Sterilised and Non-Sterilised Intervention in the Foreign-Exchange Market

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INTRODUCTION AND SUMMARY

Intervention is the term used to describe a central bank's purchase or sale of foreign exchange in the market in order to influence the exchange rate.

In economic literature, the issue of sterilised and non-sterilised interventions is discussed. This article looks at the distinctions between these concepts.

In practice most central banks today apply a short-term interest rate as their monetary-policy instrument or operational target. Whether intervention in the foreign-exchange market is sterilised or not should therefore normally be assessed on the basis of the impact on the money-market interest rates. If the intervention has no impact on the short-term interest rate, it is sterilised. If the short-term interest rate is affected, the intervention is non-sterilised.

Non-sterilised intervention may impact the exchange rate through various channels. It may work through an interest-rate channel, but also via the signals that the intervention gives about future monetary and exchange-rate policy. Finally, non-sterilised intervention may work via the effect of the central bank's intervention order on the foreign-exchange dealers' bid and offer prices. By definition, sterilised intervention does not influence the exchange rate via an interest-rate channel, but it may have a signal effect, as well as a potential effect via changes in the portfolio composition of the private sector.

In periods when the foreign-exchange market is stable, Danmarks Nationalbank's intervention is best described as sterilised, while it is non-sterilised in periods of turbulence in the foreign-exchange market.

WHAT IS INTERVENTION?

Intervention is traditionally defined as a central bank's purchase or sale of foreign exchange in the market in order to influence the exchange rate.[1]

[1] Cf. e.g. Sarno & Taylor (2002) or Humpage (2003).

In a country with a fixed exchange rate as the intermediate target of monetary policy, intervention in the foreign-exchange market may be used as an instrument to stabilise the development in the exchange rate. In the short term, Danmarks Nationalbank can influence the rate of the krone vis-à-vis the euro by selling or purchasing foreign exchange against Danish kroner through intervention in the foreign-exchange-market. When Danmarks Nationalbank sells foreign exchange (and purchases kroner), the krone will have a tendency to strengthen. When Danmarks Nationalbank purchases foreign exchange (and sells kroner), the krone will have a tendency to weaken. If Danmarks Nationalbank has regularly e.g. sold foreign exchange and purchased kroner for a prolonged period, this is an indication that the interest-rate spread between Denmark and the euro area is too narrow. In that case, Danmarks Nationalbank must raise its interest rates relative to those of the ECB.[1]

Intervention is also a "classic" monetary- and foreign-exchange-policy instrument in countries that do not maintain a fixed-exchange-rate regime. For instance, Heikensten & Borg (2002) describe the following main motives for intervention in the foreign-exchange market in a country with an inflation target:

- A supplement to the interest-rate instrument in the management of the inflation rate. This can be particularly relevant in situations with a nominal interest rate close to zero.
- Influencing the exchange rate in situations where it deviates significantly from "equilibrium".
- The functionality and stability of the foreign-exchange market.

ARE ALL DANMARKS NATIONALBANK'S NET PURCHASES OF FOREIGN EXCHANGE AGAINST KRONER[2] INTERVENTIONS?

Not all Danmarks Nationalbank's transactions in foreign exchange against Danish kroner are related to intervention in the foreign-exchange market.

Part of Danmarks Nationalbank's purchase and sale of kroner against foreign exchange is related to its role as banker to the central government, in which capacity it effects payments related to foreign-exchange-denominated central-government debt and other central-government foreign-exchange transactions (e.g. central-government foreign-exchange

1 For a detailed description of monetary policy in Denmark, see Danmarks Nationalbank (2003).

2 In connection with management of the foreign-exchange reserve, Danmarks Nationalbank also concludes transactions in the foreign-exchange market that do not involve kroner and therefore do not have any impact on the exchange rate. In addition to euro, Danmarks Nationalbank's foreign-exchange reserve includes placements in dollars, pounds sterling and Swedish kronor. In view of the fixed-exchange-rate policy they have virtually all been converted to euro via forward contracts.

disbursements as aid to developing countries or receipts under the EU's Common Agricultural Policy). When the central government receives foreign exchange, e.g. when raising a foreign-exchange loan, Danmarks Nationalbank purchases the foreign-exchange proceeds, which then become part of the foreign-exchange reserve. The equivalent amount in kroner is credited to the central government's account at Danmarks Nationalbank. Likewise, when the central government effects payments in foreign exchange, e.g. interest and redemptions on its foreign debt, the central government purchases the required foreign exchange from Danmarks Nationalbank. In a given year, Danmarks Nationalbank normally purchases foreign exchange in the market to cover the central government's net current foreign-exchange expenditure, while redemptions on the central government's foreign debt are normally refinanced via government borrowing in foreign exchange.[1]

In addition, Danmarks Nationalbank may purchase Danish kroner against foreign exchange directly from a foreign central bank (i.e. an "off-market" transaction). For instance, the Central Bank Agreement on ERM II[2] states that the ECB and the national central banks in the euro area must contact Danmarks Nationalbank beforehand if they wish to conduct transactions in Danish kroner in excess of an agreed limit. In such cases, Danmarks Nationalbank and the central bank in question may settle the transaction in full or in part on a bilateral basis outside the foreign-exchange market to avoid undesirable impacts on the krone rate.

In the "Foreign Exchange and Liquidity" press release issued by Danmarks Nationalbank on the 2nd banking day of each month, Danmarks Nationalbank's net purchases of foreign exchange are stated as the change in the foreign-exchange reserve excluding value adjustments and net government borrowing in foreign exchange. In addition to interventions in the foreign-exchange market for Danish kroner, the net purchase of foreign exchange thus also includes transactions related to the central government's net current foreign-exchange expenditure, "off-market" currency transactions in kroner with foreign central banks, and the yield on the foreign-exchange reserve.

In principle, Danmarks Nationalbank can also intervene in the foreign-exchange market for Danish kroner by purchasing or selling foreign exchange against kroner on forward terms. Unlike intervention in the

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[1] For a detailed description of the central government's borrowing in foreign exchange, see the annual publication Danish Government Borrowing and Debt, Danmarks Nationalbank.

[2] Cf. the Central Bank Agreement on ERM II of 1 September 1998 with subsequent amendments, concluded between the ECB and the non-euro area central banks. The Agreement can be downloaded from Danmarks Nationalbank's website, www.nationalbanken.dk under Monetary Policy, Exchange Rate Mechanism/ERM II.

spot market, such transactions have no immediate liquidity impact and are therefore not included in the net purchase of foreign exchange until the time that the forward transactions are settled. Danmarks Nationalbank has not used intervention in the forward krone market for some years, however.

STERILISED VERSUS NON-STERILISED INTERVENTION

Economic literature often draws a distinction between sterilised and non-sterilised intervention in the foreign-exchange market. Sterilised intervention is characterised as not having any impact on conditions in the money market. It is thus a pure "foreign-exchange-policy" operation. Non-sterilised (or unsterilised) intervention, on the other hand, is intervention that influences conditions in the money market. It is thus a combined monetary-policy and foreign-exchange-policy operation.

The concept of "conditions in the money market" depends on the choice of monetary-policy instrument[1]:

- If interest-rate targeting is applied in monetary policy, the intervention is normally said to be sterilised if the transaction in itself does not influence the short-term interest rate. If the short-term interest rate is affected, the intervention is non-sterilised.
- If liquidity targeting is applied in monetary policy, the intervention is normally said to be sterilised if the transaction in itself does not influence the net liquidity position of the monetary-policy counterparties vis-à-vis the central bank. If liquidity is affected, the intervention is non-sterilised.

The difference between sterilised and non-sterilised intervention can also be summarised as follows: if liquidity targeting is applied in monetary policy, the central bank must take active balance-sheet measures to sterilise the intervention, while non-sterilised intervention does not require any follow-up on the part of the central bank. If, however, interest-rate targeting is applied in monetary policy, non-sterilised intervention requires deliberate monetary-policy action, while the intervention is sterilised automatically if the monetary-policy stance remains unchanged.

In practice most central banks today apply a short-term interest rate as their monetary-policy instrument or operational target. Whether inter-

[1] Cf. e.g. Bofinger (2001) or Craig & Humpage (2001). A more general definition of sterilised intervention, which can be seen to include the two definitions below as special cases, is found in the Jürgensen report from 1983: "As long as monetary targets are being met (whether or not these relate to the monetary base), the monetary effects of interventions can be considered in some sense as having been neutralised".

vention in the foreign-exchange market is sterilised or not should therefore normally be assessed on the basis of the impact on the money-market interest rates.

HOW DOES INTERVENTION AFFECT THE EXCHANGE RATE?

It is useful to draw a distinction between sterilised and non-sterilised intervention when assessing the impact of intervention on the exchange rate.

Non-sterilised intervention

As stated, non-sterilised intervention in the foreign-exchange market is characterised by influencing interest rates in the money market. For instance, if the central bank purchases foreign exchange against the domestic currency, liquidity increases, and downward pressure is exerted on the short-term interest rate, which will tend to weaken the domestic currency. This is normally referred to as the "interest-rate channel" or "monetary channel" for the impact of intervention on the exchange rate.

In addition to the interest-rate channel, non-sterilised intervention might affect the exchange rate via a "signalling channel" or "expectations channel". The reason is that the intervention may give indications of the future monetary and foreign-exchange policy that will make the market revise its expectations of the future exchange rate.[1] If a central bank e.g. purchases foreign exchange against the domestic currency, this might indicate that the central bank is willing to weaken the domestic currency via future non-sterilised interventions or a future easing of monetary policy.

If the central bank announces that it is intervening in the foreign-exchange market, which typically takes place with a certain time lag, it would seem natural that the central bank's intervention sends a signal. However, secret intervention may also have a signal value. The reason is that the market makers[2] in the foreign-exchange market determine their prices on the basis of order flows. If the central bank e.g. intervenes by purchasing foreign exchange against the domestic currency, the "order" from the central bank may contribute to weakening the domestic currency if the market maker sees the central bank's order as new information on the future monetary and exchange-rate policy.

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[1] This argument is based on an assumption of asymmetrical information (the central bank knows more about the future monetary and foreign-exchange policy than the private sector).

[2] Market makers are foreign-exchange dealers, typically banks, that quote binding two-way prices in various foreign-exchange-market products for certain amounts with a fixed maximum spread between bid and offer prices.

Intervention may also have a temporary impact via the immediate effect of the intervention order on supply and demand in the foreign-exchange market (the "inventory adjustment channel").[1] In this case the central bank's intervention is seen as an "order" just like any other order. The market makers always adjust their prices for purchasing foreign exchange for or selling foreign exchange from their "inventories" to match purchase and sales orders in the foreign-exchange market. In this way the market maker ensures that its inventory is not undesirably large or small. An overweight of purchase orders pushes prices up, while they are reduced if there is an overweight of sales orders.

Finally, the literature on intervention in the foreign-exchange market also points to a "noise trader" channel in connection with intervention. Here the line of reasoning is that there are a number of agents in the foreign-exchange market that trade on the basis of technical analyses or the like. If the intervention by the central bank influences the exchange rate in a particular direction, certain market participants may "jump on the bandwagon" and thereby amplify the exchange-rate effect of the intervention.

Sterilised intervention

Sterilised intervention in the foreign-exchange market has no impact on the money-market interest rate, which means that the intervention has no effect via the "interest-rate channel".

On the other hand, sterilised intervention may influence the exchange rate via the "signalling channel" since intervention may give indications of the future monetary and foreign-exchange policy, cf. the description under non-sterilised intervention.

The literature on intervention in the foreign-exchange market also refers to the "portfolio balance channel" in relation to sterilised intervention. The intervention influences the relative distribution of domestic and foreign assets in the private sector's portfolio. Assume that the central bank intervenes by purchasing foreign exchange and selling domestic currency. Furthermore, assume that the central bank places the foreign exchange in foreign bonds and sterilises the intervention by sale of domestic bonds. If the private sector had a portfolio equilibrium prior to the intervention by the central bank, it will seek to re-establish a portfolio equilibrium by selling domestic bonds, converting the sales proceeds into foreign exchange and purchasing foreign bonds. If the domestic

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[1] The correlation between the microstructure of the foreign-exchange market and intervention is discussed in e.g. Lyons (2001) and Dominguez (2003).

and foreign bond yields are assumed to be unaffected by the intervention[1], this will tend to weaken the domestic currency until a new portfolio equilibrium has been achieved.[2] It has, however, been difficult to find empirical support for the portfolio balance channel, cf. e.g. the assessment in Chiu (2003).

ARE DANMARKS NATIONALBANK'S INTERVENTIONS STERILISED OR NON-STERILISED?[3]

Danmarks Nationalbank conducts monetary policy in Denmark by managing the 14-day interest rate. The monetary-policy counterparties have access to two facilities at Danmarks Nationalbank:

- Current-account deposits on a day-to-day basis. A ceiling (the "current-account limit") of around kr. 20 billion is imposed on the total current-account deposits of the counterparties at the close of the day. The current-account limit is broken down as individual current-account limits for the counterparties.
- Ordinary weekly market operations in which the monetary-policy counterparties can freely borrow by pledging securities as collateral (monetary-policy loans) or make deposits by purchasing certificates of deposit. The maturity of these transactions is normally 14 days.

The significance of Danmarks Nationalbank's interventions in the foreign-exchange market to the money-market interest rates and the liquidity[4] of the monetary-policy counterparties can be illustrated by considering four different cases that are discussed further below, cf. also Table 1.

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1 The reason might be that they are determined solely by fundamental economic conditions such as long-term expectations of inflation and real interest rates (for long-term bonds), or that the short-term yield is unchanged due to sterilisation (for short-term bonds).

2 Assume that the market expects the exchange rate one year ahead to match the rate prior to the intervention. In that case, the new portfolio equilibrium is achieved when the spot rate for the domestic currency has depreciated so much vis-à-vis the foreign currency that the expected future appreciation of the domestic currency is sufficiently large for the market to be "satisfied" with the holding of more domestic bonds and fewer foreign bonds. The portfolio balance channel is based on an assumption that investors see domestic and foreign bonds as imperfect substitutes. If domestic and foreign bonds are perfect substitutes, a sterilised intervention has no impact via the portfolio balance channel. The argument for a portfolio balance channel also presumes that there is no "Recardian equivalence" so that the change in the "foreign-exchange exposure" of the central bank as a result of the intervention does not "offset" the change in the foreign-exchange exposure of the private sector.

3 The impact on the krone rate of Danmarks Nationalbank's interventions in the foreign-exchange market is analysed in the article on pp. 73ff.

4 In the following, "liquidity" should be taken to mean deposits in kroner in current accounts with Danmarks Nationalbank. In this connection liquidity may also be referred to as "current-account liquidity" or "krone liquidity".

OUTLINE OF DANMARKS NATIONALBANK'S INTERVENTIONS IN THE FOREIGN-EXCHANGE MARKET

Table 1

		Direction of intervention	
		Purchase of foreign exchange (sale of kroner)	Sale of foreign exchange (purchase of kroner)
State of the foreign-exchange market	Stable	Case A: Sterilised	Case B: Sterilised
	Turbu-lent	Case D: Non-sterilised	Case C: Non-sterilised

Case A: Danmarks Nationalbank intervenes by purchasing foreign exchange against kroner in a stable foreign-exchange market

The intervention will increase the liquidity of the monetary-policy counterparties and thus tend to exert downward pressure on the overnight interest rate in the money market. However, the current-account interest rate constitutes the lower limit of the day-to-day interest rate since the counterparties can always place their excess liquidity in their current accounts with Danmarks Nationalbank, provided that the current-account limit is not exceeded. If the counterparties do not wish to hold the extra current-account liquidity, they can purchase certificates of deposit in the next ordinary weekly market operation.

If the purchase of foreign exchange by Danmarks Nationalbank entails a risk that the current-account deposits of the counterparties exceed the current-account limit, Danmarks Nationalbank will also be open for extraordinary sale of certificates of deposit. In this way the excess liquidity as a result of the intervention is placed at the 14-day interest rate. If the counterparties do not purchase certificates of deposit and the current-account limit is exceeded, an automatic sale will take place under the rules regulating the current-account-limit system.

Provided that the spread between the interest rate for certificates of deposit and the current-account interest rate is modest, an intervention purchase of foreign exchange in a stable foreign-exchange market will have only a limited impact on the money-market interest rates for a few days before the situation "normalises" around Danmarks Nationalbank's interest rates. In this case the intervention is best described as sterilised.

Case B: Danmarks Nationalbank intervenes by selling foreign exchange against kroner in a stable foreign-exchange market

The intervention will reduce the liquidity of the monetary-policy counterparties and thus tend to exert upward pressure on the day-to-day interest rate in the money market. There is no immediate ceiling on the overnight interest rate in the money market, but in the first succeeding ordinary weekly market operation at the latest the counterparties can raise liquidity so that conditions in the money market can be normalised.

If the settlement of Danmarks Nationalbank's sale of foreign exchange entails a risk that the current-account deposits of the counterparties fall to a level that is so low that it impedes the functioning of the money market, Danmarks Nationalbank will be open for extraordinary buy-back of certificates of deposit. This will implicitly impose a limit on the increase in the day-to-day interest rate.

Overall, an intervention sale of foreign exchange in a stable foreign-exchange market will have only a limited impact on money-market interest rates for a few days before the situation "normalises" around Danmarks Nationalbank's interest rates. In this case, too, the intervention is best described as sterilised.

Case C: Danmarks Nationalbank intervenes by selling foreign exchange against kroner in a turbulent foreign-exchange market

In the event of sustained downward pressure on the krone, intervention is not normally sufficient to maintain a stable krone rate. Monetary-policy tightening is therefore necessary, and consequently intervention in the foreign-exchange market in these circumstances is normally non-sterilised. In such a case Danmarks Nationalbank might therefore choose via extraordinary market operations to provide just the amount of liquidity required to prevent current-account deposits for the sector taken as one from being too low (where it would have been more "generous" in providing liquidity in a stable foreign-exchange market). This exerts upward pressure on money-market interest rates and thus dampens the pressure against the krone.

Monetary policy can also be tightened by raising the official interest rates.

In special cases it might also be relevant to adjust the monetary-policy instruments so that e.g. the normal "open window" in ordinary market operations is replaced by liquidity rationing (e.g. allocation of liquidity by auctions, as was the case during the currency crisis in 1993).

In a turbulent foreign-exchange market Danmarks Nationalbank's interventions thus normally go hand in hand with changed conditions in the money market (higher money-market interest rates) caused by explicit monetary-policy deliberations and possibly actions by Danmarks Nationalbank. Consequently, Danmarks Nationalbank's intervention to sell foreign exchange in a turbulent foreign-exchange market with downward pressure against the krone is best described as non-sterilised.

Case D: Danmarks Nationalbank intervenes by purchasing foreign exchange against kroner in a turbulent foreign-exchange market

The intervention will increase the liquidity of the monetary-policy counterparties and thus exert downward pressure on the day-to-day interest rate, but as stated previously the current-account interest rate constitutes the lower limit for the money-market interest rate. Sustained upward pressure against the krone will require a reduction of the interest-rate spread between Denmark and the euro area in order to maintain a stable krone. Consequently it will be necessary for Danmarks Nationalbank to lower its official interest rates.

Under these circumstances, Danmarks Nationalbank's intervention purchase of foreign exchange is best described as non-sterilised.

SUMMARY

In practice most central banks today apply a short-term interest rate as their monetary-policy instrument or operational target. Whether intervention in the foreign-exchange market is sterilised or not should therefore normally be assessed on the basis of the impact on the money-market interest rates. If the intervention has no impact on the short-term interest rate, it is sterilised. If the short-term interest rate is affected, the intervention is non-sterilised.

In periods when the foreign-exchange market is stable, Danmarks Nationalbank's intervention is best described as sterilised, while it is non-sterilised in periods of turbulence in the foreign-exchange market.

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