coming price and wage increases. This attempt to tackle accelerating inflation was greeted with disappointment, and the effect on the USD rate was the opposite of what had been hoped. The continued decline in USD forced the US authorities to adopt extensive measures to stabilize the exchange rate and restore confidence in the US dollar. This included wide-ranging intervention on the exchange market. Figure 4.32 shows that the big negative movement in the USD exchange rate was followed immediately by a large positive movement.

Can we identify any pattern in successive exchange rate movements which could be useful, or is the positive or negative direction of the shifts in any given week quite random? To analyse the clustering tendency the number of sequences (r) of positive and negative changes was calculated. The number of sequences is presented in Table 4.13. Thus the following pattern ++++ −− + − +++ − gives us six different sequences, $r = 6$. The null hypothesis of randomness makes no assumptions about the number of either negative or positive signs. Thus the general trend in DEM and CHF does not affect the result.

In the case of DEM and CHF, the number of positive weekly changes was considerably greater than the number of negative changes. Assuming that the size distribution is the same for both kinds of change, this agrees with what we would expect, in that these currencies increased substantially in value expressed in SEK. The reported test concerns the randomness in the sign attaching to the changes in exchange rates. Assuming a certain distribution in the number of positive and negative signs, the clustering tendency is then tested (see Bradley, 1968). The probability for the actual sequences, given the null hypothesis regarding randomness in the clustering, is

Table 4.13 Number in sequences (r) of same sign of weekly changes in the exchange rate during the period 1974–84

Currency	Negative change	Positive change	Number of sequences
GBP	256	293	249
USD	251	298	242
DEM	241	308	254
CHF	246	303	260
JPY	266	273	197
Number of observations		549	

Table 4.14 Estimated parameters in ARIMA (*p,d,q*) models for description of spot rate movements

Currency	(*p,d,q*)	Estimated model	$\hat{\sigma}_a^2$	Q	df	Note
GBP	transform		0.01178			
	(0,1,0)		0.00014			
	(0,1,1)	$w_t = a_t + 0.106a_{t-1}$ (0.0548)	0.00014	11.4	9	$r_4=0.12$; $r_{4.}=0.12$
USD	transform		0.00227			
	(0,1,0)		0.00013			
	(0,1,1)	$w_t = a_t + 0.015a_{t-1}$ (0.0561)	0.00013	4.9	9	
DEM	transform		0.01947			
	(0,1,0)	$w_t = 0.001026 + a_t$ (0.000452)	0.00006			
	(0,1,1)	$w_t = 0.001026 + a_t + 0.0442a_{t-1}$ (0.000452) (0.0556)	0.00006	6.2	8	
CHF	transform		0.04863			
	(0,1,0)		0.00022			
	(0,1,1)	$w_t = 0.001723 + a_t - 0.1413a_{t-1}$ (0.000703) (0.0552)	0.00022	14.2	8	$r_3=0.12$; $r_{3.}=0.12$ $r_6=0.12$
JPY	transform		0.02633			
	(0,1,0)		0.00018			
	(0,1,1)	$w_t = a_t + 0.0180a_{t-1}$ (0.056)	0.00018	17.8†	9	$r_9=0.17$; $r_{9.}=0.16$

S_t = spot rate at time t in absolute figures
w_t = $\ell n\, S_t - \ell n\, S_{t-1}$
$\hat{\sigma}_a^2$ = variance in residuals
Q = test quantity in Box–Pierce[a] test († significant at a 5 per cent level)
r_i = significant coefficients of autocorrelation in residuals with time lag in weeks
$r_{i.}$ = significant partial coefficients of autocorrelation in residuals with time lag in weeks.
Mean squared error is shown in brackets under each estimated parameter.

between ½ and 2 per cent. These results suggest that relationships can be established between successive exchange rate movements in the shape of a tendency to cluster. With the help of a Box–Jenkins analysis we will examine the existence of autoregressive patterns in the following section.

4.3.1 Box–Jenkins analysis of spot rates

In this section we shall discuss the results of a Box–Jenkins analysis on the spot market. The period studied here is 1974–80, involving one big devaluation of the Swedish krona. Later we will look at the sub-period 1978–80 involving no such interventions from the Swedish central bank. We can assume that the percentage change in the spot rate is stationary, and our argument will therefore be presented in terms of the first difference ($d = 1$) for the natural logarithm of the spot rate.

Table 4.14 shows the alternative models relevant to a description of exchange rate movements during the period studied. It appears that the movements can be appropriately described in terms of ARIMA (p,d,q) processes (= autoregressive integrated moving average) of the order

$$p = 0 \text{ and}$$
$$q \leqslant 1,$$

where p = number of periods backwards in time in which autoregressive dependence (AR) occurred
q = the number of periods backwards in time in which there is dependence in a moving average (MA) sense
d = number of differentiations.

Thus as regards autocorrelation, the pattern reveals coefficients which descend to zero after a time lag of two or more periods. Similarly the partial autocorrelation coefficients reveal an exponentially declining pattern. In Table 4.15 we can see which models deviate significantly from a *random-walk model*.

The model which suggests that the market is efficient (efficiency in its weakest form according to Fama, 1970; see Section 3.5.1) and which constitutes the null hypothesis in the analysis is the above-mentioned random-walk model. This is designated ARIMA (0, 1, 0) and can be written:

$$S_t = S_{t-1} + a_t + \theta_0 \tag{26}$$

In the present analysis this has been modified to apply to log-transformed differentiated exchange rates, and can be written:

$$W_t = \ell n\, S_t - \ell n\, S_{t-1} = a_t + \theta_0 \qquad (27)$$

where S_t = exchange rate SEK/foreign currency at time t
a_t = random error where $E(a_t) = 0$ and $V(a_t) = \sigma^2{}_a$
θ_0 = constant reflecting the average change per period in the process mean (drift parameter).

Testing various models, Zellner and Palm (1975) recommended choosing a high significance level, on the grounds that the loss would probably be greater if we failed to include an extra justified explanatory term than if we included such a term unnecessarily.

In our analysis it turned out that GBP and CHF required models deviating from the random-walk model. The tests applied — Zellner and Palm, and the Akaike criterion (see Melard and Rouland, 1979) — show significant deviations from this model. The need for an a_{t-1} term shows that the latest available information has not yet been fully

Table 4.15 Test of alternative ARIMA-models against the random-walk model for descriptive purposes concerning the spot rate

Currency	Model	$\lambda = \left(\frac{\hat{\sigma}_a^2}{\hat{\sigma}^2}\right)^{n/2}$	$2\ \ell n\ \lambda$	r	$AIC = n \cdot \ell n\ \hat{\sigma}_a^2 + 2 \cdot P$(minimized)
GBP	(0,1,0)				−2856
	(0,1,1)	7.52	4.0†	1	−2857′
USD	(0,1,0)				−2887′
	(0,1,1)	1.0	0	1	−2885
DEM	(0,1,0)+c				−3136′
	(0,1,1)+c	1.0	0	1	−3134
CHF	(0,1,0)+c				−2721
	(0,1,1)+c	24.1	6.4†	2	−2723′
JPY	(0,1,0)				−2787′
	(0,1,1)	1.0	0	1	−2785

The AIC-value with ′ indicates minimum value and the best model.
† Significant at a 5 per cent level (Zellner–Palm test).

expressed in the exchange rate by time $t-1$. The model for GBP shows this. If the GBP rate increases by 1 per cent one week, we can expect it to rise on an average by a further 0.106 per cent the following week.

In the case of CHF certain indicators seemed to call for the introduction of further explanatory terms. However, test runs showed that this gave a negligible reduction in the sum of the squared residuals. And to counterbalance this reduction, we have the problem of estimating further parameters. It could then happen, among other things, that the estimate of the parameter of the highest order proves significant, while intermediate parameters are non-significant. In the case of CHF there are indications of a need for an a_{t-3} term, without any sign of the need for an a_{t-2} term.

If there is no correlation between the estimates of the coefficients for a_{t-2} and a_{t-3}, as in the case of CHF, then this means that both entities should be included, or, according to Box and Jenkins (1978):

> An alternative case that can occur is that non-significant parameters occur which are not of the highest order in an operator. In this case it is not possible to remove these parameters without also removing those of highest order. The user has in these cases to examine the correlation between the parameter estimates and if significant correlation exists remove the parameters of highest order. If no correlation exists between the parameter estimates then simplification is not possible and it is necessary to accept the model with non-significant parameters.

An analysis of the residuals for the two relevant currencies suggests that higher-order terms should not be included in the model. Occasional deviating values, or outliers, may happen to fall so as to create an impression of autocorrelation. The effects of the devaluations of the krona in 7713 and 7734 were examples of this. The significance of the tested correlation coefficients could perhaps also be questioned in terms of probability, since the test refers to 10 coefficients on the 5 per cent level for the respective currencies. In terms of expectations and mass significance one coefficient will then appear significant when in fact it is not.

In the case of major disturbances such as interventions by the central bank, Jenkins (1979) suggests a refinement of the analysis:

> ...if large residuals are caused by unusual events, such as strikes, holidays or other untypical events, then techniques such as intervention analysis can be used to take account of them.

However, the intervention analysis has less to contribute when

account is taken of rates of change. A possible devaluation will appear in the usual analysis as a large residual, but when rates of change have been allowed for, this will only show during one or possibly two periods. A detailed study of the distribution of residuals over time confirms that the same model applies both before and after the devaluations of 1977.

Differences in models between the various currencies may depend on the presence of different currency regimes. According to Nelson (1973), economic–political changes can make new models necessary, or as he puts it:

> Changes in structural or behavioral relationships may lead to changes in the order of the fitted time series model or changes in the magnitude of parameters.

In view of the structural changes which occurred during our period, we should perhaps look at some models for different sample periods. The problem of identifying periods characterized by homogeneous market conditions has been discussed by many writers (see, for example, Leamer and Stern, 1972). Levich (1979) examined the development of the US dollar against a number of other currencies for the period 1962–75 and found that

> the level of the forward discount or premium, not the formal exchange rate system, may be the correct criterion for classifying sample periods.

Thus, changes over time in average values and variance in the forward rate can be taken as indicators of structural or behavioural change. Changes in level, i.e. in average values between periods, can be regarded more as an expression of structural change, while changes in the variance can be regarded as a sign of behavioural and possibly speculative change.

We can examine the question of choosing sample periods on a basis of Figures 4.13–4.17 showing the forward cost. Using the above criterion, the periods 1974–76 and 1978–80 emerge from these figures as a reasonable choice. And these are in fact also the periods we can choose, on a basis of the currency system.

A comparison of the best model for the second of these periods with the corresponding model for the whole period of the study, may prove interesting to our discussion of forecasting below. By 'best' is meant the model which, after test runs of all possible models, turns out to provide the best description of exchange rate movements in the relevant currency. In choosing between similar models, the Akaike

Table 4.16 'Best' ARIMA model in different periods

	1974–80		1978–80	
Currency	Model	Variance of residuals	Model	Variance of residuals
GBP	$w_t=a_t+0.106a_{t-1}$	0.00014	$w_t=a_t$	0.00008
USD	$w_t=a_t$	0.00013	$w_t=a_t$	0.00012
DEM	$w_t=0.001026+a_t$	0.00006	$w_t=a_t$	0.00005
CHF	$w_t=0.001723+a_t-0.1413a_{t-1}$	0.00022	$w_t=a_t-0.2024a_{t-1}$	0.00033
JPY	$w_t=a_t$	0.00018	$w_t=a_t$	0.00024

criterion has determined which model should be judged to be 'best'. Table 4.16 shows the best ARIMA models for the relevant periods. If the table is analysed as a whole it will be seen that the models containing a constant θ_0, a drift parameter, for the period 1974–80, lack such a constant for the period 1978–80. This result is not altogether unexpected.

The constant θ_0 reflects the average change per period of the mean for the process. It can probably also be regarded as an estimate of the change in the rate of exchange which can be motivated by systematic inflation differentials between the countries. For currency regimes with pegged rates these differentials will often find expression in substantial adjustments in exchange rates affected by some kind of intervention. For the period 1974–80 growth can thus be estimated on a basis of the adjustments in DEM and CHF during 1976–77. Both these countries show a systematic difference in inflation rate in comparison with Sweden throughout the period. Technically speaking the period 1978–80 included no adjustments in the exchange rate of the kind required for an estimate of the constant.

According to the Purchasing Power Parity theory, as was previously mentioned, the systematic differentials in inflation rate between two countries will ultimately find expression in changes in the exchange rate. Thus, from the point of view of forecasting, for example, the models covering the longer period are to be preferred, if we can assume that the relative inflation pattern will persist. It can be stated that the moving average term of the first order for GBP did not prove to be significant in the period 1978–80. This change, and the need for a shorter time lag, is consistent with the lower transaction costs noted for GBP during this period as compared with the period as a whole.

An increase in the variance in the residual for CHF was obtained for the model covering the later period. This increase can probably be

ascribed to the large residuals following the intervention by the Swiss central bank at the end of 1978. The results obtained are consistent with those provided in analysing changes in exchange rates for an extended period, i.e. 1974–84, for daily data and also in utilizing intervention analysis (Gudichsen and Oxelheim, 1984).

4.3.2 Correlations between exchange rate movements in different currencies, 1974–84

According to classical portfolio theory (see Markowitz, 1959), a company can reduce its total risk by diversifying its investments. The principles of this theory will be extended here to include exchange risk as well. A basic assumption of portfolio theory is that the investor is averse to risk. We can then suppose that this investor has to weight a number of risky investments with uncertain future outcomes against an alternative with a certain future yield. According to portfolio theory the risk corresponds to the amount by which the actual outcome is likely to deviate from the certain future outcome (Sharpe, 1978). The most usual statistical measure of the risk is the standard error in this deviation. The risk level and the expected yeild are related. As a result of competition between investors, there is a higher expected yield on the more risky investments. If anyone is to prefer a risky to a less risky investment, there must be some form of risk compensation. This whole argument can be applied to foreign exchange, where we have instead higher interest rates for currencies expected to depreciate and lower rates for currencies expected to appreciate.

In the case of exchange risk we can regard the position of the different currencies as a kind of portfolio. The composition of the currencies determines the total risk. Diversification is one way of affecting this risk. According to portfolio theory, under certain specifiable conditions the total risk of the portfolio is lower than that of its component parts. The expected yield on the portfolio is a weighted average of the expected yield of the constituent investments.

If there is a stable correlation pattern, this can be used to eliminate, or at least reduce, the exchange risk. Investments are then divided between different currencies according to this pattern. Some knowledge of the correlation between different rates of exchange can be useful to an investor in estimating possible exchange losses on investments involving several currencies.

If there is a stable long-term correlation pattern, a company should keep its monetary items in a diversified portfolio in terms of the currencies used. The weight assigned to each currency will be determined by the degree of correlation with the total portfolio.

Even when the correlation pattern shows that exchange rate movements are not interdependent, diversification of the portfolio can still

serve to reduce risk. The greater the number of currencies among which the risks are divided, the smaller will be the risk for the portfolio as a whole (cf. risk-pooling in insurance operations; see, for example, Sharpe, 1978).

The correlation pattern of the currencies in the Swedish currency basket, except for CAD and ESP, is shown in Tables 4.17–4.20. Analysing Table 4.17 we find only positive coefficients of correlation.

Table 4.17 Correlation between the weekly percentage change in the spot price of different currencies in SEK, 1974–84
Coefficients of correlation for the period 1974–84 based on 546 observations

Currency	GBP	USD	DEM	FRF	BEC	CHF	NLG	DKK	NOK	ITL	ATS	JPY	FIM
GBP	1.00	0.50	0.34	0.51	0.42	0.20	0.40	0.31	0.29	0.40	0.34	0.39	0.44
USD		1.00	0.10	0.30	0.15	0.09	0.16	0.14	0.19	0.37	0.12	0.45	0.45
DEM			1.00	0.59	0.85	0.64	0.88	0.66	0.59	0.33	0.95	0.35	0.19
FRF				1.00	0.63	0.43	0.68	0.49	0.36	0.48	0.61	0.42	0.27
BEC					1.00	0.56	0.89	0.69	0.66	0.39	0.83	0.35	0.22
CHF						1.00	0.59	0.39	0.41	0.25	0.64	0.30	0.13
NLG							1.00	0.67	0.61	0.42	0.86	0.37	0.22
DKK								1.00	0.53	0.32	0.65	0.24	0.21
NOK									1.00	0.27	0.57	0.26	0.36
ITL										1.00	0.35	0.30	0.26
ATS											1.00	0.35	0.19
JPY												1.00	0.27
FIM													1.00

Table 4.18 Correlation between the weekly percentage change compared to the basket in the spot price of different currencies in SEK, 1974–84
Coefficients of correlation for the period 1974–84 based on 546 observations

Currency	GBP	USD	DEM	FRF	BEC	CHF	NLG	DKK	NOK	ITL	ATS	JPY	FIM
GBP	1.00	0.00	−0.42	−0.18	−0.31	−0.22	−0.36	−0.40	−0.27	−0.16	−0.43	−0.07	−0.10
USD		1.00	−0.78	−0.48	−0.64	−0.56	−0.75	−0.61	−0.16	−0.15	−0.74	0.07	0.10
DEM			1.00	0.33	0.61	0.54	0.82	0.57	0.09	0.04	0.93	−0.11	−0.14
FRF				1.00	0.42	0.22	0.39	0.32	−0.19	0.25	0.35	−0.04	−0.11
BEC					1.00	0.32	0.64	0.55	0.08	0.07	0.60	−0.16	−0.13
CHF						1.00	0.47	0.26	0.05	0.06	0.53	0.08	−0.14
NLG							1.00	0.54	0.06	0.09	0.79	−0.13	−0.15
DKK								1.00	0.16	0.12	0.57	−0.16	0.05
NOK									1.00	−0.12	0.08	−0.13	0.42
ITL										1.00	0.06	−0.05	0.01
ATS											1.00	−0.11	−0.13
JPY												1.00	−0.13
FIM													1.00

Table 4.19 Correlation between the weekly percentage change compared to the basket in the spot price of different currencies in SEK, 1974–76
Coefficients of correlation for the period 1974–76 based on 155 observations

Currency	GBP	USD	DEM	FRF	BEC	CHF	NLG	DKK	NOK	ITL	ATS	JPY	FIM
GBP	1.00	0.11	−0.56	−0.04	−0.40	−0.42	−0.51	−0.43	−0.56	−0.06	−0.54	0.04	−0.29
USD		1.00	−0.66	−0.29	−0.59	−0.49	−0.62	−0.48	−0.54	−0.06	−0.58	0.33	−0.41
DEM			1.00	−0.06	0.54	0.51	0.62	0.41	0.56	−0.23	0.83	−0.22	0.42
FRF				1.00	0.03	0.13	0.22	0.00	−0.03	0.11	−0.01	−0.03	0.06
BEC					1.00	0.33	0.60	0.38	0.64	−0.10	0.49	−0.27	0.27
CHF						1.00	0.36	0.29	0.37	−0.02	0.51	−0.18	0.38
NLG							1.00	0.44	0.53	−0.07	0.53	−0.30	0.41
DKK								1.00	0.45	−0.06	0.42	−0.31	0.29
NOK									1.00	−0.09	0.55	−0.32	0.34
ITL										1.00	−0.21	−0.12	−0.02
ATS											1.00	−0.26	0.42
JPY												1.00	−0.19
FIM													1.00

Table 4.20 Correlation between the weekly percentage change compared to the basket in the spot price of different currencies in SEK, 1978–84
Coefficients of correlation for the period 1978–84 based on 339 observations

Currency	GBP	USD	DEM	FRF	BEC	CHF	NLG	DKK	NOK	ITL	ATS	JPY	FIM
GBP	1.00	−0.05	−0.36	−0.24	−0.28	−0.15	−0.30	−0.37	−0.14	−0.34	−0.36	−0.12	−0.05
USD		1.00	−0.82	−0.56	−0.65	−0.58	−0.79	−0.66	−0.06	−0.32	−0.80	0.01	0.20
DEM			1.00	0.49	0.63	0.55	0.90	0.67	0.07	0.38	0.96	−0.09	−0.23
FRF				1.00	0.53	0.27	0.47	0.48	−0.23	0.47	0.50	−0.06	−0.14
BEC					1.00	0.32	0.65	0.63	−0.08	0.28	0.64	−0.13	−0.19
CHF						1.00	0.51	0.28	−0.04	0.21	0.54	0.16	−0.23
NLG							1.00	0.63	−0.09	0.33	0.89	−0.09	−0.23
DKK								1.00	−0.02	0.37	0.67	−0.10	−0.15
NOK									1.00	−0.19	−0.08	−0.06	0.41
ITL										1.00	0.40	−0.04	0.01
ATS											1.00	−0.08	−0.23
JPY												1.00	−0.12
FIM													1.00

This is explained by the effects of big devaluations which make all the prices of different currencies in SEK move in the same direction. Interesting is the way in which prices move in relation to each other in a shorter perspective. This knowledge could be used in portfolio decisions.

For this reason the weekly percentage change in the spot price of different currencies as compared with the basket is shown in Tables

Table 4.21 Correlation between the monthly percentage change compared to the basket in the spot price of different currencies in SEK, 1978–84
Coefficients of correlation for the period 1978–84 based on 77 observations

Currency	GBP	USD	DEM	FRF	BEC	CHF	NLG	DKK	NOK	ITL	ATS	JPY	FIM
GBP	1.00	−0.21	−0.50	−0.33	−0.39	−0.19	−0.39	−0.50	−0.08	−0.37	−0.52	0.00	0.03
USD		1.00	−0.75	−0.59	−0.69	−0.41	−0.76	−0.69	−0.08	−0.34	−0.73	−0.07	0.05
DEM			1.00	0.54	0.76	0.38	0.92	0.81	0.06	0.38	0.97	−0.18	−0.14
FRF				1.00	0.48	0.20	0.51	0.56	−0.05	0.56	0.57	0.00	−0.05
BEC					1.00	0.25	0.76	0.77	−0.10	0.37	0.76	−0.06	−0.17
CHF						1.00	0.38	0.26	−0.17	0.34	0.41	0.15	−0.07
NLG							1.00	0.74	−0.14	0.37	0.90	−0.17	−0.24
DKK								1.00	−0.04	0.43	0.81	−0.11	−0.17
NOK									1.00	−0.26	−0.07	0.11	0.38
ITL										1.00	0.42	−0.06	−0.01
ATS											1.00	−0.22	−0.12
JPY												1.00	0.12
FIM													1.00

4.18–4.21. In discussing portfolio decisions (cross-matching) from this correlation matrix, we must always take into account a potential change in the value of SEK against the basket.

The reason for including four different tables is to demonstrate the stability and persistence of the correlation pattern over time, and over different length of the period of the registered change.

The pattern of correlation seems stable over time, even allowing for the changeover to new exchange rate arrangements in 1977. SEK/DEM and SEK/ATS are examples of exchange rates which showed high correlations throughout the period, primarily due to a connection between DEM and ATS with regard to currency arrangements. Table 4.18 shows high Pearson coefficients of correlation for several currencies during the period 1974–84. The DEM rate in particular shows a high correlation with many of the other currencies, not unexpectedly including currencies in the EMS. JPY and ITL, on the other hand, exhibit very low coefficients of correlation with all basket currencies.

Shapiro and Rutenberg (1976) studied the correlation between different USD rates, and found that the pattern varied with the length of the period concerned.

> In general, the correlation based on long-term data appears to be less positive or negative than the shorter-run correlation. This suggests that the more diversified the currency portfolio of a multinational corporation, the fewer long-term fluctuations there should be in the dollar value of its foreign cash balances.

The authors tell us that 'long-term data' refers to monthly changes and 'shorter-run' refers to day-to-day changes.

Table 4.21 shows the correlation between monthly changes. If these coefficients are compared with the corresponding coefficients in Table 4.20, we will see that Shapiro and Rutenberg's observations do not apply to SEK. In fact the reverse appears to hold. With the trend component included an even stronger correlation would appear. Thus the proportions of the currencies to be included in a Swedish company's portfolio should be selected with care, even over a longer time horizon.

4.4 ANALYSIS OF THE FORWARD MARKET

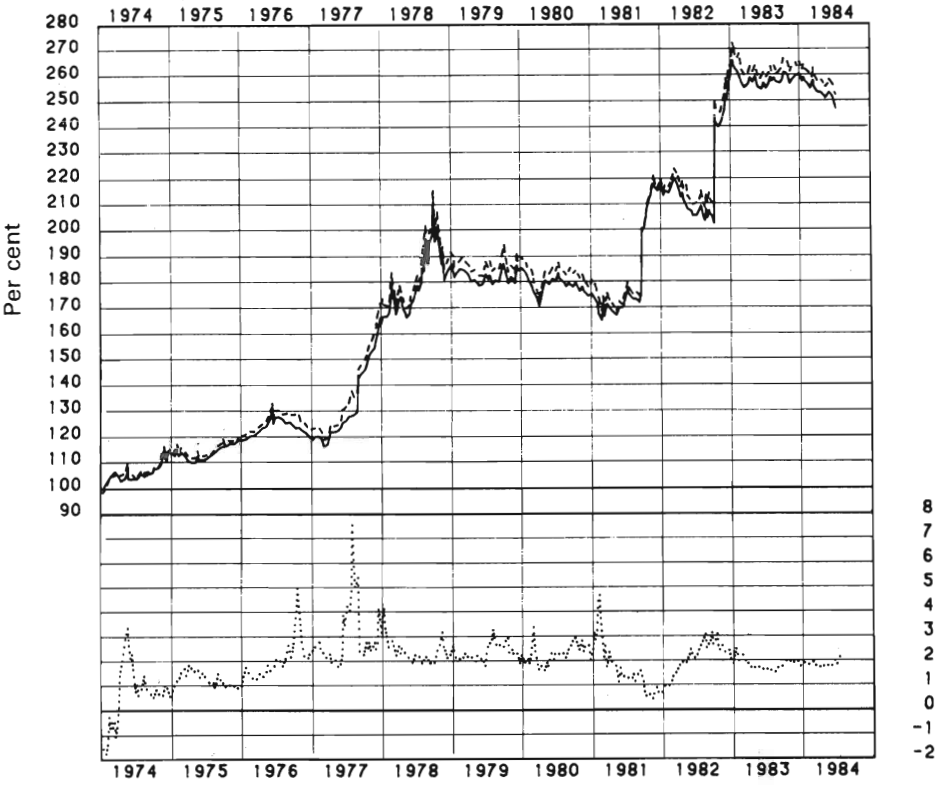
In our discussion of interest rate parity we also mentioned price determination on the forward market. In the present section we will study the possible existence of connections between successive prices on the forward market. Our point of departure is that the forward rate reflects the same information that is expressed in the spot rate at the moment of hedging. Dufey and Giddy (1975) demonstrated that the spot and forward rates for USD show high correlation in all respects. Figures 4.38–4.39 suggest that the spot and forward rates are based on the same information. We can trace various trends in the figures. CHF had premium for almost the whole period, even when the spot value was depreciating. The market was not convinced that the tendency would continue. GBP shows long periods with premiums when the spot rate was appreciating and long periods of discount when it was depreciating. However, there seems to be a time lag before the market becomes convinced that the movement tendency for the spot rate will continue.

Another interesting feature in the figure is the peak in the forward cost before the devaluation of the Swedish krona in August 1977. There is no corresponding feature at the time of the devaluations in 1981 and 1982. A high speculative pressure against the Swedish krona in the beginning of 1981, which was solved by an increase in interest rates, can be traced in the figures. A regression analysis of spot and forward rates for SEK will be reported in Section 4.5.

A forward exchange transaction refers to an agreement between two parties regarding the purchasing or sale of one currency against payment in another currency, for delivery and payment at a fixed time in the future at a rate decided upon on the date of contract. Traditionally a forward transaction refers to an exchange agreement with a delivery time more than two days after the agreement has been made. In Sweden almost two-thirds of all corporate contracts with the foreign-exchange banks for forward sales and purchases of currencies against SEK are three months or shorter.

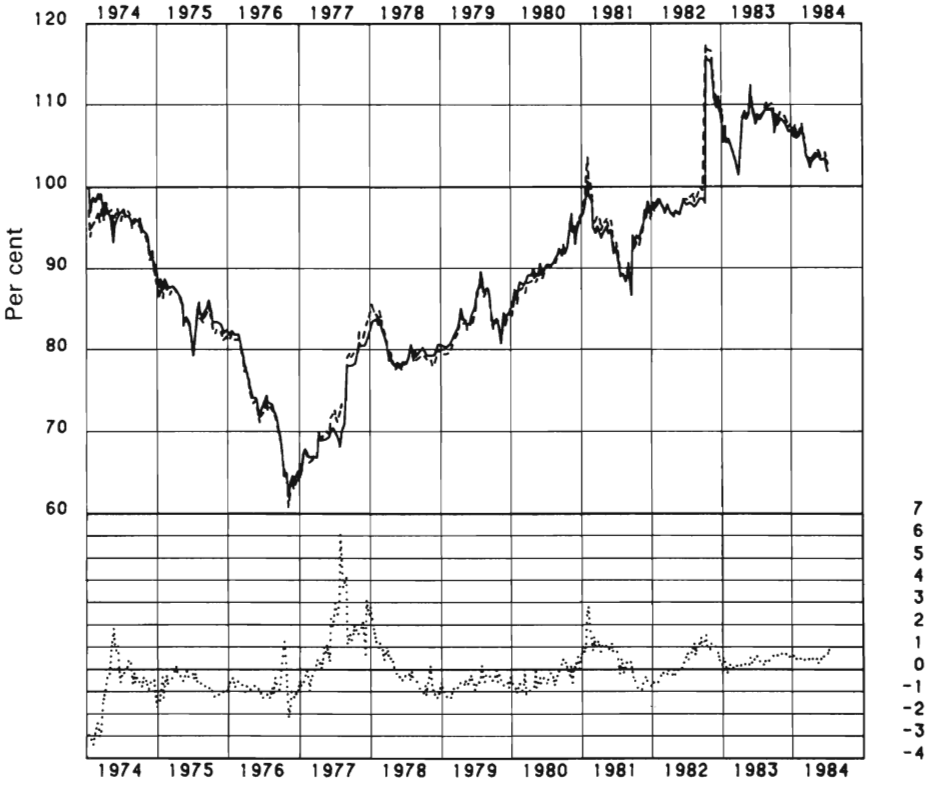
Price determination on the forward market depends entirely on

Figure 4.38 Spot and forward rates for SEK/CHF
Both rates shown at point *t*
——— Spot rate
-------- Forward rate (three months)
····· Forward premium/discount, weekly data, per cent/quarter



supply and demand. However, central banks sometimes intervene. Although the Swedish market has been growing substantially in recent years, it is still so thin that sudden changes on the supply or demand side can generate noticeable movements in exchange rates. These are then reflected on the spot market, where they reinforce the expectation-based flow of capital and increase the pressure on the domestic currency. The capital flow engendered by expectations before the devaluations of the Swedish krona in 1977 amounted to about 6–8 billion SEK. The size of the Swedish currency reserve was at that time 12 billion SEK. The length of forward contracts for the purchase of currencies for purposes other than the payment of imports, freight or charter rentals is limited. Consequently the demand side of the forward market has been relieved of interest and amortization payments on financial loans that do not fall due within the next six months. This action was probably also intended to prevent the Swedish krona from being a formal Euro-currency in a six months' perspective or longer.

Figure 4.39 Spot and forward rates for SEK/GBP
Both rates shown at point *t*
——— Spot rate
-------- Forward rate (three months)
····· Forward premium/discount, weekly data, per cent/quarter



The restriction on access to the forward market does not refer to multicurrency loans. Also, since the summer of 1980, a company in Sweden which contracts a loan in a foreign currency may buy the currency in which the loan is denominated on the forward market against another freely chosen foreign currency. On these forward transactions there is no time limit. The opportunities for covering the company's long-term loans are otherwise limited to the six last months of the lifetime of the loan. The alternative of successively covering the loan by a series of short forward contracts is blocked, since according to the regulations the forward contract should fall due when payment is made.

Table 4.22 shows the average value ($\bar{p}$) and the standard deviation (s) for the three-month forward premium/discount (a currency can be quoted in futures at a discount (*vis-à-vis* a weak currency) compared with the prevailing spot rate, or at a premium *vis-à-vis* a strong currency). The turbulence on the foreign exchange market in 1977 explains the high standard deviation for the whole period, compared

Table 4.22 Mean ($\bar{p}$) and standard deviation (s) in three-month forward premium/discount
Monthly observations per cent/quarter

	1974–84		1974–76		1978–84	
Currency	$\bar{p}$	s	$\bar{p}$	s	$\bar{p}$	s
GBP	−0.02	1.05	−0.724	0.79	0.07	0.73
USD	0.46	0.97	0.665	0.73	0.10	0.64
DEM	1.46	0.88	1.204	0.85	1.37	0.54
CHF	2.02	0.99	1.400	1.02	2.13	0.69
JPY	1.18	1.27	0.101	1.55	1.49	0.61
Number of observations	126		36		78	

to that during the sub-periods. The table shows that the distribution was considerably reduced during the last sub-period. The percentage changes in three-month forward costs is illustrated in Section 4.2.2.1.

The standard deviations in three-month forward premium/discount are much smaller than corresponding standard deviations in quarterly changes in the spot rate. The fact that the standard deviations are much smaller does not imply that there is a major advantage in using the forward market in a market value stabilizing perspective besides the value of the ex ante determination of the size of the risk. How the market or economic value is stabilized in a long-term perspective must be judged from an analysis based on the variances in spot and forward rates, and considering the discount rate. Due to the fact the variances appear to be of equal size, the discount rate is the most important parameter or variable.

4.4.1 Box–Jenkins analysis of forward rates

We can now look at the results of an analysis of the autocorrelation pattern in the setting of the three-month forward rate, and of the relationship between the forward and spot markets.

It appeared from the empirical observations made for the analysis that we could obtain stationary data for all currencies with the help of the transformation:

$$W_t = \ell n\, Z_t - \ell n\, Z_{t-1} \tag{28}$$

where $Z_t = F_t$ = three-month forward rate in absolute terms at time t.

Table 4.23 shows the identified and estimated Box–Jenkins models for the period 1974–80, which proved best in an initial analysis. Table 4.24 shows the results of tests of the different models. In two of these models were tested against the random-walk model ARIMA (0,1,0). From this last it can be seen that the random-walk model appears to

Table 4.23 Estimated parameters in ARIMA (*p,d,q*) models for description of movements in three-month forward rates

Currency	(*p,d,q*)	Estimated model	$\hat{\sigma}_a^2$	Q	df	Note
GBP	transform		0.01125			
	(0,1,0)		0.00014			
	(0,1,1)	$w_t=a_t+0.1056a_{t-1}$ (0.0547)	0.00014	13.3	9	
USD	transform		0.00240			
	(0,1,0)		0.00011			
	(0,1,1)	$w_t=a_t-0.0202a_{t-1}$ (0.0561)	0.00011	6.3	9	
DEM	transform		0.01994			
	(0,1,0)	$w_t=0.001114+a_t$ (0.00045)	0.00007	8.6	9	$r_9=0.115$; $r_{9.}=0.126$
	(0,1,1)	$w_t=0.001114+a_t+0.0187a_{t-1}$ (0.00045) (0.0553)	0.00007	8.5	8	$r_9=0.113$; $r_{9.}=0.125$
CHF	transform		0.05080			
	(0,1,0)		0.00022			
	(0,1,1)	$w_t=a_t-0.1136a_{t-1}$ (0.0553)	0.00022	16.7	9	$r_6=0.129$; $r_{6.}=0.119$
	(0,1,1)	$w_t=0.001829+a_t-0.1351a_{t-1}$ (0.00071) (0.0552)	0.00022	15.5	8	$r_6=0.131$; $r_{6.}=0.119$
JPY	transform		0.02863			
	(0,1,0)		0.00017			
	(0,1,1)	$w_t=a_t+0.0193a_{t-1}$ (0.0558)	0.00017	14.6	9	

For explanations, see Table 4.14.

Table 4.24 Tests of alternative ARIMA-models against the random-walk model for descriptive purposes concerning the three-month forward rate

Currency	Model	$\lambda = \left(\frac{\hat{\sigma}_a^2}{\hat{\sigma}^2}\right)^{n/2}$	$2\,\ell n\,\lambda$	r	$AIC = n \cdot \ell n\,\hat{\sigma}_a^2 + 2 \cdot P$(minimized)
GBP	(0,1,0)				−2930
	(0,1,1)	3.84	2.7	1	−2856′
USD	(0,1,0)				−2952′
	(0,1,1)	1.0	0	1	−2950
DEM	(0,1,0)+c				−3107′
	(0,1,1)+c	1.0	0	1	−3105
CHF	(0,1,0)+c				−2718
	(0,1,1)+c	19.3	5.9†	1	−2722′
JPY	(0,1,0)				−2798′
	(0,1,1)	1.0	0	1	−2796

The AIC-value with ′ indicates minimum value and the best model.
† Significant at a 5 per cent level (Zellner–Palm test).

where $Z_t = F_t$ (three-month) forward rate in absolute terms of at time t. provide the best description of most of the currencies studied (in total 9 of the 12 basket currencies analysed). In the case of CHF there were indications calling for a higher-order model. Both the Zellner–Palm test and the Akaike criterion suggested that the random-walk model was not the best choice for describing CHF developments. There were also indications that GBP required a higher-order model. For this currency, however, the two tests gave different results, which suggests that it was a borderline case. NOK was another such case.

If we compare the models for the forward rates with the corresponding models for the spot rates, we will see that the same currencies deviate from the random-walk model in both cases. And if we also compare the coefficients in the models for forward rates where terms of a higher order were called for, with the corresponding coefficients in the spot models, we will observe a remarkable similarity. In the case of GBP we get $\theta_{t-1} = -0.1056$ for the spot rate and $\theta_{t-1} = 0.1062$ for three-month forward rate. In the case of CHF the coincidence is equally clear: $\theta_{t-1} = 0.1413$ for the spot rate and $\theta_{t-1} = 0.1351$ for the forward rate, and for the constant $\theta_0 = 0.00172$ and 0.00183 respectively.

As a whole, the time series patterns for the spot and three-month forward rates show considerable agreement. This agreement is expressed both in the identification of (p,d,q) and in the size of the

estimated parameters. This must also reflect the fact that the actors on the forward market are aware of the time pattern in the exchange rate movements on the spot market. Speculation on the forward market then generates a time pattern there which reflects the pattern on the spot market, which presumably also means that the forward market reflects the autocorrelations in the spot series. The direct correlation between the spot and forward rates will be discussed in Section 4.5.2.1.

4.5 EXCHANGE RATE FORECASTS

Now that we have analysed the behaviour of the spot and forward rates and the validity of various equilibrium relationships, we are ready to examine the implications of this in a forecasting context. We use predicting and forecasting as synonymous terms, where other authors define forecasting as the process of generating future values from models and prediction as a process that includes the evaluation of the values by experts.

For a long time it was possible to determine the cost of capital ex ante, and entirely on a basis of agreed interest. Since the exchange market became subject to substantial fluctuations, an element of uncertainty has attached to the capital cost of loans in foreign currencies, namely exchange rate movements. Loans with floating interest rates are also subject to uncertainty in the volatility of interest rates. This meant that the choice of loan currency now had to be made on a basis of estimated capital costs, which were based in turn on expected exchange movements. In earlier sections we found that the Purchasing Power Parity theory and Fisher's Open Relationship appeared to be valid in the long run for different SEK markets, and some companies use this as their guide. However, forecasts are still needed by companies which undertake, let us say, a single short-term transaction. Such a company can be badly hit by short-run fluctuations of the kind illustrated in Figures 4.31–4.35. And so it became necessary to find prediction models for the relevant currencies. Along with the basic purpose of this study it is of central importance to discuss and evaluate the predictive power of different models and relationships. In a wider perspective we have already seen in Chapter 3 above that any deviation from total risk aversion or total risk ignorance involves a degree of *selective* hedging that calls for a forecast of exchange rates.

Above we emphasized the need for exchange rate forecasts in a financial context, as representing one of the four main *purposes* of exchange rate forecasting:

- budgetary purposes
- conversion purposes

- tender purposes or pricing purposes in general
- arbitrage or financial purposes.

Even if the exchange rate used for budgetary purposes is affected by various incentive tactics, we still need a forecast as a basis for establishing the budgetary rate to be used in the company.

The different purposes make different *demands* on the forecasts in terms of:

- precision
- periodicity
- horizon of the forecast.

These requirements then affect the *content* of the forecast, which might focus on:

- direction
- magnitude
- timing.

The forecast itself may then be concerned with:

- the direction of exchange rate movements
- a point estimate at a given future date
- an interval estimate at a given future date
- probability distribution of exchange rate movements
- a scenario of exchange rate movements.

The foreign exchange market resembles other markets in that, ultimately, supply and demand determine prices. A major difference, however, consists of the steering of the exchange rate by the different currency regimes. It is in the very nature of this control that it should be impossible to forecast, and it often comprises government decisions, perhaps connected with credit policy or fiscal arrangements. This goes a long way towards explaining the lack of agreement in research findings in this field. With regard to the problems of evaluation, for instance, Shapiro and Rutenberg (1976) point out that:

> A number of currency forecasting models are now available either in academic journals or commercially. Proponents of these models claim various degrees of forecasting success. Ultimately, however, a forecasting model is only good to the extent that its predictions will lead to better decisions. Unfortunately, none of the currency forecasting models currently available have been tested in a decision-making context.

Various explanatory variables or indicators have been tested and reported in journals and elsewhere. And yet too much of the original variation remains unexplained for these models to have any real predictive value. One cause of this, apart from the control which we have just mentioned, may be disturbances of a temporary kind attaching to the changeover to more flexible exchange rates. Some causal relationships do exist, which perhaps justifies mention of a few variables of some proven explanatory value. But it still remains to bring these variables together into one model. Here we come up against the problem of multicollinearity, misspecification, bad data, and so on, as well as the problems traditionally associated with forecasting evaluation. The parameters seem to be changing rapidly over time.

Table 4.25 Identification and ranking of the most useful indicators of future exchange rate movements

Selected indicators of future exchange rate movements	Percentage of responding firms[a]				
	Ranking of indicators			Important but not ranked	No response to question
	Degree of usefulness				
	(1)	(2)	(3)		
Balance of payments					
Official reserve basis	8.4	16.8	15.8	11.2	47.7
Liquidity basis	7.5	23.4	18.7	4.7	45.8
Balance of trade	11.2	24.3	20.5	9.3	34.6
Inflation rates (WPI)	17.8	26.1	11.1	9.3	35.5
Inflation rates (CPI)	15.0	21.4	18.7	11.2	33.6
Reserves of gold, convertible incomes	0.9	2.8	27.1	3.7	65.4
Governmental budget deficit	0.0	8.4	34.6	5.6	51.4
Money supply growth	5.6	19.6	30.9	8.4	35.5
Recent history of exchange rate movements	5.6	10.3	32.6	8.4	43.0
Country's energy position	0.0	0.9	23.4	4.7	71.0
General import trends	0.0	1.9	23.2	3.7	71.0
Other indicators[b]	18.7	7.5	8.4	9.3	56.1

[a] Based on 107 completed questionnaires.
[b] Interest rates in particular, but also: labour costs; international political developments; parallel rates of exchange (black market rates); international indebtedness; and the basic balance of payments; trade links between countries.

Source: Jilling, M. (1978): *Foreign Exchange Risk Management in US Multinational Corporations*. UMI Research Press, Stamford, p. 261.

The prediction models can be classified according to their time horizon into *short-term* and *long-term* models. Table 4.25 shows the variables which are thought to be most important in multinational companies in the USA, but without that classification. If such a classification had been included, we would probably have found that 'recent history of exchange rate movements' ranked higher in short-term forecasting than is shown in the table. We can see, for example, that 32.8 per cent of the 107 respondent companies feel that inflation rates provide the best indicator of a future change in exchange rates. This group can be broken down into 17.8 per cent who would like to see inflation measured by the wholesale price index and 15 per cent who prefer the consumer price index. 26.1 per cent believe that the inflation rate measured by the wholesale price index is the second best indicator.

A similar investigation was carried out on the 19 largest international manufacturing companies in Sweden in late 1983. An interesting change in weights, compared to those in Table 4.25, was found. The results indicate that interest rate differentials are now regarded as the best or second-best indicator of future exchange rate movements, where the exact ranking depends on the time-horizon (Oxelheim, 1984d). This shift in emphasis compared with the results in Table 4.25 can probably be explained by the change in the structure of the capital market and by the better financial education and greater experience of those concerned.

In a longer-term context structural or insight models are generally of more interest, while for shorter-term purposes time-series analytical methods, such as Box–Jenkins, are more common. In the shorter perspective we will also investigate whether forecasts based on financial quantities can provide accurate and consistent estimates of the future spot rate. We shall use Fisher's Open Relationship, the forward market premium/discount and the most recent observed spot rate as a forecast of the future rate.

Opportunities for successful forecasting arise when there is a time lag in the relationship between actual changes in exchange rate and changes in anticipatory indicators (*leading indicators*). In a system of pegged exchange rates, or in a system subject to disturbances, this is an expression of the fact that interest rates and forward rates do not fully reflect the latest information. Similarly, systematic values regarding relative inflation rates which are not manifest in exchange rates (accumulated deviations in real exchange rates), can be used as a basis for some form of forecast.

If there are no such disturbances on the market, forecasting operations will hardly be worth the bother. Structural forecasting models based on an econometric approach are usually founded on official

statistics. If the market is efficient (in a semi-strong sense, according to Fama's definition), then all forecasting efforts are pointless, since all the official information has already been taken into consideration by the market and its effects have already been discounted at the day's exchange rate. However, efficiency in its semi-strong version is difficult to test.

4.5.1 Long-term forecasts

In our first category, accepting that there are no outstanding, superior and reliable long-term models to be used, price differentials are regarded as the most important variable in exchange rate movements. This argument stems from the Purchasing Power Parity theory which was discussed in Section 4.2.1 and which is a basic assumption in most of the more comprehensive model approaches. According to this theory, equilibrium in the prices for foreign traded goods between different countries, is maintained by way of variations in exchange rates. In causal terms it should not be possible for a country's exchange rate to remain unaltered if its price and cost relationship and its competitive strength *vis-à-vis* the rest of the world have changed in any fundamental way. The fact that the central banks apply their controls to determine the timing of the change should not conceal this basic fact. From the point of view of central bank policy the equilibrium exchange rate according to PPP, for instance, might be regarded as an intermediate target between internal objectives — such as inflation and employment — and external balances. The net balance of trade and the current account will show whether a country has chosen a wrong combination of internal objectives and exchange rate.

Even if we accept the use of PPP at the corporate level, we still have the problem of forecasting the explanatory variable included in the model, namely relative price movements. To predict the course of the SEK/DEM exchange rate, forecasts of price are needed, perhaps in the shape of the consumer price index and the wholesale price index in Sweden and West Germany. Earlier experience of the reliability of the price-trend forecasts produced by the main forecasting institutes for the domestic markets, is enough to make us seriously question the precision of the exchange rate forecast based upon them. But if the purpose is simply to predict a *direction*, as a basis for a hedging decision, then this forecast is likely to be much more helpful.

During the 1970s it turned out that variations around the relative inflation path increased substantially when some form of flexible exchange rates obtained, compared with the situation when exchange rates were fixed. This variation proved to be much greater for annual rates based on quarterly data than for ordinary annual rates. Under

fixed exchange rates there was a strong correlation between the inflation rates of the different countries. This situation now seems to have been replaced by one in which inflation levels are widely divergent and often unpredictable, which makes it much more difficult to make pure forecasts based on the Purchasing Power Parity theory and projections of inflation rates.

For pegged and managed floating rates, four steps can be identified concerning long-term imbalances in the forecasting of exchange rates. These steps are:

(1) Analysis of potential imbalances in the balance of payments due, for example, to deviations from purchasing power parity
(2) Analysis of market pressure on the prevailing exchange rate
(3) Analysis of the development of the reserves and the extent to which they can be used in the future to defend the prevailing exchange rate
(4) Analysis of the probability of different economic political tools being used to correct existing imbalances.

The Purchasing Power Parity theory is well designed for use as a leading indicator in step (1). The liquidity ratio — defined as foreign assets/reserve money, both components to be found in the IMF publication *International Financial Statistics* — provides a satisfactory leading indicator for the analysis in steps (2)–(4).

The Purchasing Power Parity theorem can help us to reach an approximate *estimate of the over- or undervaluation of the currency*. Observations of this expression of accumulated imbalances can be extremely valuable in a comparison of different loan currencies. In the case of a long-term loan, it is very probable that these imbalances will be resolved during the lifetime of the loan, thus generating an additional cost, an exchange loss, far beyond what the interest rate differential may have indicated.

We have already discussed some of the difficulties connected with the model, and found them manageable, namely finding a base period when the exchange rates were in equilibrium and a price index which reflects differences in competitive strength with high validity. PPP provides a practical tool for use in forecasting along the lines suggested here.

4.5.2 Short-term forecasts

For our second category, i.e. models for forecasting exchange rate movements in the short run, there is no single obvious explanatory variable. Meese and Rogoff (1983) have shown that for USD against

DEM, JPY and GBP the structural models fail to improve on the simpler models, such as the random-walk in short-run forecasting, even though the forecast was based on the actual realized values of future explanatory variables. Although relative price changes are still important, this importance is reduced by the presence of several sources of disturbance. In the short run central bank controls will result in relatively more important effects. Central bank interventions make forecasting over shorter periods extremely hard. Speculative activities, triggered by the strong or weak trends of a currency which in turn trigger countermeasures in the shape of compensatory interest differentials, also have a considerable impact in the short term. A general belief in technical forecasts (point and figure etc.) as a basis for decision-making probably serves to reinforce the fluctuations. The result of the analysis of the long-term imbalances should of course be considered even in the shorter perspective. What, for instance, is the probability that a correction will affect the exchange rate during a shorter period and what is the probability distribution for the potential change in the exchange rate?

An example of a successful Swedish approach has been described by the group working on the STEP model (Ettlin *et al.*, 1979). Their equation is based on a modified version of the Purchasing Power Parity theory and refers to the SEK/USD exchange rate, which is explained in the model partly in terms of the prices of industrial commodities in Sweden as compared with the USA, and partly in terms of a factor expressing the number of months of Swedish imports covered by the currency reserve as compared with the corresponding situation in the USA. Thus, according to the model, reinforcement of the currency reserve can be used as an alternative by a central bank which wants to delay a basically justified depreciation of the exchange rate. The model has an explanatory value of 87 per cent. However, this figure should be related to the period concerned, namely January 1969 to April 1974.

Another method of forecasting has been suggested by the Predex Corporation (1975), an American financial institute which has had considerable success with its own forecasts and which was once the winner of the annual Euro-money forecasting competition. The Predex model is as follows:

$$S_{ij} = f\left[CB_{i,t-n};\ CB_{j,t-n};\ \frac{(MS/CP{\cdot}IP)_i}{(MS/CP{\cdot}IP)_j}\right] \tag{29}$$

where S_{ij} = spot rate between currencies i and j
$CB_{i,t-n}$ = cumulative balance of trade for country i during the last n periods

MS_i = money supply in country i
CP_i = consumer price index in country i
IP_i = industrial production in country i.

The cumulative trade balance term is regarded as an approximate measure of the outstanding debt or asset which is not expressed in a single payment figure. The last term in the expression is a measure of the relative demand for real capital (real money balance).

These two forecasting models illustrate attempts to provide forecasts over and above the *market-based forecasts*, that is, those provided by the market without cost. In the following pages we will examine the properties of these market-generated forecasts.

4.5.2.1 Forward rate as a forecast

Various forecasts provided by the market are available to us. Examples are forecasts based on Fisher's Open Relationship, others based on the forward rate, and others based on the latest available spot rate as was described in Figure 4.1. Because of the absence of a Euro-interest rate for the krona, the choice of interest rate remains open in our present discussion. If the Interest Rate Parity theory holds, then the use of the forward rate will represent a special case of Fisher's Open Relationship. The nature of forecasts stemming from this last relationship and based on different rates of interest has already been discussed. Indirectly we have thus touched upon the subject of the properties of the different forecasts. As we found short-term deviations from interest rate parity, a study of the equivalent properties of the forward rate seems called for. Figure 4.40 provides a description of the forward rate as a forecast.

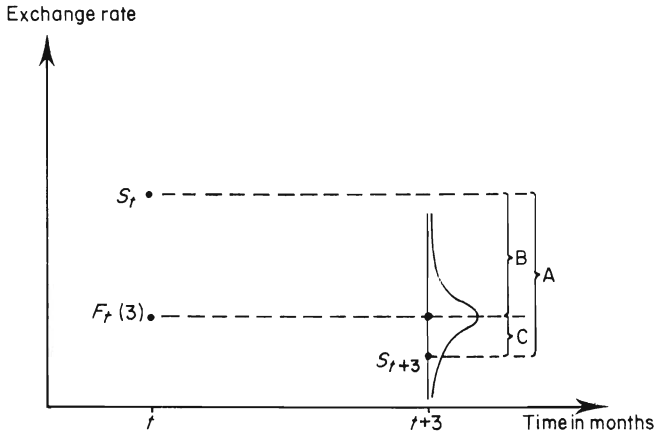
The predictive ability of the forward rate can be measured in many ways. Different combinations of exchange rate movements in relative or absolute terms, with or without overlapping in time, and in logarithmic or non-logarithmic form provide many different types of analyses, which have been performed here. An initial analysis was performed on weekly data for the whole period. The use of overlapping weekly data for these three-month estimates gave highly significant autocorrelations for all currencies between successive residuals. (Both the Durbin–Watson test, sensitive to a one-week time lag, and the Box–Pierce test, applied to a time lag of up to 26 weeks, gave significant results.) For this reason the subsequent analysis covered non-overlapping periods, i.e. using quarterly data.

Figure 4.40 The forward rate as a forecast

A = actual change in exchange rate; the difference between the spot rate of today and the future spot rate = $S_{t+3} - S_t$

B = forecasted change in exchange rate; the difference between the spot rate of today and the forward rate = $F_t(3) - S_t$

C = forecasting error; the difference between the forward rate and the actual spot rate at $t + 3 = S_{t+3} - F_t(3)$



An analysis of the forecasting ability of the forward rate written as

$$S_{t+13} = a + b \cdot F_t\,(13) \qquad (30)$$

is shown in Table 4.26. The table shows that the explanatory value is very high. At the 5 per cent level, and for the whole period, the deviation from $\beta = 1$ is not significant for any of the currencies in the analysis.

The regression equation for SEK/DEM, for instance, looks good. Here the estimate of the regression coefficient is close to 1, while the constant is of the same order of magnitude as was previously obtained as an estimate of the transaction cost. From Table 4.26 we can see that the forward rate in absolute terms provides a fairly good estimate of the future spot rate for the different loan currencies. However, the high explanatory power can be suspected to be a quasi phenomenon, to a large extent caused by the existence of a trend component.

A value greater than 1 for the *b* coefficient indicates an average underestimation of the rate of change in the currency. According to Kaserman (1973), the forward rate tends to overestimate the future spot rate, given downward movements in exchange rates,and tends to underestimate it, given upward movements in exchange rates. According to these theories the 'weak' currency GBP, compared to the

Table 4.26 Three-month forward rate as a forecast of the future spot rate, 1974–84
Non-overlapping data

Currency	Equation of regression	R^2	F	D-W	Number of observations
GBP	$S_{t+13} = 0.8 + 0.92F_t(13)$ (0.06)	0.85	229.1†	1.86	42
USD	$S_{t+13} = -0.18 + 1.05F_t(13)$ (0.04)	0.95	831.6†	1.76	42
DEM	$S_{t+13} = 6.80 + 0.97F_t(13)$ (0.04)	0.94	673.7†	1.88	42
CHF	$S_{t+13} = 10.7 + 0.98F_t(13)$ (0.03)	0.96	919.5†	2.02	42
JPY	$S_{t+13} = 0.06 + 1.01F_t(13)$ (0.06)	0.96	1090.1†	1.93	42

† Significant regression at a 5 per cent level.
Standard deviations for different estimates are given within parentheses.

Swedish krona, should have a coefficient of regression smaller than 1, at least when we analyse sub-periods, while the 'strong' currencies marked by substantial upturns in exchange rates during the period should all have values greater than 1.

Let us analyse the nature of the forecasting error when using the forward rate as forecast. Figure 4.41 provides evidence in support of Kaserman's theory. We can see that since the middle of 1980 the forward rate, SEK/USD, has almost systematically underestimated the future spot rate. In Figure 4.42 we see a similar pattern for the increase in the German mark, though not as clear as for the US dollar. In the development of the Swedish krona we can find some support of the theory.

In order to eliminate the possible influence of a linear trend component on the explanatory power, let us proceed by analyzing the forward premium/discount.

An analysis of the forecasting ability of the three-month forward premium/discount can be based on the following relation

Actual change in exchange rate =

$$= \hat{S}_{t,t+13} = \frac{S_{t+13}}{S_t} - 1 = a + b\left(\frac{F_t(13)}{S_t} - 1\right) \tag{31}$$

Table 4.27 Relative three-month forward premium/discount as a forecast of relative changes in exchange rates, 1974–84
Non-overlapping data

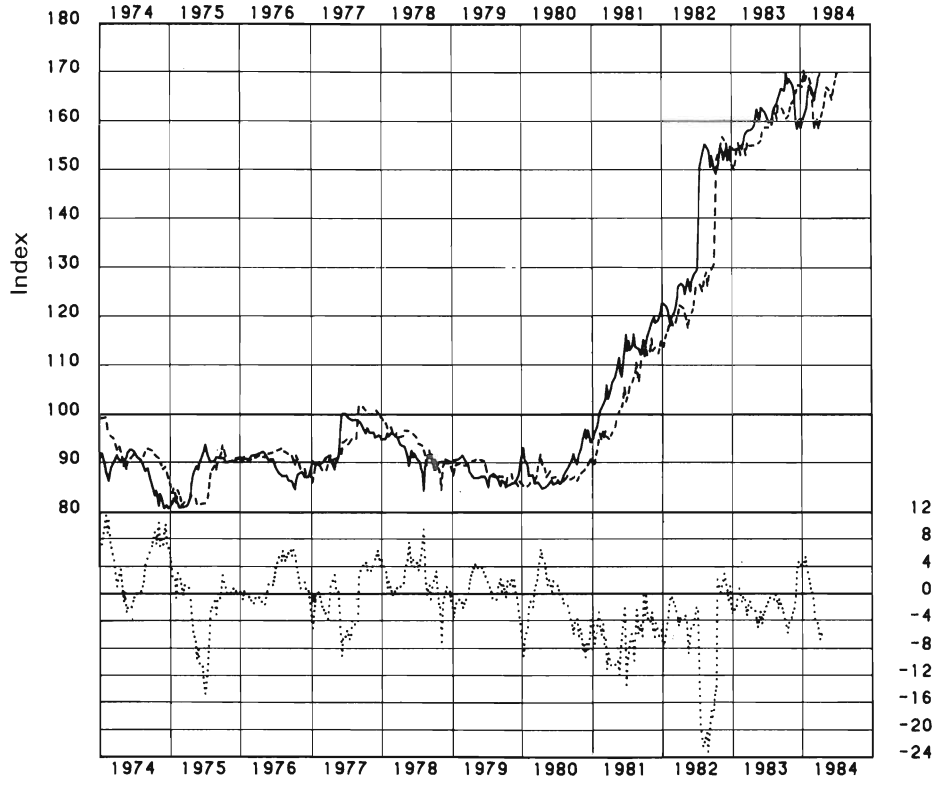
Currency	Equation of regression	R^2	F	D-W	Number of observations
GBP	$\hat{S}_{t,t+13} = 0.00+1.43\left(\frac{F_t(13)}{S_t} - 1\right)$ (0.68)	0.10	4.46†	1.72	42
USD	$\hat{S}_{t,t+13} = 0.01+0.78\left(\frac{F_t(13)}{S_t} - 1\right)$ (0.88)	0.03	0.77	1.61	42
DEM	$\hat{S}_{t,t+13} = -0.01+1.53\left(\frac{F_t(13)}{S_t} - 1\right)$ (0.97)	0.07	2.50	1.91	42
CHF	$\hat{S}_{t,t+13} = 0.00+1.01\left(\frac{F_t(13)}{S_t} - 1\right)$ (1.24)	0.02	0.66	1.95	42
JPY	$\hat{S}_{t,t+13} = 0.01 + 1.34\left(\frac{F_t(13)}{S_t} - 1\right)$ (0.82)	0.06	2.67	1.94	42

† Significant regression at a 5 per cent level.
Standard deviations for different estimates are shown in parentheses.

With the help of this regression we can examine the actual relative change in exchange rates as a function of the relative forward premium/discount. In the analysis 13 weeks are taken as an approximation of three months. The result is shown in Table 4.27.

The analysis shows that the forecasting ability of the forward premium/discount measured in terms of the explanatory value R^2 was poor. The only regression that gives a significant coefficient of correlation is the one for SEK/GBP. The analysis covered the whole period 1974–84. Regression analysis was also performed for sub-periods. Comparisons of different sub-periods show that the explana-

Figure 4.41 Distribution of forecast errors using the forward rate as a forecast, SEK/USD
——— Spot rate at T + 3 months
-------- Forward rate T + 3 months
····· Forecast error in per cent



tory power has been reduced during the first part of 1980s compared to the 1970s. This is most substantial for the SEK/USD rate. To see exactly how poor it is, we will compare it with other market forecasts in Section 4.5.2.2.

Figures 4.43–4.47 throw another light on the forecasting errors. Here we can see the ex ante cost of hedging combined with the ex post cost of hedging. The latter is the forecasting error. If the Interest Rate Parity theory and Fisher's Open Relationship are both valid, then the mathematical expectation of the forecasting error is equal to zero. The figures give some idea of the extent to which the negative and positive forecasting errors appear to cancel each other out during the period in question. Table 4.28 gives the average values and standard deviations for the forecasting error in the different periods. From the table we can

Figure 4.42 Distribution of forecast errors using the forward rate as a forecast, SEK/DEM
——— Spot rate at T + 3 months
-------- Forward rate T + 3 months
····· Forecast error in per cent

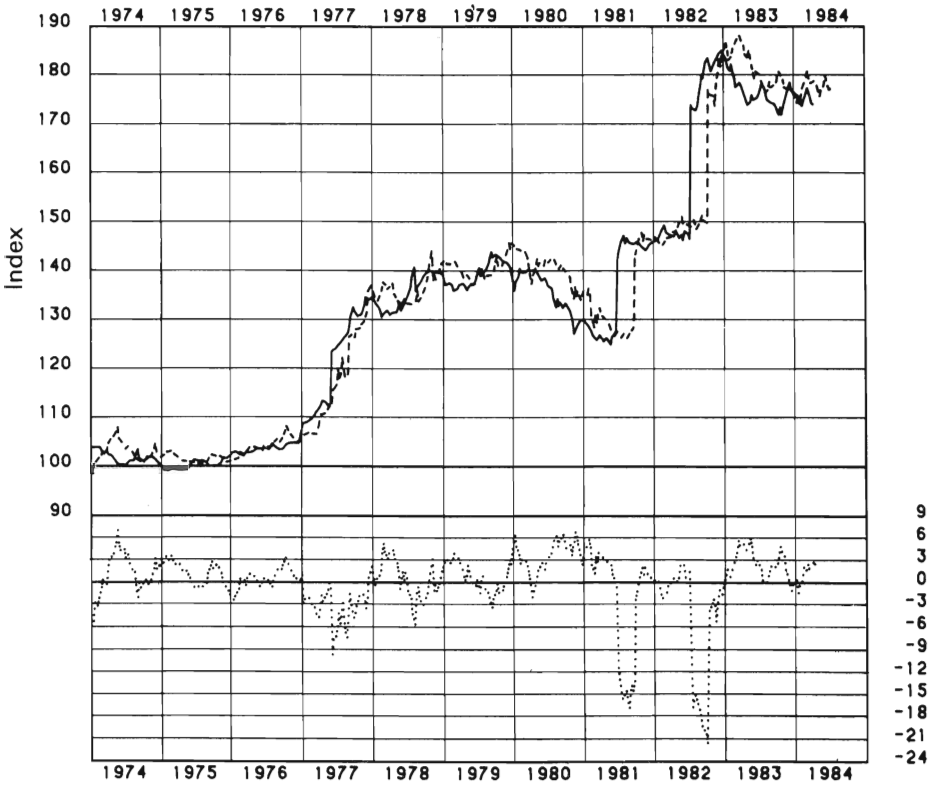


Table 4.28 Mean ($\bar{x}$) and standard deviation (s) in forecast errors in per cent in forecasts based on three-month forward premium/discount
Per cent, monthly observations

	1974–84		1974–76		1978–84	
Currency	$\bar{x}$	s	$\bar{x}$	s	$\bar{x}$	s
GBP	0.02	5.18	−2.59†	5.31	0.73	4.71
USD	0.72	5.14	−1.54	5.13	1.94†	4.88
DEM	−0.27	4.19	−1.06†	1.86	−0.43	4.91
CHF	−0.04	5.85	−0.42	3.81	−0.79	6.41
JPY	−0.43	6.16	−0.93	4.78	0.48	6.76
Number of observations	123		36		75	

† The mean significantly different from zero at a 5 per cent level.

Figure 4.43 The cost of cover with three-month forward transactions, SEK/GBP
Per cent per quarter, weekly data
-------- Ex ante cost = three-month forward premium/discount in relative form
——— Ex post cost = opportunity cost = forecast error in per cent

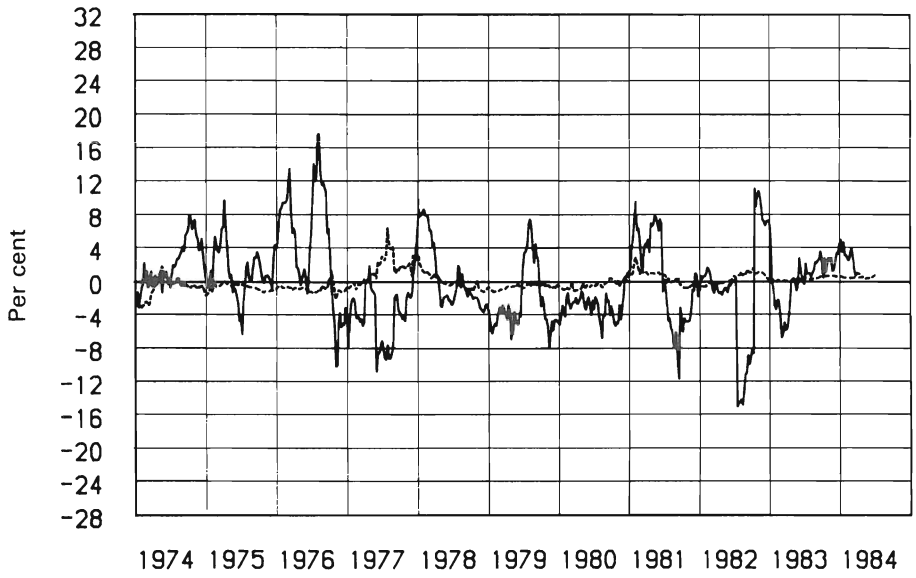


Figure 4.44 The cost of cover with three-month forward transactions, SEK/USD
Per cent per quarter, weekly data
-------- Ex ante cost = three-month forward premium/discount in relative form
——— Ex post cost = opportunity cost = forecast error in per cent

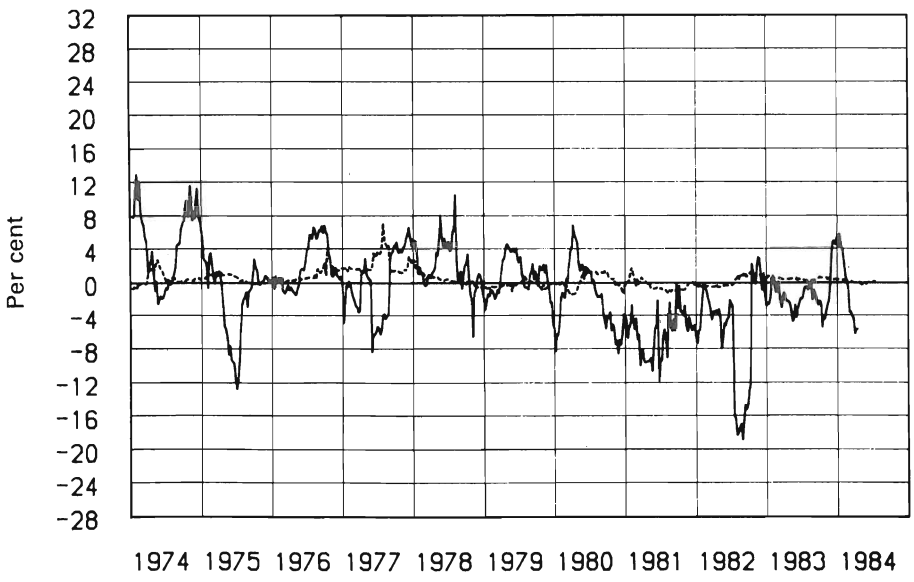


Figure 4.45 The cost of cover with three-month forward transactions, SEK/DEM
Per cent per quarter, weekly data
-------- Ex ante cost = three-month forward premium/discount in relative form
——— Ex post cost = opportunity cost = forecast error in per cent

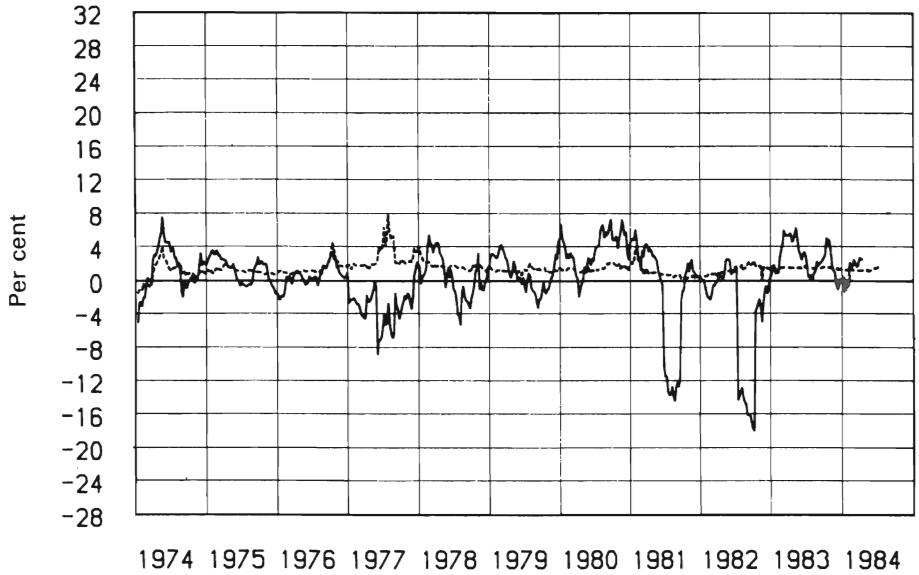


Figure 4.46 The cost of cover with three-month forward transactions, SEK-CHF
Per cent per quarter, weekly data
-------- Ex ante cost = three-month forward premium/discount in relative form
——— Ex post cost = opportunity cost = forecast error in per cent

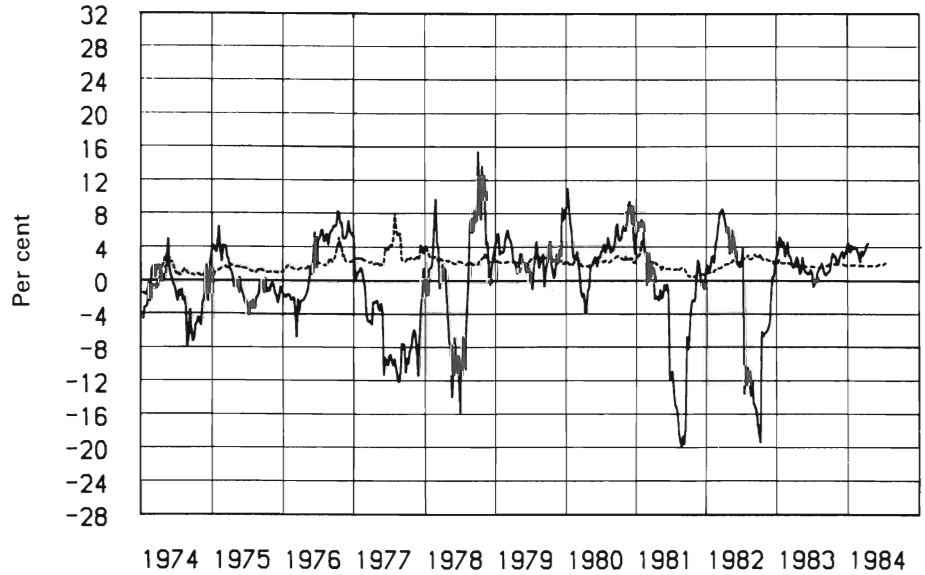
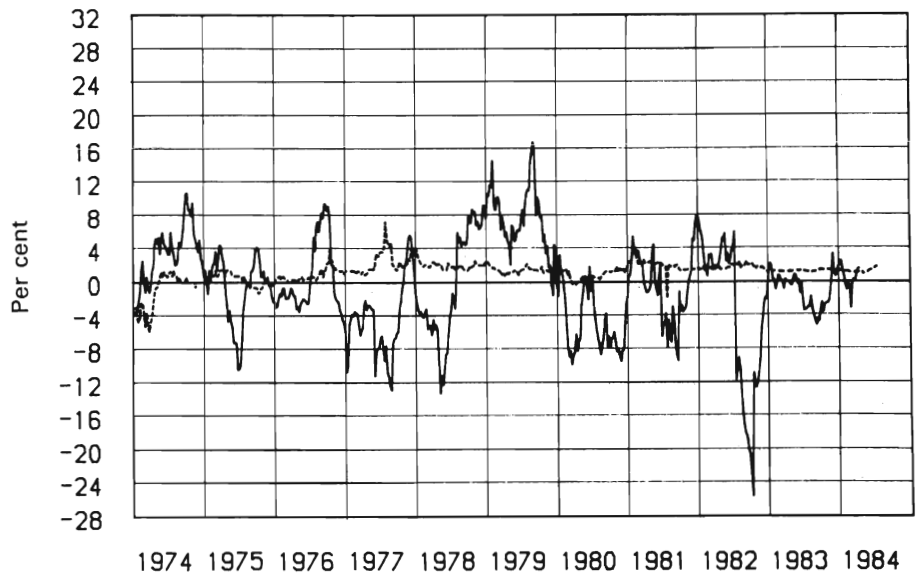


Figure 4.47 The cost of cover with three-month forward transactions, SEK/JPY
Per cent per quarter, weekly data
-------- Ex ante cost = three-month forward premium/discount in relative form
——— Ex post cost = opportunity cost = forecast error in per cent



see, for instance, that the standard deviation in the forecasting error when using the forward rate SEK/DEM has increased dramatically after the change in exchange rate system in Sweden.

Note that to allow for later comparisons, the forecasting error is defined here as actual outcome less the forecast outcome. Thus all the signs for the averages are the opposite of those appearing in Figures 4.43–4.47.

Bearing these points in mind, let us analyse the forecasting error in terms of the costs of three-month exchange transactions. The forecasting errors are also interesting because the forward cost is often included in the calculated interest in evaluating a variety of projects.

In the literature of this subject we find two main schools of thought with regard to cost, one advocating an ex ante estimate and the other a calculation ex post. Rodriguez and Carter (1976) are advocates of the former. In their view:

> The cost of hedging in the forward market, like the cost of covering trade transactions in that market, is the discount of the currency in the exchange markets.

The cost can then be written as the difference between the forward rate

(here three months, or in our approximation 13 weeks) and the prevailing spot rate:

$$F_t\,(13) - S_t$$

or in relative terms

$$\frac{F_t\,(13)}{S_t} - 1$$

In Figures 4.43–4.47 this cost is described by a broken line as a three-month percentage. By a simple calculation the cost can be converted into an annual percentage. However, this gives us a misleading picture as regards the transaction cost. But the advantage of this conception of cost is that all the determinants are known in advance. In a company's decision-making the cost of the forward transaction can thus be compared with expected losses on anticipated exchange rate movements. It is also easier to evaluate the cost of various hedging alternatives. For a small company the opportunity cost is often of very little interest. The company need only look at the ex ante cost to see that it protects the margins.

The figures show that the hedging cost on three-month forward rates was positive for certain currencies throughout the period, for instance for DEM and CHF. During this period, of course, both Switzerland and West Germany had lower interest rates and a lower inflation rate than Sweden.

The proponents of an ex post approach maintain that the real cost cannot be determined before settlement date when the spot rate is known. Hoyt (1972) thus claims that the forward transaction has a cost

> that is indeterminate at the time it is entered into because until the contract is settled, the exchange rate at which the off-setting purchase or sale can be made is unknown.

This approach would give us the following cost for a three-month forward transaction:

$$F_t\,(13) - S_{t+13}$$

The cost in relative terms can be written

$$\frac{F_t(13)}{S_{t+13}} - 1$$

The cost refers to the transaction carried out at time t and is reported in Figures 4.43–4.47 at that time. It is marked in the figures by an unbroken line. The relationship between the costs is

$$\frac{F_t\,(13)}{S_t} = \frac{F_t\,(13)}{S_{t+13}} \cdot \frac{S_{t+13}}{S_t} \tag{32}$$

Regardless of the approach adopted, all are agreed on the importance of the spot rate on settlement day. The argument is about the way this rate should be used in the cost calculations. Some authors (e.g. Hoyt, 1972) maintain that the difference between the forward rate and the spot rate at the time of the hedging action should be regarded as the cost of the contract. According to this view, the difference between the forward rate and the spot rate at the end of the period then represents the gain or loss on the contract. These potential gains or losses can be defined in terms of opportunity costs and should not be regarded, as advocated by the other side, as the real cost of the contract.

However cost is defined, the cost of the forward transaction can be either positive or negative. The ex ante approach, represented in the figures by a broken line, gives a premium for the selling rate (a positive value in the figure), if the forward rate is above the prevailing spot rate.

As an example of these methods, which according to Jilling (1978) are equally common in US companies and according to Oxelheim (1984d) equally common in Swedish multinationals, let us take a *purchase* of DEM on 4 July 1979 for delivery in three months. On that day the spot rate was 231.20 SEK/100 DEM and the forward rate was 234.00 SEK/100 DEM. Three months later the spot rate was 237.25 SEK/100 DEM.

On 4 July the cost of the transaction could be calculated as follows:

$$\frac{234.00}{231.30} - 1 = 0.0117 = 1.17 \text{ per cent}$$

Three months later on settlement day, it could be evaluated as follows:

$$\frac{F_t(13)}{S_t} = \frac{234.00}{231.30} = \frac{F_t(13)}{S_{t+13}} \cdot \frac{S_{t+3}}{S_t} =$$

$$= \frac{234.00}{237.25} \cdot \frac{237.25}{231.30} = 0.986 \cdot 1.026$$

The price rise during the period amounted to 2.6 per cent — the hedging cost ex ante was 1.17 per cent. As a result of the hedging procedure there was a profit or a negative cost (depending on the school we belong to) amounting to $(1-0.986) \cdot 100 = -1.4$ per cent. The comparison is formulated such that a negative value is the same as a profit. This amount is designated with an unbroken line in Figures 4.43–4.47, and it is this which represents the actual forecasting error.

Thus a value less than zero means that the hedging process resulted in a profit compared with the actual outcome. A positive value means a loss or an additional cost. For a company which *sold* on the forward market, the converse would hold.

The figures might give the impression that there were continuous profit opportunities throughout the period. This was not the case; the impression stems from the fact that the analysis is based on weekly observations. Thus it takes thirteen weeks before a profit opportunity can be evaluated. And in most cases, when there are long chains, they are of about that length. A *Q*-test (Box–Pierce test; see Anderson, 1976) for the relevant currencies, shows highly significant autocorrelation in successive forecasting errors for all the currencies in the study as a result of overlapping.

It can be seen from Table 4.28 that systematic forward hedging each week throughout the period 1974–84, by buying a constant amount for delivery three months later, would have given an average gain of 0.72 per cent for USD. However, the result is not significant in an analysis at the 5 per cent level. None of the currencies shows a systematic error during this period. For the period 1978–84 there have been systematic deviations for USD. The question, then, is whether the significant deviations can be explained in terms of the transaction cost. If the values obtained are compared with these costs, it does not look as though the costs alone could explain the deviations in the case of USD. Thus for USD the deviations are economically significant. There was an average profit of 1.7 per cent on three-month forward purchases in USD, after subtraction of the transaction cost. Splitting up into shorter sub-periods with bias, we find that forward purchases in CHF during the sub-period 1978–80 led to an average loss of 1.9 per cent per quarter.

4.5.2.2 Comparison of market-based forecasts, 1974–84

In this section we will examine how successfully the various market-generated forecasts have reflected the spot rate three months later. The forecasts will be assessed on a basis of their lack of bias and the size of the standard deviation in the forecasting error. If it is stable and can itself be estimated, a systematic deviation can be allowed for in the forecast and need not thus necessarily represent an insurmountable obstacle.

Tables 4.29 and 4.30 show the properties of the different market-generated forecasts. Observations were made on a monthly basis in all cases, to allow for the greatest possible comparability. Forecasting errors have been calculated throughout as:

Table 4.29 Mean forecast error in forecasting the change in spot rate three months ahead
Per cent, monthly observations

Currency \ Method	1974–84				1974–76				1978–84			
	1	2	3	4	1	2	3	4	1	2	3	4
GBP	0.79	0.82	0.02	0.25	−2.03†	−2.34†	−2.59†	−3.02†	1.51†	1.49†	0.73	1.01
USD	1.63†	1.78†	0.72	1.50†	−0.82	−0.89	−1.54	−0.63	2.85†	2.94†	1.94†	2.38†
DEM	0.62	1.14†	−0.27	1.40†	−0.49	0.07	−1.06†	0.15	0.50	0.83	−0.43	1.23
CHF	0.20	1.58†	−0.04	2.36†	−0.71	0.72	−0.42	1.12	−0.49	0.67	−0.79	1.77†
JPY	1.24†	1.52†	−0.43	2.05†	−0.77	−0.73	−0.93	−0.63	1.44	1.63	0.48	2.50†
Number of observations	123				36				75			

† Significantly different from zero at a 5 per cent level.

Method 1: Forecasts according to Fisher's Open Relationship based on three-month treasury bill rates.
Method 2: Forecasts according to Fisher's Open Relationship based on three-month commercial bank prime lending rates.
Method 3: Forecasts based on three-month forward premium/discount.
Method 4: Forecasts based on last available spot rate. S_t as a forecast of S_{t+13}. That means that the forecast change is 0.

actual outcome − forecast outcome =

$$= \left(\frac{S_{t+13}}{S_t} - 1 \right) - (\text{forecast change } t,\ t+13) \qquad (33)$$

The average forecasting errors are reported in Table 4.29. *Fisher's Open Relationship based on interest rates for treasury bills* shows systematic significant errors for USD and JPY for the whole period. During 1974–76 the interest differential substantially overestimated the actual change in exchange rate for GBP, and during 1978–84 the same method led to a substantial underestimation for GBP and USD. *Fisher's Open Relationship based on the commercial banks' prime lending rates* produced a bias for the whole period, with a systematic underestimation of USD, DEM, CHF and JPY. Thus, in the case of these currencies, the differences in lending interest rates on an average underestimated actual exchange rate movements. This also meant an additional cost for the borrower contracting a loan in these currencies rather than in SEK. This additional cost will be analysed in the next chapter. As regards the sub-periods, GBP shows bias during 1974–76. The overestimation is approximately the same as for Fisher's Open Relationship based on treasury bills. During 1978–84 the prime lending rate differential exhibited a significant deviation from zero in the case of GBP and USD only. There was quite a large underestimation of exchange rate movements in the latter currency here. This meant, for instance, that the interest differential undercompensated for the exchange rate movements and thus contributed to a positive additional cost for loans in USD during this sub-period.

The *forward market premium/discount* as a percentage gives us a bias with respect to sub-periods only. During 1974–76 the method produces a bias for GBP of the same size as in the two alternatives with Fisher's Open Relationship. Thus a negative average value for the forecasting error means that on an average the forward premium/discount overestimated exchange rate movements. For the last sub-period the relative forward premium/discount gives a systematic underestimation of the future spot rates for USD.

Lastly, the fourth method is based on the *random-walk model* without θ_0. This model exhibits systematic forecasting errors in 1974–84 for all currencies except GBP. It is a matter of underestimation. The Box–Jenkins models discussed above showed clearly that a shift parameter was needed for at least two of these currencies. This shift parameter, which was calculated for each of the two currencies, seems to give direct expression to the systematic inflation differential between Sweden on the one hand and Switzerland/West Germany on the other during this period. As we have previously found trends in all four currencies showing systematic errors, to find such errors was to be

Table 4.30 Standard deviation in the forecast error in forecasting the change in spot rate three months ahead
Per cent, monthly data

	1974–84				1974–76				1978–84			
Method	1	2	3	4	1	2	3	4	1	2	3	4
Currency												
GBP	5.26	5.26	5.18†	5.31	4.78	4.81	3.85†	4.87	4.81	4.75	4.71	4.57†
USD	5.43	5.51	5.14†	5.54	5.07	5.09	4.62†	5.34	5.19	5.35	4.88†	5.41
DEM	4.72	4.59	4.19†	4.74	1.61	1.39†	1.85	1.51	5.53	5.39	4.91†	5.46
CHF	6.39	6.46	5.85†	6.52	3.53	3.56	3.69	3.43†	6.92	6.99	6.41†	7.11
JPY	6.60	6.75	6.16†	6.84	4.75	4.73	4.21†	4.92	7.13	7.35	6.76†	7.30
Number of observations	123				36				75			

† Smallest standard deviation for each combination currency/period.

For explanations of the different methods, see Table 4.29.

expected when carrying out our analysis for a long period. The systematic errors might here be seen as an expression for the need of a drift parameter in the models. For the period 1978–84 only USD exhibits a systematic forecasting error, in the form of an underestimation of the movements.

The standard deviation in the forecasting errors can be seen in Table 4.30. It appears to be a question of quite small differences between the methods, by currency and period. The lowest standard deviation in each currency/period combination is marked with a dagger. For the period as a whole, forecasts based on the forward premium/discount model exhibit the lowest standard deviation for all currencies. For the period 1974–76 the forward premium/discount model produces the lowest values for three of the five currencies. For the sub-periods we can find some observations indicating the lowest standard deviation for the random-walk model. However, in a system of pegged rates this model can provide the user with some unpleasant surprises. Severe imbalances, often expressed as expectations affecting interest rates and forward costs, do not emerge in any form at all when this method is used. With the Box–Jenkins model described in Section 4.3.1, these imbalances can find expression in the shape of the parameter which we have just discussed. For this procedure to be meaningful, it is necessary that the imbalances observed in the period studied should find the same expression in the future too. We can also see from Table 4.30 that there has been a substantial increase in the standard deviation in the forecast error from the period 1974–76 to the period 1978–84 for all currencies and for DEM in particular. This will, of course, affect the size of uncertainty in the outcomes of all decisions based on these forecasts.

If any model is to be preferred to the others, the choice would tend to favour the forward premium/discount model. For the whole period under investigation this model has produced unbiased forecasts which also show the smallest variance compared to the forecasts generated by the other models considered. However, our analysis pinpoints the fact that our forecasts contain different pieces of information and therefore it might be possible to obtain the best forecast from a combination of the four models discussed here. In general, such a model can be expected to generate more accurate forecasts, provided the correlation between the errors in the constituent models is less than 1. According to Nelson (1972) the *composite model* can be very much more accurate in its forecasts, provided the new forecast embodies information which was not used in the individual models. As an alternative to the traditional approach, Winkler and Makridakis (1983) also recommend, combining the information provided by different kinds of forecasting by aggregating the forecasts themselves. This

eliminates the problem of having to select a single method and relying exclusively on its forecasts. The integration of the forecasts can be derived from the regression equation:

$$S^*_{t+13} = a + b_1 \cdot S^*_{1,t+13} + b_2 \cdot S^*_{2,t+13} + \\ + b_3 \cdot S^*_{3,t+13} + b_4 \cdot S^*_{4,t+13} \tag{34}$$

In this equation $S^*_{3,t+13}$, for example, represents forecasts based on method 3 above. In the process of combination one type of forecast might come out on top, so that the others disappeared and the equation would be reduced to a simple regression with, for instance, the forward premium/discount remaining as the sole indictor or explanatory variable.

Can we tell from these tables, which currency is easiest to forecast? We have no uniform instrument for comparisons, and so the question cannot be answered precisely. The forecasting error is a function of the transaction cost and the risk premium. If these factors vary between currencies, it does not necessarily mean that these currencies will differ in the ease with which they can be predicted. Thus potential investors in a particular currency may have been correct in their expectations regarding the currency concerned, but may still have refrained from investing, perhaps because the transaction cost exceeded the expected profit. This might then mean that the price of the currency remained the same and a forecasting error arose. Bearing this in mind, we can state that regardless of the method used the forecasts for DEM reveal the smallest standard deviation in forecasting errors in almost all combinations of models and periods investigated. The standard deviation in forecasting errors implies in itself that systematic errors have been allowed for, and can therefore be used, with the above reservations as a guideline for comparisons.

The expectations of the market participants are problematic in all foreign exchange model building. We have now analysed empirically the validity of two hypotheses simultaneously. In the case of the forward rate, for example, it is a question of whether this rate reflects the expectations of the market, *and* whether these expectations have been fulfilled. In this case the forecasting error has two components, which can be written

$$S_{t+13} - F_t(13) = [S_{t+13} - E(S^*_{t+13})] + \\ + [E(S^*_{t+13}) - F_t(13)] \tag{35}$$

4.5.3 Exchange rate forecasts in corporate planning

Our empirical analysis suggests that the traditional market estimates can provide us with forecasts which are not, generally speaking, subject to systematic error. However, Table 4.30 showed that there is some bias in certain models during some periods. By and large we could conclude from the previous section that the prices of various financial instruments can be used to give rough forecasts of the future spot rate. This knowledge can be useful to a borrower, for instance, in many contexts. The forecasts, particularly in the short run, can be used in planning a change of loan currency or the forward hedging of pending amortizations and interest amounts. Let us look briefly at the kind of forecasting advice which could usefully be addressed to the borrower.

In the *long run* the Purchasing Power Parity theory seems to hold for prediction purposes. Anyone wishing to make use of this situation will have to forecast the changes in the relative inflation rates between the relevant countries, which is of course a major drawback. However, a company planning to contract a medium-term or long-term loan would do well to study relative purchasing power parity indexes, both bilaterally and multilaterally. These indexes indicate the imbalance in the exchange rate which may be going to be corrected by way of a revaluation or devaluation. The probability of such an adjustment being made during the lifetime of the loan must be assessed on a basis of economic–political considerations. It is not at all certain that the imbalance will lead to an adjustment before the loan has been settled. A change in important economic conditions (a real shock) may mean that the index never returns to its former state of equilibrium. Presumably, however, the adjustment will eventually be made, and there is therefore every reason for the borrower to take it into consideration in choosing his loan currency.

Thus the choice of loan currency should be based on a composite forecast combined with an economic–political evaluation of deviations from purchasing power parity on the one hand, and predicted exchange rate movements during the lifetime of the loan based on Fisher's Open Relationship on the other.

In the *short run* the borrower can with good grounds rely on the various market estimates which we have discussed above. To quote Dufey and Giddy (1978b):

> Since the market's forecasts — implicit in the term structure of interest rates and of the forward exchange rates — are readily available in the financial markets, which are both competitive and efficient and in which the firm is unlikely to have a particular

> advantage, there is an *a priori* rationale for making borrowing and investment decisions based on these forecasts.

If a company has decided to employ other information as a decision base, the market's estimates can be used to control and evaluate management's financial allocations. To quote Dufey and Giddy again:

> ...the risk and ex post performance of the decisions taken should always be compared against the outcomes of decisions based on market-based forecasts. The market's projections constitute the best benchmark for the evaluation of financial management's performance.

The question is whether there is any hope, on an average, of making forecasts more accurate than those provided by the market at no cost. Under the circumstances described above there is no gain to be expected from manipulating with time and currencies in connection with loans or investments. Financial management should rather concentrate its attention and its time on *planning for the deviations from the market's forecasts* which will occur. What matters is how the company's cash flow will be affected by deviations from these forecasts. For a loan in a given currency, it is easy to calculate the effect. For the multinational company as a whole it will be a complicated business. Technical consideration will also come into the picture, for instance whether the return on different assets should be measured in book terms or in terms of expected future cash flow. Financial planning should concentrate on achieving a composition and a time structure for total debts such that every unforeseeable change in returns will be balanced by a change in the effective cost of the debts, thus securing expected returns against unexpected changes in conditions on the financial market. This cover should be provided on the debts side, since the structure of real assets is often determined by commercial–strategic considerations.

A company whose return on operations is negatively correlated or noncorrelated with short-term interest rates, should contract long-term loans at fixed interest rates. This stabilizes capital costs, thus reducing the effect of unforeseeable changes in interest rates on the final cash flow. The other factor that determines the capital cost of foreign loans is exchange rate movements. This time, when a company's or a unit's return on operations is positively correlated with the value of a particular currency, then the unit should be financed in that currency. Every unforeseen depreciation of this currency reduces not only the return but, to counterbalance this, also the effective cost of the debt. 'Effective' cost includes interest plus exchange rate movements.

It is a difficult task to see that, at any given moment, a change in the cash flow on the assets side is counterbalanced by an equivalent change on the debts side. Not infrequently a difference will arise — *a residual risk*. The size of this risk should be estimated and it should represent the basis for top-level decisions about possible restructuring — perhaps decisions of a strategic nature, concerned with basic factors such as new production processes or technology.

Nobody responsible for predicting exchange rates can be reproached for failing to forecast unforeseeable events on the financial market, i.e. deviations from the market-based forecasts. The decisions and performance of such forecasters can be evaluated by comparing the cost of their forecasts with the improvement which these represent in comparison with the free market-based forecasts. Further, the responsible management should be judged by the way in which the effects of unforeseeable forecasting errors are reduced as a result of the effective structuring of the company's cash flow.

Therefore, as an alternative to the market's forecasts, a company may seek to generate forecasts of its own. Perhaps the people responsible for forecasting in the company feel that they have access to inside information or that they possess special predictive ability. Their own forecasts should be used when the risks they involve are counterbalanced by the expected profits. The consequences of actions based on these forecasts (which may be generated within the company or purchased from a financial institute), must be systematically evaluated against the results which should have been obtained by using the market-based forecasts. Both methods suffer from forecasting errors. If the generation of forecasts over and above the free market-based predictions is to be justified, then the average improvement in results should cover the additional cost of generating the forecast oneself.

What grounds would justify a company in making its own forecasts? Perhaps the market-based forecasts deviate from market expectations on account of evident disturbances on the financial market — harsh credit restrictions, currency controls, interest regulations, etc. Some cases in the empirical analysis, i.e. some combinations of methods, currencies and periods, exhibited significant systematic deviations from interest rate parity, for example. The forward rate for GBP on the Swedish market during 1974–76, for instance, showed a systematic underestimation of the spot rate on the settlement date. A company which consistently purchased a constant amount of GBP every month during this period, would have enjoyed an average profit of about 2 per cent per month after paying the transaction cost. A company which undertook a single transaction of this kind during the period ran the risk of losing on it. Assuming that forecasting errors were more or

less normally distributed, the probability of loss would have been about 30 per cent.

Market restrictions of this kind do not necessarily lead to systematic errors in the market estimates, since there are various opportunities for arbitrage. The administrative controls, such as currency regulations, determine who will be able to utilize the systematic deviations. The more flexible a company's legal and operational structure, the easier it will be for that company to exploit the opportunities for profit. Therefore not everyone could have made use of the opportunities we have just described on the GBP market. But for multinational corporations with juridical units in several countries, centrally coordinated in the consolidated financial planning, there will be ample opportunities for utilizing the opportunities afforded by arbitrage. A good deal of the financial planning of such companies consists of finding legal ways of getting round national restrictions on arbitrage. The restrictions also tend to leave loopholes, so that a country's economic activities are not totally hampered.

Attempts to exploit the systematic deviations from the market-based forecasts are certainly not without risk. So a company must have some kind of yardstick whereby those responsible can decide whether the gains are worth the greater risk involved. As we have seen, an ex post analysis of the forward market in GBP showed that monthly purchases of GBP during 1974–76 would have given an average profit of 2 per cent. However, about 30 per cent of these purchases yielded a loss — one transaction actually involved a 10 per cent loss in one month.

When the exploitation of these opportunities leads to a capital structure coinciding with what would have been chosen to balance fluctuations in returns on capital, then no complicated decisions are called for. Only when it results in a debt structure deviating from what would have been desirable in terms of risk reduction, is the decision less straightforward. It becomes a question of weighing the greater risk against the expected reduction in cost.

Finally, it should not be forgotten that implicitly market-based forecasts play an important part in budgeting and control. Many corporations estimate the financial cost of a project on a basis of an interest rate derived from previous loan costs. Further, changes in the foreign subsidiaries' cash flows are often converted at the rate of exchange at budget date. Both these procedures are acceptable, given stable exchange rates and rates of interest. The use of the current price in itself implies utilization of a market-based forecast, since it is the rate predicted by the random-walk model. The model for DEM and CHF in the empirical analysis proved to need a shift parameter, to be able to follow average exchange rate movements in the long run. Therefore in using the current spot rate in connection with budgets, allowance

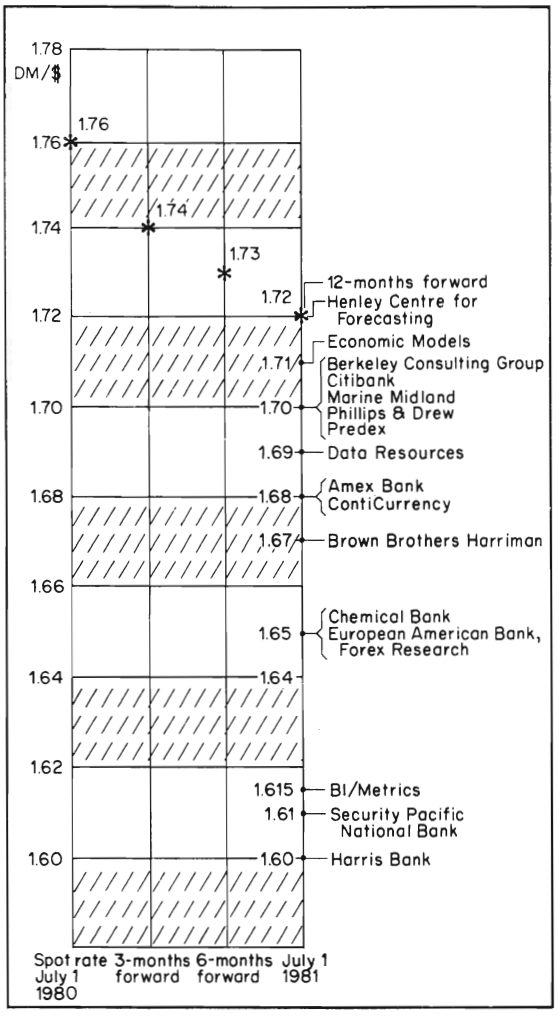
should be made for this. This quantity, which reflects relative inflation movements, can be derived from the historical material, as in our Box–Jenkins analysis of the spot market. Or if relative inflation movements are assumed to have taken on a new pattern, it can be calculated with the help of predicted future rates of inflation, which, however, is no easy task. A compromise for *budget* purposes would be to carry out a sensitivity analysis with the current spot rate and a rate augmented for deviations from purchasing power parity. Furthermore, to use the market-based forecasts for *internal conversion* purposes is a good way of avoiding conflicts due to personal judgement involved in recommended conversion rates.

For their exchange dealings many companies rely on forecasts from banks and financial institutes. The degree of forecasting success of some well-established financial institutes is exemplified in Figure 4.48. The figure is taken from *Euromoney* annual forecasting competition. In fact the forecasts reported had strikingly little success in the competitions, and this pattern is not rare. Of the 16 forecasting financial institutes, none succeeded in indicating the right direction in the exchange rate movements. If we also examine the size of the errors, we find that the result is even more depressing for any businessman who trusted the ability of these financial institutes to generate reliable forecasts.

Is it possible, with this forecasting perspective, for companies to eliminate the risks of substantial exchange losses on their own? The answer, that it is no more possible for them than for the banks and financial institutes, sounds rather discouraging in the light of what we have just said. The decisive factor, and what gives the banks their advantage, is the ability to be on-line for information. It is to a large extent a question of a telephone market. Contracts, worth millions of dollars, are agreed in the space of a few minutes. Written confirmation follows, but the contract is verbal and binding. The risk of loss is everywhere present. Big companies operate their own arbitrage departments, thus heightening their state of preparedness. For other companies this solution is too expensive, especially since the revenues are as uncertain as we have seen them to be. But the development within the computer field will in the future provide companies with better contact with the financial market.

The intellectual aspect of forecasting should not be ignored: the learning involved will be useful and will improve the company's chances of achieving a differentiated and intelligent exchange policy. Experience of this kind may explain the growing tendency in US multinational corporations to develop exchange forecasting and to make their own forecasts.

Figure 4.48 Deutschemark against US dollar — a forecast competition
Exchange rate 1981-07-01 was 2.35.



A 1975 study of 107 such companies (Jilling, 1978) has shown that only three had no form of forecasting and that four relied on external forecasts. Seventeen companies made trend adjustments without actually producing any formal forecasts. Of the remaining 83 companies, 40 concentrated on 'direction of movement' and 33 made point estimates of the spot rate at one or more future dates. The remaining companies made interval estimates, and two of them estimated the complete probability distribution for the changes.

It is interesting to compare Jilling's 1975 figures, showing how many companies mentioned forecasting as the weakest link in their exchange risk management program, with the 1977 figures of Evans, Folks and Jilling, published in 1978.

Exchange rate forecasting is still the weakest link in our foreign exchange risk management program
(Response distribution as a percentage)

	Strongly agree	*Agree*	*Not sure*	*Disagree*	*Strongly disagree*	*No response*
1975	19.0	25.2	23.4	20.6	7.5	3.7
1977	28.8	29.6	22.4	14.1	5.1	0.0

The 1975 study included 107 American multinational corporations and the 1977 study included 156. The forecasting problem, or at least the awareness of the problem, seems to have increased.

In late 1983 top managers in Swedish multinational corporations show a much higher percentage under 'strongly agree' (Oxelheim, 1984d). None of the companies studied (the 19 largest MNC) had a formal forecasting model of their own. They pick relevant information (or a forecast) from the data supplied by banks and financial institutions. Opinions about what is meant by relevant information differed from company to company, and referred to their macro 'model-view' respectively. For instance, a manager who believes in the effect of the current account deficit on exchange rate movements selects a forecast from a bank which stresses this variable. This multiplicity of 'models' implies a lack of any national consensus about how expectations are formed, which may indicate that the Swedish market is inefficient. Furthermore, in contrast to the situation in Europe and the US (Meierjohann, 1984), only three out of the 19 Swedish top multinationals rely on 'technical analysis' in forecasting foreign exchange rate movements.

Thus, we have established that there is no 'super' model for explaining and forecasting fluctuations in foreign exchange rates, and we will bear this fact in mind in the following discussion of possible solutions to the information problem. With the existence of such a model, the accounting and reporting situation might have been considerably easier than it is at present in the mid-1980s. However, in the absence of such a model, there seems to be good reason for choosing the equilibrium relationships analysed in this chapter as a

point of departure in developing standards to improve the information situation. We have found short-term deviations from these relationships, but there are good indications of their long-term validity. There are good grounds for believing that the forecasts provided in this way are the best available, representing a kind of market consensus. However, at least in the short run, these forecasts require some form of modification if they are not to violate the objectivity rule when applied in an accounting context. This problem will be discussed in Chapter 7.

Chapter 5

Financial market fluctuations and the cost of foreign loans, 1974–84

5.1 INTRODUCTION

We found in the previous chapter that interest differentials did not always counterbalance exchange rate movements during 1974–84. For some currencies this fact found expression in a significant deviation from Fisher's Open Relationship. In the present chapter we will study the effects of these deviations on the cost of foreign loans during the same period.

In Section 5.2 we will discuss the concept of the cost of capital and its constituent parts.

The reason for the systematic deviation from Fisher's Open Relationship may have been that exchange rate movements were greater than was motivated by real economic quantities, perhaps on account of currency preferences. Or it could have been because the interest differential reflected unrealistic expectations about the future development of these quantities — perhaps, for instance, the Swedish interest rate did not reflect expectations particularly well on account of interest rate regulations. Swedish interest rates were, during the period under investigation, largely based on the discount rate. Movements in this rate and in other related interest rates will be discussed in Section 5.3.

In Section 5.4 we shall try to establish what the deviation from Fisher's Open Relationship meant to companies in different countries in the way of additional costs for borrowing in foreign currencies on the international capital market rather than in the domestic currency. The total cost for borrowers from different countries is exemplified in this section.

Finally in Section 5.5 we shall exemplify the way in which loan costs would have been affected by hypothetical hedging on the forward exchange market and this will be compared with the non-hedging alternative.

5.2 CORPORATE COST OF CAPITAL

We have already discussed the cost of capital in Chapter 3 and elsewhere. We can now complete the picture by considering taxation and inflation.

$$\begin{aligned} \text{Capital cost} = \; & [E/(E+D)] \cdot C_E + \\ + \; & [D_f/(E+D)] \cdot [(1-t) \cdot (r_f - \hat{S}) - \hat{P}] + \\ + \; & [D_d/(E+D)] \cdot [(1-t) \cdot r_d - \hat{P}] \end{aligned} \tag{36}$$

where E = equity
D = debts
D_d = debts in domestic currency
D_f = debts in foreign currency
r_f = foreign interest rate
r_d = domestic interest rate
t = tax rate
$\hat{S}$ = change in exchange rate, for example SEK/foreign currency
$\hat{P}$ = domestic rate of inflation
C_E = real cost of equity

The relative size of the different components in the cost of capital changed considerably during the period 1974–84. The proportion of debts in foreign currencies increased after the first oil crisis in most industrial countries. It was in their governments' interests to encourage such a development, and to let domestic companies help to finance the growing current account deficit. Swedish industrial companies, for instance, increased their average ratio of foreign debts from 12 per cent in 1974 up to 20 per cent in 1982. This increase was balanced by a corresponding decrease in debts in domestic currency. During 1982–84 the share of debts in foreign currencies has increased another 4 per cent due to the upswing in the US dollar rate. At the end of 1984 the proportion of debts in foreign and domestic currencies of total capital were 24 and 48 per cent respectively.

Because foreign capital represents an increasing part of total capital, variations in the cost of foreign loans due to fluctuations in exchange rates have also become increasingly important. According to Levy and Sarnat (1978b) this is reflected in the demand for a higher return on equity or, in their words:

> ...the greater the variability in the earnings stream, the higher will be the average required return on equity.

In the face of falling returns on total capital, equity yield can be maintained fairly well for a time with the 'boost' of big, cheap loans. The risks that accompany this type of financing have been all too obvious in Sweden since 1975, when for long periods the return on total capital has been lower than the average interest rate on debts, with serious repercussions on the return on equity as a result. With an average solvency of just above 25 per cent in the middle of the 1980s and one third of the debts consisting of foreign loans, it is easy to understand the inmpact that fluctuations in exchange rates can have on the return on total capital.

So far in this section we have been discussing these loans as a form of financing, representing what we have called an offensive approach. However, such loans may also be part of an overall hedging strategy, in which case we can speak of an underlying defensive purpose. The cost argument should then be related to the hedging strategy. Let us illustrate this in a simple example.

A Swedish company invoices in a currency other than its own. The invoicing currency is expected to depreciate. The company considers borrowing on the outstanding claim, and selling the sum spot against SEK. The loan, whose amount corresponds to the claim, is then paid off with this when it falls due. Until then, the amount in SEK is placed in an interest-bearing account in order to reduce the gross loan cost. A company which had an outstanding three-month claim amounting to GBP 100,000 in the middle of 1979, borrows the corresponding amount for three months at an interest rate of 15 per cent per annum. We then get the following:

(1)	The company sells GBP 100,000 spot against SEK at an exchange rate of SEK/GBP 9.2350	923,500 SEK
(2)	Interest on three-month investment in SEK 10.25 per cent (923,500 × 0.1025 × 0.25)	23,665 SEK
		947,165 SEK
(3)	Interest cost on loan in GBP (100,000 × 0.150 × 0.25) = 3,750 GBP to be paid after three months and bought at forward rate at an exchange rate of SEK/GBP 9.194	34,477 SEK
		912,688 SEK

If the company had decided to sell the whole sum direct for delivery in three months, the yield would have been:

$$100{,}000 \times 9.1625 = 916{,}250 \text{ SEK}$$

Given interest rate parity, the two methods should produce roughly the same result.

Thus, according to economic theory and the equilibrium relationships described above, the following is important for the cost of foreign loans (see also Chapter 3):

- according to the Purchasing Power Parity theory, relative changes in inflation level will be counterbalanced by exchange rate movements
- the interest rate relationship is directly connected with expected developments in the relative price relationship
- the forward market provides an unbiased estimate of the future spot rate.

If we link these relationships together, we can conclude that, on a perfect market and with reservation for transaction costs, the cost of a hedged position can be expected to be equal to the cost of an open position.

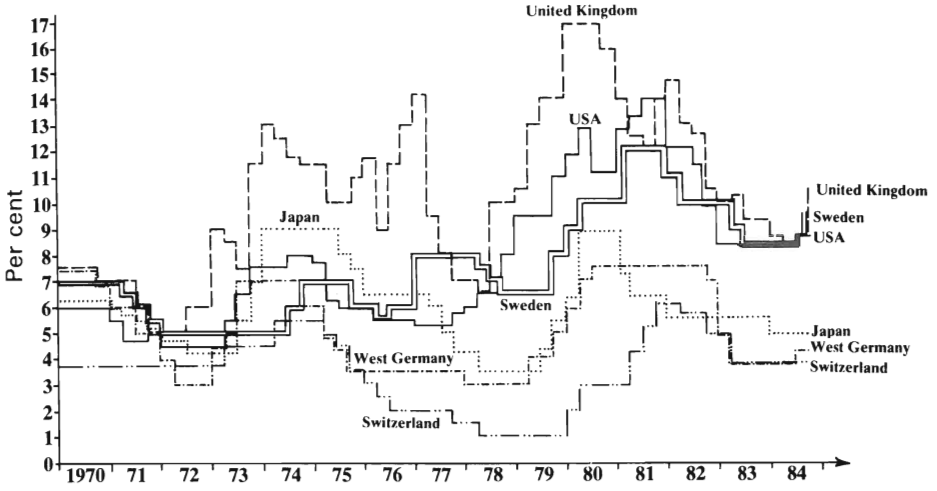
Economic theory will also provide an equilization of the expected real rate of interest in the long term, as was shown in Figure 4.1. The cost of loans in different currencies could be expected to be the same.

5.3 INTEREST RATE PATTERNS

In Chapter 4 we saw that in the case of DEM and CHF, for example, there were significant deviations from Fisher's Open Relationship during 1974–84. One of the reasons for this may have been that expectations about future price relationships were not fulfilled. The *nominal interest rates*, if reflecting these expectations, were thus unable to predict future spot rate movements satisfactorily. Another reason for the deviation in Sweden may be that because of the Swedish interest rate regulations, domestic interest rates provided a poor measure of the market rate during this period. Let us now examine the fixing of interest rates, and the fluctuations generated in the rates. We must distinguish here between interest rates which are administrative in character and those which are fixed on the market.

The lending rates of the Swedish banks follow the movements of the Swedish central bank discount rate. However, this connection is

Figure 5.1 Official discount rate
End of period, per cent per annum



Note: For the United Kingdom the minimum lending rate is used.

growing weaker. The number of administratively fixed interest rates is diminishing. Over the last few years an adaptation to international interest rates seems to have occurred. Up to the mid-1970s the discount rate was not primarily steered to regulate capital flows over the borders; it was kept down as a political measure connected with housing policy. In the spring of 1974, there was a change in policy, the Swedish discount rate was increased with the formal motivation to encourage companies to turn to the international capital market. Movements in the discount rate in Sweden and in other countries in the present study can be seen in Figure 5.1. This reveals the same fanlike development since 1974 that we also find in exchange rate trends, as illustrated in Figure 4.30, except that the countries naturally appear in the reverse order. At the end of 1971 the distance between the extreme values for the discount rates of the different countries was 1.75 per cent; at the end of the 1970s it was 16 per cent. The variability in discount rates was contagious, as we can see in Table 5.1. The greater volatility of interest rates for all terms, *and* the variability in money growth since 1979, are stressed, for instance, by Mascaro and Meltzer (1983). This indicates that recent policy does not minimize risks.

Waves could be traced in the development of discount rates, indicating the importance of these rates as economic political tools. However, this is not true for all countries. For instance, France and Spain have not changed their discount rate since 1977. However, the

Table 5.1 Variability of long-term interest rates[a]

Country	Standard deviation of long-term monthly rates					Standard deviation of trend-adjusted long-term monthly rates				
	68–70	71–73	74–76	77–79	80–82	68–70	71–73	74–76	77–79	80–82
United States	0.8	0.4	0.4	0.9	1.5	0.5	0.3	0.5	0.6	1.5
Canada	0.6	0.4	0.5	0.7	1.7	0.4	0.3	0.5	0.4	1.6
United Kingdom	0.8	1.2	1.0	1.0	1.4	0.5	0.9	1.1	1.0	1.6
Germany	0.9	0.8	1.2	0.9	1.0	0.8	0.7	1.2	0.8	1.0
Japan	0.3	0.6	0.3	0.8	1.0	0.6	0.7	0.4	0.9	0.9
France	0.7	0.5	0.4	0.7	1.4	0.3	0.5	0.7	0.8	1.1
Italy	1.1	0.5	1.7	0.5	2.5	0.6	1.1	1.1	1.0	1.9

[a] Secondary market yields for the United States, ten-year Federal Government bonds; for Canada, government bonds with maturities of ten years and more; for the United Kingdom, government stocks with maturities of twenty years; for Germany, public-sector bonds; for Japan, local-authority bonds; for France, public-sector bonds; for Italy, Treasury bonds.

Source: Bank of International Settlements, *Fifty-third Annual Report*, June 1983.

rates in the figure seem to exercise that function, and since the beginning of the 1980s the interest rates seem to have been converging again. Whether this is part of a cyclical or a long-term pattern remains to be seen.

From a comparison with Figure 4.30, which shows exchange rate movements, we can see that some time passed before the sharply diverging exchange rates affected expectations in such a way that the relative strength of the currencies showed itself in interest levels. This delay may have contributed to the significant deviation from Fisher's Open Relationship in the case of DEM and CHF which we observed in Chapter 4. In the case of the US dollar the explanation seems to lie in the change in economic policy after October 1979, involving a tighter monetary policy.

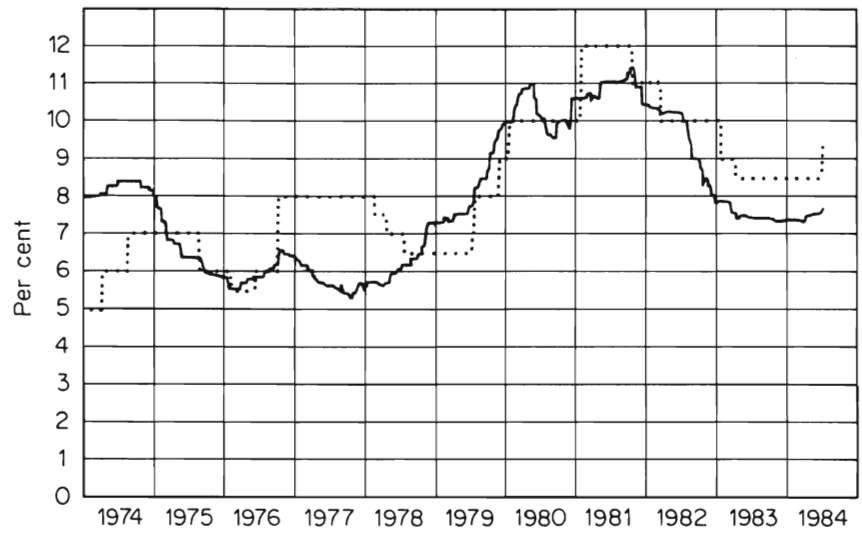
The upturn in the Swedish discount rate at the end of the 1970s, which is illustrated in Figure 5.2, started almost two years after the increase in the equivalent average for the OECD countries. The frequent increases between 1979 and 1981 were provoked by a growing foreign exchange drain. The Swedish central bank also hoped by these measures to encourage Swedish companies to borrow on the international capital market. Thus the frequent increases can be seen as an expression of a further change in policy as regards the discount rate on the part of the central bank. The close connection with the international market was acknowledged. This might mean fewer deviations in future from the various equilibrium relationships discussed in Chapter 4.

Figure 5.2 Swedish official discount rate *vis-à-vis* the weighted average of the OECD discount rates

Per cent per annum

····· Sweden

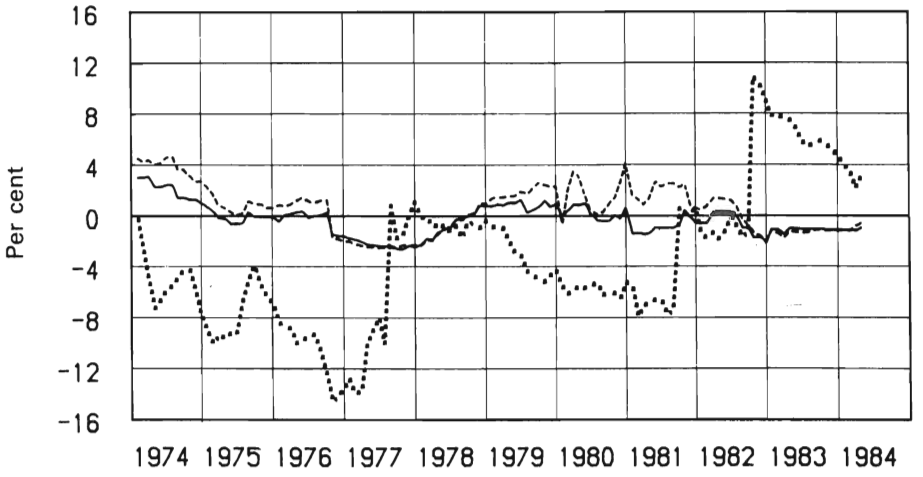
——— Weighted averge[a] for the 15 largest OECD countries



[a]An average based on weights from the capital flows weighting matrix in OECD Economic Studies, Spring 1984.

In discussing the discount rate as an economic political instrument let us look at Figure 5.3. In this figure we can see the movements of the differentials in discount rates and commercial bank prime lending rates. Both differentials are calculated as the difference between the weighted average of the rates for the 15 largest OECD countries and the corresponding Swedish rates. The weights used are taken from the capital flows weighting matrix presented in OECD (1984). Figure 5.3 also shows the movements of the Swedish krona compared with its purchasing power parity, as illustrated in Figure 4.8. The idea is to show how far the interest differentials, as aggregates, have balanced the deviations from purchasing power parity. This is an analysis of the same kind as Fisher's Open Relationship, at an aggregated level and according to our definition of that relationship. However, expectations are important. But if we assume that at *every* moment the actor on the market has to consider a potential correction of the deviation from purchasing power parity and corresponding claims for compensation in the interest rate differentials, then in a way we are taking expectations into account. Figure 5.3 reveals little indication of such a balance between deviations from purchasing power parity and interest rate differentials. Possible explanations could lie in the existence of political risks or of political guarantees of one sort or

Figure 5.3 Interest rate differentials and deviations from purchasing power parity
Per cent, monthly observations
——— Differences between the weighted average of discount rates in major OECD countries and the Swedish discount rate
-------- Differences between the weighted average of commercial bank prime lending rates in major OECD countries and the Swedish rate
····· The deviation of the Swedish krona from Purchasing Power Parity (see Figure 4.8).



another. Such guarantees could influence the claims for a big enough interest differential in the short term, but not the necessity for the central bank to have a big enough difference in their long-term economic political considerations. We might find evidence for such a hypothesis in the figure if we compare the movements of the two kinds of differential.

Figure 5.4 shows how the differentials in discount rates have counterbalanced the deviation of the Swedish krona from purchasing power parity. The Swedish krona has obviously had insufficient protection from the Swedish discount rate throughout almost the whole period 1974–81. After the devaluation that year it has been 'overprotected', under an assumption of a 1:1 relation between discount differentials and deviations from PPP.

In an efficient market the long-term prospects are discounted and here we can find a potential explanation for this apparent 'overprotection'. This means that the central bank has to take the discounted view into account in preventing an exchange drain. The discounted view is based on a kind of average of expectations geared to different time horizons.

If we also consider real interest in our global view of capital flows, we are no nearer an explanation of the deviations in Figure 5.4 unless we assume that the market participants have formed 'wrong' expecta-

tions on a basis of this rate. However, explanations may be found in differences between countries with regard to taxes (see, for example, Shapiro, 1984).

Provided that interest rate parity prevails, the covered Euro-dollar interest rate can be used to define a 'Euro-krona interest rate', i.e. a short-term interest rate outside national controls. Figure 5.5 shows the validity of this interest rate and of the corresponding rates for the other Euro-currencies in our study. If we compare the Swedish 'Euro-rate' in Figure 5.6 with movements in the Swedish discount rate and other Swedish rates based on the discount rate, we will see from the extremely jagged form of the curve that the 'stickiness' in the national rates might lead to deviations from interest rate parity. This agrees with observations which we have discussed earlier.

In the case of long-term loans, too, there are signs that Swedish interest rate policy has become more closely linked to interest rate movements on the international markets. Because of Sweden's growing need to import capital since the middle of the 1970s, domestic interest rate policy has obviously been based more closely than before on interest rate movements on the major national and international foreign exchange markets. This adjustment in interest rate policy has become increasingly marked, and intensive borrowing operations

Figure 5.4 The balance between discount rate differentials and deviations from purchasing power parity for SEK

Per cent, monthly observations

——— The differences between the weighted discount rate in major OECD countries and the Swedish discount rate minus the deviation for the Swedish krona from Purchasing Power Parity.

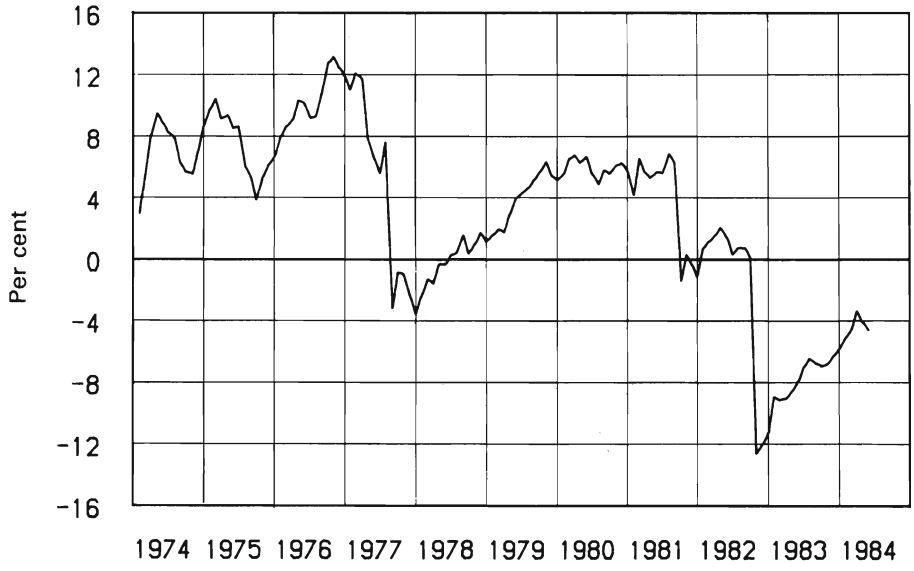


Figure 5.5 Three-month Euro-interest rates
Per cent per annum, weekly observations, Tuesday closing rates
——— GBP; ----- DEM; ····· CHF; ·-·-·- JPY; ——— SEK (derived)

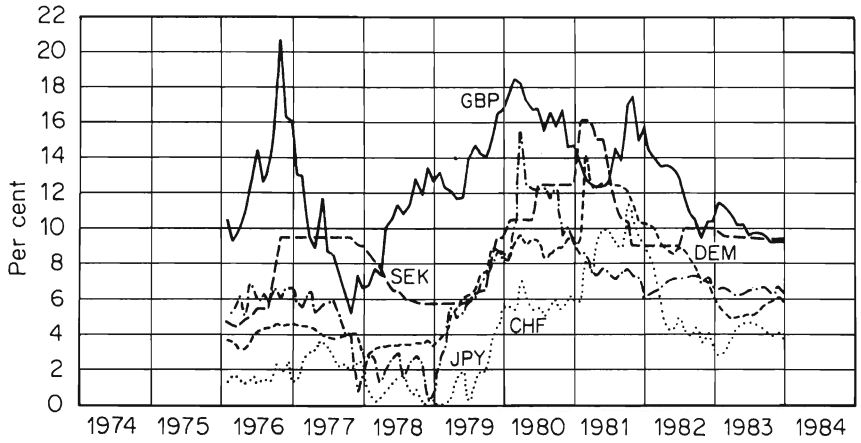
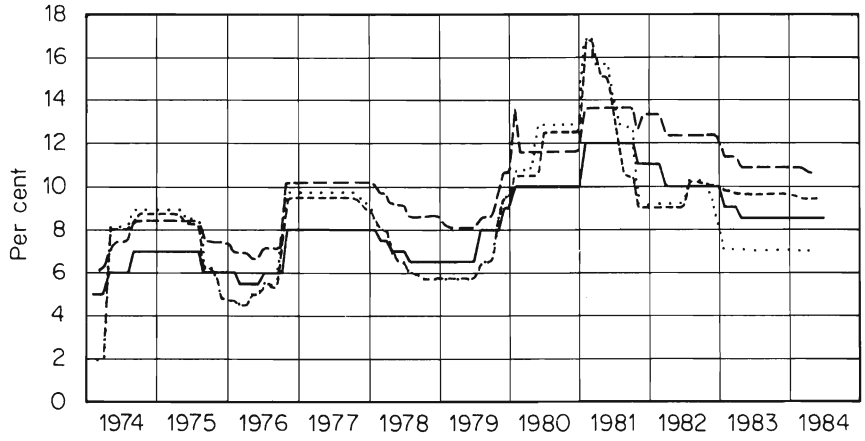


Figure 5.6 Rates of interest in Sweden
Per cent per annum, monthly observations, end of period
——— Discount rate[a]
-------- Euro-deposit rate (three months, derived)[b]
····· Treasury bill rate (three months, derived)[a]
·-·-·-·- Commercial bank prime lending rate (three months)[b]



[a]Administrative rates. (From July 1982 there was a change in the treasury bill rates due to the appearance of a second-hand market. In this figure the rates for the period after that date are estimated in accordance with the earlier definition.) [b]Market rates.

outside the national borders are affecting conditions on the domestic capital market.

How far the Swedish financial market is integrated is still an open question. Diminishing deviations from interest rate parity might indicate that the scope for an independent monetary policy has decreased. In macro modelling of the Swedish economy the small-country-

assumption is frequently used and the interest rate exogenously determined. No studies based on a Fisherian proposition has yet been carried out concerning the Swedish economy. The results of all studies of international financial market integration up today can be summarized as verifying the existence of significant linkages between financial markets, while not indicating levels of asset substitutability across markets which would be required to rule out the possibility of domestic policy having impacts on domestic interest rates. There are indications that no country appears sufficiently small so that the small-country-assumption appears a valid approximation.

However, despite the international integration both long-term and short-term differences in *real rate of interest* seem to prevail. In a short-term perspective (three-month rate) these differences between the block currencies have been considerable since the breakdown of the Bretton Woods agreement. During the 1970s the US rate was temporarily 5 per cent lower than the corresponding German rate. The early 1980s has exhibited a reverse pattern. These differences have been invoked by many researchers as the main explanation of the foreign exchange pattern over the last 10 years. Over long periods a fairly convincing correlation between actual changes in exchange rates and expected changes in the differential between real rates of interest could be found.

If we assume purchasing power parity, risk neutrality, uniformity in expectations and an immediate responsiveness to change incentives, then real interest rates can be expected to be the same. The theory is based on the assumption that the capital market is fully integrated. The presence of different types of currency regime suggests that this integration is far from perfect, as we have already seen in Chapter 4. Table 5.2 gives us some idea of the historical differences between real rates of interest in the form of bond yields.

Figure 5.7 shows systematic differences as regards real interest rates on industrial bonds; West German industrial bonds, for instance, obviously had the highest real interest rate throughout the 1970s. Even if the recorded rates of price increase are often poor surrogates for inflationary expectations, we can see temporary deviations in long-term real interest rates that violate many of the claims of economic theory. (Compare this with our discussion of the nominal interest rate as reflecting the expected rate of inflation.) The greatest differences appear in the years immediately following the breakdown of the Bretton Woods system. At that point the UK decided to adopt an expansive monetary policy, while West Germany and Switzerland preferred a restrictive policy. This gave rise to a new situation, with inflation differentials of which it was difficult to assess the size. Substantial differences are also visible immediately after the change in economic policy in the USA in October 1979.

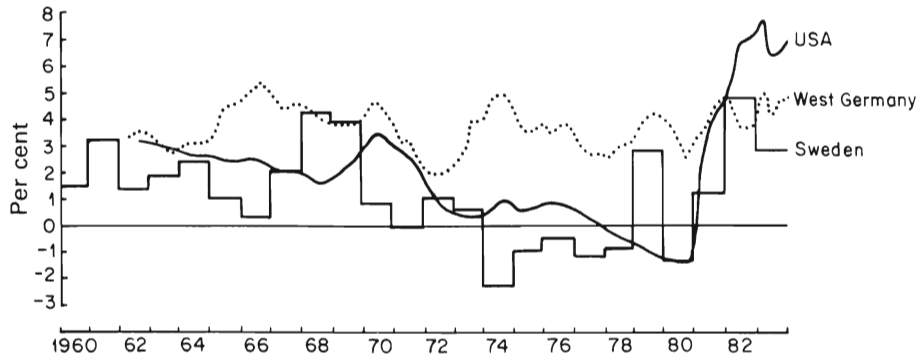
Table 5.2 Real bond yields

Items and periods	United States	Japan	United Kingdom	Germany	France	Italy	Belgium	Switzerland
	annual averages, in percentages per annum							
Real yields[a]								
1963–72 average	2.7	1.6	2.7	4.1	2.7	3.0	3.0	1.0
1974–77 average	0.3	−5.3	−3.9	2.8	−0.6	−5.7	−1.7	0.7
1979–82 average	1.8	3.6	0.5	3.7	1.6	−0.7	5.7	0.1
1980	−1.6	1.9	−4.5	3.0	0.6	−5.3	6.0	0.7
1981	3.2	2.9	2.1	4.7	3.1	−0.2	6.3	−0.3
1982	6.5	5.1	2.9	3.3	3.0	3.6	4.9	−1.1
1983 1st quarter	7.5	5.2	5.3	3.1	5.3	2.3	3.7	−1.3
Memorandum items:	in percentages							
Inflation rates[b]								
1963–72 average	3.2	5.7	4.8	3.2	4.6	4.3	3.8	4.5
1982	6.2	2.7	8.6	5.3	11.8	16.6	8.7	5.6
Real GNP growth rates								
1963–72 average	4.0	9.8	2.8	4.7	5.5	5.6	4.8	4.4
1982	−1.7	3.0	1.4	−1.1	1.8	−0.3	−0.7	−1.7
Budget deficits[c]								
1963–72 average	0.1	−0.2[d]	0.5	−0.0	−0.5	5.4	1.7	—
1982	3.8	4.1	1.6	3.9	2.9	12.0	12.2	—
1983[e]	4.5	3.4	2.5	3.8	2.3	11.6	10.7	—

[a] Representative long-term bond yields deflated by six-month moving averages of percentage changes over twelve months in consumer prices.
[b] Year-on-year increase in consumer prices.
[c] Net lending (—) by general government as a percentage of gross national product.
[d] 1965–72.
[e] OECD estimates and forecasts.

Source: Bank of International Settlements, *Fifty-third Annual Report*, June 1983.

Figure 5.7 Real interest rates on industrial bonds



Note: For West Germany and the USA the effective long-term rate on industrial bonds are given. They are deflated by annual averages of the consumer price index. For Sweden the lowest rate of issue is given, also deflated by the consumer price index.
Source: OECD, IUI

Table 5.3 Margins on long-term bonds
Per cent, per annum

Currency	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
USD	2.75	3.25	3.00	1.00	0.25	3.25	3.50	2.75	0.75	0.25
DEM	1.00	2.75	3.25	0.00	1.50	4.75	4.50	2.50	2.75	3.25
SEK	0.50	1.50	2.25	2.25	1.75	2.25	3.50	1.75	3.25	3.50

Table 5.3 shows how the *margin*, i.e. the difference between the interest rate and the discount rate, has changed during the 1970s on three bond markets. The table gives the minimum margins, derived from the annual average discount rate and the interest rate on bonds. The apparent cyclical variations in the USD and DEM margins can be interpreted as an expression of the time-lag in the long-term interest rate — another source of variation that has to be taken into account.

What can we say about price determination and the fixing of interest rates on the Euro-market? Euro-bonds carry fixed interest rates which can be expected to be somewhat lower than the interest rate on bonds on national markets (see Section 3.3). However, the actual issuing procedure is generally more expensive on this market than on the national markets. At the beginning of the 1980s the cost of issue for a general Euro-bond loan in USD for a first-class borrower (as opposed to private placement) was between 2 per cent and 3 per cent of the loan sum, with the exact interest rate depending on the sum and the length of the loan. These costs represent compensation to the lenders, the underwriters and the agents, the three groups which in different ways see that the loan is invested on the market. The average bond loan on the Euro-dollar market was USD 50 million.

'Floating rate' bond loans differ from ordinary bond loans mainly in that their interest rate is variable, following the short-term rate on the Euro-market. The interest rate margin here is usually about 0.25 per cent above LIBOR, which is the interest rate on foreign exchange dealings between banks on the Euro-market.

Euro-bank loans normally run at flexible interest rates, which can generally be changed every six months, and which are based on LIBOR. The borrower has to pay a certain margin over and above LIBOR. This margin reflects general market conditions and the borrower's credit status, and is somewhere between 0.5 and 3 per cent. (For a description of the procedures on the Euro-market, see Dufey and Giddy, 1978a.) The median value is between 1 and 2 per cent. In the contract the margin can be linked to various economic quantities, varying in size accordingly.

In an open market there will be a relation between short-term and long-term interest rates. The latter should be the same as the average of the expected future short-run rates. If it is not, the market forces would operate by way of speculation to see that it became so. Thus the interest rate on a six-month treasury bill should be approximately the same as the average of the present interest rate on a three-month treasury bill and the interest rate which the market expects on a three-month treasury bill in three months' time — assuming that the interest rate is free and is allowed to adjust to the market. If, for example, today's three-month treasury bill runs at 10 per cent interest and a six-month bill at 12 per cent, then the three-month treasury bill contracted three months ahead can be expected to run at 14 per cent, calculated as follows:

Expected yield at time 0 on an n-month treasury bill placed

$$\text{at time } t = \frac{\text{Present interest rate on a } (t+n) \text{ months treasury bill} \cdot (t+n) - \text{Present interest rate on a } t\text{-month treasury bill} \cdot t}{n} \tag{37}$$

Finally, during the last ten years many innovations have appeared in the world of interest rates. Over the last decade a good deal of inventiveness has been shown with regard to financial instruments; besides all the models of swaps, there have been many innovations recently in financial futures and options.

5.4 ADDITIONAL COST INDEX

To take one example, what did the deviation from Fisher's Open Relationship cost the Swedish borrower who turned to the internation-

al capital market between 1974 and 1984? A medium-term loan contracted at the beginning of 1974 and repaid at the end of 1979 cost the borrower slightly more than 20 per cent a year if the loan was denominated in CHF. Loans with the same conditions, but denominated in USD, JPY or SEK, had a yearly cost of only 5–7 per cent. Another way of measuring this is to specify an additional cost index. Just as the purchasing power parity index was an indicator of the validity of the Purchasing Power Parity theory, so the additional cost index can help us to test (with our definition) the Fisher's Open Relationship. From a base value of 100, an index number for every quarter is produced, expressing the extent to which the interest rate differential has counterbalanced exchange rate movements. Here the different countries are compared with Sweden, but that does not mean that comparisons cannot be applied to different combinations of countries. The index in Figures 5.8–5.11 expresses the effective additional cost of loans in foreign currencies compared with loans in SEK. A value greater than 100 means that it was more expensive to borrow in the relevant currency than to borrow in SEK. It is a question of three-month roll-over credits at the prime interest rate in the relevant currencies. The additional cost for a month is registered in the middle of the month in question.

Figure 5.8 shows that the cost of capital for a borrower who contracted a loan in CHF around the beginning of 1974 to mature at the end of 1983 was 85 per cent higher than if a corresponding loan had been contracted in SEK on the Swedish loan market. The figure also shows that an American borrower for that period would have had

Figure 5.8 Index of additional cost of borrowing in USD or CHF as compared to SEK, 1974–84
Monthly data, capital cost of the loan in SEK = 100

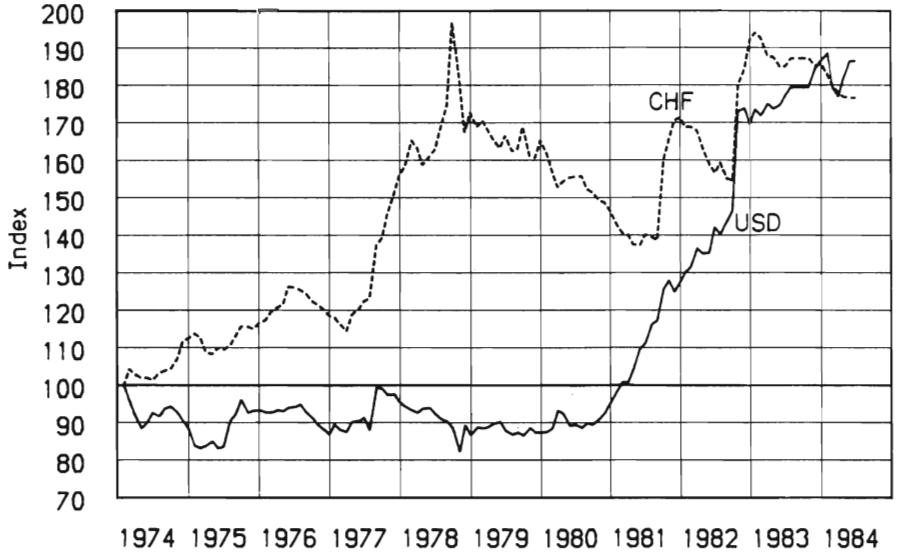
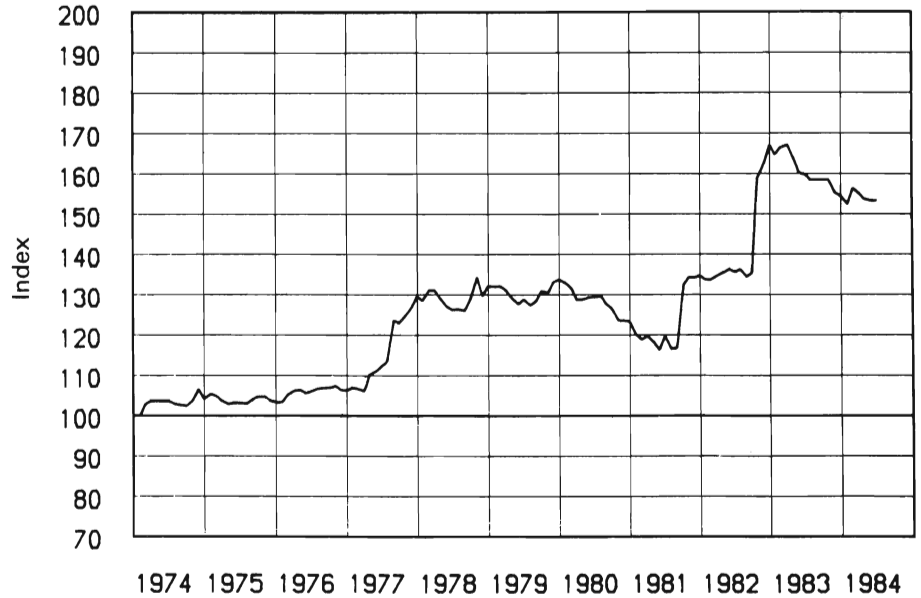


Figure 5.9 Index of additional cost of borrowing in GBP as compared to SEK, 1974–84
Monthly data, capital cost of the loan in SEK = 100

Figure 5.10 Index of additional cost of borrowing in DEM as compared to SEK, 1974–84
Monthly data, capital cost of the loan in SEK = 100



the same cost by borrowing in CHF rather than in USD. However, the distributions would have been very different. Thus, for instance, a loan in CHF cost more than twice as much as a loan in USD during the period from 1974 up to September 1978. For a new loan contracted for the same amount the Swedish central bank at that later date gave Swedish borrowers an opportunity to prepay foreign loans. Many Swedish companies who had poor experience of CHF as a loan currency switched to loans in USD, which could have been a very costly business. The situation resembles that of the Swedish shipyards which invoiced in USD and borrowed in CHF during the same period.

Figures 5.9 and 5.11 show that the cost of capital for a loan contracted in 1974 and settled at the end of 1979 would have been almost the same for JPY and GBP as if the loan had been placed in SEK.

An additional cost index for the 1970s as a whole shows only minor differentials at the beginning of the period. Noticeable differences start to appear in the middle of 1971. To complete the picture of the 1970s, it should be added that from the end of 1969 until the end of 1973 the additional cost for DEM was 20 per cent and for CHF and JPY 10 per cent. For GBP and USD it was minus 10 per cent and minus 12 per cent respectively.

Thus we can see from Table 5.4 that the interest differentials were not enough to counterbalance exchange rate movements. During the 1970s it was definitely more expensive to borrow in strong currencies

Figure 5.11 Index of additional cost of borrowing in JPY as compared to SEK, 1974–84
Monthly data, capital cost of the loan in SEK = 100

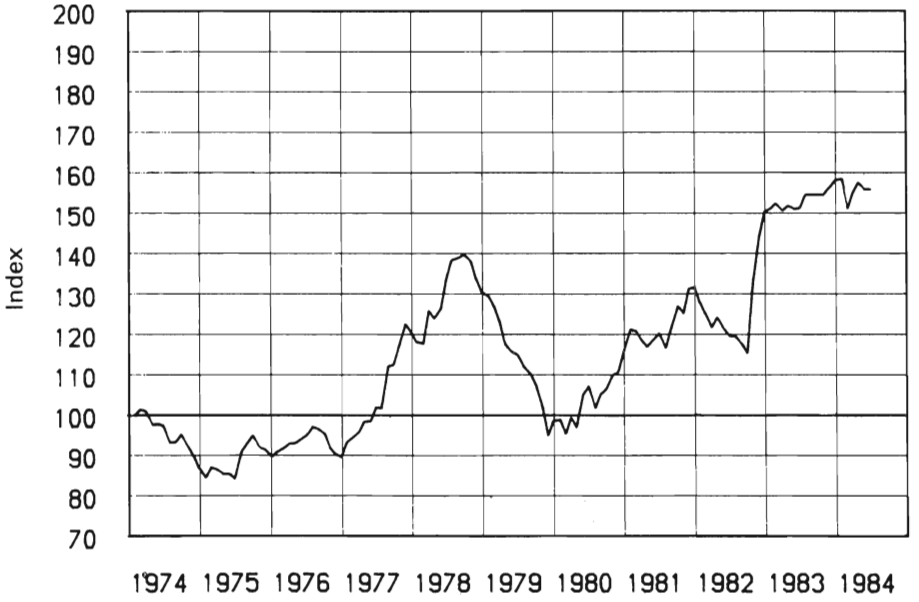


Table 5.4 Additional cost of foreign loans
Per cent per annum for a Swedish borrower

Currency	Period		
	1969/79–1979/80	1973/74–1979/80	1977/78–1983/84
GBP	−1.4	0.5	6.7
USD	−3.4	−2.1	11.7
DEM	3.7	4.9	2.8
CHF	5.0	8.7	1.9
JPY	0.0	−0.5	4.7

than in weak ones with slightly higher rates of interest. This is a reflection of what can be observed on the national level, namely that real interest rates are usually especially low in times of high inflation. A look at the situation in the USA in the middle of the 1980s also shows just how inadequate an indicator of a weak currency high interest rates can be, if interpreted in a stereotyped manner.

However, since the third quarter of 1978 there have been long periods when it has been more expensive to borrow in the strong currencies than to borrow in SEK. From this point in time and up to the Swedish devaluation in 1981 it was considerably cheaper to take up loans in currencies stronger than SEK and especially stronger than GBP (regarded here as a weak currency). For that period it would have cost 15 per cent less to borrow in JPY, with the above-mentioned loan construction, compared with borrowing in SEK, and around 25 per cent less to borrow in CHF. To borrow in GBP during the same period would have meant an additional cost of 28 per cent.

Table 5.5 shows the additional cost as an annual percentage divided between exchange rate movements and interest rate ratios. We can see, for example, that since the end of 1969 a loan in DEM during the 1970s has increased by an average of 5.4 per cent each year owing to exchange rate movements, and that this rise has been insufficiently balanced by the interest rate differential. On an average these interest rates were 1.6 per cent lower in West Germany than in Sweden during the relevant period. It can also be seen that a loan in USD during this period would have contributed to a gain from exchange rate movements and from the interest rate relationship. The distribution of the components in the additional cost from Table 5.5 should be noted and borne in mind when we discuss the accounting of the capital cost of foreign borrowing below. An interesting feature in Table 5.5 is the distribution of cost between GBP and USD on the one hand and DEM, CHF and JPY on the other. The generation of an additional cost (gain) on both the exchange rate and the interest rate sides may be typical of the currency of a country with a tight monetary policy, while under

Table 5.5 Additional cost of foreign loans for a Swedish borrower—separated into an interest rate part and a foreign exchange rate part
Per cent per annum

	Period					
	1969/70–1979/80		1973/74–1979/80		1977/78–1983/84	
Currency	Change in exchange rate	Interest rate	Change in exchange rate	Interest rate	Change in exchange rate	Interest rate
GBP	−3.0	1.6	−1.8	2.2	4.5	2.1
USD	−2.6	−0.8	−0.8	−1.3	9.5	2.0
DEM	5.4	−1.6	8.0	−2.9	4.7	−1.8
CHF	8.5	−3.2	12.9	−3.7	8.0	−5.6
JPY	2.1	−2.1	2.7	−3.1	9.9	−4.7

Table 5.6 Actual cost in local currency on loans on the Swiss bond market for borrowers from different countries
Per cent per annum of the original amount borrowed

Maturity	1969/70–1979/80	1969/70–1974/75	1972/73–1979/80	1974/75–1979/80
Loan conditions at the beginning of the period	6.5	6.5	6.25	8.25
Actual loan cost for borrowers from				
USA	18.6	15.8	18.8	20.5
United Kingdom	19.0	19.1	19.9	21.0
West Germany	9.5	9.3	10.7	11.9
Japan	12.2	12.7	14.7	12.2
Sweden	15.5	12.6	18.3	18.3

other types of economic policy the two sides counterbalance each other instead of going in the same direction.

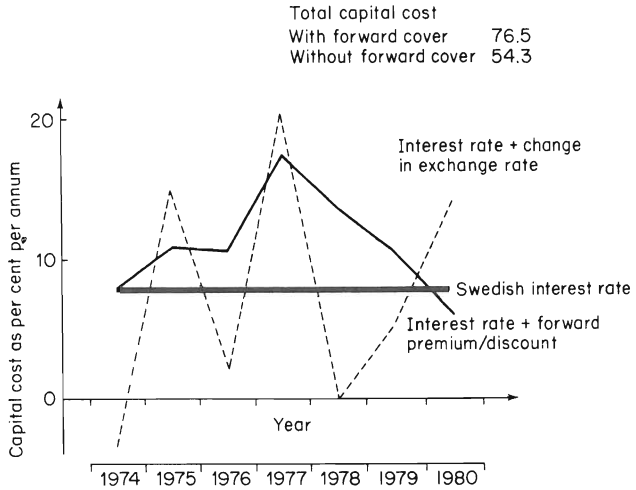
So far our analysis has been concerned only with the additional cost involved in choosing one currency rather than another. Obviously, however, the total level of costs is also interesting. To illustrate this question the cost of loans taken up on the Swiss bond market during the 1970s are shown in Table 5.6.

5.5 THE COST OF HEDGING A LOAN — AN EXAMPLE

Figure 5.12 illustrates loans contracted in USD and SEK on the conditions applying at the end of 1973 on the international capital

Figure 5.12 Example of the capital cost of a loan in USD, covered on the forward market, and a loan in SEK

Capital cost as per cent of the amount originally borrowed



market. The cost of capital is reported with, and without, use of the forward market. The length of the loan is assumed to be seven years. A forward contract of this length is difficult to get on the Swedish forward market. Even if it had been possible technically speaking, it would not have been compatible with current currency regulations. The forward hedging alternative is given here on account of its interest to our subsequent discussions, and it has been calculated on the assumption of rolling six-month hedging and interest rates. To allow for comparison, the interest rate for an equivalent loan contracted on the Swedish loan market is included in the figures.

The figures show the cost of forward hedging and the cost of the unhedged alternative. For loans in USD, forward hedging would have given an additional cost of about 22 per cent of the original loan sum, compared with the unhedged alternative. Thus in this case the small profit which could have been obtained by taking up the loan in USD rather than in SEK was transformed into a loss as a result of hedging.

Chapter 6

Main approaches to foreign exchange accounting

6.1 INTRODUCTION

Having analysed the fluctuations on the financial market and discussed some of the forecasting problems in Chapters 4 and 5, we can now turn to the question of the foreign exchange accounting.

In this chapter we will examine certain trends in the accounting of exchange rate differentials. These differentials are of two kinds: exchange rate differentials on claims and debts for individual companies, and differentials in the translation of the financial statements of foreign subsidiaries in the consolidated accounts.

Section 6.2 provides a short recapitulation of the problems involved.

In Section 6.3 we will examine the principles that apply internationally. We will also discuss the extent to which new principles have answered the objections raised against the old ones. Because of the interest aroused by FASB 8 and the debate that this has generated, our discussion will focus chiefly on this statement, and on ways in which its successor, FASB 52, can be regarded as an improvement. In this section we will also pay special attention to the principles laid down in the United Kingdom and Canada, and by the International Accounting Standards Committee (IASC).

6.2 RECAPITULATION OF THE PROBLEMS INVOLVED

In foreign exchange accounting two major issues can be identified. The first concerns companies which carry on transactions in foreign currencies; how should these transactions be translated into the reporting currency of the company and subsequently be entered in its accounting records? The second issue concerns parent companies, which have to prepare consolidated financial statements and to report their own financial performance and that of their foreign subsidiaries.

The central question here is how to translate the foreign subsidiary's balance sheets and profit and loss accounts into the parent's currency.

Foreign currency transactions are usually translated at the spot rate on the date at which the transaction is booked. In cases where forward cover is taken, the underlying transaction may be booked at the forward rate instead. If the exchange rate at settlement differs from the exchange rate used to record the transaction, the result in both cases will be a gain or a loss.

The average exchange rate for a period is usually used to translate profit and loss accounts. The rate on the date of the original transaction is used as an alternative. The translation of the subsidiary balance sheets involves two main problems: the choice of a translation method and the treatment of associated gains and losses. As regards the first of these, two choices are at present available: the historical rate or the closing rate. If the historical rate is chosen, assets and liabilities are translated at the spot rate on the date when the assets and liabilities were acquired, or at the spot rate on the date of any subsequent revaluation. If the closing rate is used, assets and liabilities are translated at the spot rate on the balance sheet reporting date. If there is a change in the exchange rate between balance sheet dates, there will be translation gains and/or losses for items translated at the closing rate.

The application of this choice to each balance sheet asset and liability has generated many different translation methods. The four basic translation methods are shown in Table 3.3 and were also discussed in Chapter 3. The difficulties inherent in foreign exchange accounting are illustrated in Figure 6.1.

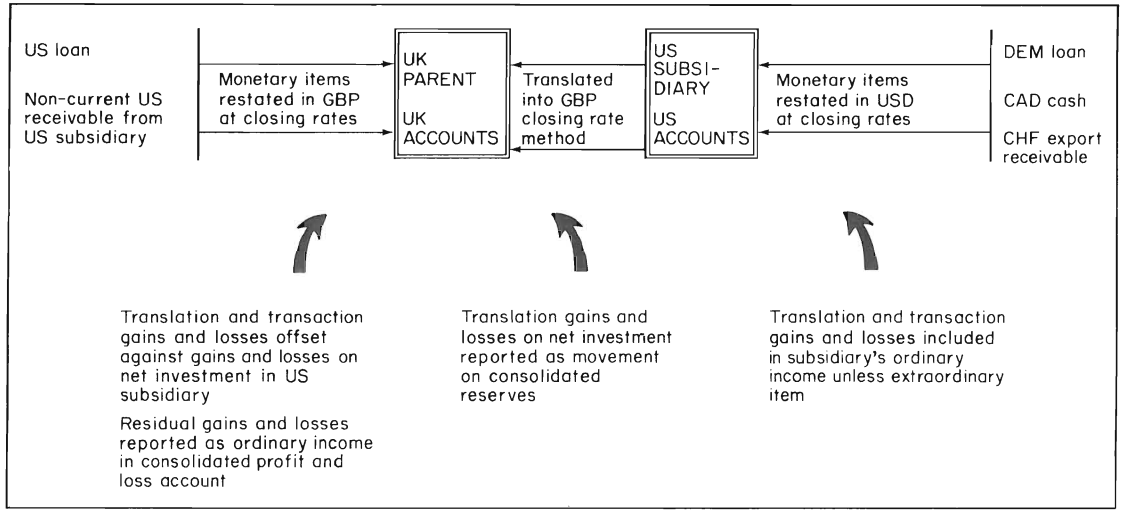
6.3 INTERNATIONAL APPROACHES

In this section we will analyse some major principles. We will start from the period following the breakdown of the Bretton Woods agreement, and will see how the main principles have evolved and what criticisms have led to the development of new principles. We will focus first on developments in the United States and the United Kingdom.

In many countries experience of the workings of FASB 52 are being awaited with some excitement. In Europe considerable uniformity in accounting practice with regard to foreign currencies has emerged — a remarkable fact in view of the diversity of legal and accounting regulations in the different countries.

As regards individual foreign currency transactions and those relating to the translation of foreign currency financial statements, practice in the various countries can be regarded as uniform. Taxation law and

Figure 6.1 Examples of problem areas in foreign exchange accounting
The example refers to the UK



taxation principles have long been ingrained in continental European accounting. As regards foreign currency translation for gains and losses, however, practice is somewhat varied.

In translation, the closing rate method appears to have gained the widest acceptance. The closing rate method is often used in countries that rarely practise consolidation — primarily because it is the simplest method to understand and the easiest to calculate. This method tends to produce translation gains rather than losses in traditionally soft-currency countries.

The International Accounting Standard Committee (IASC) decided to discontinue its efforts to establish an international norm for foreign exchange accounting until FASB had concluded its deliberations. Once FASB 52 had appeared, IASC presented their proposal in March 1982. We will discuss their contribution later in this section.

During 1978 the fourth directive on company law was passed by the EEC, including rules for the evaluation of assets and debts. However, there is no explicit mention of the evaluation of claims and debts in foreign currencies. Nonetheless Article 41 is of interest in this context. It runs as follows:

> 1. Where the amount repayable on account of any debt is greater than the amounts received, the difference may be shown as an asset. It must be shown separately in the balance sheet or in the notes on the accounts.
>
> 2. The amount of this difference must be written off by a reasonable amount each year and completely written off no later than the time of repayment of the debt.

Article 41 apparently also applies to debts in foreign currencies, a point which is of special interest in our present context. Thus in the Common Market countries, losses on foreign loans can be spread over the remaining lifetime of the loan. In these countries the inclusion of exchange gains on unrepaid debts in foreign currencies in the year's result is not generally allowed. Taken together, the fourth and seventh EEC Directives require the disclosure of the bases used to translate foreign currency items, although neither directive prescribes the translation method to be used or the treatment of exchange gains and losses. (A more prescriptive approach is taken by the EEC Commission in its proposed directive relating to the financial statements of banks.)

Other international organizations such as UN and OECD have not issued any statements about foreign exchange accounting and reporting.

6.3.1 Development in the US standards

The American Accounting Committee FASB published a statement in 1975 (Financial Accounting Standards Board, 1975; Accounting for the translation of foreign currency transactions and foreign currency financial statements, *Statement of Financial Accounting Standards, No. 8*, Oct.), which triggered a good deal of controversy and aroused much negative criticism. According to this statement the temporal method, which has been roughly described in Chapter 3 above, should be used. It also meant that American companies should account for all gains and losses on the translation of claims and debts in foreign currencies in the profit and loss account for the quarter in which the change in exchange rate had occurred.

FASB 8 required that when a company was translating monetary assets and liabilities (e.g. cash, accounts receivable, accounts payable, accrued expenses and debt) contained in its foreign financial statement, it should use the 'current exchange rate' (the closing rate). This rate is defined as the rate in effect on the balance sheet date. In translating other balance sheet accounts (mainly nonmonetary assets and liabilities such as inventory and fixed assets) from the local currency into the reporting currency, the historical exchange rate should be used. Accordingly, when exchange rates alter during a reporting period, a company will report a translation gain or loss measured in relation to its net monetary position at the beginning of the period. Thus a translation adjustment flowed through the current period's income statement.

If the company's foreign operation is leveraged, for example, the foreign unit would probably have a net monetary liability position (i.e. a short or negative position in foreign currencies). Assuming that the foreign currency appreciated in relation to the reporting currency, the parent company would report a translation loss. This result appears because net liabilities are translated at the higher rate prevailing on the balance sheet date, while net nonmonetary assets are translated at the lower historical rate and cost. This translation loss could be designated as a pure 'accounting loss'. Under FASB 8 it would be charged against current income.

One argument *in favour of* FASB 8 was that nonmonetary assets carried on a historical cost basis should not be translated at the closing rate, because the recognition of gains and losses on assets accounted for at that cost is usually deferred until the assets are sold, or their costs are in some way deducted from operating revenues.

One argument *against* Statement No. 8 was that it failed to recognize the increase in the future net-revenue-generating capacity of the nonmonetary assets in terms of US dollars or the parent company's currency.

This translation problem can be illustrated in two simple examples, illustrating two dimensions of the problem. Negative figures are placed within brackets.

Example 1

— Assume that a German subsidiary of a US multinational borrows USD 60 million in DEM. The purpose behind the loan is to finance the construction of a factory, which will cost USD 80 million in DEM. The parent company is providing USD 20 million.

— Assume that the DEM appreciates 10 per cent against the US dollar.

	FASB 8	*With acceptance of an increase in nonmonetary assets*
Debt before appreciation	(USD 60)	(USD 60)
10 per cent appreciation of DEM	(6)	(6)
Debt after appreciation	(USD 66)	(USD 66)
Factory before appreciation	USD 80	USD 80
10 per cent appreciation of DEM	—	8
Factory after appreciation	USD 80	USD 88
Translation gain (loss)	(USD 6)	USD 2

Example 2

Demonstrating the effect of translation on a company's profit margin.

— assume the average rate for the period to be	0.40
— assume the historical rates for inventory to be	
— at the beginning of the year	0.35
— at the end of the year	0.38

	Local currency	*Rate used*	*US dollars*
Revenue	700	0.40	280
Cost of goods sold:			
Opening inventory	500	0.35	175
Purchases	400	0.40	160
	900		335
Ending inventory	500	0.38	190

	Local currency	*Rate used*	*US dollars*
Cost of goods sold	400		145
Gross profit	300		135
Gross profit	43%		48%

The result of translation as shown in Example 2 will be the same in the case of the balance-sheet account ratios, such as current and debt to equity ratios. The ratios in terms of USD will not reflect the ratios that exist in terms of the foreign currency financial statements, because historical rates are used to translate nonmonetary assets but current rates are used for monetary assets and liabilities.

Since the international recommendations which are being discussed widely at the present time are influenced by FASB 8, there seems good reason to examine the objections which have been raised to this statement, and to take these as a point of departure in our search for better solutions. As a result of the various criticisms, a group was appointed in the USA in 1979 to revise FASB 8. In August 1980 this group presented a new draft. In December 1981 the US Financial Accounting Standards Board issued a new Statement, No. 52, to replace its controversial Statement No. 8. The new statement was adopted by a 4–3 vote of the FASB board, which reflected the controversial nature of foreign currency translation.

The *criticism of Statement No. 8* centres on the basic issues of the unrealistic economic results produced, the reporting of unrealized gains and losses, and the effect on corporate operational policies. The weakness of the Statement lies in its espousal of the temporal translation method, which distorts the relationship between the monetary and nonmonetary accounts by stating the monetary balances at current values and the nonmonetary items at rates measured in terms of historic purchasing power and historic foreign exchange values. In this context the closing-rate method must be said to be more consistent with the entity accounting concept. The criticism of FASB 8 was directed mainly at the powerful fluctuations in the reported profit or loss which the method engenders. Because of these fluctuations, which have no equivalent in the cash flow, the company's growth possibilities are difficult to forecast from the reports.

The variations in results arise because all exchange gains and losses are incorporated into the profit and loss account. Many American

companies turned increasingly to hedging transactions, in order to reduce the variations, partly because it was felt that the variations in results were probably generating equivalent fluctuations in share prices.

Since the introduction of FASB 8 American companies have made increasing use of *external* hedging, such as hedging on the forward market. Evans, Folks and Jilling (1978) report:

> Firms have begun to use forward contracts to cover accounting exposure more extensively since January 1, 1976.
>
> Firms also reported that the volume of their forward contracts has expanded substantially.
>
> The use of forward contracts has increased more at those firms that were required to change substantially their accounting practices to confirm to FASB Statement 8.

Since the changeover to FASB 8, US companies have incurred costs for reducing accounting exposure, some of which they cannot expect to cover by equivalent revenues — transaction costs and risk premiums, for example. A situation can then arise, in which the banks perhaps increase their revenues, while companies are incurring higher costs, and all this can affect the willingness to invest.

As a result of the hedging operations, a book profit, a translation differential, is often covered by a real cost or loss with a consequent drain on liquidity. Evans, Folks and Jilling (1978) report widespread agreement in the companies included in their study as to the misleading effect of this on the company's various stakeholders. The following are their figures:

> Currently prevailing accounting principles mislead management, stockholders, and security analysts, because the cost of protection against exchange rate changes is not separately identified, while exchange gains and losses can be highly visible in the consolidated income statements of multinational corporations.

	Strongly agree	*Agree*	*Not sure*	*Disagree*	*Strongly disagree*	*No response*
Percentage	47.4	35.9	10.3	3.8	1.3	1.3

The changeover to FASB 8 is also said to have affected policy-making; for example, planned investments have not been made. Evans, Folks and Jilling conclude that:

> it is evident that the particular accounting standard in use, Statement No. 8, did have an impact on the way that firms manage foreign exchange.
>
> Statement No. 8 has had an impact on foreign investment policies. Some firms reported that they have refrained from making investments that were otherwise acceptable. Others have adjusted their 'hurdle rate' due to exchange risk.

Underlying the first of these conclusions is a suspicion that the emphasis has been transferred from economic exposure, which is so important to the company, to accounting exposure.

Finally, let us look at the attitude to FASB 8 of the 156 multinational American companies which took part in Evans, Folks and Jilling's study:

> Our company needs a more flexible method of translating foreign currency balance sheet items than FASB No. 8.

	Strongly agree	*Agree*	*Not sure*	*Disagree*	*Strongly disagree*	*No response*
Percentage	38.5	21.8	26.9	7.7	4.5	0.6

In conclusion, many individuals believed that FASB 8 failed to reflect adequately the underlying economic reality of foreign operations and distorted 'real operation results'. These individuals argued that the Statement provided misleading and useless information. According to this Statement, management was forced to make uneconomic financing decisions, such as replacing a low interest debt in a country with a strong currency by a high interest debt in a country with a weak currency, and to use cash to hedge 'paper' accounting losses.

The new *Statement, No. 52*, was designed to adjust those parts of Statement No 8 that drew so much fire: (1) the requirement that all translation and transaction gains and losses be reported on income statement, and (2) the monetary/nonmonetary method or the temporal method of translation. FASB 52 replaces the temporal method of translation by the closing rate method (current rate method) in a

two-step process, allowing more managerial discretion in three areas, namely the definition of the functional currency, application to subsidiaries' operations in hyper-inflationary economies, and the treatment of transactional gains and losses on investor/investee transactions.

Furthermore, three assumptions attach to the *functional currency* approach. These are: (1) an enterprise may operate and generate cash flows in a number of separate economic environments; (2) each of the enterprise's operations can be identified as operating in one primary economic environment; (3) the enterprise may commit itself to a long-term position in a specific economic environment. The determination of the primary economic environment for each foreign operation is the first critical issue to be faced when it comes to implementation. There will be a fundamental problem in the translation of foreign currency financial statements when nonmonetary assets are translated at current exchange rates and the functional currency is highly inflationary.

In cases where the local currency is designated as the functional currency of an operation, the closing rate method of translation is to be used. Where the US dollar is the functional currency, the old method will continue. The situational approach separates the cases where the foreign operations are an extension of the parent company's operation. If the foreign operations depend on a parent company, then the functional currency is the parent company's currency. The functional currency is the foreign currency if the foreign operations are independent of the parent company. To provide relief for companies operating in highly inflationary economies, FASB 52 allows the US dollar to be used as the functional currency. FASB decided, as a practical solution, that if a country has cumulative inflation of approximately 100 per cent or more over a three-year period, local currency financial statements must be remeasured using the reporting currency (e.g. the US dollar) as the functional currency.

Under FASB 52, the current rate is used to translate all foreign assets and liabilities and a weighted average rate is used to translate all foreign revenue and expense items. If the foreign assets and liabilities are part of an ongoing foreign operation and are not an extension or an integral component of the parent company's operations, the translation adjustment related to the foreign net assets is included as a separate component of stockholders' equity and is not included in net income.

Of central importance is the argument that the translation adjustment is not expected to be converted into the reporting currency in the foreseeable future, and that it arises only in the process of translation for the purpose of consolidation. This translation adjustment is ex-

cluded from the determination of net income for the period in which the change in exchange rate occurs. The translation adjustment does not affect functional currency cash flows and is unrelated to the determination of net income for the foreign operation, and it would continue to be reported as a separate component of stockholders' equity until:

- the foreign operation is sold, or
- there is a substantial or substantially complete liquidation of the net investment in the foreign operation.

In these cases, the accumulated adjustments would be reported currently in income insofar as they refer to sale or liquidation. The basic idea is that translation adjustments which are remote and whose realization is uncertain should be excluded from the determination of income and allowed to flow direct into stockholders' equity.

The translation adjustments are regarded as comparable to undistributed earnings. A foreign currency transaction involves: (1) a foreign bank account; (2) the billing of export sales; (3) the purchase of imported goods; (4) loans arranged with foreign financial institutions; (5) intercompany transactions and; (6) forward exchange contracts.

A foreign operation is measured in its own functional currency under FASB 52. Substantially different financial statements could result from using FASB 52 rather than FASB 8, if a company has many foreign operations. In many cases net translation adjustments will be significantly reduced, changing from gains to losses or vice versa, and will be reported in stockholders' equity rather than in income. The *expected improvement* is that since the unrealized mathematical balance-sheet translation gains and losses are not acknowledged in income, the short-term fluctuations in currency rates will no longer do so much to obscure those long-term income trends which are more relevant to forecasts of profitability and the company's return on capital.

There are also special regulations for the reporting of forward exchange contracts, and the disclosure of the net sum of exchange gains and losses other than translation differentials which have affected the net result for the period.

According to FASB 52, gains and/or losses on long-term loans in foreign currencies should be disclosed in a separate component of equity, when the loans are to be regarded as cover for an investment in a foreign subsidiary.

And what can be said of the practical *experience* of FASB 52 to date? The Statement has been criticized, mainly because it is believed that including the translation adjustment in the equity section rather than in

the income determination, represents an erosion of the clean-surplus concept. Because of this 'weakness' FASB 52 is said to provide false, misleading signals, severely damaging the credibility of financial and accounting reporting (Wojciechowski, 1982): (1) by misrepresenting the US dollar cash flow; (2) by misrepresenting the results of operations; (3) by failing to equate accounting with economic exposure; and (4) by failing to provide meaningful information to management as a basis for business decisions. A disregarded feature of the closing rate method is its impact on international management-performance evaluation systems. Fluctuating investment values and depreciation charges do not produce meaningful rate-of-investment (ROI) results, for assessing alternative investment opportunities, for example, or for comparing the profit contribution of domestic and foreign operations.

Another criticism from US multinationals is that the Statement measures net investment in the foreign subsidiary in terms of US dollars, but measures individual assets and liabilities in the local foreign currency. Among the problems following the adoption of the Statement, we can expect difficulties in comparing return-on-equity figures for the multinational corporations, complications in making projections, and the necessity of providing more explanations and greater disclosure in financial statements. Furthermore, the 'foreign currency = local currency' approach seems to be realistic when cash is not repatriated periodically. FASB 52 also maintains the illusion of a stable monetary unit, but abandons it when inflation rages.

The future will provide more experience. So far we can note that the exclusion of foreign currency adjustments has provided a practical solution to the problem of uncertainty in the amount and timing of realization. However, if comprehensive income is to be truly comprehensive, then the fact that an item has not been realized is insufficient reason to justify exclusion from income. FASB 52 could simply be modified to treat translation adjustments as income, but with full and fair disclosure as a separate component of income. Alternatively, FASB 52 could stay intact without modification, but could be treated as a justifiable exception to the comprehensive income concept.

The criticism of FASB 52 discussed above illustrates the price to be paid for a reduction in the volatility of reported earnings, which characterized Statement No. 8. We have here an incentive to look for alternative ways of handling the foreign exchange accounting problems.

6.3.2. Development in the UK standards

The UK Exposure Draft 16 (September, 1975) specified that translation and conversion differences should generally be reported in the profit

and loss account. However, it did not require companies to adopt a particular translation method. The next exposure draft, No. 21, 'Accounting for foreign currency translation', was more detailed, permitting only the closing rate or temporal method in translation.

The purpose of consolidation is to report the financial results of a group of companies as if it were a single entity. Accordingly, similar accounting items should be uniformly treated on a common accounting basis. The application of the closing rate method to a historical cost accounting system does not satisfy this requirement. ASC gave in ED 21 a warning, that using the closing rate to translate a nonmonetary asset (denominated in foreign currency and carried at historic cost) results in a meaningless number, which is neither historic cost nor current value. In a historical cost accounting system the temporal method is conceptually appealing, as it is consistent with underlying accounting principles and satisfies the purposes of consolidation. However it does result in misleading exchange differences and, as the US experience of FASB 8 has shown, can lead to both an increased volatility in earnings and an unattractive behavioural reaction on the part of financial managers.

ED 21 was replaced by ED 27 in October 1980. In essence, the proposals in ED 27 were as follows: foreign subsidiary balance sheets to be consolidated by the closing rate method, unless the foreign operation is a direct extension of the parent company — in which case the temporal method of translation should be used; foreign subsidiary profit and loss accounts to be consolidated at the average rate for the period; transaction exchange differences to be included in the operating profit for the year; translation exchange differences to be treated as a movement on reserves.

Exchange differences on foreign currency borrowings can be offset only against differences on translating net overseas investment, and be reported as a movement on reserves only to the extent that a parent company borrows a foreign subsidiary's local currency to finance an equity investment in that subsidiary.

The situation in the UK in 1984 is based on SSAP 20, 'Foreign currency translation', April 1983, which corresponds to ED 27 with some significant changes. The recommended base is still the 'net investment concept'. This concept applied to foreign exchange accounting can be summarized as follows: exchange differences from translating non-local-currency denominated monetary assets/liabilities should be included in local currency operating profit. The differences will then flow through to the consolidated profit and loss account. The exchange differences from consolidating foreign subsidiary financial statements should be treated as reserve movements.

According to statements in the UK in 1984, the foreign subsidiary balance sheet should be consolidated by the closing rate method,

unless the foreign operation is a direct extension of the parent company — in which case the temporal method should be used. The aim of the temporal method is to translate the transactions and balances of the foreign entity as if they had been undertaken direct by the parent.

To achieve this objective: (i) nonmonetary assets, e.g. fixed assets and stock, are translated at the historical rate; (ii) monetary assets and liabilities, e.g. debtors and creditors, are translated at closing rate; (iii) profit and loss account items are translated at appropriate historical rates; (iv) exchange differences are included in profit before taxation.

According to SSAP 20, the main purpose of cover in the parent company's accounts is to allow gains on translation of investments to be set against losses on borrowings. Hence there is a departure from the principle that nonmonetary assets be translated at historical costs. As a matter of prudent business practice, companies will seek to limit their exposure to foreign currency fluctuations by matching foreign currency assets with liabilities in the same currency and vice versa. Thus a translation deficit will be automatically offset by a translation surplus on the liability.

The US FASB 8 was much criticized (prior to its replacement by FASB 52) for prescribing an accounting treatment which failed to recognize this commercial reality.

The offset procedure in the consolidated accounts according to SSAP 20 means that the surplus incorporated in the consolidated accounts arises from retranslation of the underlying net assets, rather than the original investment.

6.3.3 Comparisons of international recommendations or statements

Let us now compare different major proposals or statements on the subject of foreign exchange accounting. We have discussed the situation in the USA and the UK above. Let us also look at the situation in Canada. The Canadian Institute of Chartered Accountants (CICA) decided not to put into effect a recommendation of their own (CICA 1978), until the situation in the USA had been clarified. The CICA recommendation of 1978 would have brought Canadian companies more in line with the original FASB 8, except as regards the treatment of losses on long-term loans in foreign currencies. According to CICA 1978 these losses should be distributed over the remaining lifetime of the loan. Just this right to spread exchange losses on long-term loans, was the subject of particular attention in the revision of FASB 8. We

will here study section 1650 from CICA, June 1983. A fourth, IAS 21, proposal which can be included in our comparison comes from the International Accounting Standards Committee (IASC), July 1983.

Let us start by comparing recommendations or statements referring to *assets and liabilities in foreign currencies*. The situation can be summarized as in Table 6.1, where we can see that evaluation at the closing rate is recommended in all four of the proposals under consideration. As regards the treatment of exchange rate differentials, there is also agreement that these should generally be included in the income statement.

As can be seen from Table 6.1, CICA's recommendation is very close to FASB 52. The main difference is that, according to CICA, exchange rate differentials on long-term items *must* be amortized over the remaining period of maturity of the item, and there is a slight difference in an explicit section, 'Hedge of monetary assets and liabilities'.

ASC and IASC differ from FASB and CICA, mainly in their treatment of forward foreign exchange contracts. IASC deviates also from the other three in allowing special treatment of exchange losses due to devaluation or in connection with loans for the acquisition of an asset.

As regards the *consolidation* process, different concepts are used, as can be seen in Table 6.1. There is agreement in the choice of translation method for financial statements in integrated companies, i.e. foreign entities whose business is so closely interlinked with that of the parent company that it should be regarded as a direct extension of it rather than as a separate or quasi-independent business of its own. The temporal method is recommended by all four organizations. The consensus also includes the treatment of exchange rate differentials in such companies. Slight modifications can be seen in the table.

In the case of translation in companies that cannot be described as integrated, the use of the closing rate is recommended by all four organizations in non-hyperinflationary situations. In hyperinflationary situations FASB and CICA recommend the use of the temporal method, while ASC and IASC recommend recalculation at current cost and translation at the closing rate. The definition of hyperinflation differs, as the table shows, and FASB is the only one to specify the concept in figures.

Exchange rate differentials (i.e. the translation adjustment) in the case of the non-integrated companies are presented in the equity section rather than in the income determination, according to the recommendations of all four organizations, in situations that cannot be described as hyperinflationary.

Table 6.1 Comparisons between proposals and statements for foreign exchange accounting

Assets/liabilities	FASB (December 1981)	ASC (April 1983)	IASC (July 1983)	CICA (June 1983)
1. Evaluation in the balance sheet	Closing rate	Closing rate, or the rate contracted for a certain transaction or a contracted rate in a separate but adjacent forward exchange contract	Closing rate or the rate contracted in a forward exchange contract	Closing rate
2. Treatment of exchange rate differentials. Main rule	Included in income determination	Included in income determination	Included in income determination. Amortization of exchange differentials on long-term items is *allowed*	Included in income determination. Exchange differentials on long-term items *must* be amortized on the remaining period of maturity
(a) Treatment of exchange gains and losses on long-term monetary items, where not offset against net equity investments	Included in income statement of period	Normally included in income statement of period but may be deferred and amortized to income over the term of the item	Generally included in income statement of period	Deferred and amortized to income over the term of the item
3. Forward exchange contracts are seen as transactions in foreign currencies. Exchange rate differentials appearing between the date of contract and the balance-sheet date influence the income reported	YES	NO	NO	YES

4. Hedging as regards:				
(a) Items bought or sold. The exchange differentials influence the cost/revenue from the transaction	YES	NO, but see point 1 above	NO, but see point 1 above	YES
(b) Net investment in a non-integrated subsidiary. The exchange rate differentials are reported in the equity section, and in the consolidated statement are subtracted from the differentials on the corresponding investment	YES	YES, but as an alternative the differentials may be included in income determination. (See below under consolidation)	YES, but as an alternative the differentials may be included in income determination	YES
(c) Use of forward exchange contracts	YES	NO, but see point 1 above	NO, but see point 1 above	YES
(d) The existence of a special section about hedge of monetary assets and liabilities	NO	NO	NO	YES
5. Special treatment of exchange losses on loans which are used to finance the acquiring of an asset and which are due to devaluations, for instance, is given	NO	NO	YES, (if there have been no practical hedging alternatives). The exchange loss can be activated as a part of the cost of acquisition to the extent that it is possible considering the 'real' value	NO

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Table 6.1 cont'd Comparisons between proposals and statements for foreign exchange accounting

Assets/liabilities	FASB (December 1981)	ASC (April 1983)	IASC (July 1983)	CICA (June 1983)
6. Differentials on operations/transactions of internal character:				
(a) Concerning integrated subsidiaries	Like other assets and liabilities	Like other assets and liabilities	Like other assets and liabilities	Like other assets and liabilities
(b) Concerning non-integrated subsidiaries, long-term items are presented in the equity section	YES	YES	YES	YES

Consolidation	FASB (December 1981)	ASC (April 1983)	ISAC (July 1983)	CICA (June 1983)
7. Special concepts used	Functional currency. Net investment	The closing rate/net investment method (at net investments). The temporal method at direct extension of the trade of the investing company	Foreign entity (net investment). Foreign-based operations that are integral to the operations of the parent	Self-sustaining foreign operations (net investment). Integrated foreign operation
8. Method of translation for integrated companies	Temporal (M–N/M)	Temporal (M–N/M)	Temporal (M–N/M)	Temporal (M–N/M)
9. Treatment of exchange rate differentials from integrated companies	Included in income determination	Included in income determination. (Caution, and even some doubt, about unrealized exchange gains)	Included in income determination, with amortization of exchange differentials on long-term items. At a devaluation giving no practical hedging possibility, an exchange loss on a loan used to finance a recently acquired asset can be activated on this asset	Included in income determination, with amortization of exchange differentials on long-term items

10. Method of translation for non-integrated companies (except in inflationary economies)				
(a) Assets/ liabilities	Closing rate	Closing rate	Closing rate	Closing rate
(b) Income items	At average rate for the reporting period	At average rate or at closing rate for the reporting period	At average rate or at closing rate for the reporting period	At average rate for the reporting period
11. Treatment of exchange rate differentials from non-integrated companies (except in inflationary economies)	In the equity section as a separate item. The accumulated adjustments would be reported currently in income when the foreign operation is sold or when there is a substantial or substantially complete liquidation of the net investment in the foreign operation	In the equity section	In the equity section. The difference between the result at the average rate and at the closing rate can alternatively be included in the income determination	In the equity section as a separate item
12 The notion of hyperinflation	Highly inflationary economy is characterized by a cumulative inflation of approximately 100 per cent or more, over a three-year period	Very high rates of inflation. Hyperinflation	High rates of inflation	Highly inflationary economy

Cont. overleaf

Table 6.1 cont'd Comparisons between proposals and statements for foreign exchange accounting

Consolidation	FASB (December 1981)	ASC (April 1983)	IASC (July 1983)	CICA (June 1983)
13. The method of translation for non-integrated companies, given hyperinflation	Temporal (M-N/M)	Recalculation at current cost may be required. After that, use of the closing rate in accordance with the main rule	Recalculation at current cost. After that, use of the closing rate in accordance with the main rule	Temporal (M–N/M)
(a) With a treatment of non-monetary assets in hyperinflation economies	Historical rates used to translate such items	Preferable to adjust financial statements for the effects of changing prices before translation, but use of historical rates to translate such items is permitted	Financial statements should be adjusted where possible to reflect current price levels before translation	Historical rates used to translate such items
14. Treatment of exchange rate differentials from non-integrated companies, given hyperinflation	Included in income determination	In the equity section	In the equity section	Included in income determination
15. General disclosure rules	Requires disclosure of net exchange gain or loss in income statement	Does not require disclosure of net exchange gain or loss in income statement	Requires disclosure of net exchange gain or loss in income statement	Requires disclosure of net exchange gain or loss in income statement
	Requires detailed explanation of movements in separate equity account	Movement in reserves arising from translation must be disclosed separately but not analysed	Movement in reserves arising from translation must be disclosed separately but not analysed	Requires detailed explanation of movements in separate equity account
		Requires disclosure of accounting policies adopted	Requires disclosure of the method used for translating the financial statements of foreign operations and of the procedure selected (i.e. closing or average rates) for translating the income statement of foreign entities	
		Companies and groups to disclose the net exchange gains and losses on foreign currency net borrowings identifying separately amounts which offset in reserves and credited or changed to income		

6.4 DIRECTIONS FOR FURTHER RESEARCH ON FOREIGN EXCHANGE ACCOUNTING

As we have seen in Section 6.3, there seems to be a high level of uniformity in many important parts of foreign exchange accounting in the leading organizations considered here. Let us now analyse two aspects of the compromise that has emerged. First, let us see how far the new rules have answered the criticism that the old rules such as FASB 8 generated fluctuations in reported earnings. And secondly, let us briefly discuss the related problems that will arise from the adoption of the 'new' and commonly accepted accounting rules.

The means adopted for reducing volatility in reported earnings involves the exclusion of foreign currency translation adjustments from income statements. Although this approach to the problem is easy to understand, it may be regarded as inconsistent with a comprehensive income approach. What kind of intercompany accounts and balances will next be excluded from income determination? It did provide a practical solution to the problem of uncertainty in the amount and timing of realization, but in terms of the theory for accounting this treatment of the fluctuations has not settled many of the arguments between the participants in the now 25-year-old debate.

Furthermore, little progress has been made with regard to the intractable problem of reflecting operating results realistically in hyperinflationary countries. For operations elsewhere, the switch to translating nonmonetary items such as inventories at the closing rate, will also cause some distortion. Thus, representing as they do a compromise measure, the new rules still cannot provide a panacea for dealing with the distortions of volatile exchange and inflation rates.

The price paid for the reduction in fluctuations in income statements is, given the rules analysed in Section 6.3, an erosion of the clean-surplus concept. Research efforts must be directed towards finding alternative ways that do not demand this high price. An alternative way of attacking the problem is to investigate the nature of the exchange rate. The translation rules considered above are expressed in terms of the historical exchange rate and the closing rate. The exchange rate must be seen as an intermediate political target, a role that needs to be considered. Oxelheim (1981) emphasized the need to analyse the exchange rate and its determinants in order to find normative bases for use in foreign exchange accounting. The idea behind this analysis was to find alternative bases, which would eliminate or reduce the random element and the central-bank-generated disturbances in income statements, due to volatile exchange rates. Such an analysis is reported in Chapter 4 and new proposals for accounting standards based on the normative bases studied will be discussed in the next chapter.

A second area for further research concerns the effects of the adoption of the rules presented in Section 6.3. There are problems connected with the integration of these rules with other generally accepted accounting principles (GAAP), and problems of interpretation which concern both the managers responsible and financial analysts in general.

Problem areas that may open up as companies attempt to integrate the requirements of the new rules with other generally accepted accounting principles, include the following: (1) statements of changes in financial position; (2) constant currency and current cost information; (3) equity investments; (4) discontinued operations; (5) capitalization of interest cost.

Problems of interpretation, following the adoption of the new rules, will certainly include: (1) difficulties in comparing return on equity figures for the multinational corporations; (2) complications in making projections; (3) the need for more explanation and disclosure in financial statements. Moreover, the rules will require companies to come up with new strategies for hedging exposures and financing operations. The potential gyration in the equity portions of balance sheets may lead to distortions and a whole new series of headaches. The impact may also be felt on loan covenants relating to shareholders' equity amounts.

The high degree of discretion permitted may produce a range of different results from similar data, causing interpretation problems for the financial analysts. FASB 52, for instance, provides for such discretion by not specifying the three-year period that should be used in deciding whether a country ranks as having a highly inflationary economy. Within the company, the incongruity between accounting and economic results seems to persist and, in order to take full advantage of the discretion opportunities, managers must state their overall financial goals and foreign objectives very clearly. A shift in emphasis towards transaction risk management can be anticipated.

Research efforts must also be directed towards the relation between foreign exchange accounting and inflation accounting. Many researchers claim that the application of the closing rate method to inflation-adjusted accounts would be the best means of reducing the discrepancy between accounting and economic results. Reported gains and losses would be 'real', so their inclusion in operating profit would be appropriate. Furthermore, current cost accounting combined with the closing rate method would be consistent with the purposes of consolidation.

Finally, legislation aspects should also be considered in this context. A potentially disastrous situation can arise when a firm loses money on foreign exchange transactions and the tax system provides no relief for

the losses — despite the fact that exchange losses/gains can be regarded as components of the capital cost which are just as important as interest rates. An examination of trends in both US and UK tax law as it touches on exchange rate fluctuations, suggests that the relevant law in these two countries is both complex, unsatisfactory, and inappropriate to the situation prevailing in the middle of the 1980s. The law appears to be based on statutes and cases dating from a time when currency fluctuations were not a major problem, and the situation is aggravated by a lack of symmetry and certainty in the tax structure. Legislative attempts to bring order out of the present chaos seem to be called for.

Chapter 7

Proposals for new accounting standards for monetary items

7.1 INTRODUCTION

In this chapter we will discuss information questions connected with corporate foreign monetary items. For illustrative purposes the discussion will be concentrated on corporate foreign loans and the problems connected with reporting the capital cost of such loans. As was stressed in Chapter 6, this is an area for further research. Our point of departure for the discussion will be the various monetary laws and relationships, whose empirical validity were analysed in Chapter 4.

In Section 7.2 we shall briefly recapitulate the demands and requirements which appear to have guided the choice of different accounting principles. Our discussion and evaluation of these principles will be based on an example, which will be introduced in Section 7.3. In this section we will also discuss the importance of amortizations and the length of the accounting period (annual, quarterly, etc.) in the light of the aims of accounting. In our discussion of the length of the accounting period, we will also exemplify the variation in the cost of capital (and the consequent effect on results) which would occur if debts were evaluated at the closing rate.

In Section 7.4 we will examine an evaluation of debts based on an exchange rate derived from the Purchasing Power Parity theory. Methods based on Fisher's Open Relationship and on a combination of this relationship and Interest Rate Parity theory are described in Sections 7.5 and 7.6. An empirical evaluation of the way in which these three methods would have operated between 1974 and 1984, assuming the loan conditions described in Section 7.3, will be reported and discussed in Section 7.7.

7.2 NEED FOR NEW PRINCIPLES

In Chapter 2 we discussed the aims of accounting and some of the requirements of good accounting. Specifically we looked at these

requirements in connection with the capital cost of corporate foreign loans, as a basis for our subsequent examination of different accounting alternatives. Two fundamental requirements were formulated in Chapter 2, namely the forecasting requirement and the payment capacity requirement. To these two requirements two other requirements were added, that it should be possible to assess a company's financial allocations on a basis of its accounting documents and that the standards must be *easy to handle* at the corporate level.

There are many other potential requirements that could be formulated. The *basic idea* is to eliminate from the company's financial reports any short-term fluctuations due to systematic or random disturbances in exchange rates, in order to facilitate assessments of the company's future profitability. Besides, a more even distribution will also improve the company's payment capacity.

The foregoing requirements must be translated into quantitative measures for empirical testing of the effectiveness of the proposed methods. Such quantitative measures were proposed in Chapter 2 and will be recapitulated later in connection with our tests of proposed methods.

In the present chapter we will examine and assess some models for evaluating corporate foreign loans, and in particular that part of the capital cost of the loan which is to be allowed to affect the profit and loss account in a given year.

Here we come up against the problem of the timing of the realization of the loan. In most countries the legal regulations in accounting law are based on realization arguments, even in the case of transactions in foreign currencies. When, in such cases, can we speak of realization? By definition it should be the point in time at which a company's position in a foreign currency is reduced or terminated. But for companies involved in continual foreign business it is impossible, practically speaking, to apply a consistent principle on this point. And indeed FASB 8 did reject the idea of a single point at which claims or debts are liquidated.

The international criticism of FASB 8 and FASB 52, and the general uncertainty which has informed the debate on this issue, has motivated the present search for alternative evaluation procedures. In this search we can focus either on the profit and loss account or the balance-sheet aspect. The principle of prudence, for example, is conservative from the point of view of the balance sheet, but is generally far from cautious in profit and loss terms. In the present book we will focus on the implications of the evaluation principles for the effect of the capital cost on results.

How well does evaluation at the closing rate reflect the 'true' value of the debt? In earlier sections we have discussed ways in which

different currency regimes can steer the value of a country's currency in terms of foreign exchange. Under a system of pegged exchange rates we can assume that the closing rate will quite often deviate from the rate which could be motivated by real economic conditions such as the relative competitiveness of two trading countries.

In 1976, for example, evaluation in Sweden at the closing rate would have substantially underestimated the size of the loan, perhaps encouraging the management of a Swedish company to make expansive economic decisions as a result. This could be seen in Table 4.1. A loan in JPY taken up in the beginning of 1974 would have been underestimated by around 20 per cent in the financial reports for 1976. In 1976 the value of the Swedish krona did not provide an accurate picture of Sweden's competitive position *vis-à-vis* the rest of the world. The krona was clearly overvalued, in view of the fact that from an 'equilibrium' situation, Swedish wage costs per unit produced had risen by 25 per cent during 1975–76, in relation to a weighted average of the corresponding cost trends among Sweden's main competitors. This development found expression in the exchange rate first in 1977, in the devaluations. In view of all this, the large resulting losses on loans in foreign currencies, given evaluation at the closing rate, should 'by rights' have been spread over the three years of imbalance, namely 1975–77. From the point of view of payment capacity, the evaluation in the corporate accounts for 1975–76 should have anticipated the change in exchange rate that occurred in 1977.

In devising alternatives for the evaluation of foreign loans, two aspects should be considered — to defer and to anticipate — both in combination with amortization. In the case of amortization various models of distributing the costs can be considered.

Exchange rate movements since 1973 indicate that an *amortization approach* which suggests uniform amortization over the remaining maturity of the loan to exchange losses calculated, for example, at the closing rate, would not have succeeded in levelling out the effect on the results. We must realize, as was shown in Figure 4.30 for SEK, that there are trends in the development of many exchange rates. Given a systematically rising or falling exchange rate, this procedure leaves an unacceptably large residual to dissolve when the loan is liquidated. Thus, from this point of view, the obligation for Canadian companies to defer and amortize exchange gains and losses over the remaining maturity of a long-term loan seems theoretically inconsistent.

According to the *anticipation alternative* for long-term loans, changes in exchange rate during the lifetime of the loan are distributed in accordance with factors reflecting the 'true' exchange relationship at every point in time. The main differences between this 'true' situation and the actual exchange relationship consist of random

effects and effects generated by central bank action. These last depend in turn on the type of currency regime to which the two countries in question belong. By 'true' is meant, when the two alternatives based on financial variable are discussed, the exchange rate as assessed by the market as opposed to the rate managed by the central bank.

In connection with long-term loans we have already mentioned the problem of finding a homogeneous method for handling interest costs and exchange differentials in accounting terms. In the anticipation alternative, the capital cost can be formulated according to economic theory as the actual lending rate plus an estimated additional amount for expected changes in exchange rates. In simple terms the argument can be stated as follows:

Capital cost = lending rate + change in exchange rate

The change in exchange rate can be divided into a systematic component and a disturbance factor. The latter includes random effects and the effect of occasional factors such as intervention on the part of the central bank.

The systematic and perduring component in exchange rate changes can be described in terms of various factors derived from economic theory, among them the three normative bases whose empirical validity was discussed in Chapter 4. Thus, the systematic component in expected changes in exchange rate can be estimated on a basis of Purchasing Power Parity theory, Fisher's Open Relationship, and on a combination of this last and Interest Rate Parity theory. In practice, the systematic component in the three alternatives can be calculated with the help of the following:

(a)	Purchasing Power Parity theory:	→	relative price index
(b)	Fisher's Open Relationship:	→	interest rate differentials on the Euro-market
(c)	Interest Rate Parity theory combined with Fisher's Open Relationship:	→	forward market premium/discount

In the long run the random deviation can be expected to add up to zero. The success of the method can be judged among other things by the size of the dissolved reserve at the time of the final settlement. If a

method does not function well, because of bias, there will often be a snowball effect. The relative size of the effect can be measured, for instance, in relation to the range, i.e. the distance between the extreme values of the capital cost. Alternative measures for use in evaluating the different methods will be discussed in Section 7.7.

Then, for instance, the estimated capital cost (lending rate plus the estimated exchange rate component) could be reported under financial costs and revenues in the profit and loss account. In the balance sheet the debt is evaluated on a basis of the estimated exchange rate so that congruence is achieved.

7.3 CONDITIONS IN THE EXAMPLE

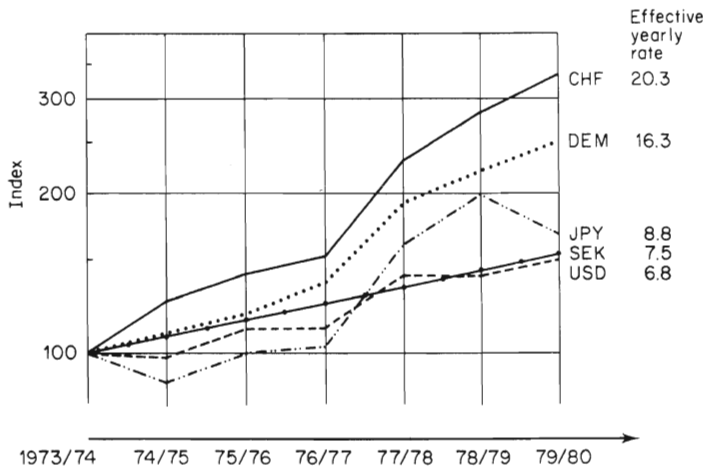
The success which the different methods would have enjoyed in a historical perspective will be illustrated with the help of an *example*. The period chosen is 1974–79. This period involves a change in the exchange arrangement for the Swedish krona and also a couple of devaluations. It starts from a state, which can be characterized as equilibrium and ends in a situation, where the Swedish krona was 'overvalued' compared to the weighted value of the currencies in the Swedish basket (see Figure 4.8). As we have seen in Chapter 4 the subsequent period did involve two more devaluations, which, in case of inclusion, would have further enforced the need for new principles and stressed the value of our results. At the beginning of 1974 the opportunities for contracting loans on the international capital market were limited to a few currencies, namely DEM, USD, JPY and CHF. The loan conditions for medium-term loans to run for six years are shown below. The loan conditions for USD, DEM and CHF have been taken from *Euromoney*, February 1974, and refer to conditions at the beginning of 1974 for loans to first-class-risk borrowers. Loans in JPY were not particularly frequent at this time. The conditions reported refer to private placements. No loans in GBP were on offer at the time. The example has therefore been limited to the four currencies mentioned above. For purposes of comparison, the conditions for loans in SEK are also given, although the difficulty of contracting loans in Sweden has already been pointed out (see the schedule on next page).

It is assumed that the loans were payable in full on maturity, that they were contracted at the end of 1973, and that they ran to the end of 1979.

What the loans would have cost in the four currencies, expressed as an average annual percentage, can be seen in Figure 7.1. The calculation is consistent with earlier estimates in this book, i.e. it is based on compound interest growth without any form of disbursement

Currency	Interest and investment costs (per cent/year)
USD	8.58
DEM	9.68
CHF	8.60
JPY	7.30
SEK	7.80

Figure 7.1 Debt growth and yearly effective growth rate, 1973/74–1979/80
Growth rate for Swedish borrower expressed in per cent per annum, log. scale



of either interest or principal before the loan is liquidated. However, to make the illustration more realistic, it will be assumed below that interest is paid every year unless quarterly accounts are reported, in which case it will be assumed that interest is paid every quarter.

7.3.1 Amortization

Up to now we have made only brief mention of amortization, mainly because an amortized loan can be regarded as a series of loans of different lengths. Thus, for example, a loan contracted to run for ten years, which is amortized by equal annual payments, can be regarded as ten loans from one to ten years in length. Amortization in itself creates no new accounting problems, and in fact the general validity of our present findings covers the special aspects connected with the periodic amortization payments. The accounting principles discussed

here can thus be applied in full to these 'subloans'. The same applies to current interest payments.

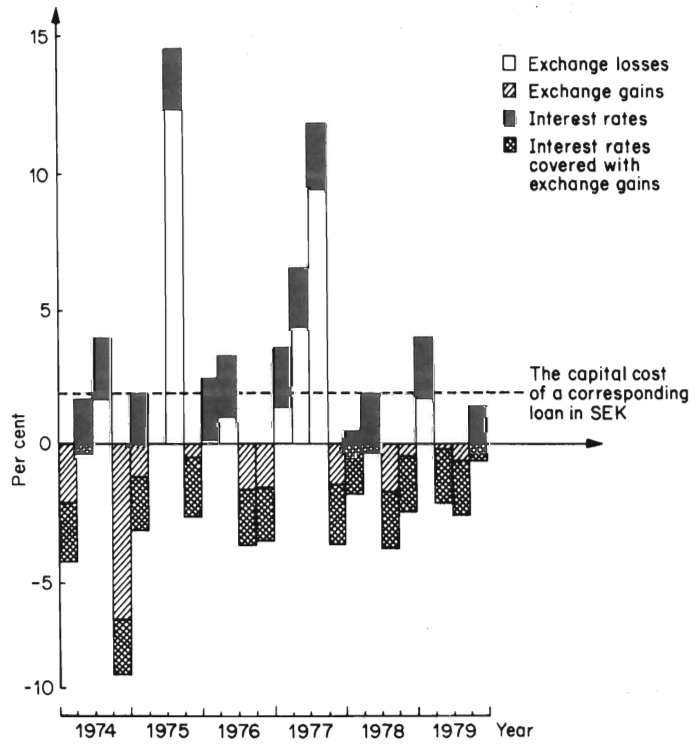
7.3.2 Accounting periods

How often should accounting take place? The two most common alternatives are once a year or once a quarter. The first is most usual in Europe in combination with interim reports, while the latter is recommended in the USA.

In this section we will look at the distribution of the cost of capital by the quarter and by the year for the relevant loan currencies. The closing rate has been used. The cost of capital is divided into two components, interest costs and exchange rate changes. It is assumed that interest is paid at the same intervals as the reporting of results by the company.

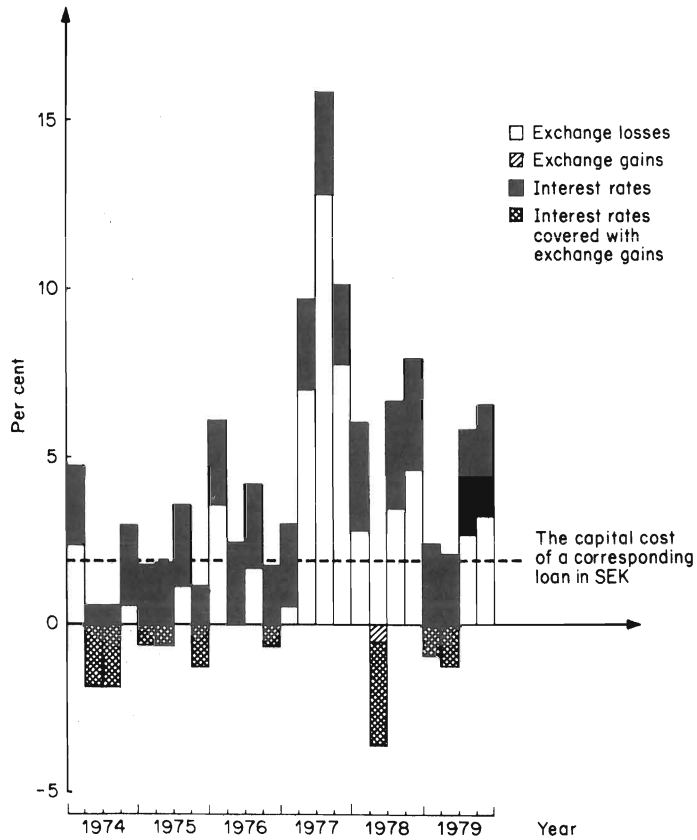
Figures 7.2–7.5 show the distribution of the cost of capital in quarterly accounts. Does quarterly accounting provide for a better overview of a

Figure 7.2 Quarterly capital costs in the profit and loss account, loan in USD
The capital costs on a quarterly basis as a percentage of the original amount borrowed in USD, divided into interest rates and exchange rate gains and losses. Medium-term loan[a] translated into SEK on a basis of the closing rate



[a]Based on conditions for medium-term loan to prime borrower in the Euro-market in January 1974.

Figure 7.3 Quarterly capital costs in the profit and loss account, loan in DEM
The capital costs on a quarterly basis as a percentage of the original amount borrowed in DEM, divided into interest rates and exchange rate gains and losses. Medium-term loan[a] translated into SEK on a basis of the closing rate

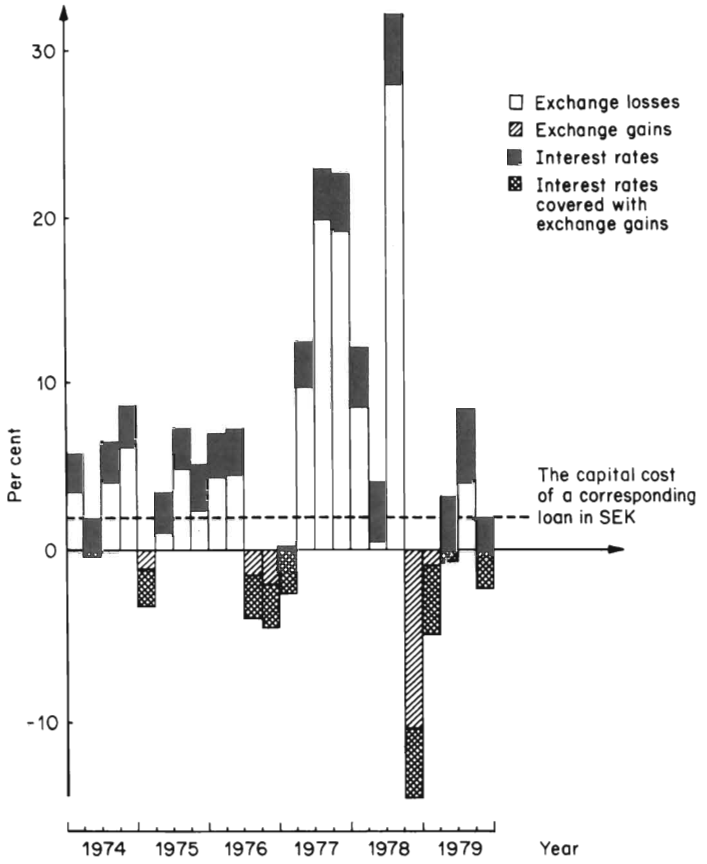


[a]Based on conditions for medium-term loan to prime borrower in the Euro-market in January 1974.

company's general economic state? Are there better opportunities for assessing the company's ability to generate future profits? To allow a comparison we must also study the effects of the cost of capital on results in a system of annual accounts. These effects can be seen in Figure 7.6. For a further comparison, the figures also include the capital cost of equivalent loans raised on the Swedish capital market.

Table 7.1 shows very clearly why there has been so much criticism in the USA of the use of quarterly accounting combined with translation of the closing rate. In order to illustrate the oscillations to which American businessmen and industrialists have objected so strongly, the largest sequential difference between the cost of capital by the quarter for the respective years of the loan's lifetime is exhibited. The table shows that for loans in USD the annual capital cost in 1975, for example, was 14.9 per cent of the original amount

Figure 7.4 Quarterly capital costs in the profit and loss account, loan in CHF
The capital costs on a quarterly basis as a percentage of the original amount borrowed in CHF, divided into interest rates and exchange rate gains and losses. Medium-term loan[a] translated into SEK on a basis of the closing rate



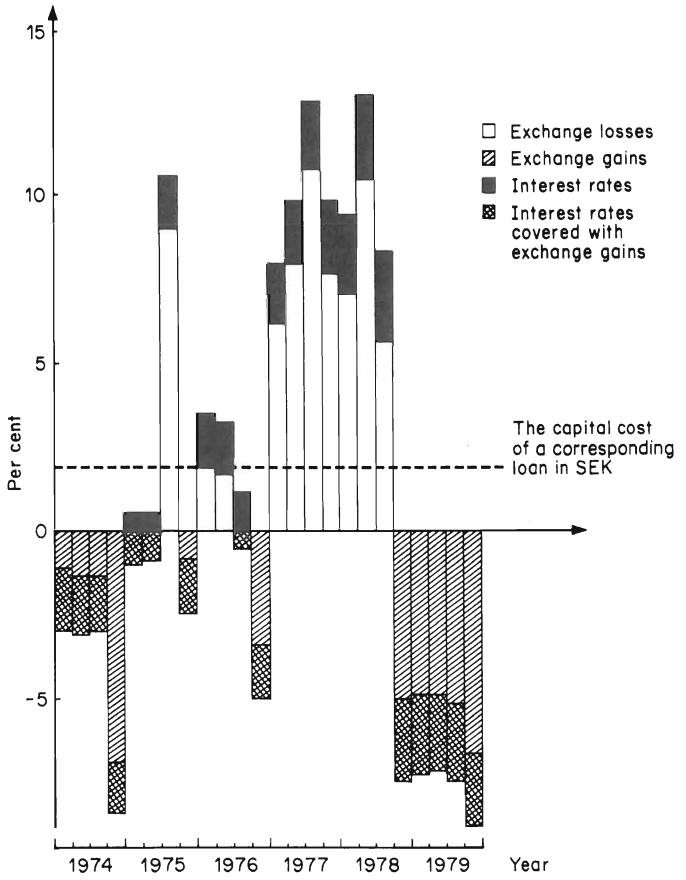
[a]Based on conditions for medium-term loan to prime borrower in the Euro-market in January 1974.

borrowed. The capital cost per quarter should thus be in the range of 4 per cent. That year the greatest sequential difference was 15.0 per cent. This difference arose when the capital cost for the third quarter was 14.5 per cent, while for the fourth it was represented by a 'revenue' of 0.5 per cent.

The answer to the questions which we asked at the beginning of this section is that by translating at the closing rate, we get such large and apparently random variations as to vitiate the whole idea of achieving a better overview and a better basis for forecasts by adopting a system of quarterly accounts.

To defer and amortize, where the capital cost does not contain any trend component, serves to modify the random variation. However, in other cases it means that the exchange gains or losses accumulate until the loan is finally liquidated.

Figure 7.5 Quarterly capital costs in the profit and loss account, loan in JPY
The capital costs on a quarterly basis as a percentage of the original amount borrowed in JPY, divided into interest rates and exchange rate gains and losses. Medium-term loan[a] translated into SEK on a basis of the closing rate



[a]Based on conditions for medium-term loan to prime borrower in the Euro-market in January 1974.

As well as providing a basis for evaluating different accounting periods, Figures 7.2–7.6 also give us a general idea of the irregularities in the distribution of the capital cost over time, which can be ascribed to the system of pegged exchange rates. This aspect is particularly clear in Figure 7.6, where we can compare the capital cost during the years of imbalance 1975–77.

7.4 METHOD BASED ON PURCHASING POWER PARITY THEORY

In evaluating corporate foreign loans using an exchange rate derived from Purchasing Power Parity theory, we can proceed basically in one

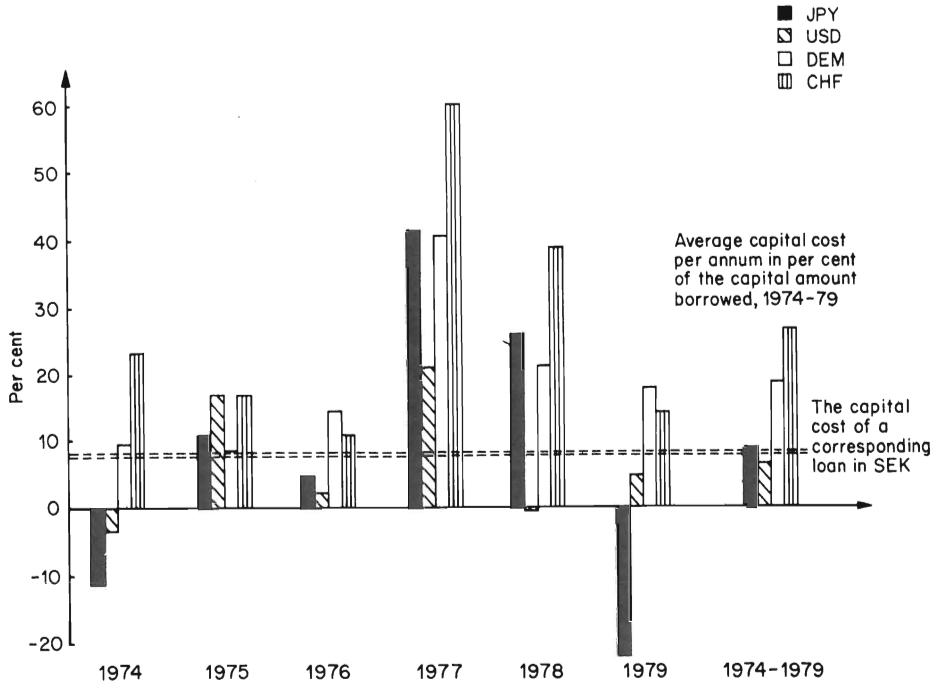
Table 7.1 The distribution of capital costs for a Swedish borrower when the foreign debt[a] is evaluated on a basis of the closing rate

Currency	Year	Capital cost as a per cent/annum of the original amount borrowed	Max. successive difference in capital costs per quarter within a year, per cent/quarter	(Range within year)
	74	−3.4	10.3	(10.3)
	75	14.9	15.0	(15.0)
	76	2.6	4.8	(4.8)
	77	20.5	13.2	(13.2)
USD	78	−0.1	3.6	(3.6)
	79	4.6	4.0	(4.4)
	74	9.4	4.1	(4.1)
	75	8.4	2.4	(2.4)
	76	14.3	3.7	(4.3)
	77	40.5	6.6	(12.7)
DEM	78	21.2	7.2	(8.4)
	79	17.9	3.8	(4.1)
	74	−11.2	5.6	(5.8)
	75	11.3	11.4	(11.4)
	76	4.6	4.5	(6.8)
	77	41.5	3.0	(4.8)
JPY	78	25.7	13.3	(15.5)
	79	−22.0	1.5	(1.6)
	74	23.4	4.4	(6.6)
	75	15.0	4.4	(8.2)
	76	10.8	8.4	(9.0)
	77	60.2	12.2	(22.6)
CHF	78	38.6	42.4	(42.4)
	79	14.7	6.3	(9.2)

[a] Based on conditions for medium-term loan to prime borrower in the Euro-market in January 1974.

of two ways. One starts from the assumption that the closing rate does not altogether correspond to the exchange rate motivated by real economic developments. By using an exchange rate derived from Purchasing Power Parity theory, we allow for these developments, while at the same time the random element in the exchange rate is eliminated and prevented from affecting the evaluation of the long-term loan. This type of evaluation satisfies, in the first instance, the

Figure 7.6. The capital cost distribution on a yearly basis
As a percentage of the original amount borrowed



payment capacity requirement and the forecasting requirement, but must also be regarded as easy to apply in the company.

According to the second alternative, exchange rate movements for the lifetime of the loan are derived from Purchasing Power Parity theory; and together with the interest these movements are distributed as an annuity over the whole period of the loan. This type of evaluation satisfies, in the first instance, the need to be able to assess the company's financial allocations on a basis of its accounting. The difficulty lies in obtaining forecasts of inflation rates in different countries. Expectations regarding future inflation rates already exist in a way in the market interest rates which are used in Fisher's Open Relationship. Thus, practically speaking, it should be easier to use this relationship to assess the company's financial allocations. How this relationship works will be evaluated later and for this reason we will not discuss the second alternative here. Being based on genuine forecasts of the inflation rates makes a potential implementation of this second alternative more difficult than the first one as it conflicts with the principle of objectivity (see Section 2.2).

7.4.1 Prerequisites

In the following discussion the same equilibrium base has been chosen for all the four currencies for which examples are given. The base chosen is January 1974. As a description of price movements in different countries we have used the producer price index or an equivalent index. On a basis of these national figures, indexes of relative price movements are drawn up. These indexes correspond to those used as a basis for the purchasing power parity index described in Chapter 4.

7.4.2 Application of the method, with an example

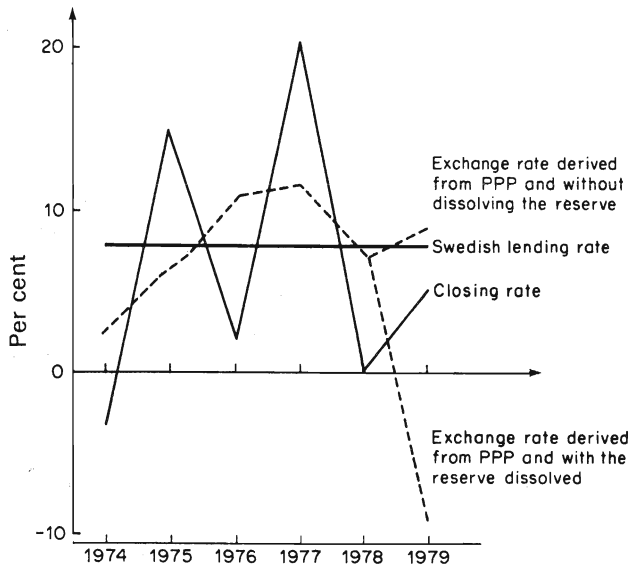
The principle can be exemplified by a loan in a foreign currency to a sum corresponding to SEK 100. When the loan was contracted, the relative producer price index was 100. A year later it had risen to 107, the following year to 114 and, finally, to 120 during the year leading up to final liquidation. An index number of 120 tells us that the producer price level had risen 20 per cent faster in Sweden than in the other country in the comparison.

The index is used as follows: on the first year's accounting date, 7 units are earmarked as an exchange loss. Next year, a further 7 units are earmarked, since the debt has risen from SEK 107 to SEK 114. In the last year of the lifetime of the loan, the relative price index has risen to 120, and according to the purchasing power parity method the loan has increased accordingly. However, the borrower is going to liquidate the loan, and so cannot wait for the purchasing power parity index to level off to 100. If this value does in fact obtain, then the exchange loss which has been earmarked in the profit and loss account will be equal to SEK 6 (120−114). Or perhaps the imbalance in the competitive position has not yet found expression in the exchange rate, and the present exchange rate index is, let us say, 115. Obviously this is the value which will be used, and an exchange loss of SEK 1 (115−114) will be charged to the company's result for that year. Similarly, the index is used to assess the size of the debt in the balance sheet.

The equilibrium rate is easy to establish. It is equal to the actual rate at the starting point, at equilibrium, multiplied by the development in relative producer price indexes for the two countries studied. Suppose the SEK/DEM exchange rate is 1.70 at the point when equilibrium obtains between the exchange rate SEK/DEM and the relative price levels. If from that time the level increases 5 per cent faster in Sweden than in Germany for a particular period studied, then the new equilibrium rate at the end of the period would be $1.70 \cdot 1.05 = 1.79$ SEK/DEM.

An evaluation of the debt using an equilibrium exchange rate based on PPP produces a reduction in the random and central-bank-generated disturbances compared with using the closing rate. This is exemplified for our medium-term loans in Figures 7.7–7.10. As the latter source of disturbances, for example, generates delay effects, an added advantage of using an equilibrium exchange rate is that it gives a better payment capacity through a more even distribution of capital costs over the whole period. The disturbances generated by the central banks arise, for example, as a result of political targets, or as a result of applying the IMF recommendation 'to prevent sharp and disruptive fluctuations from day to day and from week to week'.

Figure 7.7 PPP calculated capital cost in the profit and loss account, loan in USD
The capital costs to a Swedish borrower as an annual percentage of the original amount borrowed



The dissolved reserve in the figures represents the amount borrowed which affects the profit and loss account at the time of liquidation of the loan, due to the difference between evaluating the debt on a basis of the closing rate and on the equilibrium rate. A big difference means that the debt will be greatly over- or undervalued in a purchasing power parity sense when the loan is liquidated. This means that the borrower has made a big gain or a big loss in terms of relative purchasing power.

In the PPP method the estimated cost due to changes in exchange rate is based on actual rather than expected inflation rate. In the

Figure 7.8 PPP calculated capital cost in the profit and loss account, loan in DEM
The capital costs to a Swedish borrower as an annual percentage of the original amount borrowed

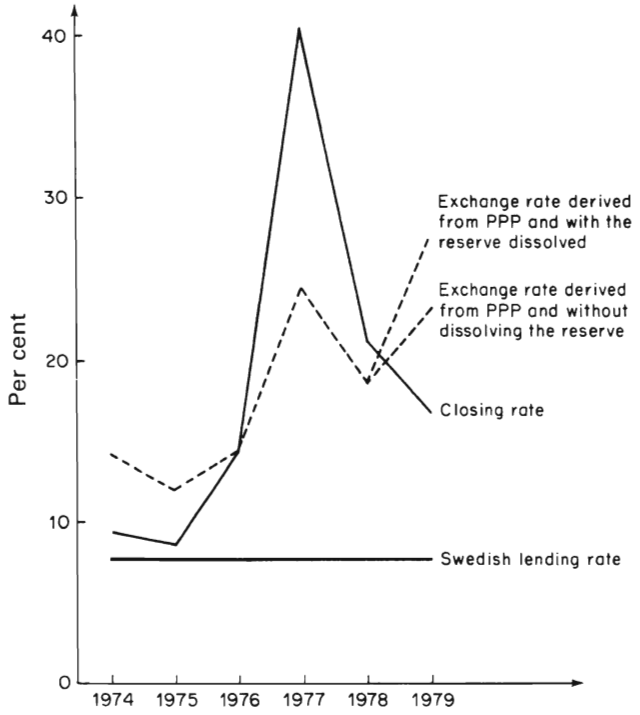


Figure 7.9 PPP calculated capital cost in the profit and loss account, loan in CHF
The capital costs to a Swedish borrower as an annual percentage of the original amount borrowed

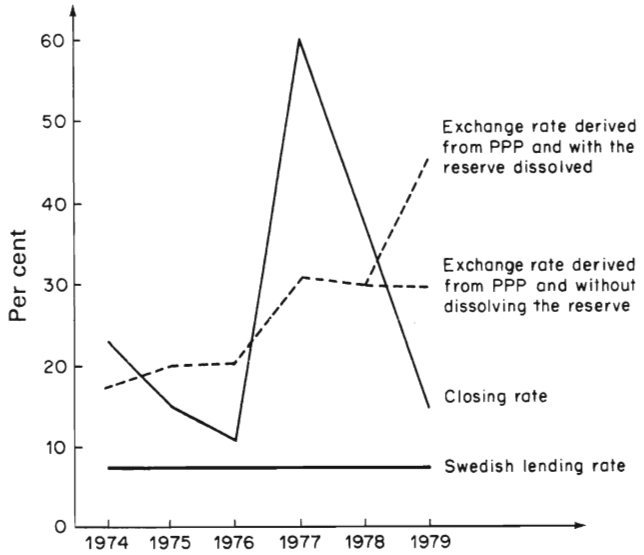
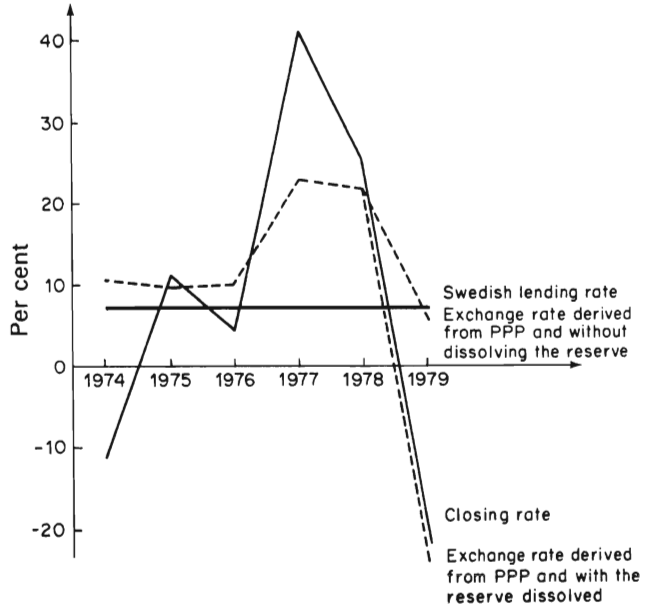


Figure 7.10 PPP calculated capital cost in the profit and loss account, loan in JPY
The capital costs to a Swedish borrower as an annual percentage of the original amount borrowed



subsequent two methods proposed here it is based on pure estimates of future changes in exchange rate.

7.5 METHOD BASED ON FISHER'S OPEN RELATIONSHIP

According to Fisher's Open Relationship we can expect the capital cost to be the same, regardless of the currency in which a loan is contracted. Accordingly, the capital cost can be equated each year with the domestic interest on a corresponding loan. This alternative has certain advantages, particularly as a basis for evaluating the company's financial allocations in terms of opportunity costs. Further, it gives a straight cost distribution. All random exchange-based variations that can encumber results are eliminated. The disadvantage of the method, from the point of payment capacity, is that it is based on expectations and is rather insensitive to change in basic economic conditions that can affect exchange rates. An alternative approach, with assessment of exchange rate movements over a shorter time horizon, could involve annual estimates of exchange rate movements based on interest rates for equivalent periods.

7.5.1 Prerequisites

What interest rates should be used? Generally speaking the Euro-interest rates are most appropriate, since they are unaffected by national controls.

The practical problem here is to find a comparable domestic interest rate. If the difference between long-term interest rates provided a good measure of trends in exchange rates, then the interest-rate differential would provide a basis for distributing the capital cost with equal amounts, as is possible for domestic loans.

To some extent, however, the development of long-term interest rates has lagged behind the development of exchange rates, which has contributed to an unsatisfactory performance for this form of forecasting during the period studied.

The way in which the lending rate on the long-term Swedish capital market reflected expectations about inflation in the longer term has already been discussed in earlier sections. We found that at the beginning of the 1970s the fixing of interest rates on this part of the capital market in Sweden differed somewhat from the approach in the USA and West Germany, for example. The recent adjustment in levels may mean that the long-term interest rate could perhaps be used in future for anticipating future exchange rate movements. The relevant lending rate should then be compared, for example, with the long-term interest rate in Sweden at the time when the loan was contracted. The difference represents an estimated extra cost for expected exchange rate movements during the lifetime of the loan.

According to a straightforward use of Fisher's Open Relationship the debt is expected to increase by a factor corresponding to the difference between the interest rate for loans in SEK and the relevant lending rate. Therefore, this difference ought to be charged each year to the profit and loss account, as a measure of that part of the expected increase in the debt which can be ascribed to the particular year.

No full analysis has been made here of accounting based on the alternative mentioned above. This is because examples based on the differentials applying for long-term loans in 1973–74 would have produced reserves when the loans were liquidated, corresponding to almost the total change in the exchange rate during the period.

Because of the problems involved in a straightforward use of this last method, a *modified version* has been analysed here. The basic idea is still that, due to the character of the monetary system and the effects of speculation, the closing rate will give a misleading picture of the 'correct' change in the exchange rate for a particular year, when we are calculating the annual capital costs of medium-term or long-term debts which are to be included in the company's financial reporting. In

the modified version of Fisher's Open Relationship the change in the exchange rate for a particular year is estimated as the difference between the risk-standardized interest rates (twelve months) offered at the beginning of the year under consideration.

7.6 METHOD BASED ON FORWARD EXCHANGE RATES

As we found deviations from the Interest Rate Parity for some periods in our analysis in Chapter 4, we should now consider the methods based on interest differentials and the method based on the forward premium/discount as two different types of approach.

With some exceptions the forward exchange rate has previously proved able to provide an unbiased estimate of the future spot rate in a long-term perspective. A potential source of error in the estimate in the short term is the presence of a possible risk premium due to the asymmetrical risk distribution of the borrowers. If there is a long forward market with high volumes, the forward cost as an annual percentage may prove to be a practical and useful estimate of additional cost in the shape of exchange gains and losses, thus providing a way of eliminating both random and managed disturbances in the exchange rate.

7.6.1 Prerequisites

The long-term market in Sweden is very thin, which means that full application of this alternative is not possible. However, here also a *modified version* can be adopted insofar as the twelve months' forward premium or discount from the beginning of that year is used as the market estimate of exchange rate movements for a particular year in the accounts at the end of the year. This alternative, like the alternative based on Fisher's Open Relationship, starts from an assumption that the market estimate of exchange rate movements provides a better description of 'true' exchange rate trends than the actual exchange rate which obtains on accounting day and which is generated within a system of pegged exchange rates. JPY has not been included in our comparison here, because of the problem of exchange rate quotations for a twelve-month period in this currency at the beginning of the period under investigation.

7.7 COMPARISON OF RECOMMENDED METHODS

Let us first briefly summarize the pros and cons of the different methods proposed. We can analyse three ways of estimating the part of capital cost, which emanates from future changes in the exchange

rate. In our discussion of forecasting in Chapter 4 we found that the relative price trend could be regarded as the main factor explaining changes in exchange rates over a long time horizon. But its usefulness in forecasting was limited because of the difficulty of predicting price developments in the different countries. However, because of its pegged character the exchange rate is regarded as a 'controlled' quantity, and there is therefore good reason for using an alternative rate, namely the rate motivated on grounds of purchasing power parity. To solve this problem, the model proposed here takes as its point of departure accumulated deviations from PPP. One hypothesis is that, compared with the closing rate, the use of this rate will reduce random or central-bank-generated disturbances. Since these last lead to time lags and cause unfavourable redistributions of profit and loss figures, the suggested method has the further advantage of allowing for better payment capacity and a smoother distribution of capital costs over the whole period. In practice, the method is easy to apply. The choice of index and base period is a central but perfectly manageable problem.

In the method geared to purchasing power parity, the estimated additional cost is thus based on actual inflation. In the other two methods it is based on pure estimates of future exchange rate movements. In the alternative involving accounting for loan costs at the interest rate for equivalent loans in the domestic currency; the difference between this rate of interest and the actual lending rate then constitutes the estimated additional cost due to future exchange losses. The practical problem here is to find the comparable domestic interest rate. If the difference between the long-term interest rates adequately reflects the development in exchange rates, then the interest differential would provide for perfect linearization of the effects on results by way of a straight cost distribution. However, as we have already seen, the long-term interest trend lags behind exchange rate movements, which is probably why this anticipation method would not work satisfactorily for the period studied. During the 1970s interest rates did not adequately counterbalance changes in exchange rates. However, there are grounds for some optimism, in the interest differentials which have emerged since. Discount rate differentials might provide an acceptable approximation, and can serve to smooth out the effects of exchange rate differentials on results provided it can be assumed that the margins for similar types of loans in two currencies are equal. However, as was previously pointed out, the discount rates are not always used actively as an economic policy tool. In our application of a modified version standardized commercial bank prime lending rates are used.

In the third alternative, making use of the forward hedging cost, the absence at least in many countries of a sufficiently long-term forward

market constitutes a major practical limitation. If there were such a market, this alternative would be the easiest to use in purely practical terms. Theoretically, assuming interest rate parity and provided that Fisher's Open Relationship holds, the forward rate and the interest rate differential both provide an unbiased estimate of the future rate. During the period 1974–84 the three-month forward rate, as well as the interest differentials, exhibited a bias for some currencies and, what is more important, a rather big variance in the forecast error for all currencies. Will the forward rates on a long-term market also exhibit these characteristics? If they do, the value of using the forward hedging cost as an estimating instrument is rather dubious.

How well have these different methods worked in the past? Before answering this question, let us recapitulate the requirements that such methods should fulfil:

(1) They should help the outside observer to assess a company's earnings and financial status
(2) They should make it possible to 'reserve' appropriate funds for deployment as required at a later date, for example in connection with a devaluation.

To provide a quantitative yardstick of the effectiveness of the methods in accounting for the capital cost of long-term loans, the following requirements can also be formulated:

(1) The capital cost should be evenly distributed over the lifetime of the loan
(2) There should be a negligible reserve to dissolve when the loan is finally settled, i.e. corresponding to a slight difference between actual and estimated rates.

The requirement regarding the even distribution of capital costs is motivated by the necessity of maintaining payment capacity, and is of course also an important element in the stabilization of the company's market value. A completely even distribution cannot be achieved without using some estimates of the predicted additional cost. By 'even' or rather 'more even' distribution is meant a smoother distribution of the capital cost than would be obtained from an evaluation based on the closing rate in a system of pegged exchange rates. However, if an exchange rate based on the Purchasing Power Parity theory is used, the distribution of the capital cost cannot be more even than the underlying relative inflation trends.

Fulfilment of the second requirement can be effectively measured by comparing the size of the reserve with some measure of the variation

avoided as a result of applying the method in question. Thus it should be possible to compare the reserve with the range in the capital cost or with the greatest of the successive annual differentials.

7.7.1 Empirical evaluation

Figures 7.11–7.14 show how well the three methods would have worked during the period 1974–79 which corresponds to the lifetime of the loans in our example. According to Fisher's Open Relationship the capital cost of the corporate foreign loan can be expected to be the same as an equivalent loan in the domestic currency. Provided that this loan has a fixed interest rate, there will be a straight cost distribution. Thus, for the sake of comparison, the cost distribution for the loan in SEK, which represented the hypothetical alternative in 1974, has been included in the figures. Each figure also shows the cost distribution which would have obtained, given an evaluation based on the closing rate. The outcomes of the suggested methods should be compared with that distribution as well as with the domestic cost distribution.

What criteria should be used in this evaluation? If we limit ourselves to quantitative aspects only, many ways of measuring the improve-

Figure 7.11 Capital costs in the profit and loss account — comparison of different accounting standards for a loan in USD for a Swedish borrower

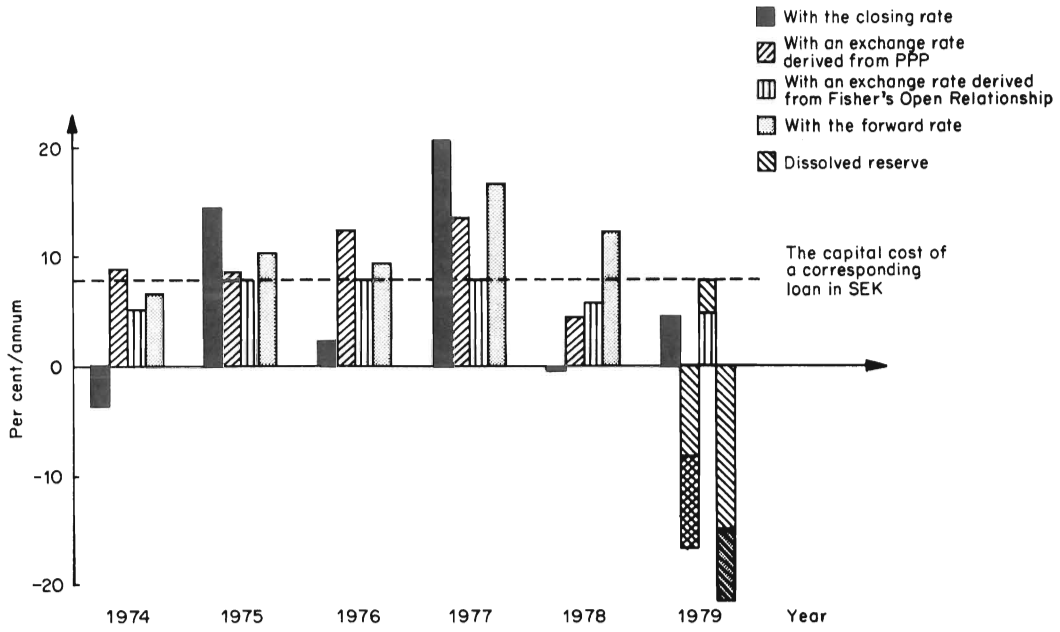


Figure 7.12 Capital costs in the profit and loss account — comparison of different accounting standards for a loan in DEM for a Swedish borrower

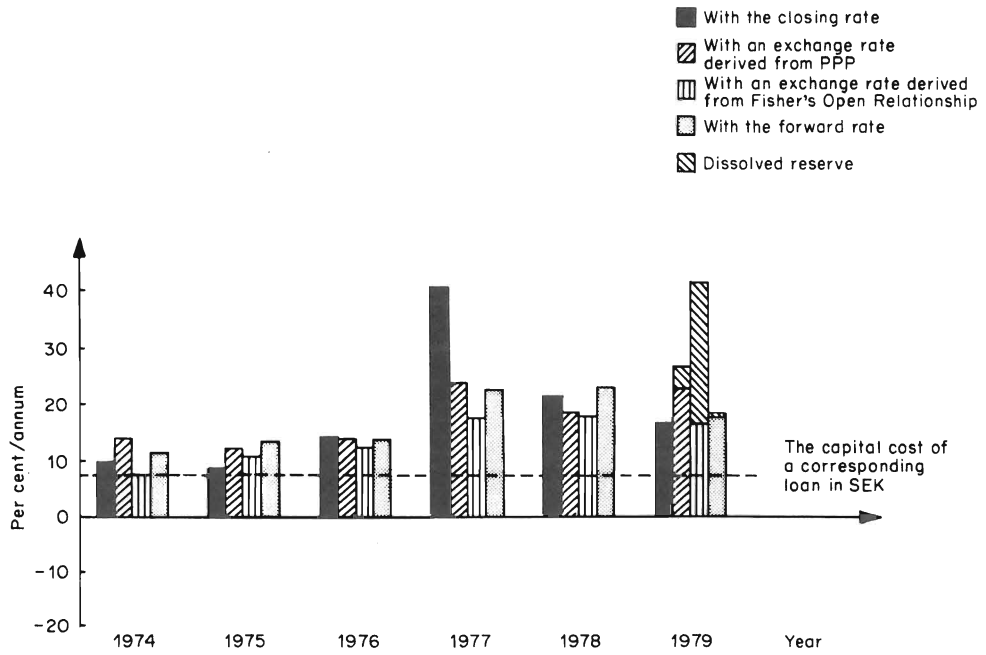


Figure 7.13 Capital costs in the profit and loss account — comparison of different accounting standards for a loan in CHF for a Swedish borrower

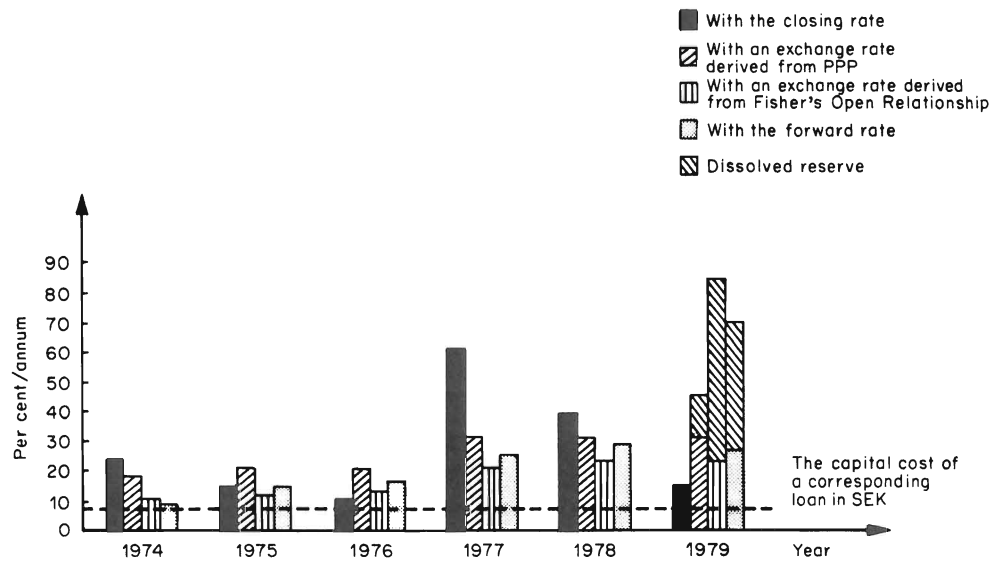
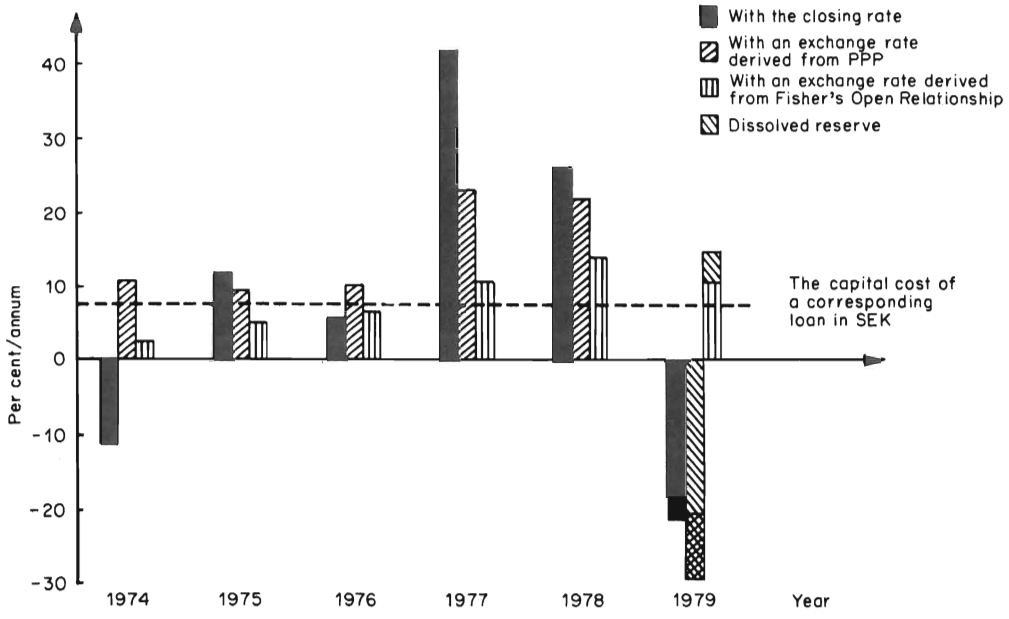


Figure 7.14 Capital costs in the profit and loss account — comparison of different accounting standards for a loan in JPY for a Swedish borrower



ment are open to us. We have already formulated a requirement regarding the size of the reserve when the loan is liquidated, and another referring to the variation in the cost distribution. Let us consider these in the present context.

What is expressed by the *reserve*, i.e. by the difference in the value of the debt on settlement at the closing rate and at a rate based on one of the suggested methods? If the method based on the Purchasing Power Parity theory is used, then the reserve expresses the deviation from purchasing power parity which can be regarded as a result of random or central-bank-generated disturbances; it can be seen as the profit or loss in terms of purchasing power resulting from the fact that the loan is not being liquidated when equilibrium prevails. With regard to the significance of the reserve, this method differs from the other two. Given Fisher's Open Relationship in the version used here, the reserve expresses instead the difference between expected exchange rate movements and actual changes. If these expectations exactly reflect inflation trends, the reserve will correspond to the one obtained when the Purchasing Power Parity theory was applied. It is assumed here that we start from equilibrium. If it is assumed that the interest rate is based solely on expected inflation, the difference between the two reserves provides an expression of a mismatch

between expected relative inflation and actual developments. Thus, with the method based on Fisher's Open Relationship and with the method based on the forward rate, the reserve has two components, one expressing the difference between expected relative inflation and actual inflation developments, and one expressing the difference between this last and actual exchange rate movements.

The *variation* in the capital cost of the foreign loan (cf. the second requirement above), can be analysed in many ways. We can examine three ways of measuring this variation. The range expresses the total distribution, i.e. the difference between the highest and lowest annual capital cost during the period. The maximum change from one year to another provides a measure of annual variation. The standard deviation, expressing the average variation during the period, is a third measure. All three measures are calculated here for two cost distributions: one when the reserve is dissolved and one when it is not. The choice of the standard deviation as a measure of the variation stems from a desire to compare the alternatives in terms of the smoothness of the cost distribution. If we abandon this approach, we can turn to regression analysis, in which case the variance in the residuals can be used as a measure of the distribution of the cost. The size of the reserve should be studied separately in the 'non-dissolved' alternative.

In Tables 7.2–7.4 the different methods are compared with the method based on the closing rate for the four loan currencies which we have used in our example for the period 1974–79. The tables show the size of the reserve when the different methods are used; relative sizes appear in the three bottom rows in each column, i.e. for each method and each currency. When the method based on Purchasing Power Parity theory is used, the reserve is relatively large in the case of USD and JPY compared with DEM and CHF. On the whole the reserves have diminished, i.e. for certain currencies they exhibit higher negative values from year-end 1978 to year-end 1979, corresponding to the decline in the purchasing power parity index for SEK against a weighted average of basket currencies (see Figure 4.8). The devaluation of the Swedish krona in 1981 brought the exchange rate close to its equilibrium in a purchasing power parity sense, thus to a great extent eliminating the reserve in different currencies. Under the method based on purchasing power parity, the value of the relative size of the reserve generates no negative information. The only value that exceeds 1 refers to dissolved reserves in relation to the total change in exchange rate during the period. This particular measure is mainly interesting in connection with currencies exhibiting a systematic trend, which does not apply to USD during the relevant period.

When the method based on Fisher's Open Relationship is used, the reserve shows high values for DEM and CHF. In some cases the

Table 7.2 Measures for comparison of different accounting standards when accounting for capital costs of borrowing in foreign currencies, 1974–79. Closing rate against PPP rate

Evaluation of the foreign debt using the closing rate (CR) as against using an exchange rate derived from PPP; capital cost as an annual percentage of the original amount borrowed

Measures \ Currency: Method:	USD			DEM			CHF			JPY		
	CR	PPP	PPP/CR	CR	PPP	PPP/CR	CR	PPP	PPP/CR	CR	PPP	PPP/CR
Range												
—excl. the reserve	23.9	8.7	0.36	32.0	12.0	0.38	49.4	17.6	0.36	63.1	28.6	0.45
—incl. dissolved reserve	23.9	21.7	0.91	32.0	15.5	0.48	49.4	27.9	0.56	63.1	46.3	0.73
Max. successive change per annum												
—excl. the reserve	20.6	8.7	0.42	26.2	9.8	0.37	49.4	10.3	0.21	47.3	15.3	0.32
—incl. dissolved reserve	20.6	13.0	0.63	26.2	9.8	0.37	49.4	15.6	0.32	47.3	44.8	0.95
Standard deviation												
—excl. the reserve	9.3	2.6	0.28	11.8	5.2	0.44	19.2	6.0	0.31	23.2	9.3	0.40
—incl. dissolved reserve	9.3	8.2	0.88	11.8	6.2	0.53	19.2	10.4	0.54	23.2	16.7	0.72
Dissolved reserve		−18.1			4.2			16.2			−29.5	
Dissolved reserve/range[a]		0.76			0.13			0.33			0.47	
Dissolved reserve/max. successive change[a]		0.88			0.16			0.33			0.62	
Dissolved reserve/total change in exchange rate		1.66			0.10			0.19			0.57	

[a] When the closing rate is used.

Table 7.3 Measures for comparison of different accounting standards when accounting for capital costs of borrowing in foreign currencies, 1974–79. Closing rate against interest rate differential

Evaluation of the foreign debt using the closing rate (CR) as against using an exchange rate cost component derived from Fisher's Open Relationship (FOR); capital cost as an annual percentage of the original amount borrowed

Measures \ Currency: Method:	USD			DEM			CHF			JPY		
	CR	FOR	FOR/CR	CR	FOR	FOR/CR	CR	FOR	FOR/CR	CR	FOR	FOR/CR
Range												
—excl. the reserve	23.9	2.9	0.12	32.0	9.2	0.29	49.4	12.4	0.25	63.1	8.7	0.14
—incl. dissolved reserve	23.9	2.6	0.11	32.0	36.3	1.13	49.4	77.4	1.56	63.1	12.3	0.20
Max. successive change per annum												
—excl. the reserve	20.6	2.4	0.12	26.2	5.2	0.20	49.4	7.0	0.14	47.3	4.4	0.09
—incl. dissolved reserve	20.6	2.9	0.14	26.2	25.5	0.97	49.4	62.1	1.26	47.3	4.4	0.09
Standard deviation												
—excl. the reserve	9.3	1.2	0.13	11.8	4.4	0.37	19.2	5.5	0.29	23.2	4.4	0.19
—incl. dissolved reserve	9.3	2.0	0.22	11.8	13.1	1.11	19.2	28.6	1.49	23.2	5.1	0.22
Dissolved reserve		1.9			26.7			63.2			3.6	
Dissolved reserve/range[a]		0.08			0.83			1.28			0.06	
Dissolved reserve/max. successive change[a]		0.09			1.02			1.28			0.08	
Dissolved reserve/total change in exchange rate		0.17			0.62			0.72			0.08	

[a] When the closing rate is used.

Table 7.4 Measures for comparison of different accounting standards when accounting for capital costs of borrowing in foreign currencies, 1974–79. Closing rate against forward rate
Evaluation of the foreign debt using the closing rate (CR) as against using an exchange rate cost component derived from the forward rate (FR); capital cost as an annual percentage of the original amount borrowed

Measures \ Currency: Method:	USD			DEM			CHF		
	CR	FR	FR/CR	CR	FR	FR/CR	CR	FR	FR/CR
Range									
—excl. the reserve	23.9	10.1	0.42	32.0	12.2	0.38	49.4	18.4	0.37
—incl. dissolved reserve	23.9	33.2	1.39	32.0	15.4	0.48	49.4	60.6	1.23
Max. successive change per annum									
—excl. the reserve	20.6	7.2	0.35	26.2	8.5	0.32	49.4	8.9	0.18
—incl. dissolved reserve	20.6	29.2	1.42	26.2	8.5	0.32	49.4	42.2	0.85
Standard deviation									
—excl. the reserve	9.3	3.8	0.41	11.8	5.1	0.43	19.2	7.5	0.39
—incl. dissolved reserve	9.3	12.0	1.29	11.8	6.1	0.52	19.2	22.1	1.15
Dissolved reserve		−23.6			8.3			44.3	
Dissolved reserve/range[a]		0.99			0.26			0.90	
Dissolved reserve/max. successive change[a]		1.15			0.32			0.90	
Dissolved reserve/total change in exchange rate		2.17			0.17			0.51	

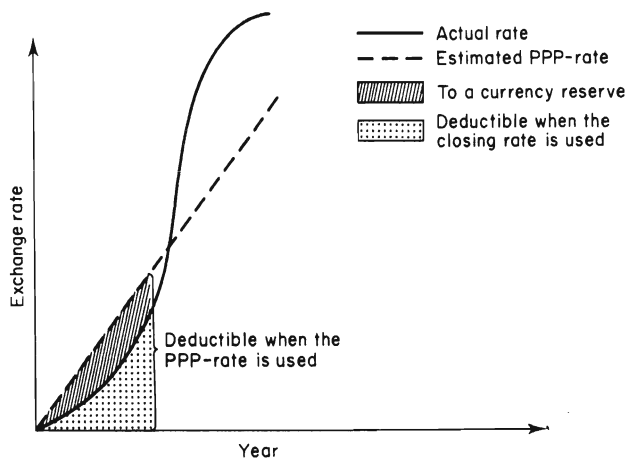
[a] When the closing rate is used.

relative size exceeds 1. The discount rate differential has not been able to keep pace with the trend in exchange rate movements. The small reserves in the case of USD and JPY depend largely on the fact that these currencies do not exhibit any corresponding trend during the period.

The method based on forward rates gives us big reserves, relatively speaking, for two of the three currencies studied.

Tables 7.2–7.4 show that the variation in the capital costs as reflected in results was much less when the method based on purchasing power parity was used. The measures of variation when the dissolved reserve is included are all sensitive to the choice of time for settlement in our example. 1979 was a year with a big deviation

Figure 7.15 Taxation of exchange rate differentials



from PPP for the Swedish krona, which means that the standard deviations including dissolved reserves could be expected to be at their greatest. For instance, if 1981 had been taken as the time for final settlement, the standard deviations (with dissolved reserves) would have been half the size of those arising if the method based on the closing rate had been used.

The patterns generated by the other two methods are not as uniform as this. With undissolved reserves, the relative variation is slight compared with the purchasing power parity method and with the closing rate method. However, this reflects a slight variation in interest differentials rather than any ability to distribute costs satisfactorily. If the dissolved reserve is taken into account in calculating the variation,

then we will obtain quite different values. Most measures will reflect the fact that these fundamentally interest-based methods lead to more variation than a method based on the closing rate. This serves to underline the importance of taking the size of the reserve into account in the evaluation. The difference in standard deviations is so great, that allowing for a transaction cost or risk premium on the forward rate would probably make no difference to our conclusions.

The empirical evaluation suggests that our quantitative requirements are best satisfied by the proposals based on the Purchasing Power Parity theory. Furthermore, this method seems to have few drawbacks.

Finally, attention should also be paid to taxation aspects. If we disregard the different countries' regulations about deductible costs, we can describe the 'normal' situation for a borrower in a country with a pegged 'weak' currency as shown in Figure 7.15.

Chapter 8

Summary and recommendations

We have assumed in this book that the closing rate is used as an intermediary political target, which means that it contains central-bank-generated disturbances as well as random variations. This gives rise to an information problem in the corporate context. If the closing rate is used in accounting, then these disturbances will affect the profit and loss account and the balance sheet. This makes it more difficult for the analyst to evaluate the future prospects of the company, thus violating the fundamental principles of accounting.

The objections to all the major recommendations available today are serious ones. In FASB 8 the profit and loss account was affected by all variations in exchange rates, which made any analysis of the company almost impossible. Today the consensus seems to tend towards an alternative whereby part of the variation, depending on the character of the particular business, is not shown in the profit and loss account, thus involving a breach of the clean profit principle. In this book we have taken a different approach: we have analysed the character of the exchange rate, with a view to finding other ways of reducing the impact of volatile exchange rates on the profit and loss account.

In the absence of any 'super' model of the behaviour of the exchange rate, the information problem will persist. On the subject of model-building at a macroeconomic level there is broad agreement about certain basic equilibrium relationships, and from a practical point of view these are very attractive for accounting purposes as well. We have analysed these relationships here and found them to possess acceptable validity in the longer term, but we also found fairly substantial short-term deviations between the theory and our empirical observations.

First let us see what our empirical findings mean to the different arguments for and against undertaking the corporate management of foreign exchange risk.

Many companies rely on the validity of the Purchasing Power Parity theory, concluding that they have no exposure to foreign exchange risk to cope with. Since we found substantial deviations from PPP in the short term, there is every reason for the company to consider this type of risk here. Furthermore, as PPP is based on aggregated price levels, there is also a risk exposure for the individual company due to the fact that the relative prices of its inputs and outputs may change.

Some companies admit the existence of an exchange risk but argue, referring to the Modigliani–Miller theorem, that corporate hedging decisions are irrelevant. In our discussion of the information problem in the present book we saw how difficult it is for the investor (shareholder) to manage the risk himself rather than leave it to the companies represented in his portfolio. We have pointed out that the company's financial reports do not provide the investor with adequate information to cope with such a task. We have also discussed how to improve the reports in order to facilitate all investment or hedging decisions made by decision-makers outside the company. But the fact still remains that corporate size and structural factors in society will always make it easier for companies than for individual investors to hedge at a lower cost.

There is also a third type of arguments raised against corporate risk management. Some companies admit the existence of an exchange risk and even the appropriateness of the company coping with this risk, if indeed it should be coped with at all; but they claim that there is no point in hedging since the value of such a procedure is so uncertain. However, as we have found above that the variances are smaller in the forward rate than in the future spot rate in a three-month perspective, we may argue that, over this term, a forward contract will reduce the variance in our cash flow due to exchange rate fluctuations. We have also emphasized that it is important, at least for a small company, to be able to establish the cost of exchange rate fluctuations on an ex ante basis.

The short-term deviations from various equilibrium relationships, which have been emphasized here, provide the company with all the arguments needed for considering foreign exchange risk and trying to cope with it systematically. The company has to take the variation around different market equilibria into account in these plans. Here we come up against the information problem in two dimensions: one internal (forecasts and feedback as elements of corporate planning) and the other external (foreign exchange accounting). In the long term the validity of the equilibrium relationships provides the company with guidelines how to handle the information problem.

In the case of corporate foreign exchange forecasting, we found that short-term forecasts based on these relations showed quite big stand-

ard deviations in forecasting error but that they generally provided unbiased estimates of the forward spot rate.

In the very short perspective fluctuations were found to follow a random-walk model, suggesting that the 'best' forecast in that time perspective is the current exchange rate. In a slightly longer perspective, perhaps 3-6 months, we found the market-based forecasts to be on almost the same level as regards bias and standard deviations. However, over the period as a whole, the forward premium/discount revealed the smallest standard deviation in all the five currencies studied. Four market-based forecasting mechanisms were evaluated, and as they appear to be geared in part to different information, the 'best' forecast would perhaps be a weighted average of the four forecasts thus generated.

We still await proof that it is possible to improve on the market, and the forecasts that it generates. The staff of a company may feel they have the capacity to do it, in which case the market-based forecasts will serve as a check for their own forecasts. The rest of us will have to plan according to the relationships underlying the market-based forecasts, taking the fluctuations in these forecasts into account in our planning process.

The prospects for long-term forecasting appear to be a little better. Deviations from purchasing power parity seem to provide good grounds for forecasts. The direction and magnitude of the deviations are fairly easy to estimate, but their timing remains a problem. Timing — plus a probability distribution for central bank intervention — must be examined in a political perspective and the degree of openness to foreign trade on the part of the countries involved must also be taken into account. The probability that a deviation from PPP will be corrected during the lifetime of a long-term loan must be regarded as great, which means that the question of timing is less problematic in the longer view.

In the foreign exchange accounting of long-term monetary items, the relationships can — and do — help to reduce fluctuations in the profit and loss account due to 'non-systematic' movements in exchange rates in a manner that is consistent with the theory.

According to the theories presented above, the cost of a foreign loan can be expected to equal the cost of an equivalent loan in the domestic currency. But if loan contracted by domestic companies on the international capital market are not to be less advantageous than loans contracted in the home currency, we must consider not only the level of the total cost but also the distribution of cost over the lifetime of the loan. This means for a foreign loan a straight cost distribution which is based *a priori* on some form of forecast of exchange rate movements. If Fisher's Open Relationship is used, the forecast is obtained with the

help of the interest differential; it can also be obtained with the help of the forward rate. Because of the straight cost distribution which results from either of these methods, it becomes easier to evaluate a company's exchange arrangements in terms of opportunity cost.

We have not examined any accounting method based on these two alternatives in such a pure form here, because the interest differentials obtaining in connection with long-term loans during the period 1973–74 would have resulted in reserves at liquidation more or less corresponding to the total change in exchange rate for the period. In the case of the method based on the forward rate, no analysis was possible due to the absence of rates covering the whole period of a long-term loan.

In the two financial alternatives the money market normally supplies forecasts of developments in the exchange rate, which can be used in the calculations. The necessary information can be obtained without difficulty from economic journals. If the PPP-based method is similarly used, forecasts of inflation rates will be required as a basis for forecasting exchange rates. Good forecasts of inflation rates are difficult to find. The interest rate differential which is used in Fisher's Open Relationship can be regarded in itself as representing the market's estimate of developments in relative inflation during the period concerned.

From a practical point of view and especially in view of the 'new' pattern displayed by interest rates, there is every reason to use these estimates and thus to spread the costs according to Fisher's Open Relationship, when the accounting process is to be used for internal calculations and for the control of various financial dispositions in terms of opportunity costs. The slight difference in the 1973/74 long-term interest rates and the lagged adjustment can be seen as a temporary problem during the transition to new exchange rate systems and new patterns of inflation, following the breakdown of the Bretton Woods agreement.

However, although the two expectation-based methods discussed here are relatively easy to use, they can produce deviations with serious implications for the company if major changes, which could not have been anticipated with the indicators used, occur in certain fundamental economic variables during the loan period. These consequences would primarily affect payment capacity. From this point of view it seems more reasonable to distribute costs on a basis of some variable which is related to changes in real economic variables, and which has a close bearing on developments in the exchange rate. Thus it can be justified in this context to evaluate foreign debts on a basis of an exchange rate derived from PPP — an equilibrium rate which is not

a forecast in any traditional sense. The improvement in payment capacity that this method allows is sometimes won at the cost of the greater variation in the distribution of capital costs up to the moment just before settlement, which the above-mentioned methods allow. However, during the period investigated the variation under this method is markedly less than it would have been with a distribution of costs based on the closing rate (see Table 7.3). In our empirical study of the period 1974–84, the PPP method resulted in a substantial improvement in terms of payment capacity, compared with an evaluation based on the closing rate. This advantage was illustrated in Figures 7.11–7.14, and it is what we would expect in view of the time lag between changes in relative inflation and the effect of these changes on exchange rates.

The modified versions of the methods based on Fisher's Open Relationship and the forward rate do not produce the same positive effect in the shape of a straight cost distribution that we get if we apply the methods in their pure forms. In our present context we have examined them mainly as an alternative to the method based on purchasing power parity, and in light of their ability to improve predictive capacity in general and payment capacity in particular. In this respect, however, both methods have proved clearly inferior to the method based on purchasing power parity.

The PPP-based method has an accumulative character, i.e. the deviations accumulate. Fisher's Open Relationship for example, does not have this character. When it is used for accounting purposes it can quickly reach a new level without expressing the difference between the new and the old one. This must be regarded as a serious drawback.

If accounting is based on an exchange rate derived from purchasing power parity, exchange hedging on grounds of 'prestige' (cf. Chapter 6) will probably not be necessary and investors are more likely to be able to go ahead with their investments as planned.

When it comes to *implementing* the proposal based on purchasing power parity, the choice of equilibrium point will be of central importance, and special attention will have to be paid to possible conflict with the principle of objectivity. However, the proposal seems within reasonable limits to be fairly robust when evaluated for different tentative equilibrium points. And as regards any conflict with the objectivity rule, it should be remembered that the proposal is based on *realized* deviations from PPP only. As we have seen, the proposal is intended to improve the assessment of a company's earnings and its financial status. With PPP-theory as a normative basis this can be achieved by eliminating two kinds of disturbance: central-bank-generated and random. An accounting standard based on the PPP-

theory will take care of this second kind at least, and it will improve the accounting with regard to the first unless the choice of equilibrium point is obviously absurd.

In the case of long-term items which can be expected to return to equilibrium at least once during their lifetime, the use of this system is well motivated. And even if there is no return to equilibrium during the loan period, the results of using the PPP system will not be much worse than if the closing rate had been applied. At least the random disturbances will have been eliminated. Nor is there any problem about access to the various indexes.

In conclusion, the PPP-based method should be used in external reporting as well as in internal reporting. If the primary concern of the internal reporting is the control and evaluation of the company's financial allocations, however, then the method based on Fisher's Open Relationship is recommended so that an evaluation in terms of opportunity cost can be obtained.

All three methods can be accepted as appropriate tools for internal use in corporate planning, without further complications.

We have geared our discussion to corporate financial loans, to underline a focus on medium- and long-term distribution effects. The results can of course be extended to apply to net monetary items in the medium and long term as well.

Our empirical findings, which show that the PPP-theory holds in a long-term perspective but reveals quite considerable deviations in the short term, can also be used in connection with the translation of foreign currency financial statements. The previously favoured use of the monetary/nonmonetary method implies acceptance of the validity of the PPP-theory in both the long- and short-term perspectives, which contradicts the empirical findings of the present study. The consensus of today around the closing rate method means that none of the major accounting organizations has taken advantage of the long-term validity of the equilibrium relationships discussed above. According to our findings, short-term assets and liabilities should be translated at the closing rate, and long-term assets and liabilities at an exchange rate based on the PPP-theory. In view of the long-term validity of the PPP-theory, nonmonetary items should be translated at the historic rate in long-term contexts. But for the sake of consistency, both monetary and nonmonetary long-term items should be translated to an exchange rate based on the PPP-theory, as proposed in this report.

Appendix 1

Exchange rate arrangements

(As of July 31, 1984)[1]

Currency pegged to					Flexibility Limited in terms of a Single Currency or Group of Currencies		More Flexible		
US Dollar	French Franc	Other currency	SDR	Other composite[2]	Single currency[3]	Cooperative arrangements[4]	Adjusted according to a set of indicators[5]	Other managed floating	Independently floating
Antigua & Barbuda	Benin	Bhutan (Indian Rupee)	Burma	Algeria	Afghanistan	Belgium	Brazil	Argentina	Australia
Bahamas	Cameroon	Equatorial Guinea (Spanish Peseta)	Burundi	Austria	Bahrain	Denmark	Chile	Costa Rica	Canada
Barbados	C. African Rep.	Gambia, The (Pound Sterling)	Guinea	Bangladesh	Ghana	France	Colombia	Ecuador	Japan
Belize	Chad	Lesotho (South African Rand)	Iran, I.R. of	Botswana	Guyana	Germany	Peru	Greece	Lebanon
Bolivia	Comoros	Swaziland (South African Rand)	Jordan	Cape Verde	Maldives	Ireland	Portugal	Guinea-Bissau	South Africa
Djibouti	Congo		Kenya	China, P.R.	Qatar	Italy	Somalia	Iceland	United Kingdom
Dominica	Gabon		Rwanda	Cyprus	Saudi Arabia	Luxembourg		India	United States
Dominican Rep.	Ivory Coast		São Tomé & Principe	Fiji	Thailand	Netherlands		Indonesia	Uruguay
Egypt	Mali		Seychelles	Finland	United Arab Emirates			Israel	
El Salvador	Niger		Vanuatu	Hungary				Jamaica	
Ethiopia	Senegal		Viet Nam	Kuwait				Korea	
Grenada	Togo			Madagascar				Mexico	
Guatemala	Upper Volta			Malawi				Morocco	
Haiti				Malaysia				New Zealand	
Honduras				Malta				Nigeria	
Iraq				Mauritania				Pakistan	
Lao P.D. Rep.				Mauritius				Philippines	
Liberia				Nepal				Spain	
Libya				Norway				Sri Lanka	
Nicaragua				Papua New Guinea				Turkey	
Oman				Romania				Uganda	
Panama				Singapore				Western Samoa	
Paraguay				Solomon Islands				Yugoslavia	
St. Lucia				Sweden				Zaïre	
St. Vincent				Tanzania					
Sierre Leone				Tunisia					
Sudan				Zambia					
Suriname				Zimbabwe					
Syrian Arab Rep.									
Trinidad and Tobago									
Venezuela									
Yemen Arab Rep.									
Yemen, P.D. Rep.									

Classification status[1]	1979	1980	1981	1982	End of Period 1983				1984					
	A	A	A	A	QI	QII	QIII	QIV	Feb.	Mar.	Apr.	May	June	July
Currency pegged to														
US Dollar	42	39	38	38	37	36	35	33	33	33	33	33	33	33
French Franc	14	14	14	13	13	13	13	13	13	13	13	13	13	13
Other Currency	4	4	5	5	5	5	5	5	5	5	5	5	5	5
of which: Pound Sterling	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
SDR	14	15	15	15	14	14	12	13	12	11	11	11	11	11
Other currency composite	20	22	21	23	24	25	27	27	28	28	28	28	28	28
Exchange rate adjusted according to a set of indicators	3	4	4	5	5	5	5	5	5	6	6	6	6	6
Cooperative exchange arrangements	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Other[6]	33	34	37	38	39	39	40	41	41	41	41	41	41	41
Total[7]	139	141	143	146	146	146	146	146	146	146	146	146	146	146

[1] Excluding the currency of Democratic Kampuchea, for which no current information is available. For members with dual or multiple exchange markets, the arrangement shown is that in the major market.
[2] Comprises currencies which are pegged to various 'baskets' of currencies of the members' own choice, as distinct from the SDR basket.
[3] Exchange rates of all currencies have shown limited flexibility in terms of the U.S. dollar.
[4] Refers to the cooperative arrangement maintained under the European Monetary System.
[5] Includes exchange arrangements under which the exchange rate is adjusted at relatively frequent intervals on the basis of indicators determined by the respective member countries.
[6] This category includes all currencies of countries under the headings of 'Flexibility Limited in Terms of a Single Currency' and 'More Flexible': 'Other managed floating' and 'Independently floating'.
[7] Including the currency of Democratic Kampuchea.

Source: International Monetary Fund, *International Financial Statistics*, September 1984.
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Appendix 2

Relevant variables and sources in the data base used

Variables	Notes about registration	Sources
Exchange rates		
Spot, buying rate	weekly 1974-01-01–1984-10-01	SE-bank, Sweden
Three-month forward buying rate	weekly 1974-01-01–1984-10-01	SE-bank, Sweden
Spot, selling rate	weekly 1974-01-01–1984-10-01	SE-bank, Sweden
Three-month forward selling rate	weekly 1974-01-01–1984-10-01	SE-bank, Sweden
Interest rates		
Official discount rate	weekly 1974-01-01–1984-10-01 United Kingdom (minimum lending rate)	OECD
Three-month Euro-rate	weekly 1974-01-01–1984-10-01 GBP, USD, DEM, CHF, SEK, NLG Swedish rate derived from US rate Tuesday deposit bid rate	*Financial Times*
Rates on treasury bill	monthly 19174-01-01–1984-07-01 Belgium — three-month treasury certificates Japan — 60 to 62-day non-interest-bearing discount government bills Netherlands — three-month treasury bills Sweden — new issues of	World Financial Markets, Morgan Guaranty Trust Company

Variables	Notes about registration	Sources
	three-month treasury bills. The appearance of an open market in July 1982 has been taken into account in a consistent manner United Kingdom — 91-day treasury bills at tender United States — three-month treasury bills Germany — 60 to 90-day treasury bills as sold by the German Central Bank and recently Frankfurt 90-day rate	Bundesbank, Germany
Commercial bank lending rates to prime borrowers	monthly, 1974-01-01–1984-07-01 Austria — overdraft rate for prime borrowers, including commission Belgium — prime overdraft rate Denmark — approximate rate for loans and advances to prime borrowers Finland — average rates on total commercial bank lending France — base lending rate, excluding a commission of 0.05% per month on highest debit balance during the month. A spread above base rate is often added Germany — approximate effective overdraft rate for prime borrowers Italy — unsecured overdraft rate for prime borrowers Japan — average contracted interest rate for short-term loans of city banks. In addition, compensating balances may be required	World Financial Markets, Morgan Guaranty Trust Company

Variables	Notes about registration	Sources
	Netherlands — overdraft rate for prime borrowers, including commission Norway — overdraft rate, including a commission of 0.25% per quarter on the total line of credit until January 1983. New series as of February 1983, special rate of first class, large borrowers Sweden — overdraft rate for prime industrial borrowers, commission not included Switzerland — unsecured overdraft rate for prime borrowers, excluding commission of 0.25% per quarter on average or highest outstanding debit balance in quarter United Kingdom — clearing bank base lending rate. A spread above base rate is often added United States — prime rate of Morgan Guaranty Trust Company	
Domestic corporate bond yields	monthly, 1974-01-01–1984-07-01 France — INSEE tax-adjusted average yield on outstanding private corporate bonds Germany — Bundesbank average yield on industrial bonds Japan — secondary market yield for NTT bond maturing March 1987 Netherlands — CBS average yield on three 6% to 5% corporate bonds until December	World Financial markets, Morgan Guaranty Trust Company

Variables	Notes about registration	Sources
	1981. New series as of January 1982, yield of domestic long-term bonds issued by major banks Norway — 5.75% Dalen Portland-Cement bond of 1969–84 until December 1982. New series as of January 1983 average yield of long-term industrial bonds Sweden — Central Statistical Bureau average yield on industrial bonds Switzerland — average yield on outstanding bonds of four leading Swiss companies. Mixture changed as of January 1982 United Kingdom — F.T. (*Financial Times*) Actuaries 20-year debentures and loans until February 1981, F.T. Actuaries 25-year debentures and loans United States — Salomon Brothers index of new issue yields for Aa industrial bonds with five-year call protection	
Euro-rates, medium-term loan	1973–74	*Euromoney*
Price indexes		
Consumer price indexes	monthly, 1974-01-01–1984–07-01	FN, *Monthly Bulletin of Statistics*; OECD, *Main Economic Indicators*
Producer price indexes	monthly, 1974-01-01–1984-07-01 As exceptions wholesale prices are registered for Austria, Belgium, Denmark and Switzerland	FN, *Monthly Bulletin of Statistics*; OECD, *Main Economic Indicators*

Appendix 3

Break-even point for foreign loan decision-making

The Swedish company may face a choice between, for example, a domestic loan at a high rate of interest or a loan at a lower rate in a more stable foreign currency such as DEM. A choice of the low-rate currency means that the borrower does not expect a shift in exchange rates such that the effective payment of interest and amortizations will exceed the corresponding amounts for the loan in the domestic currency. The choice can be formalized by calculating the break-even point, i.e. the point at which the costs for the domestic and foreign loans are equal.

Assume that the domestic loan runs for n years at an interest rate of $100 \cdot r_{Swe}$ per cent per year, to be paid annually z times. The cost of the loan per sub-period is designated x, and is obtained from the following equation

$$1 - \sum_{i=1}^{nz} \frac{r_{Swe}/z}{(1+x)^i} - \frac{1}{(1+x)^{nz}} = 0 \qquad \text{(A3.1)}$$

The cost of the loan x will be r_{Swe}/z units, to be paid annually z times. Now let us consider a loan in DEM, for example, with the same life of n years and with the same payment arrangements for an interest rate of $100 \cdot r_{WGer}$ per cent per year.

When the loan is issued, the rate of exchange is S_1 DEM/SEK. The relative rate of depreciation is assumed to be $100 \cdot d$ per cent per $1/z$ of the year.

The cost of the foreign loan is designated y and is obtained from the following equation

$$1 - \sum_{i=1}^{nz} \frac{r_{WGer}/z}{(1+d)^i \cdot (1+y)^i} - \frac{1}{(1+d)^{nz} \cdot (1+y)^{nz}} = 0 \qquad \text{(A3.2)}$$

If the costs are to be the same, then

$$y = x = (r_{Swe}/z)$$

If we insert this into equation (A3.2), we obtain:

$$1 - \sum_{i=1}^{nz} \frac{r_{WGer}/z}{(1+d)^i \cdot (1+r_{Swe}/z)^i} - \frac{1}{(1+d)^{nz}\,(1+r_{Swe}/z)^{nz}} = 0 \qquad \text{(A3.3)}$$

If the costs of the loan are to be the same, the degree of depreciation d must satisfy equation (A3.3), which gives us:

$$d = \frac{r_{WGer} - r_{Swe}}{z + r_{Swe}} \qquad \text{(A3.4)}$$

If d assumes this value, then the cost of the domestic loan is the same as the cost of borrowing abroad, and the break-even point at the end of the period is $S_1 \cdot (1 + d)^{nz}$ DEM/SEK. The loan decision is then made on a basis of the company's evaluation of the size of the probable rate of exchange at the end of the lifetime of the loan. The question which then arises is the extent to which the irregular swings in the exchange rate reduce the value of the break-even point as a decision criterion.

In view of the distribution of random variations in the exchange rate over the lifetime of the loan, the size of the present value of the interest payments and amortizations will be affected. The break-even point as a decision criterion should thus be replaced by an interval of break-even points. If, on the other hand, interest payment and amortization occur only when the loan is liquidated, the creation of a break-even interval will naturally not add any new decision information.

Appendix 4

Examples of different methods of translation

Some examples are given below of different methods for translating the financial report of a foreign subsidiary expressed in terms of the of currency in the country where it is located.

It is assumed in the examples that a wholly-owned subsidiary is reporting in its own currency FC (foreign currency), and that this report is to be translated into the parent company's currency LC (local currency).

At the end of the year covered by the report, the following applies:

Parent company (in LC)			
Shares in subsidiary	20	Other debts	20
Other assets	80	Equity	80
	100		100
Foreign subsidiary (in FC)			
Current assets excluding stocks	20	Short-term debts	20
Stocks	20	Long-term debts	40
Machines	40	Equity	20
	80		80

The exchange rate at the beginning of the year was 1 LC = 1 FC and at the end of the year 1 LC = 2 FC. Stocks and machines were purchased at the beginning of the year. The loan was also contracted at that point.

Translation of the foreign subsidiary's balance sheet into the parent company's currency using different methods gives the following results and differences:

Monetary/nonmonetary method

Current assets excluding stocks	10	Short-term debts	10
Stocks	20	Long-term debts	20
Machines	40	Equity	40
	70		70

This method gives a translation gain of 20 LC.

The *temporal method* in its modified form with stocks translated at the closing rate, gives the following balance sheet.

Current assets excluding stocks	10	Short-term debts	10
Stocks	10	Long-term debts	20
Machines	40	Equity	30
	60		60

According to this method the translation gain is 10 LC.

The *current/noncurrent method* differs from the other methods reported here in its treatment of long-term debts. When this method is used, translation is based on the historic rate. The subsidiary's balance sheet assumes the following appearance in LC.

Current assets excluding stocks	10	Short-term debts	10
Stocks	10	Long-term debts	40
Machines	40	Equity	10
	60		60

This method yields a translation loss of 10 LC.

Current method

Current assets excluding stocks	10	Short-term debts	10
Stocks	10	Long-term debts	20
Machines	20	Equity	10
	40		40

This method yields a translation loss of 10 LC, which generally corresponds to the change in the exchange rate multiplied by equity, i.e. in the present case $0.5 \cdot 20$.

The different methods yield results which also reflect differences in the underlying assumptions about items which are exposed to ex-

change risk. The *exchange risk*, given the above methods, will be as follows:

Balance-sheet items	M/NM	T	C/NC	C
Current assets excluding stocks	20	20	20	20
Stocks	—	20	20	20
Fixed assets and machines	—	—	—	40
Short-term debts	20	20	20	20
Long-term debts	40	40	—	40
Net exposure	−40	−20	20	20

Appendix 5

Different ways of influencing the risk exposure

Internal group/company means

1 Change in contract currency
2 Contract in domestic currency
3 Matching of revenues and costs in current operations (structural matching)
4 Total matching of revenues and costs in current operations with revenues and costs in the financial side of the group
5 Change in payment rhythm (leads/lags for parent company/subsidiary)
6 Change in payment rhythm (leads/lags parent company/other foreign stakeholders)
7 Advance payments in other forms
8 Allocation of responsibility for borrowing and payments between parent company and foreign subsidiary
9 Structural changes in debts/claims of an exchange nature (weak currencies versus strong)
10 Currency reserves (for example with internal forward hedging)
11 Export financing arrangements in the group
12 Internal pricing routines (transfer pricing)
13 Adjustments in level of stocks
14 Change in credit conditions in foreign supplier's or foreign customers
15 Cross-matching based on correlation
16 Change in prices on export markets
17 Change in prices on local markets

External group/company means

18 Forward market transactions
19 Foreign loans

20 Swap arrangements (parallel loan/deposit)
21 Sell future receivables
22 Arrangements for financing exports
23 Factoring
24 Leasing
25 Currency options
26 Financial futures

Appendix 6

Yield on spot and forward speculation

The following are the results of two types of speculative transactions during the period 1974–84. The yield has been calculated by the quarter, and is expressed as a percentage of the period. The quarter has been approximated at 13 weeks.

Spot speculation means that a given currency is purchased at sight once per quarter, is invested in treasury bills in the currency country, and is exchanged back into SEK after three months. Figures A6.1–A6.4 show the development of the yield on such transactions in GBP, USD, DEM and JPY. Table A6.1 shows the average values ($\bar{a}_s$) and the standard deviations (s) for the yield, which is calculated according to the following formula:

$$a_s = \left[\frac{S^{buy}_{t+13} \; x(1 + r_{for}/4)}{S^{sell}_{t} \; x(1 + r_{Swe}/4)} - 1 \right] \cdot 100 \qquad \text{(A6.1)}$$

Table A6.1 Mean ($\bar{a}_s$) and standard deviation (s) in speculative yield on spot transactions
Quarterly data, per cent per quarter

	1974–84		1974–76		1978–84	
Currency	$\bar{a}_s$	s	$\bar{a}_s$	s	$\bar{a}_s$	s
GBP	0.68	5.47	−2.58	4.36	1.36	5.17
USD	1.32	5.47	−1.48	4.65	2.50	5.17
DEM	0.48	4.52	−0.24	1.82	0.22	5.29
JPY	−0.12	6.00	−3.91	4.40	0.75	5.81
Number of observations	42		12		26	

Figure A6.1 Yield on spot speculation SEK/GBP
Quarterly data, per cent per quarter

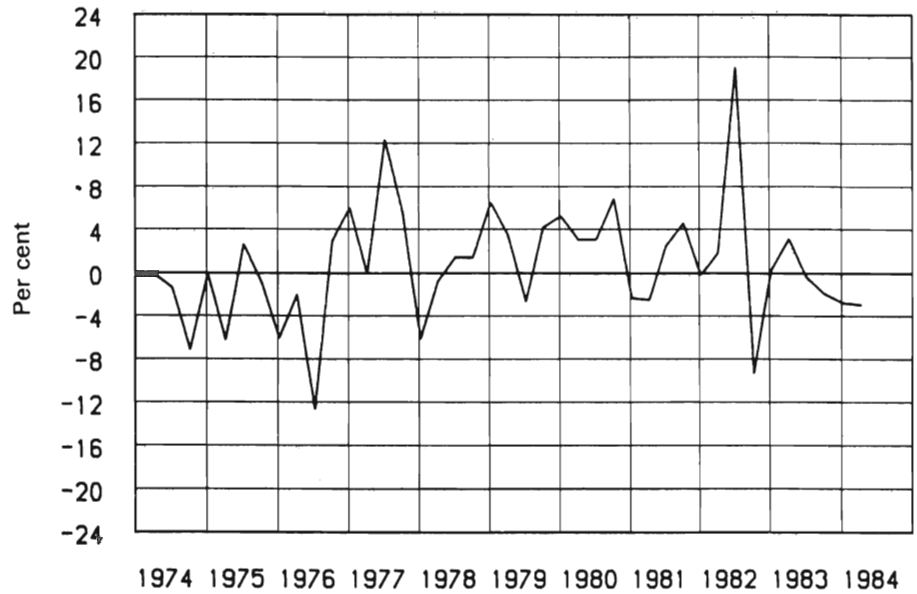


Figure A6.2 Yield on spot speculation SEK/USD
Quarterly data, per cent per quarter

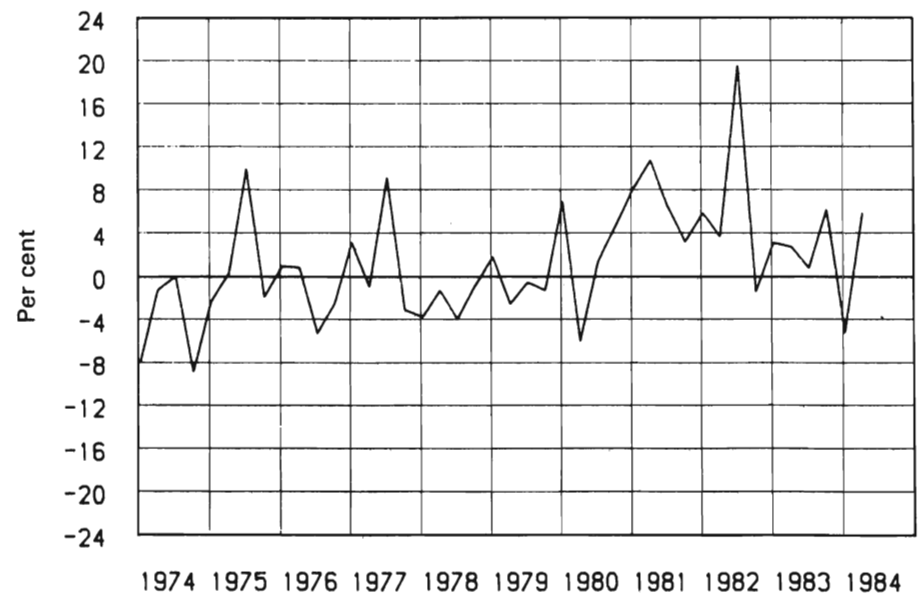


Figure A6.3 Yield on spot speculation SEK/DEM
Quarterly data, per cent per quarter

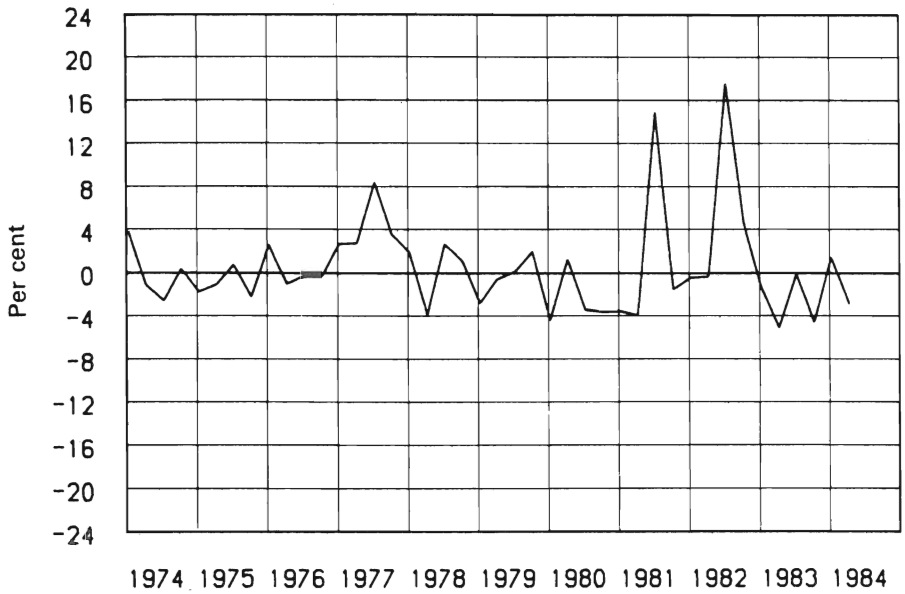
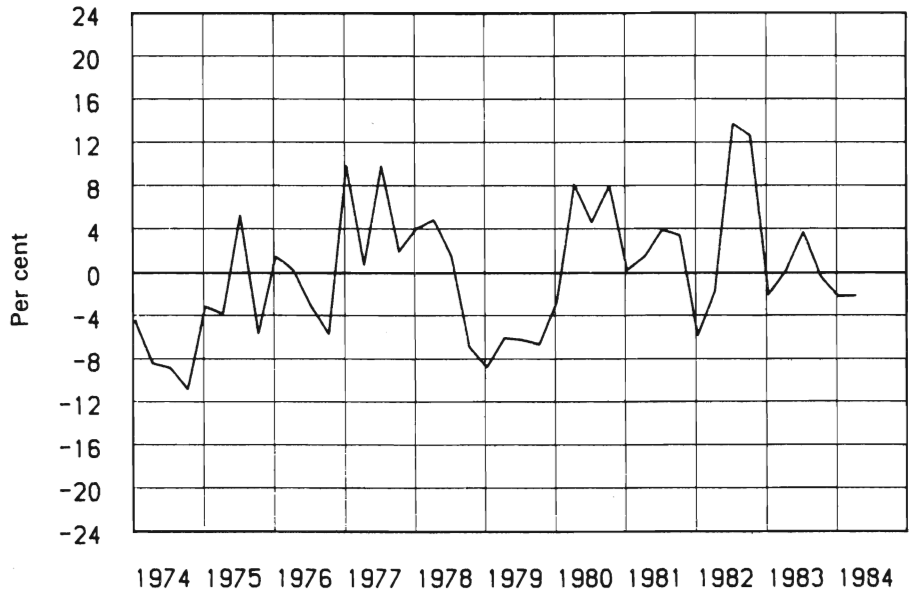


Figure A6.4 Yield on spot speculation SEK/JPY
Quarterly data, per cent per quarter



The notations 'buy' and 'sell' refer to the currency bank's transactions. The yield has been calculated in terms of opportunity costs. The alternative consists of investing the money in Swedish treasury bills for an equivalent period. A negative value of a_s thus implies that for the period in question it would be more favourable to choose this safe investment rather than the corresponding investment abroad. Spot speculation in US dollar shows a positive average value for the whole period, indicating profitability. However, this profitability is not statistically significant at a 5 per cent level.

Forward speculation means here the consistent purchase of currency for delivery in three months. The purchase of currency takes place every quarter at the rate $F_t^{sell}(13)$, and the sale of the amount purchased takes place three months later (here approximated as 13 weeks later) at S_{t+13}^{buy}.

Figures A6.5–A6.9 show the development of the yield on this form of speculation during the period 1974–84. The average values ($\bar{a}_f$) and standard deviations (s) are shown in Table A6.2. Here the yield has been calculated according to the following formula:

$$a_f = \frac{S_{t+13}^{buy} - F_t^{sell}(13)}{F_t^{sell}(13)} \cdot 100 \qquad \text{(A6.2)}$$

Figure A6.5 Yield on forward speculation SEK/GBP
Quarterly data, per cent per quarter

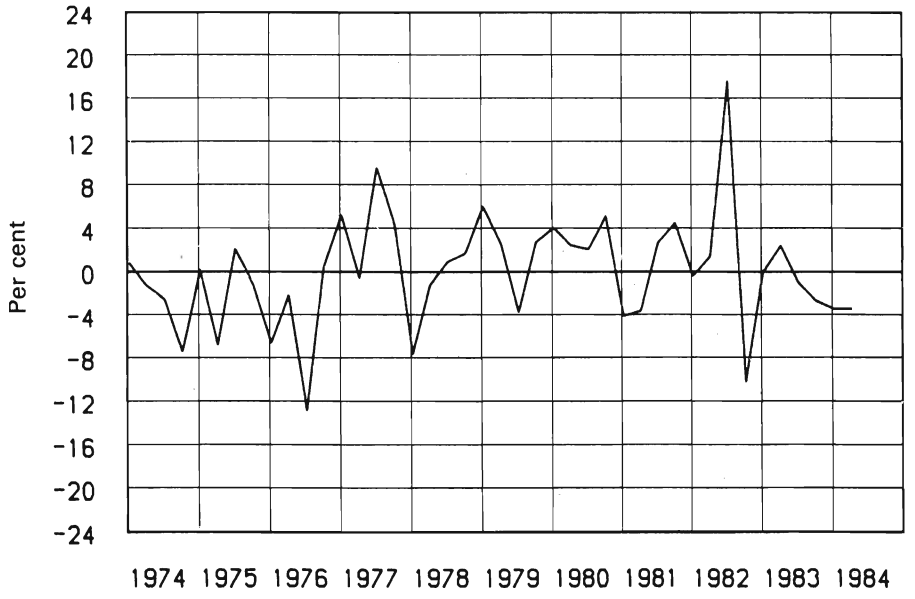


Figure A6.6 Yield on forward speculation SEK/USD
Quarterly data, per cent per quarter

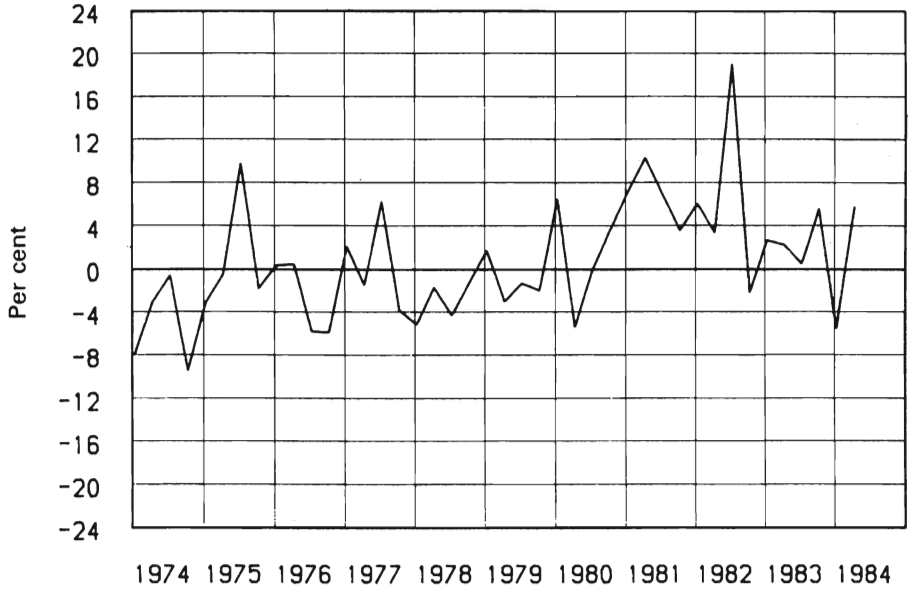


Figure A6.7 Yield on forward speculation SEK/DEM
Quarterly data, per cent per quarter

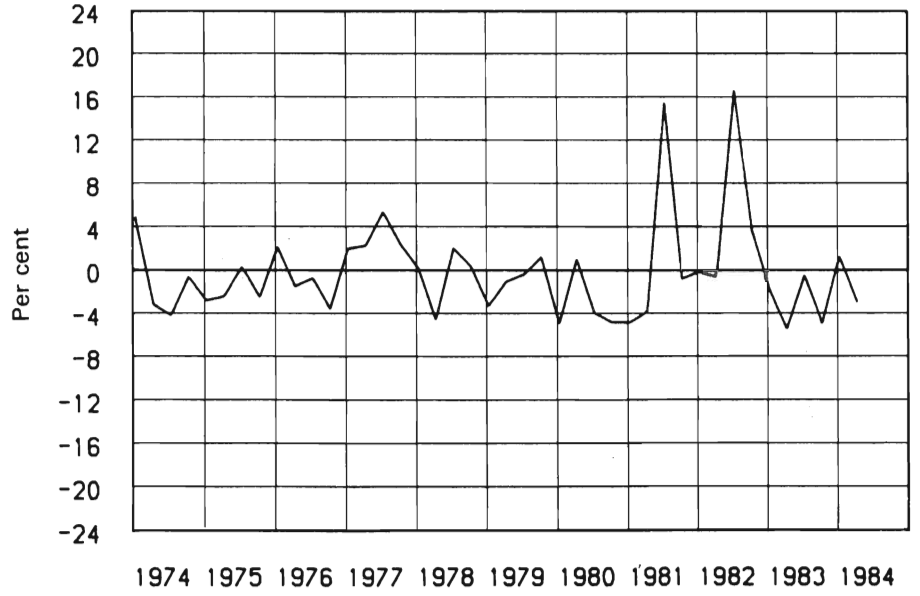


Figure A6.8 Yield on forward speculation SEK/CHF
Quarterly data, per cent per quarter

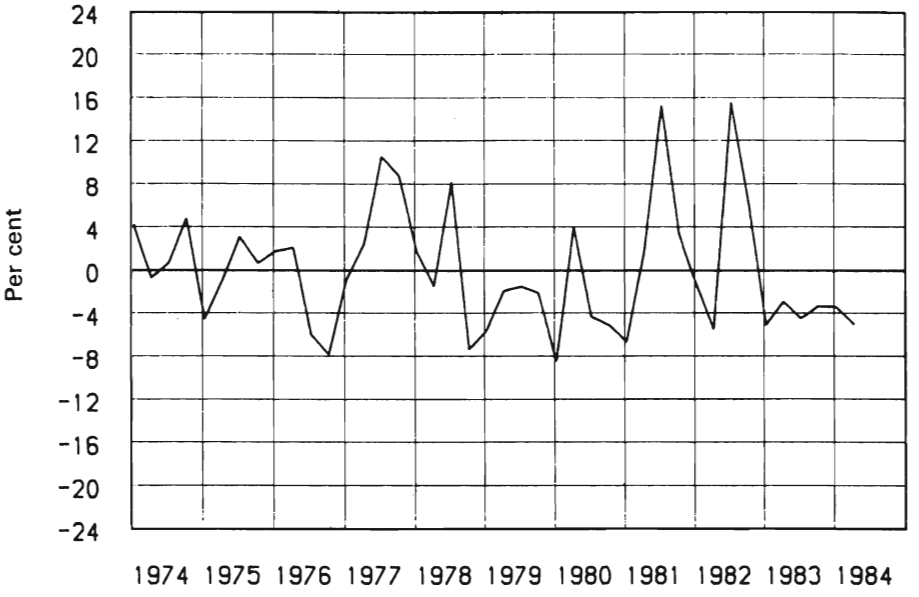
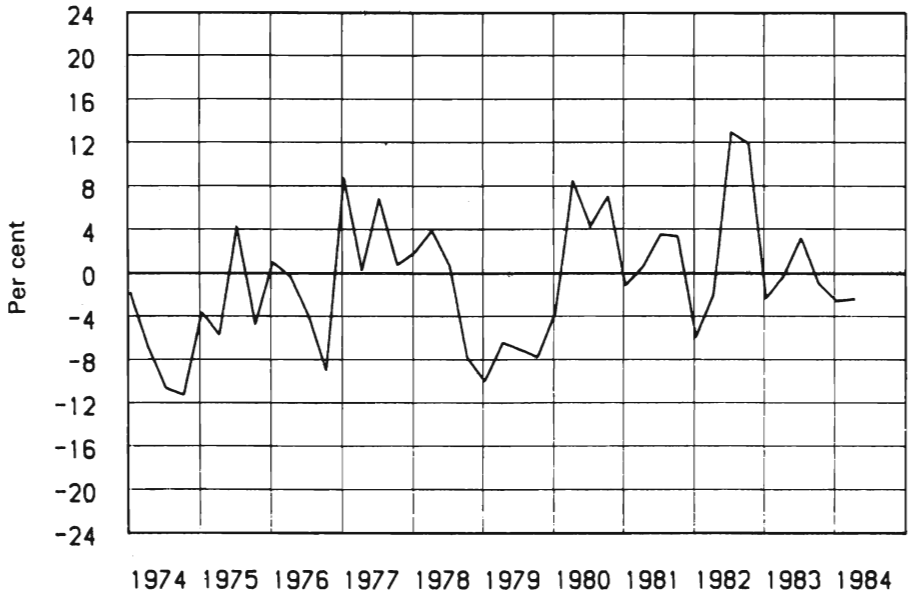


Figure A6.9 Yield on forward speculation SEK/JPY
Quarterly data, per cent per quarter



A positive value for a_f means that the transaction has been profitable during the period concerned. On an efficient market the average yield on this type of forward speculation in a given currency can be expected to be weakly negative as a result of the transaction cost, which is a function of the purchase-sale margins.

Table A6.2 shows USD as the only currency which would have given a positive average yield on speculative purchases in futures during the period 1974–84. However, the result lies within the margin of error, which means that the average yield on this type of transaction is not demonstrably greater than zero in statistical terms. The studied

Table A6.2 Mean ($\bar{a}_f$) and standard deviation (s) in speculative yield on forward transactions
Quarterly data, per cent per quarter

	1974–84		1974–76		1978–84	
Currency	$\bar{a}_f$	s	$\bar{a}_f$	s	$\bar{a}_f$	s
GBP	−0.79	5.27	−3.12	4.22	0.59	5.14
USD	0.72	5.51	−2.25	4.79	2.08	5.50
DEM	−0.21	4.56	−1.18	2.49	−0.26	5.33
CHF	0.03	5.74	−0.20	3.85	−0.71	6.19
JPY	−0.79	5.90	−4.37	4.51	0.09	5.85
Number of observations	42		12		26	

occasions are envisaged as representing a random selection from a population consisting of the same number of occasions as there are days in the period. The result obtained agrees well with the result in Table 4.27. This table shows that on an average the forward exchange rate overestimated the future spot rate for all the currencies investigated during 1974–84. This overestimation suggests that speculation in the form of systematic forward *selling* would have been profitable during the period. Big negative values in Table A6.2 mean that forward selling has yielded a profit. The size of this profit, still not significant in a statistical sense for the period 1974–84, is the same as the values in the table less the transaction cost. On an efficient market, speculation by way of forward selling can be expected to give an average yield, which in terms of a_f is weakly positive.

A test of the autocorrelation pattern for time shifts up to four quarters using the Box–Pierce test, shows no demonstrable pattern for any combination of currency and period.

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Corporate Forecasting and Reporting Problems

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