

# Monetary policy as an instrument in the current economic situation in Norway

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*It has been argued that the Norwegian authorities should use monetary policy as an instrument in order to dampen the ongoing upturn in the Norwegian economy. This article looks at some potential effects of monetary policy tightening and compares them with the effects of a corresponding tightening of fiscal policy. With the help of calculations on a macroeconomic model, we illustrate that monetary policy can be a more effective instrument than fiscal policy if the primary concern is to reduce inflation, because a given inflation effect may be achieved with a smaller contraction in the level of activity. However, this tightening will have a greater short term negative impact on exposed industries than a comparable fiscal contraction. If the tightening is based on the desire to shield exposed sectors from an accelerating rise in wages and costs, this may seem paradoxical.*

## 1. Introduction

The Norwegian economy is now experiencing the strongest cyclical upturn since the first half of the 1970s. Between 1992 and 1997 mainland GDP expanded by nearly 19 per cent, the same growth as during the previous ten years. The number of persons employed increased by more than 9 per cent in the same period, and unemployment has fallen from more than 6 per cent to below 4 per cent of the labour force. As a result of the sharp rise in employment during the past four years, a record-high proportion of the working-age population is now in employment. A further increase in the demand for labour may thereby result in larger geographical, sectoral and skills imbalances in the labour market than we have witnessed so far during this upturn.

There are several reasons why this may be perceived as a problem:

1. Increased pressures in the labour market may result in a period of considerably higher wage and price inflation than we have recorded in recent years. This may impair the market's role as a disseminator of information and

thus the basis for sound economic planning at the company and personal level.

2. With a fixed exchange rate, higher wage and price inflation will probably entail a sharper rise in costs in Norway than among our main trading partners. If this trend is not quickly reversed, it will contribute to a loss of market shares for Norwegian industries exposed to competition, which in the longer run will make us more dependent on uncertain petroleum revenues.
3. Temporary imbalances in the labour market may also result in restructuring costs for companies and individuals. In addition, fluctuations in production and employment may have negative consequences in the longer term; it is easy to close down existing enterprises but difficult to establish new ones.<sup>1</sup>

The first point relates to some direct costs of inflation. The second point refers to a potential structural problem, which is related to the question of how great a difference between domestic consumption and domestic production can be sustained in the long run without resulting in substantial imbalances in our economic relations with other countries.<sup>2</sup> The last point indicates a potential cyclical problem related to short-term fluctuations in the economy. Whereas long-term problems linked to the relationship between domestic consumption and domestic production cannot be resolved by monetary policy alone, cyclical imbalances may be remedied using both fiscal and monetary policy measures.

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- 1 Statistics Norway's macroeconomic models contain a similar effect: Since, according to these models, a given change in unemployment has a greater effect on the level of real wages the lower the level of unemployment at the start, the level of average real wages will over time be higher when unemployment fluctuates around a given level than when unemployment remains stable at this level. Conversely, this means that average unemployment over time may remain at a lower level for a given level of real wages ("competitiveness") if unemployment is stable than if it fluctuates.
- 2 When evaluating this question, it must be taken into account that the projected, large current-account surpluses over the last and next few years partly reflect the conversion of petroleum wealth to foreign assets. In the long term it is the return on these assets which must finance the difference between domestic consumption and domestic production. It is thus not possible to use the size of these surpluses to gauge the performance of the Norwegian economy.

A number of economists have recently argued that monetary policy should be explicitly aimed at price stability, thereby permitting monetary policy tightening.<sup>3</sup> Norges Bank (1997) has also presented arguments for a shift to an inflation target. The central bank nevertheless recommends that a stable krone exchange rate should be maintained as the objective of monetary policy, but that the guidelines should be adjusted to permit greater flexibility in the conduct of monetary policy.

Based on the growing interest in monetary policy as an instrument for stabilizing the economy, we discuss in this article potential consequences of a tightening of monetary policy using calculations from Statistics Norway's macro-econometric model KVARTS. In section 2 we argue that monetary policy tightening will probably represent a breach with our current fixed exchange-rate policy, and we discuss how this can be dealt with in the model-based calculations. There is, however, considerable uncertainty associated with how market participants in Norway will respond to a change in regime.

In section 3 we point out that monetary policy tightening will have an effect through two channels, i.e. an interest-rate channel and an exchange-rate channel. While the effects of an interest-rate change on the real economy will primarily operate through the effects on household demand, changes in the exchange rate have a direct impact on profitability and production in exposed sectors of the economy. Furthermore, changes in the exchange rate have an effect on consumer prices through the prices of imported consumer goods. The magnitude of the effect of monetary policy tightening on inflation and the real economy will thus depend on the relative strength of the two channels. This is illustrated through sensitivity analyses.

In section 4 we outline a possible fiscal policy tightening. The fiscal contraction is scaled in such a way that the effect on mainland GDP during the period of tightening is about the same as with the monetary policy tightening described earlier. A comparison of the two measures shows that monetary policy tightening has a greater effect on prices, wages and manufacturing output than a comparable fiscal contraction.

Monetary policy tightening may thereby be appropriate if price inflation is perceived as the main problem. The situation may, however, be different if the primary concern is that higher wage growth in the long run may undermine profitability in sectors exposed to competition. In this case it may appear paradoxical to tighten policy using the interest rate because a stronger krone may squeeze companies' profits on the revenue side.

Section 5 presents a summary and points to a possible continuation of the analysis.

## 2. Relationship between the interest rate and exchange rate as a result of monetary policy tightening

It is common to assume that a country's central bank can control the level of interest rates in the money market. The objective of a stable exchange rate, however, places constraints on Norway's interest-rate policy, and there is reason to believe that Norges Bank in the current situation cannot raise interest rates on its own initiative without this having an effect on the exchange rate.

With unrestricted cross-border capital movements, participants in the foreign exchange market may freely choose between investments in Norwegian kroner and foreign currencies. For a Norwegian participant, the return on a krone investment is given by the Norwegian interest rate. The return on a corresponding investment in a foreign currency consists of two components: the interest rate abroad and any gains or losses resulting from a change in the exchange rate during the investment period. If the interest rate in Norway is the same as the interest rate abroad plus the expected change in the exchange rate, the two investments will in terms of *expectations* be equal. Since the return on foreign currency investments will be uncertain for Norwegian investors, it is likely that the projected return on foreign currency investments must be higher than the secure return on equivalent investments in Norway if Norwegian participants are to consider them equal *as a whole*. For the sake of convenience, we can call this excess return a risk premium.<sup>4</sup>

If the return on foreign investments is greater than the level necessary to compensate for the risk of such investments, exchange-market participants are likely to borrow in Norway, buy foreign currency from Norges Bank and invest this capital abroad. This situation cannot persist over time because Norges Bank's foreign exchange reserves would gradually be depleted. Alternatively, Norges Bank would incur interest losses equal to the private participants' interest gains if they were to succeed in satisfying the private sector's demand for foreign currency by borrowing abroad. The situation is slightly different if high Norwegian interest rates result in foreign currency inflows to Norway because Norges Bank can always offer Norwegian kroner in exchange. In this case as well, however, the central bank would incur interest costs, now equal to the difference between the interest rate on investments in kroner and in foreign currencies.

Based on the reasoning above, a reasonable balance between supply and demand in the foreign exchange market requires that the *return* on foreign currency investments cannot deviate (too) much from the return on equivalent krone investments. With a credible fixed exchange-rate policy against ECU on the part of Norges Bank, the likelihood of a (substantial) change in the exchange rate appears

3 See, for example, Frøyland and Leitemo (1997), Svenson (1997) and an interview with Erling Steigum jr. and Jan Tore Klovland in Aftenposten on 10 December 1997.

4 The situation will be the reverse for foreign participants. They will want a risk premium for investing funds in Norway.

to be very limited. In this case, Norwegian money market rates cannot deviate too much from equivalent ECU rates. This was clearly illustrated in 1996 when Norges Bank attempted to maintain Norwegian money market rates at a higher level than interest rates in ECU countries. As a result of sizeable current-account surpluses, a depreciation of the krone must have been considered very unlikely, and the krone must have been perceived as a favourable investment alternative for financial investors. The Norwegian krone as an attractive investment alternative is actually confirmed by Norges Bank's considerable net sales of kroner through 1996 and up to early January 1997 when interest rates were reduced and interventions were halted.

In line with the experience and views indicated above, we will assume that the Norwegian krone will immediately appreciate if Norges Bank were to increase interest rates in order to curb the domestic cyclical upturn. This appreciation of the krone, however, cannot be a lasting phenomenon. Assume, for example, that Norwegian money market rates are approximately on a par with equivalent ECU rates, and that the foreign exchange market is in balance at this interest-rate level. Assume then that the 3-month Norwegian money market rate is raised by, say, 2 percentage points. With an appreciating krone, it will be possible to reap currency gains in addition to interest gains by placing funds in Norway, and both factors point to currency inflows and continued appreciation. According to the KVARTS model, prices and wages adjust only gradually to a change in the exchange rate. Persistent appreciation will thereby contribute to a deterioration in the business sector's competitiveness, increase imports and reduce exports and the current-account balance. This is not compatible with a reasonable balance in the economy in the long run.

If the exchange rate level is initially regarded as compatible with such a balance, the views expressed above imply that with an increase in interest rates the krone must first appreciate and then gradually depreciate towards an "equilibrium" level, which in the long run results in approximately the same balance in the external account as in a situation with no interest-rate increase.<sup>5</sup> A gradual depreciation of the krone will entail that market participants who have invested in the krone market will incur currency losses. A higher interest rate in Norway compared with the level abroad may compensate for this, and the expected return will be the same for the two types of investments if investors believe that the krone will appreciate by 2 per cent per year. If this perception is to be well-founded, the process must in fact bring the exchange rate to a level which results in a reasonable balance in the external account in the long run.

How much the krone must initially appreciate in order to provide scope for a subsequent depreciation of 2 per cent

per year also depends, however, on how long Norwegian interest rates are expected to remain higher than foreign rates. If the interest-rate differential is expected to persist for one year, the krone must initially appreciate by 2 per cent. If the period of tightening is expected to last for two years, the krone must appreciate by 4 per cent, etc. In practice, exchange-market participants will not know this with certainty. In order to form a tenable opinion, they must have some knowledge of how interest and exchange rate changes affect the economy and of the objective the authorities want to achieve by raising interest rates. It is only under such conditions that they, with any degree of certainty, can estimate the exchange-rate change which, combined with the observed interest-rate change, will resolve the authorities' policy problem. On the assumption that the exchange rate moves in such a way that the expected return on foreign currency investments is equal to the return on krone investments, i.e. that the uncovered interest parity condition is fulfilled, the duration of the interest-rate increase is then determined.<sup>6</sup>

The views expressed above illustrate both that the formation of expectations figures prominently in an analysis of the effects of monetary policy changes and why it is important that private sector participants are aware of and have faith in the objective of monetary policy. If the objective of monetary policy lacks credibility or is not known, the formation of expectations will lack a sufficient anchor, and all parties will have problems in estimating the exchange-rate movements resulting from an interest-rate change. In this situation, it will also be difficult for the authorities to decide on the magnitude of the interest-rate change.

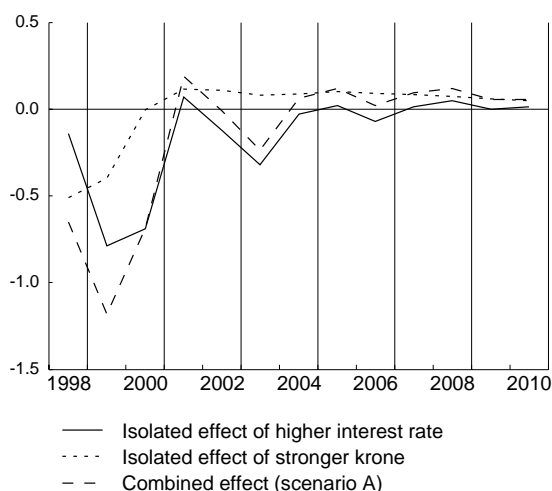
A known and credible monetary policy objective nevertheless provides no guarantee for a predictable exchange-rate path with monetary policy tightening. The various market participants may be uncertain or have differing opinions as to how the economy functions, and this can contribute to exchange-rate movements which clearly depart from that outlined above. The same may be the case if market participants demand compensation for risk, and the size of the risk premium is changed as a result of a revision of monetary policy.

In practice, it can therefore not be ruled out that monetary policy tightening may lead the Norwegian economy into a period of more unstable exchange rates. This means that it is difficult to estimate the consequences of this policy revision and indicates that several possible paths should be studied. As a first step, however, we have decided to disregard this problem and assume that the exchange rate moves in such a way that the uncovered interest parity condition is fulfilled *ex post*. A breakdown of the results into interest-rate and exchange-rate effects and some sensitivity calculations nevertheless allow us to draw some conclusions concerning the importance of alternative assumptions.<sup>7</sup>

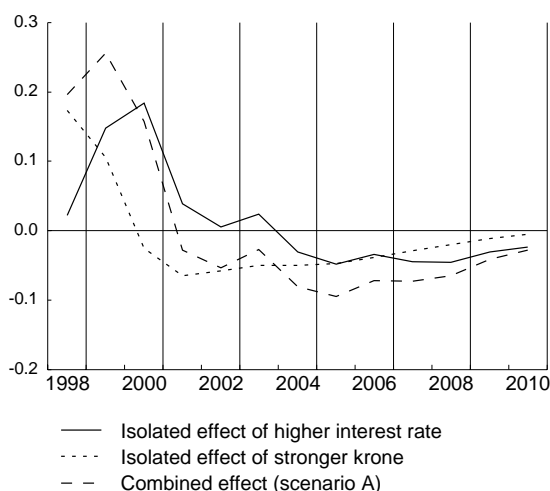
5 Since temporary exchange rate changes also influence the path of exports and imports, they may have consequences for the foreign debt and thereby interest flows. This entails that the new "equilibrium" exchange rate is not necessarily identical to the old one.

6 This reasoning also requires that there are no systematic deviations between expected and actual exchange-rate movements.

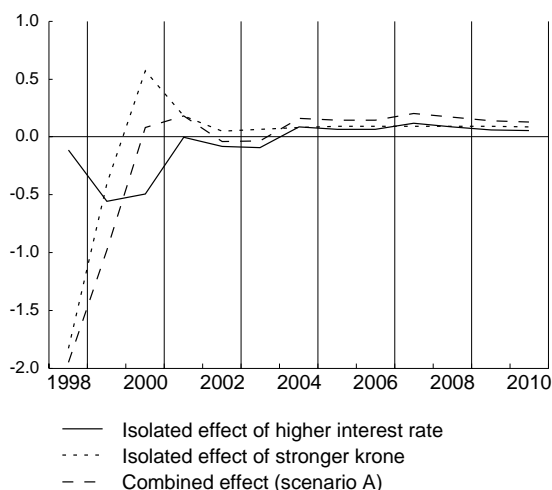
**Figure 1: Monetary policy tightening scenario A:**  
Effect on mainland GDP in per cent



**Figure 3: Monetary policy tightening scenario A:**  
Effect on unemployment rate in percentage points



**Figure 2: Monetary policy tightening scenario A:**  
Effect on man. industry's value added in per cent



age points for a period of two years, while the exchange rate is kept unchanged.

2. *The exchange-rate channel* is illustrated by a calculation in which the Norwegian krone immediately appreciates by 4 per cent and then depreciates by about 0.5 per cent per quarter over a period of two years, while the interest-rate level is kept unchanged.
3. The effect of *monetary policy tightening* (later described as scenario A) is illustrated by combining the first two calculations.

The effect of changes in the interest-rate level and/or the exchange rate is estimated as the difference between two paths for the Norwegian economy: a baseline scenario where the measure is not implemented and another scenario where it is implemented. Our baseline scenario, which extends to the year 2010, is characterized by approximate trend growth in most real aggregates and relatively moderate price and wage inflation. In 1998 and 1999, the baseline scenario is fairly close to the forecasts presented in *Economic Survey 1/98*. Labour force participation rates, however, have been adjusted, entailing that the unemployment rate is generally 3.5 per cent.<sup>8</sup>

### 3. Effects of monetary policy tightening

Based on calculations on the quarterly macroeconomic model KVARTS, this section looks at the effects of a temporary interest-rate increase when the exchange rate is assumed to adapt in such a way that the uncovered interest parity condition is fulfilled *ex post*. This monetary policy tightening influences the economy through two channels, an interest-rate channel and an exchange-rate channel. As a means of clarifying the effects, we carry out the analysis in three steps:

1. *The interest-rate channel* is illustrated by a calculation in which the money market rate is increased by 2 percent-

#### 3.1. Interest-rate channel

In this calculation, we look at the effects when the Norwegian money market rate for a period of two years is 2 percentage points higher than the level in the baseline scenario. As noted earlier, this may be interpreted as the isolated interest-rate effect of monetary policy tightening in a new monetary policy regime, but the calculation also illustrates the effect of a corresponding increase in

7 Our solution may be considered a technical approximation to a situation which is new for the Norwegian economy. The approximation, however, has some support in the experience of other countries. For example, in an evaluation of British macroeconomic models, Fisher et al. (1990) argues that the hypothesis of forward-looking uncovered interest parity provides the best description of exchange-rate determination in the market for pound sterling.

8 It may seem paradoxical that the baseline scenario is characterized by this stability - there should then be no reason to introduce contractionary measures. The baseline scenario, however, is not intended to be a forecast of future developments. Stability is incorporated in order to make it easier to interpret the results of the calculations of effects.

ECU/EURO rates within the current regime.<sup>9</sup> We assume that changes in the money market rate fully feed through to financial institutions' deposit and lending rates after two quarters. This is slightly faster than that derived from the relationships in KVARTS, but seems to be in reasonable accord with the pattern of recent years.

As will be seen in table 1 and figures 1 to 5, an interest-rate increase has a contractionary effect on the level of activity in the mainland economy. In the first three years following the interest-rate increase mainland GDP is lower than in the baseline scenario, while the effects after this time gradually peter out. It is also seen in table 1 that mainland GDP growth in the first year is reduced by 0.1 percentage point as a result of this interest-rate increase, while growth in the second year is reduced by 0.7 percentage point. In the following two years growth is higher than in the baseline scenario. Manufacturing activity is also reduced compared with the level in the baseline scenario, but the reduction is in relative terms slightly less than for other goods-producing and service industries. Inasmuch as the interest-rate increase reduces domestic demand, the more the sectors produce for the domestic market the more they are affected.

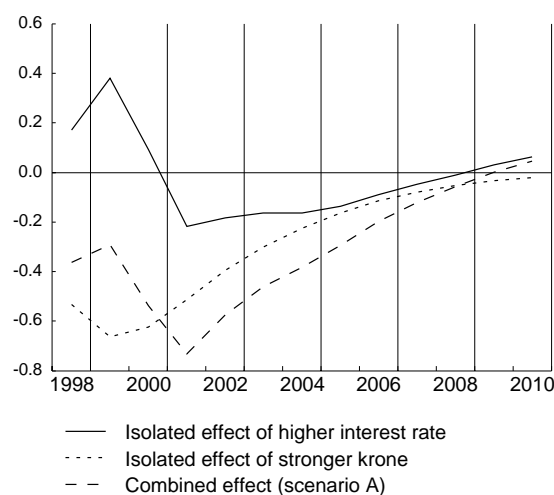
The interest-rate increase translates into higher house rents and thus moderately higher price inflation the first two years. Over the next two years inflation is reduced slightly compared with the baseline scenario, and in the fourth year the level of consumer prices is slightly lower than in the baseline scenario. Inflation is thereafter moderately higher than in the baseline scenario, so that the effect on the price level is gradually eliminated. In the first two years following the interest-rate increase the effect on wages is negligible. In the third and fourth years hourly wage growth is reduced slightly until wage levels gradually return to the level in the baseline scenario.

According to KVARTS, it is primarily households which directly respond to an interest-rate increase. Four effects are in evidence: Because household assets are greater than household liabilities, higher interest rates result in higher income.<sup>10</sup> In isolation, this points to higher consumer demand. Second, the interest-rate increase entails that current consumption is more expensive relative to future consumption, which points to lower demand. Third, the interest-rate increase entails that housing costs rise. The demand for housing is reduced, and prices in the market for existing dwellings decline. Households' housing wealth falls compared to the level in the baseline scenario, and this also points to lower purchases of goods and services for consumption. Fourth, higher house rents point in isolation to a reduction in household real disposable income. All in all, household consumption is reduced by 0.3 and 1.3 per cent, respectively, compared with the level in the baseline scenario in the first two years following the interest-rate

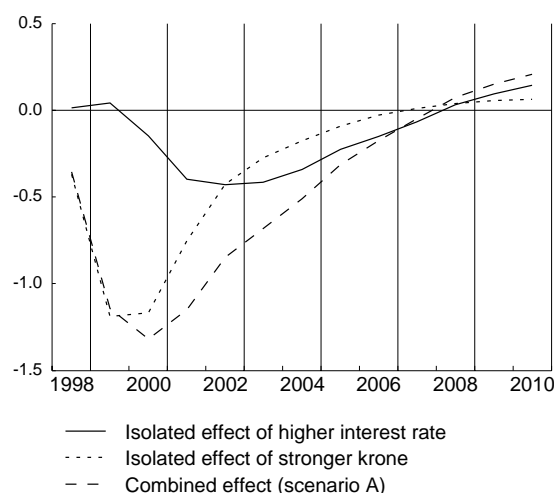
**Table 1. Effects on the Norwegian economy of a 2.0 percentage point increase in the money market rate in 1998 and 1999. Percentage deviation from the baseline scenario unless otherwise indicated**

	1998	1999	2000
Private consumption	-0.3	-1.3	-1.0
Mainland investment	-0.4	-2.6	-3.1
Exports	0.0	0.0	0.0
Imports	-0.2	-1.2	-1.1
Mainland GDP	-0.1	-0.8	-0.7
Manufacturing	-0.1	-0.6	-0.5
Unemployment rate (difference in p.p.)	0.0	0.1	0.2
Average hourly wages	0.0	0.0	-0.1
Consumer price index	0.2	0.4	0.1
Current-account balance (diff. in bill. Nkr)	0.7	4.7	4.9

**Figure 4: Monetary policy tightening scenario A: Effect on consumer price index in per cent**



**Figure 5: Monetary policy tightening scenario A: Effect on average hourly wages in per cent**



9 This interpretation presupposes, however, that foreign rates have an immediate impact on Norwegian money market rates. In the standard version of KVARTS this adaptation does not take place quite as rapidly. This interpretation also presupposes – somewhat unreasonably – that a European monetary contraction has no effects on Norwegian export market growth.

10 In the next section we look further at the importance of this effect.

### The KVARTS model as a tool for analyzing macroeconomic policy

The KVARTS model belongs to a Keynesian inspired modelling tradition. With the exception of resource-based industries<sup>1</sup>, the level of activity in the short term is determined by changes in aggregate demand. In the longer term, supply-side factors, such as changes in factor productivity, capital stock and the labour force, play an important role for economic developments. The model, however, does not contain mechanisms which ensure full resource utilization or balance in the external account. According to the KVARTS model, both supply and demand shocks can thus have lasting effects on the level of activity in the economy.

According to KVARTS, total demand for Norwegian-produced goods and services increases with the magnitude of the public sector's purchases of goods and services, with household wealth and disposable income (where real wage income is an important component) and with the level of activity abroad. An increase in Norwegian prices relative to foreign prices will result in a shift in demand from Norwegian to foreign producers. Higher interest rates have a dampening effect on demand in the short and medium term, even in the current situation where households' interest-bearing assets exceed their interest-bearing liabilities.

Firms are assumed to set the prices of their goods for the export and domestic market on the basis of their own variable unit costs and the import price measured in kroner, which in the standard version of the model (with a fixed exchange rate) functions as an indicator of the price of competing foreign products. In the long term an increase of 1 per cent in both unit costs and import prices also results in an increase of 1 per cent in Norwegian product prices.

Wages are assumed to be determined in the negotiations between trade unions and employers (see Bowitz and Cappelen 1997 for a further discussion). The model has some of the same features as the Scandinavian inflation model in that manufacturing industry has a leading role in wage determination as a whole. Manufacturing wages are dependent on consumer prices and producer prices (equal weights). The effect of employers' social security contributions and indirect taxes on wages is based on the same weights as producer and consumer prices. In the long run an increase of 1 per cent in both consumer and producer prices will result in a corresponding rise in nominal wages, while changes in labour productivity will have a full impact on the level of real wages. According to KVARTS, lower unemployment results in higher real wages, but it takes some years before the effect is exhausted. Furthermore, the effect of a given change in unemployment on wages is less the higher the level of unemployment at the outset. Changes in unemployment are determined by the demand for and supply of labour. Whereas demand depends on production and the relative price of labour, supply is primarily determined by demographic factors and the level of unemployment.

According to the KVARTS model, a change in import prices will in the long run fully feed through to Norwegian prices and wages (on the assumption that administratively determined prices are changed in step with other Norwegian prices). In this time horizon the real exchange rate (i.e. the relationship between foreign and Norwegian prices measured in a common currency) is independent of the nominal rate. In the short and medium term, however, this is not the case, a factor which permits monetary policy in this time horizon to have real economic consequences through the exchange rate.

Developments in import prices must be determined by the model user, who must then decide how quickly an exchange-rate change will feed through to import prices measured in kroner. We assume that some forward contracts are drawn up in kroner and that foreign exporters take account of the competitive situation in the Norwegian market when setting prices. Both factors contribute to lags between a change in the exchange rate and its impact on import prices (measured in kroner). Such lags are incorporated in the model version applied, and are discussed further later in this article. For export industries, however, there are no such lags; cost competitiveness deteriorates immediately when the Norwegian krone appreciates. We have therefore included a separate competitive price indicator in the export relationships, with a full and immediate impact as a result of exchange-rate changes. Based on more recent analyses of annual data, we have also made some adjustments to the parameters in the export relationships.<sup>2</sup>

In the KVARTS model, domestic interest rates are linked to interest rates in the money market. With a stable current-account balance these shadow corresponding ECU rates so that the differential between short-term real interest rates in Norway and in the ECU area is constant in the long run. This description of interest-rate formation is based on the experience of a period in which monetary policy has generally been aimed at maintaining a stable rate of exchange between the Norwegian krone and a basket of foreign currencies, in recent years with the ECU as the operational target. Our interpretation is that it indicates the level of Norwegian interest rates which is compatible with a reasonably stable exchange rate over time.

<sup>1</sup> Along with petroleum activities, primary industries, the electricity supply sector and refinery activities are important examples of such industries. Production in these industries is assumed to be given from the supply side and are exogenous in KVARTS.

<sup>2</sup> The empirical quantification of the export model in KVARTS is still based on the old national accounting system. As the effects from exports are an important element in the analysis of monetary policy tightening, we have chosen to anticipate an ongoing reestimation of the export model by including long-term relationships estimated on the basis of new annual data from Statistics Norway's MODAG model. The empirically based dynamic specification has, however, for some goods resulted in fairly unreliable short-term reactions. We have chosen a solution whereby the speed of adjustment to changes in cost competitiveness in the export volumes of all goods that are determined in the model is the same as the speed of adjustment in MODAG for the relatively large commodity group miscellaneous manufactured goods.

**Table 2. Effects of a 4 per cent appreciation at the beginning of 1998, followed by a gradual return of the exchange rate through 1998 and 1999. Percentage deviation from the baseline scenario unless otherwise indicated**

	1998	1999	2000
Private consumption	0.0	-0.5	-0.4
Mainland investment	-0.4	-1.4	-0.7
Exports	-0.9	-0.1	0.6
Imports	-0.1	-0.6	-0.1
Mainland GDP	-0.5	-0.4	0.0
Manufacturing	-1.8	-0.4	0.6
Unemployment rate (difference in p.p.)	0.2	0.1	0.0
Average hourly wages	-0.4	-1.2	-1.2
Consumer price index	-0.5	-0.7	-0.6
Deflator traditional imports	-1.9	-1.4	-0.5
Deflator traditional exports	-1.4	-1.7	-0.6
Current-account balance (diff. in bill. Nkr)	-4.2	0.2	3.0

increase. In the third and following years, when nominal interest rates have returned to the level in the baseline scenario, the effects on private consumption taper off.

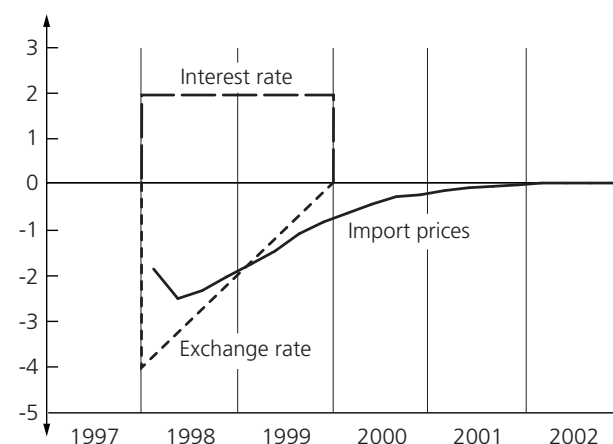
Lower demand compared with the baseline scenario will also result in reduced production, particularly in industries which supply a considerable share of their production for consumption purposes. This curbs investment in these industries, and thus also production in manufacturing and construction. Lower production results in lower employment, which makes a negative contribution to household income. Unemployment rises marginally compared with the level in the baseline scenario. The current-account balance improves by nearly Nkr 5 billion in the second and third year, but in the long term shows little deviation from the level in the baseline scenario.

### 3.2. Exchange-rate channel

In the second calculation we look at the effects of a 4 per cent appreciation of the Norwegian krone at the beginning of 1998, which is reversed during the subsequent eight quarters. For most goods, we have assumed that 30 per cent of the exchange-rate change will feed through to import prices in the first quarter and 65 per cent in the second quarter, thereafter rising by 5 per cent per quarter with a full impact in the ninth quarter.<sup>11</sup> Inasmuch as the exchange rate in this calculation deviates from the level in the baseline scenario for two years, import prices are reduced compared with the baseline scenario until the end of the first quarter of 2002. The effect on average import prices is shown in figure 6, and we see that the greatest impact is felt in the second quarter when import prices are 2.5 per cent lower than in the baseline scenario.

**Figure 6. Monetary policy tightening: Scenario A**

Change from baseline scenario for exchange rate<sup>1</sup> and import prices in per cent and for money market rate<sup>2</sup> in percentage points



<sup>1</sup> Negative figures denote stronger krone in relation to the baseline scenario.

<sup>2</sup> Annual interest rate.

Initially, the appreciation entails that the price of foreign products falls relative to the price of Norwegian products, measured in a common currency. Norwegian producers lose market shares in the export and domestic market. Export growth is lower than in the baseline scenario for a few years, while import shares rise in relation to the levels in the baseline scenario. In isolation, this contributes to reducing growth in Norwegian production, and thus employment and income. Unemployment rises and productivity in manufacturing industry is reduced. If we look at the two “years of tightening” combined, household demand is reduced by 0.4 per cent compared with the level in the baseline scenario, while exports are reduced by 0.5 per cent and mainland business fixed investment by 0.9 per cent. As a result, manufacturing output is reduced by 1.1 percentage points, while production in other mainland-based industries falls by 0.6 per cent.

In the third year the initial exchange-rate impetus is eliminated, but as a result of lags in the economy, prices in Norway (including import prices) will for a period still be slightly lower than in the baseline scenario. The competitive prices of export-oriented enterprises, however, will be back to the level in the baseline scenario. For a period this results in some improvement in the competitive position of this sector and higher Norwegian exports than in the baseline scenario. The level of activity in the Norwegian economy is thus also moderately higher than in the baseline scenario for a period.

A lower rise in import prices contributes to lower consumer price inflation in the first two years. In the following years inflation is higher than in the baseline scenario, while the level of consumer prices gradually returns to the level

11 This is the same impact profile which was assumed in the projections based on various exchange-rate assumptions in *Economic Survey 1/97* and it applies to most import prices. The exceptions primarily refer to the import price of crude oil, the shipping sector’s operating expenditure and direct consumption abroad by resident households where the impact comes immediately, as well as the import price of refined petroleum products, which in the standard model is also determined as a function of the crude oil price.

**Table 3. Effects of monetary policy tightening in 1998 and 1999 (scenario A). 2 percentage point increase in money market rate and 4 per cent appreciation at the beginning of 1998 followed by a gradual return of the exchange rate through 1998 and 1999. Percentage deviation from baseline scenario unless otherwise indicated**

	1998	1999	2000
Private consumption	-0.3	-1.8	-1.4
Mainland investment	-0.8	-4.1	-3.8
Exports	-0.9	-0.2	0.6
Imports	-0.3	-1.7	-1.2
Mainland GDP	-0.7	-1.2	-0.7
Manufacturing	-1.9	-1.0	0.1
Unemployment rate (difference in p.p.)	0.2	0.3	0.2
Average hourly wages	-0.4	-1.1	-1.3
Consumer price index	-0.4	-0.3	-0.5
Deflator import trad.varer	-2.0	-1.4	-0.6
Deflator eksport trad.varer	-1.9	-1.3	-0.4
Current-account balance (diff. in bill. NKr)	-3.5	4.7	7.8

in the baseline scenario. Towards the end of the period the effect on levels may be considered exhausted.

In the first year slower price inflation results in higher real wage growth. Gradually (second and third year) higher unemployment, reduced productivity and lower profitability in manufacturing industry contribute to real wage growth (and level) which is lower than in the baseline scenario. In the fourth and fifth year this situation is reversed, and real wage growth is higher than in the baseline scenario. In the fifth and subsequent years the effects on the real wage *level* are in reality exhausted. The current-account balance deteriorates in this scenario by a good NKr 1 billion when the first three years are considered as a whole.

The estimates in this section are based on the experience of a period in which Norway has attached importance to maintaining a stable exchange rate. It may be argued that an active use of monetary policy for stabilization purposes will result in a greater degree of currency hedging. This may dampen the effects of short-term exchange-rate fluctuations, not only on profitability and the level of activity, but also on import and consumer prices.

### 3.3. Overall effects of monetary policy tightening in 1998 and 1999

The effects of one (possible) tightening of monetary policy may now be illustrated by combining the two calculations discussed above.<sup>12</sup> We thus assume that the interest rate is increased by 2 percentage points for two years, while the Norwegian krone immediately appreciates by 4 per cent, gradually falling back to the level along the baseline scenario over the next two years (see figure 6). The effects of this policy change are shown in table 3 and in figures 1 to 6.

**Table 4. Effects of monetary policy tightening in 1998 and 1999 (scenario A) when the return on household insurance claims is not considered to have a stimulating effect on consumption. Percentage deviation from the baseline scenario unless otherwise indicated**

	1998	1999	2000
Private consumption	-0.8	-2.7	-1.7
Mainland investment	-0.8	-1.6	-0.9
Manufacturing	-2.1	-1.2	0.0
Unemployment rate (difference in p.p.)	0.2	0.3	0.2
Consumer price index	-0.4	-0.3	-0.6

The tightening of monetary policy results in a lower level of activity in the two actual “years of tightening” (i.e. the years with a higher interest rate), as well as in the following year. During the remainder of the period the effects on the real economy are small. In the first year it is particularly exposed sectors which record a reduction in the level of activity, while in the following two years other industries are most affected by the tightening. This is related to the appreciation of the krone, which results in an immediate deterioration in cost competitiveness, while the reduction in domestic demand is more gradual. During the second year the negative export effects are eliminated, while the negative domestic demand impulses, primarily from the household sector, are markedly amplified. In the third year household demand continues to remain at a substantially lower level than in the baseline scenario, while exports are moderately higher.

If the two years of tightening are considered as a whole, household demand is reduced by 1.5 per cent, while exports are reduced by 0.5 per cent. Value added in manufacturing industry is reduced by 1.5 per cent, while value added in other mainland-based industries is reduced by 1.2 per cent. The unemployment rate in this period is 0.2 percentage point higher than in the baseline scenario.

The interest-rate increase and the appreciation of the krone have the opposite effect on consumer prices the first few years. However, the exchange-rate effects dominate, entailing that consumer price *inflation* in the first year is 0.4 per cent lower than in the baseline scenario. In the second year, on the other hand, the rise in the consumer price index is slightly stronger than in the baseline scenario. The overall effect on inflation is therefore negative for two years. In 2001, the consumer price index in this scenario is 0.7 per cent lower than in the baseline scenario, after which inflation is again marginally higher than in the baseline scenario, with the effect on the price level exhausted in 2009.

Wage growth is reduced in the first year in line with the effect on inflation. In the second and third year wage growth is reduced further. In the third year the tightening of monetary policy has reduced average hourly wages by

<sup>12</sup> As a result of level dependence in the model (and rounding), the results may deviate slightly from a pure summing of the effects of the two individual calculations.

**Table 5. Effects of monetary policy tightening in 1998, scenario B. Percentage deviation from the baseline scenario unless otherwise indicated**

	1998	1999	2000
Mainland GDP	-0.3	-0.7	0.0
Manufacturing	-0.8	-0.3	0.1
Unemployment rate (difference in p.p.)	0.1	0.1	0.0
Consumer price index	0.0	0.0	-0.3

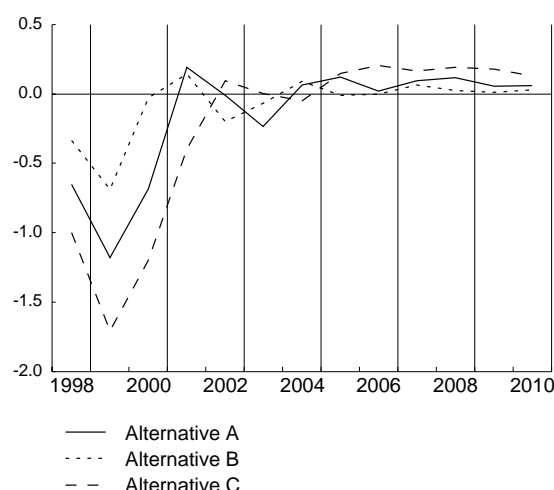
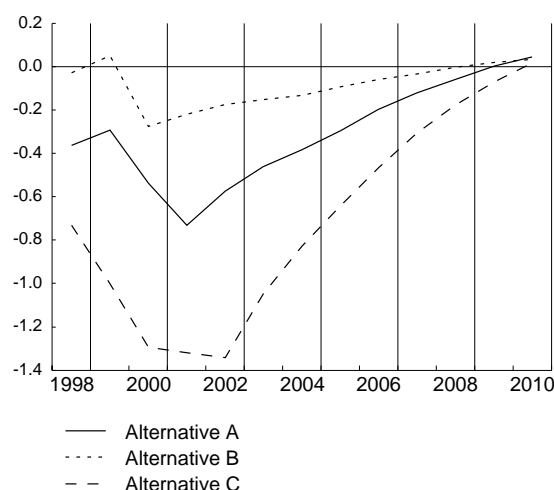
**Table 6. Effects of monetary policy tightening in 1998, scenario C. Percentage deviation from the baseline scenario unless otherwise indicated**

	1998	1999	2000
Mainland GDP	-1.0	-1.7	-1.2
Manufacturing	-3.2	-2.2	-0.5
Unemployment rate (difference in p.p.)	0.3	0.4	0.3
Consumer price index	-0.7	-1.0	-1.3

1.3 per cent. During the remainder of the period wage growth is slightly higher than in the baseline scenario, and towards the end of the period the level is also marginally higher than in the baseline scenario.

The current-account balance deteriorates by Nkr 3.5 billion in the first year of tightening and then shows an improvement of Nkr 12.5 billion over the next two years combined. Towards the end of the period net foreign assets are moderately higher than in the baseline scenario, but are moving downward. The projected path for the exchange rate is thus in reasonable accord with the requirement of an unchanged balance in the external account in the long run.

As will be seen from the discussion above, the effects of monetary policy tightening depend on the relative strength of the interest-rate channel and the exchange-rate channel. In our calculations, an assumption that the return on all household interest-bearing assets has a stimulating effect on consumption contributes to weakening the effects through the interest-rate channel because an interest-rate increase based on this assumptions means that income which stimulates consumption also increases. However, about half of the household sector's interest-bearing assets consists of claims on insurance companies, and it may be argued that the return on this portion of household assets in the short run does not stimulate consumption to the same extent as the return on bank deposits, etc. In the quantification of KVARTS, however, little evidence has been found to support this, and return on insurance claims is therefore considered to have a stimulating effect on consumption on a par with other interest income and expenditure. In the light of the uncertainty associated with the quantification of macroeconomic models, we present below the results of

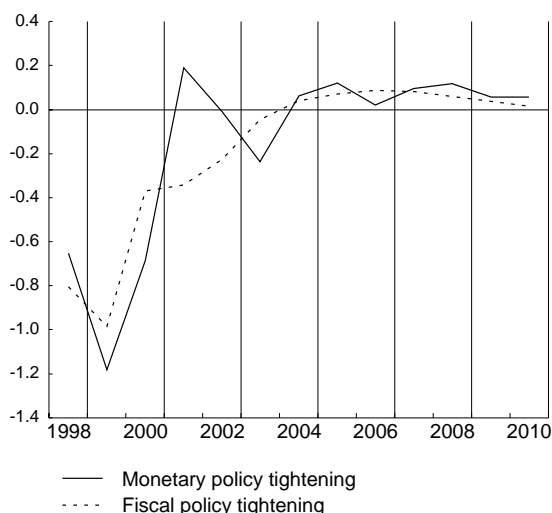
**Figure 7: Monetary policy tightening: Effect on mainland GDP in per cent****Figure 8: Monetary policy tightening: Effect on consumer price index in per cent**

a sensitivity analysis in which we have assumed that the return on insurance claims does not have the effect of stimulating demand.<sup>13</sup>

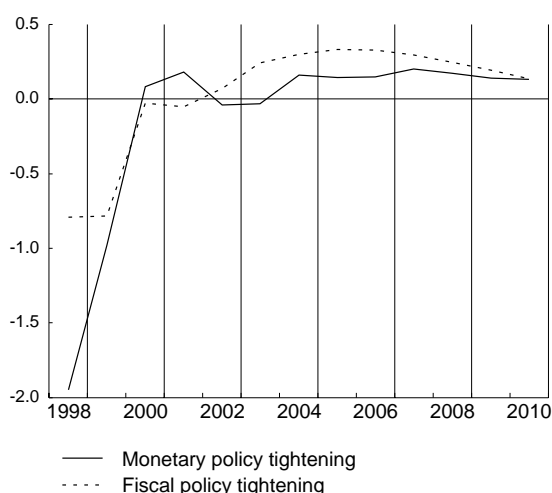
Table 4 presents the result for some of the main aggregates. Seen as a whole, the effect on private consumption in the first three years is 50 per cent stronger than when the return on insurance claims is assumed to stimulate consumption. As a result, the effects on mainland GDP are also noticeably stronger. Manufacturing output is also more severely affected than when the return on all interest-bearing assets is considered to have a stimulating effect on consumption, and unemployment rises slightly more. The effect on the consumer price index, however, is the same in the two calculations. This is because it is the change in the exchange rate which generates the strongest price impetus, and this change is assumed to be independent of whether or not the

13 As an hypothesis about behaviour in the long term, however, this assumption seems unreasonable. Sooner or later the return must be paid, and it is difficult to understand why it should not then stimulate demand. The assumption may, however, be of interest as a basis for short-term sensitivity analysis.

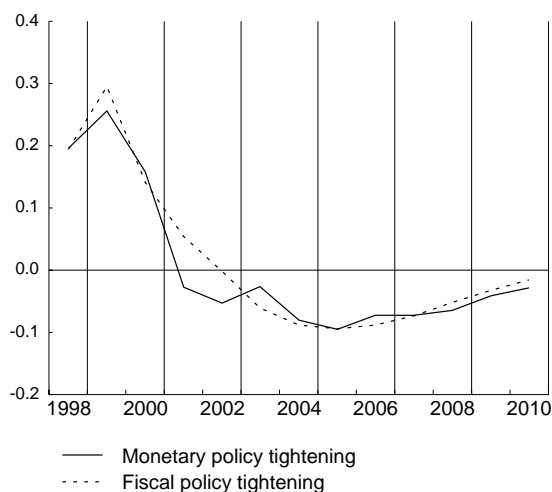
**Figure 9: Effect on mainland GDP in per cent**



**Figure 10: Effect on manufacturing industry's value added in per cent**



**Figure 11: Effect on unemployment rate in percentage point**



return on households' insurance claims is considered a demand-stimulating factor.

### 3.4. Alternative monetary policy tightening

Under our assumption of uncovered interest parity (*ex post*), the relative strength of the interest-rate channel and the exchange-rate channel depends not only on how the interest rate (and for that matter the exchange rate) affects the economy, but also on the duration of the tightening. In order to illustrate this, we have made two additional calculations. In the first (scenario B) we consider a situation in which the interest rate is 2 percentage points higher than the level in the baseline scenario for one year, and the immediate appreciation is 2 per cent. In the second (scenario C) we assume that the interest rate is 2 percentage points higher than in the baseline scenario for three years, and that the immediate appreciation is 6 per cent. In these two calculations we also assume that the exchange rate returns to the level in the baseline scenario at the end of the period of tightening. The effect on some main aggregates is illustrated in tables 5 and 6.

As we see in tables 3, 5 and 6 and figures 7 and 8, the effects of a 2 percentage point interest-rate increase are very different depending on whether the expected duration is one, two or three years. A tripling of the length of the period from one to three years results in a threefold increase in the contractionary first-year effect on activity in mainland Norway, while the effect on manufacturing industry is quadrupled. With a one-year period of tightening the effects on the consumer price index are not seen until the third year. On the other hand, a period of tightening which lasts three years has strong effects on the consumer price index as early as the first year.

If the effects of a tightening of monetary policy on the economy are so dependent on the duration of the tightening as our calculations indicate, they also illustrate the importance of a clear (and understood) monetary policy objective. The authorities can increase the interest rate, but they cannot in advance commit themselves to maintaining a high interest rate for a specific period. The immediate impact on the exchange rate will thus depend on exchange-market participants' expectations concerning the duration of the policy, irrespective of whether such perceptions later prove to be correct or not. As an extreme, let us consider a situation where the interest-rate increase is expected to be short-lived. In this case the exchange rate within our framework will for practical purposes not change. As the opposite extreme, expectations that an interest-rate increase will extend over a longer period will result in an immediate and strong strengthening of the exchange rate. A number of other variants can be constructed between these two extremes. Moreover, it is quite possible that market participants' expectations change over time, for example if after a period they are seen as incorrect. Such changes may – but not necessarily – translate into repeated changes in the exchange rate. Lacking well confirmed alternatives, however, it may appear most productive to discuss the effects of a

tightening of monetary policy based on the assumption that market participants are not mistaken as we have assumed in this analysis.

#### 4. Contractionary fiscal policy as an alternative to monetary policy tightening

In the above we have looked at some possible effects of a tightening of monetary policy. The evaluation of a policy measure, however, depends not only on the effects of the measure but also on what the authorities can achieve in other ways. A relevant alternative may be a tightening of fiscal policy. This tightening, however, can also be designed in many ways, and the effect will largely depend on the precise formulation of the measure. If the primary aim is to reduce pressures in the labour market, this can be done by reducing public sector demand in areas where the shortages are greatest. If the aim is to improve public sector balances and the current-account balance, one can cut back on the use of material inputs and capital goods that are primarily produced abroad (for example, cars, aircraft and PCs). If the aim is to influence the composition of consumption, the authorities can change excise duties, taxes and transfers. The composition of production can also be influenced through the composition of public sector investment and material input demand. In practice, however, this is not always so simple inasmuch as the use of instruments cannot be solely based on stabilization policy considerations.

Even though the effects of fiscal policy tightening depend on how this is implemented, there are some clear, shared features. Within a fixed exchange-rate regime there will by definition be no effects from a change in the exchange rate, and the interest-rate change which is necessary to maintain a stable exchange rate will probably be marginal for relevant measures. This implies that a comparison of monetary policy tightening and fiscal policy tightening may be of interest, even though the exact design of the alternatives compared may always be considered somewhat arbitrary.

##### 4.1. Effects of fiscal policy tightening in 1998 and 1999

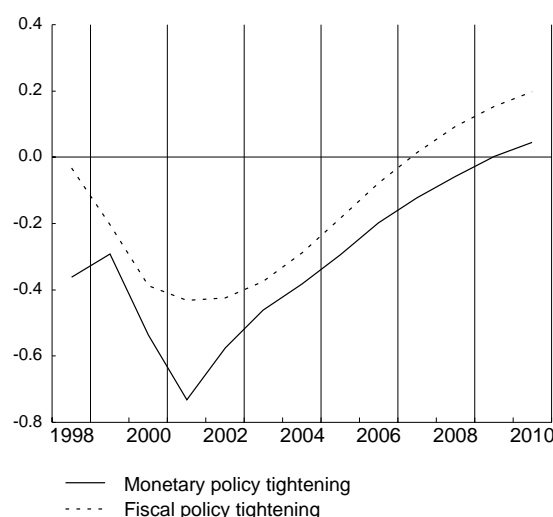
In the following we present the model-estimated effects of one possible fiscal policy tightening, notably a reduction in public sector construction investment of Nkr 8 billion (1993 prices) in 1998 and 1999, which corresponds to about 1.0 per cent of mainland GDP. In 2000, this investment returns to the level in the baseline scenario. The calculations are scaled in such a way that the tightening in the first two years has about the same effect on the level of activity in the economy as the tightening of monetary policy described as scenario A. Some of the results from these calculations are shown in table 7 and in figures 9 to 13.

The first-order effects of this fiscal policy tightening is that pressure in the construction sector is reduced. Employment and wages decline compared with the level in the baseline scenario, and household income and demand are thereby

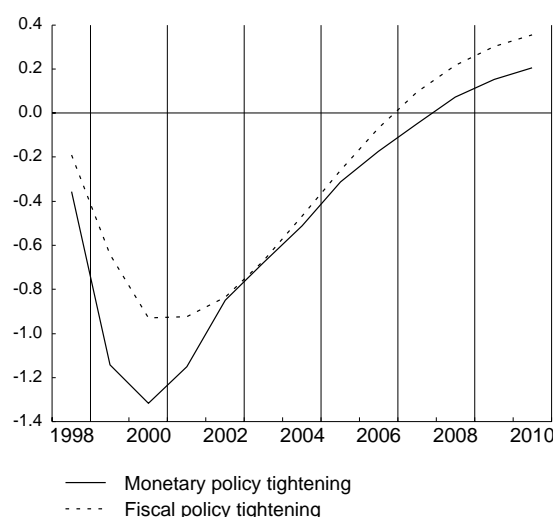
**Table 7. Effects of fiscal policy tightening in the form of a reduction of Nkr 8 billion (1993 prices) in the level of public sector construction investment in 1998 and 1999. Percentage deviation from the baseline scenario unless otherwise indicated**

	1998	1999	2000
Private consumption	-0.3	-0.6	-0.7
Mainland investment	-5.4	-6.5	-1.8
Exports	0.0	0.1	0.2
Imports	-1.0	-1.4	-0.7
Mainland GDP	-0.8	-1.0	-0.4
Manufacturing	-0.8	-0.8	0.0
Unemployment rate (difference in p.p.)	0.2	0.3	0.1
Average hourly wages	-0.2	-0.6	-0.9
Consumer price index	0.0	-0.2	-0.4
Current-account balance (diff. in bill. Nkr)	3.7	5.8	4.0

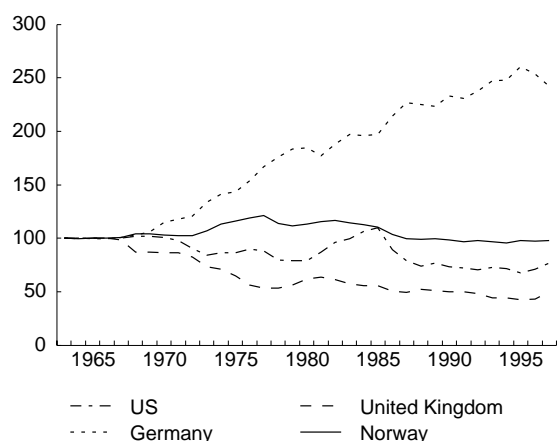
**Figure 12: Effect on consumer price index in per cent**



**Figure 13: Effect on average hourly wages in percent**

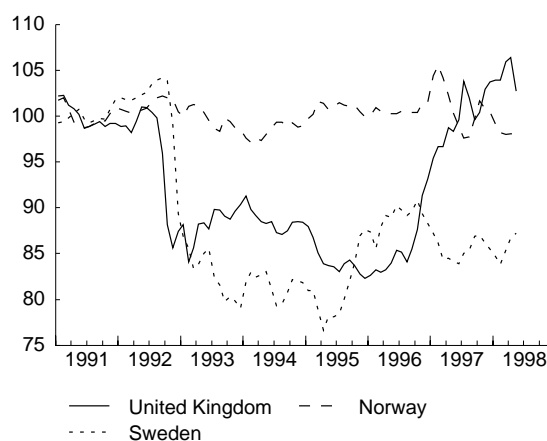


**Figure 14. Nominal effective exch. rates 1963-97 1)**  
Indices 1963=100



1) The Bretton-Woods system finally collapsed in 1973.  
Source: IMF and Norges Bank.

**Figure 15. Nominal effective exch. rates 1991-98 1)**  
Indices 1991=100



1) Both £ and S.kr. were floated in the autumn of 1992.  
Source: IMF and Norges Bank.

reduced. A slight improvement in cost competitiveness results in a moderate rise in production in some export industries, while the reduction in domestic demand also leads to an overall decline in the business sector's investment demand.

Growth in private consumption is reduced in the first three years by an average 0.3 percentage point per year. This trend is then reversed, and towards the end of the period private consumption is 0.2 per cent higher than the level in the baseline scenario. As a result of the immediate impact on construction activity, mainland GDP is as much as 0.8 per cent lower than in the baseline scenario as early as the first year. In line with a gradually stronger effect on household demand, as well as business fixed investment, the effect on mainland GDP in the second year reaches 1.0 per cent. From the third year there is no direct impetus from economic policy and the reduction in the level of activity gradually slows. In the last six years mainland GDP is slightly higher than in the baseline scenario.

Wage growth is reduced by about 0.3 percentage point per year in the first three years, and hourly wages then remain approximately unchanged the next two years. Inflation declines at a slower pace and by a smaller margin, with a reduced rise in the consumer price index of 0.2 percentage point in the second and third years. The consumer price index remains 0.4 per cent lower than in the baseline scenario in the following three years before the effects gradually peter out.

#### 4.2. Comparison of monetary policy - fiscal policy

As noted, the calculations showing fiscal policy effects are scaled in such a way that the effect on mainland GDP in the first two years combined is approximately the same as in scenario A with monetary policy tightening. In the following we look more closely at similarities and differences between the results of these two calculations.

Fiscal policy tightening has a slightly faster impact on the level of activity than monetary policy tightening. The first-year effect on mainland GDP of the stipulated reduction in public sector investment demand is 82 per cent of the effect in the second year, while in the case of monetary policy tightening the corresponding figure is 55 per cent. With monetary policy tightening the interest-rate increase entails that the effect on the level of activity in the third year is greater than the effect of a reduction in public sector investment. Based on these aspects fiscal policy may be considered a more precise cyclical regulator as it has a faster impact and the impact is of a more limited duration. This conclusion will apply to all three monetary policy tightening scenarios.

Using unemployment as a starting point, the results above can to some extent be turned around. The first-year effect on unemployment is 66 per cent of the second-year effect for fiscal policy tightening, but as much as 77 per cent for monetary policy tightening. With regard to the relationship between the first- and second-year effects on unemployment, the monetary policy alternative being studied plays an important role; the situation for scenario B is identical to that of fiscal policy tightening.

Whereas monetary policy has an effect on inflation the very first year, the consumer price index is not affected until the second year in the case of fiscal policy tightening. Even though the interest-rate effect on house rents entails that with monetary policy tightening inflation in the second year is slightly higher than in the baseline scenario, the combined effect on inflation is greater than with fiscal policy tightening both in the first two and first three years combined.

The effect on wages of the two tightening methods has the same profile the first two years, but the effects of monetary policy tightening are approximately twice as great. In the third year the effect on wage growth with the shift in monetary policy is virtually exhausted, while it continues with

fiscal policy tightening. In subsequent years the effect of the shift in fiscal policy is definitely the most lasting.

Tightening with the help of fiscal and monetary policy has different consequences for the composition of industries. The appreciation of the krone in the case of monetary policy tightening reduces activity in sectors exposed to competition. The cutbacks in public sector investment, on the other hand, primarily affect construction activity and other sheltered industries. As an indication of this, the reduction in value added in manufacturing industry<sup>14</sup> in the two years of tightening is 80 per cent greater with a tightening of monetary policy than with a reduction in public sector investment.

## 5. Concluding remarks

Monetary policy tightening has an effect on the economy through two channels, an interest-rate channel and an exchange-rate channel. If the exchange rate moves in line with the theory of uncovered interest parity, the relative strength of the two channels will depend on the duration of monetary policy tightening. The longer the interest rate is kept high, the stronger the effect on the exchange rate will be, and thus also the effect on prices, wages and the level of activity.

Fiscal policy tightening, on the other hand, can normally be implemented without having an effect on the exchange rate, and this has an influence on the relative effects of comparable monetary and fiscal policy tightening.

Our illustration of fiscal policy tightening is constructed in such a way that the effect on mainland GDP is approximately the same as with the monetary policy tightening being compared. Without an impact on the exchange rate, the effects on prices, wages and manufacturing output will be less than with monetary policy tightening, while the effects on unemployment are moderately stronger. If the primary concern is price inflation, it may thus appear that monetary policy is a more effective instrument than fiscal policy because a given inflation effect can be achieved with a smaller reduction in mainland GDP. However, the tightening will have a greater adverse effect on industries exposed to competition compared with the use of fiscal policy instruments. If the tighter policy is based on a desire to shield exposed sectors from an accelerating rise in wages and costs, this may appear paradoxical.

In the calculations in this article, we have assumed that an interest-rate increase will represent a breach with the fixed exchange-rate policy. We have argued that this tightening should be accompanied by a new monetary policy objective because this can contribute to influencing the formation of expectations. There are a number of countries among Norway's main trading partners that have established an inflation target for the conduct of monetary poli-

cy. Such a reorientation of monetary policy raises a number of questions which have not been answered here.

First, there is reason to believe that a shift from a "fixed" to floating exchange rate will result in greater fluctuations in nominal exchange rates. The experiences of other countries suggest this, as illustrated in figures 14 and 15. It is not obvious that the description of the behaviour in other parts of the Norwegian economy will be autonomous to such a change. The question is probably particularly relevant for the description of investment behaviour and for the link between the exchange rate and import prices. It is also conceivable, however, that a more active use of the interest rate for stabilization purposes will result in a greater proportion of fixed-rate loans, thereby weakening the relationship between household demand and money market rates. Moreover, it should be borne in mind that a revision of the monetary policy framework can result in changes in wage determination, and perhaps also contribute to weaker government budget discipline. It is only by finding answers to these questions that it will be possible to carry out a thorough quantitative analysis of the consequences of a change in the monetary policy regime. Such an analysis should, on an empirical basis, attempt to estimate how the Norwegian economy might react to different "shocks" with alternative monetary policy targets, as an extension of Rødseth (1996) and other theoretical analyses in this area.

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<sup>14</sup> Manufacturing industry as a whole has substantial deliveries to the domestic market. Tightening measures which entail reduced cost competitiveness may therefore affect "pure" export industries far more severely than manufacturing industry on average.