

Chapter 1 – Introduction

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The Norwegian krone appreciated substantially from summer 2000 to January 2003. In the same period, the interest rate differential against other countries was high and increasing. Interest rates abroad declined, whereas in Norway, they remained relatively high. International stock markets fell sharply. The risk of a further decline in international share prices fuelled a growing interest in interest-bearing papers and many investors started to look at currencies with high interest rates. This led to increased demand for the Norwegian krone.

The krone exchange rate was reasonably stable until the mid-1990s. This was ascribable, among other things, to low wage inflation and the fact that aggregate demand did not contribute to pressure in the economy. The krone then gradually started to fluctuate more. Movements in the exchange rate have been substantial over the past two years compared with the first half of the 1990s. However, the fluctuations are not so great when compared with those in other commodity-exporting countries. This is related to the Norwegian Petroleum Fund mechanism and the mandate for fiscal policy, which dampen the effect of changes in oil prices on the exchange rate.

The new guidelines for economic policy introduced in March 2001 changed the interaction between the different components of economic policy. Previously, growth in public expenditure was reduced or other fiscal measures implemented if the labour market was tight and wage growth was high. The government is now striving to base its budget policy on the new fiscal rule, which entails a moderate and steady phasing in of the use of oil revenues. The National Budget levels out fluctuations in the economy by means of automatic stabilisers.

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Monetary policy will also help to stabilise economic conditions. The new guidelines were introduced in a period when the labour market was tight and wage growth in Norway was particularly high. As economic conditions were difficult abroad, a strong Norwegian krone was inevitable in periods.

Conditions in the foreign exchange market are unstable. In the short term, it can be difficult to explain – let alone predict - what is driving exchange rate movements. Economic theory can, however, help us to understand some of the fundamental forces that influence long-term trends in the exchange rate. In this booklet, we present examples of different approaches to analysing exchange rate movements. The seven articles are based on empirical and theoretical analyses and will help to cast light on movements in the exchange rate during this period, both individually and as a whole.

We start by looking at mechanisms that are of importance to the determination of long-term trends in the real exchange rate. The consequences for the Norwegian economy of phasing in oil revenues has been the subject of economic analyses for more than 30 years, see for example Report to the Storting no. 25 (1973-74), which discusses problems related to changes in industry structure resulting from changes in the use of oil revenues. The introduction of the fiscal rule in spring 2001 generated a renewed interest in the subject. In Chapter 2, Ragnar Torvik² analyses dynamic adjustments in the real exchange rate with increased use of oil revenues. He argues that in the short term the exchange rate will appreciate in real terms in order to realise a transfer of resources from the exposed to the sheltered sector. He shows that this real appreciation may be greater in the short term than the long term, that it may be temporary, and that the long-term equilibrium level for the real exchange rate will be determined by conditions on the supply side of the economy. If, for example, sectors that expand over time also become more productive (e.g., from "learning by doing"), the long-term result may be a real depreciation of the krone exchange rate.

Whereas Torvik focuses on long-term conditions on the supply side to explain movements in the real exchange rate, there is also a large body of literature in this field which offers a num-

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ber of alternatives approaches to understanding long-term developments in the real exchange rate. Q. Farooq Akram, Kari-Mette Brunvatne and Raymond Lokshall³ present an overview of some alternative explanations for movements in real equilibrium exchange rates in Chapter 3. Real equilibrium exchange rates are often used as benchmarks for assessing whether the real exchange rate is over- or undervalued. Three different methods for calculating real equilibrium exchange rates are presented: the theory of purchasing power parity (PPP), behavioural real equilibrium exchange rates (BEER) and fundamental real equilibrium exchange rates (FEER). The authors also give an overview of recent empirical research on real exchange rates based on these approaches.

The PPP approach assumes that the real equilibrium exchange rate is constant. In practice, however, we observe both trends and cycles in the real exchange rate over different time horizons. The BEER and FEER approaches are based on the assumption that the real equilibrium exchange rate may vary over time. The BEER approach defines the real equilibrium exchange rate as a function of underlying economic conditions. The real equilibrium exchange rate is derived from an empirical model that is based on actual movements in the real exchange rate. Several different economic conditions and mechanisms have proved to be important in explaining actual movements in the real exchange rate. Such conditions may include differences in productivity growth between countries, changes in variables that represent the terms of trade, differences in public expenditure between countries, net financial assets and the interest rate differential against other countries. The FEER approach is based on an empirical model of macroeconomic variables that are influenced by the real exchange rate. The real equilibrium exchange rate FEER is defined as the level that is achieved when the macroeconomic situation is characterised by internal and external balance. Conditions that contribute to increasing net foreign assets and capital income provide the basis for a stronger real equilibrium exchange rate.

In Chapter 4, Q. Farooq Akram applies the three different approaches (PPP, BEER and FEER) to Norwegian data and calculates real equilibrium exchange rates over different time horizons. It appears that actual movements in the Norwegian real exchange rate over the past 30 years can be interpreted in the light of the PPP approach, which implies a constant real equilibrium

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exchange rate. However, this approach does not explain fluctuations in the actual real exchange rate over time. Nor does it cast light on which variables determine the level of the equilibrium real exchange rate. The BEER approach, which is based on an empirical model of the Norwegian real exchange rate, shows that actual movements in the real exchange rate can be linked to different productivity trends for Norway and its trading partners, the interest rate differential against other countries, as well as saving and investment behaviour and the real oil price. These variables also appear to determine the level of the real equilibrium exchange rate that is achieved when these variables are at their equilibrium level/path. Akram also illustrates that growth in public spending over a longer period can, in isolation, contribute to a relatively long-term deviation from the real equilibrium exchange rate. Such spending growth could be associated with the fiscal rule. This would imply that the oil- and business cycle adjusted government deficit should be at a level corresponding to a four per cent real return on funds invested in the Government Petroleum Fund. It is expected that this deficit will increase steadily in the years ahead and that the fiscal rule therefore entails a further phasing in of oil revenues.

With the help of the FEER approach, Akram puts the use of oil revenues in a wider perspective. He focuses on permanent income from total petroleum wealth, both that which still remains in the ground ("in the seabed") and that which has been reinvested ("in the book") in financial assets through the Government Petroleum Fund. Calculations of real exchange rates that achieve internal and external balance, FEER, show that even though highly optimistic estimates of permanent income from petroleum wealth may result in a very strong exchange rate today, it will eventually only cover a falling share of imports, as the economy expands over time and import demand increases. The real exchange rate that gives external balance must therefore depreciate over time and stabilise at a level in the long term that corresponds to the situation without petroleum wealth.

With an inflation target, the central bank will constantly assess the economic situation and set interest rates with the aim of achieving the inflation target. The economy is, however, constantly changing, and the central bank must always assess the economic situation in light of recent economic shocks and events when setting interest rates. In Chapter 5, Øistein Røisland and Tommy Sveen⁴ look at how the exchange rate reacts to cost push shocks and show that the

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effect depends on how the central bank responds to the shock. Normally, the central bank would raise interest rates sufficiently to push up the real interest rate and thereby achieve a real appreciation in the exchange rate in the short term. The effect on the nominal exchange rate is, however, uncertain. The more emphasis the authorities place on avoiding variation in the current inflation rate measured as a deviation from the inflation target, the more likely appreciation is. If, on the other hand, the authorities place considerable importance on avoiding variations in the activity level, the result may be an instant depreciation of the exchange rate. Within a flexible inflation targeting framework, a nominal appreciation seems to be the most likely alternative.

In 2002, the interest rate differential against other countries increased, among other things as a result of interest rate cuts by Norway's trading partners. In summer 2002, Norges Bank increased its key rates in response to a change in the inflation outlook, resulting from the expansive wage settlement. The theory of uncovered interest parity says (somewhat simplified) that when the interest differential with other countries is positive, investors who want to invest at higher interest rates in Norway will take an exchange rate risk, as normally in such situations the krone would be expected to depreciate over the course of the period. The theory can also be used to indicate how much the krone will appreciate when the interest differential widens. In Chapter 6, Arne Kloster⁵, Raymond Lokshall and Øistein Røisland look at how much of movements in the krone exchange rate can be explained by the interest rate differential. The authors take as their starting point the apparently striking parallelism in movements in the krone exchange rate and the interest rate differential from summer 2000 to February 2003. They use the theory of uncovered interest parity to analyse the changes in the exchange rate during this period and show that the interest rate differential only explains less than half of the nominal appreciation of the krone to November 2002, whereas the depreciation between November 2002 and February 2003 is more than covered by the narrowing of the interest rate differential in this period. Therefore, an important conclusion is that the degree to which the interest rate differential explains changes in the exchange rate will vary over time. As a possible explanation for the appreciation of the krone, the authors point out that the risk premium on investments in NOK has apparently been falling since the start of 2000 and argue that it

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seems to have been largely negative since the start of 2002. Several market participants have argued that the krone has a potential role as a "safe-haven currency" in situations where the global economy is affected by fears of war and the threat of major consequences for oil prices. This would then counterbalance the expected lower return on investments in NOK as a result of the negative risk premium.

Market participants often refer to special themes or sentiments when explaining movements in the exchange rate. Bjørn E. Naug⁶ investigates whether it is possible to trace such effects in an empirical analysis of exchange rate movements in Chapter 7. He estimates a monthly model for the trade-weighted exchange rate index and includes effects from oil prices, the interest rate differential against other countries, changes in US share prices and an indicator for expected variation between major currencies. The analysis implies that the appreciation from May 2000 to January 2003 may be linked to the fact that the interest rate differential against other countries (a) increased substantially from spring 2000 to November 2002 and (b) was positive and high during the entire appreciation period. The wider interest rate differential seems to explain about 40 per cent of the appreciation from May 2000 to January 2003. The positive interest rate differential interacts with share prices and expected currency volatility and implies that falling stock markets abroad and expected weaker fluctuations between major currencies caused the krone to strengthen. This effect seems to explain more than half of the appreciation. As share prices and expected fluctuations between the major currencies fell over the appreciation period the krone became more sensitive to interest rates during this period. The appreciation in 2002 is also related to the sharp increase in the oil price and the status of the krone as a safe-haven currency during the unrest in the Middle East. The model predicts most of the depreciation from January to July 2003. It misses much of the short-run fluctuations in this period, however, and it cannot explain why the krone was relatively stable from July to November 2003. It is strongly emphasised that conditions in the foreign exchange market are expected to be unstable; it cannot be ruled out that other factors may be important in explaining changes in the krone exchange rate in the future. This could be a source of forecast errors.

⁶ Bjørn E. Naug is a researcher in the Research Department of Norges Bank.

Finally, in Chapter 8, Dagfinn Rime⁷ looks at two new directions in financial economics, behaviour-based finance theory and the microstructure approach to the foreign exchange market, to see what light they can throw on movements in the exchange rate. Rime points out that the new theories raise a number of questions relating to key assumptions in established finance theory, such as all participants having the same information or that all participants can be characterised as rational in their behaviour. The conclusions are that deviations from an equilibrium exchange rate may be persistent, that it is reasonable to think that participants in the foreign exchange market may have different information and that this can have implications for exchange rate determination. Results from the behaviour-based finance theory may shed further light on persistent deviations from fundamental conditions, or explain why market participants behave in an apparently irrational manner and often reinforce the overall effect in the market through herd behaviour. Risk premiums may be permanently higher in a market with irrational participants.

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