

The monetary transmission mechanism in Poland

Jerzy Pruski¹ and Piotr Szpunar²

I. Introduction

The monetary transmission mechanism (MTM) describes how changes in the short-term interest rate introduced by monetary policy affect aggregate output and inflation. As there are a number of ways through which monetary policy actions may have an impact on output and inflation, routine approaches usually concern only selected parts of this complex transmission mechanism (cf Mishkin (1995)). Some more comprehensive studies, however, attempt to put these channels into a unified model framework.³

The composition of this paper reflects both approaches: a comprehensive model approach, as well as some separate studies. In the second section we present and discuss the monetary transmission channels which form the most important parts of this mechanism in Poland as they are reflected in the core forecasting model of the National Bank of Poland (NBP) – the ECMOD. The third section presents separate studies investigating separate channels not explicitly incorporated in the ECMOD model, eg the credit and expectations channels. The fourth section discusses the role of monetary aggregates in monetary transmission and in the conduct of monetary policy in Poland. The last section recapitulates and highlights the major problems connected with the monetary transmission channels.

II. Monetary transmission channels in the ECMOD

The ECMOD is a quarterly macroeconomic model of the Polish economy (Fic et al (2005)). It has been in operation as the core forecasting model of the NBP since May 2005. As in the case of most macroeconomic models used at central banks, the ECMOD's theoretical foundations derive both from classical and from Keynesian theories. In the short term, economic growth is mainly determined by demand factors, rigidities and inertia, while in the long run it is the supply side that shapes the behaviour of the economy. In such a setup there is scope for monetary policy to influence the demand side of the economy in order to smooth out fluctuations in output and inflation in the medium run. However, in the long run, monetary policy actions exert no influence on the economy.

The ECMOD has been developed to generate forecasts of key macroeconomic variables, including the projections of inflation, GDP, its components, and other categories relevant for

¹ First Deputy President, National Bank of Poland.

² Deputy Director, Macroeconomic and Structural Analyses Department, National Bank of Poland.

The authors are highly indebted to Katarzyna Budnik, Tatiana Fic, Adam Kot, Ewa Stanisławska and Ewa Wróbel for their valuable input. The authors are also grateful to Katarzyna Budnik for her excellent research assistance and Adam Kot for providing helpful reviews of the paper.

³ Contrary to some new concepts regarding the MTM (eg the one proposed in Svensson (2006), which suggests that “the monetary-policy transmission mechanism should be seen as a mapping from an instrument-rate path to target-variable paths, not as a mapping from an instrument-rate level to a level of the target variables at some particular horizon”), in the present analysis we stick to the more standard view of the MTM as an explanation of a lagged reaction in output and inflation to short-term interest rate changes.

the conduct of monetary policy. The model serves as a simulation tool enabling quantification of the effects of monetary policy and exogenous shocks resulting from changes in foreign demand, oil prices, etc. Monetary transmission in the ECMOD focuses on the two most important channels transmitting monetary impulses into the economy: the interest rate and exchange rate channels. To construct a complete picture of the MTM more easily, before proceeding to the description of the two channels, we will now present the final stage of the transmission process, ie the determination of inflation.

Direct determinants of inflation

In the ECMOD model, the main consumer inflation concept is represented by the core CPI inflation index. The inflation equation is based on the concept of cost-push inflation, according to which prices depend on the costs of production factors, ie unit labour costs and import prices. The price level is also influenced by demand factors quantified using the output gap. Where demand outstrips supply, sellers are able to demand higher margins, which results in price growth. Otherwise, demand lower than supply necessitates a reduction in margins. Inflation is additionally affected by inflation expectations, which, however, are assumed to have adaptive properties. For this reason, they are represented in the model by the lagged inflation.

Interest rate channel

Within the ECMOD framework, the short-term interest rate is an exogenous variable. In this way, the model can simulate the influence of the interest rate on changes in the behaviour of endogenous variables such as output and inflation. A rise in nominal interest rates translates into an increase in the real rate of interest and the user cost of capital. Higher real interest rates dampen private consumption, and a higher user cost of capital hinders investment activity.

A drop in the consumption growth rate builds on the inter-temporal substitution and liquidity constraint of households. According to the hypothesis of inter-temporal consumption substitution, higher real interest rates encourage the postponement of current consumption.

Investment results from the discrepancy between the desired level of capital stock (fixed at the level of equality of the marginal product and the user cost of capital), and the current capital stock. For this reason, a higher level of the user cost of capital triggers a cutback in investment demand. In other words, enterprises reduce their wish for capital input and, in effect, investments, in response to the rising user cost of capital (higher real interest rates).

A reduction in both output categories mentioned above leads to a fall in aggregate demand. Facing falling demand, enterprises cut both wages and employment in order to re-establish the balance between their costs and prices, on the one hand, and to sustain a technologically optimal labour input given the new level of output, on the other. In addition, wage changes in the model are tied to the unemployment gap. As cuts in employment tend to increase the unemployment rate, the employee's wage expectations are squeezed. Hence, the reduction of wages is accomplished by a reduction in the demand for labour and lower expected wages of workers. Moreover, wage growth also depends on inflation directly – a fall in inflation eases wage pressures. The estimated parameters of the ECMOD imply that in response to a monetary tightening the wage bill decreases faster than the GDP. Consequently, this leads to a reduction in unit labour costs. The decline in unit labour costs constitutes the most important deflationary impulse, as the concept of inflation modelling applied in the ECMOD relies on the cost-push approach.

GDP deceleration negatively affects investment demand, which translates into lower potential GDP growth. However, a faster decrease in actual GDP than in potential GDP results in widening the output gap, while a declining output gap exerts additional negative

pressure on inflation. The direct linkage between the growth rate of consumer prices and the output gap is, however, relatively weak.

It should be mentioned that the re-estimation of the model in early 2006 revealed that the impact of the output gap on net inflation had decreased further. According to the research results of Chmielewski and Kot (2006), who estimated the net inflation equation from the ECMOD on a series of rolling samples of data, the output gap coefficient has been gradually losing statistical significance since 2003. They interpret this result as meaning that the equation should be supplemented by international factors. Next, the authors found that the output gap is still significant in the equation when net inflation is adjusted for a change in price indexes of "tradable" goods. In other words, they separated globalisation-affected inflation from domestically driven inflation and verified that the latter is responsive to monetary policy changes. This result corresponds to the findings of Borio and Filardo (2006), indicating the rising importance of the global output gap in relation to the domestic output gap in the Phillips curve for a group of 16 industrialised economies.

Clearly, the ECMOD introduces some short-cuts in the modelling of the interest rate transmission channel. The model does not demarcate between household and corporate investment demand. Furthermore, the model makes use of 3M WIBOR, and no deposit or loan rates are explicitly modelled. Neither does the model distinguish between interest rates for the household and corporate sectors, on which some comments can be found in Crespo-Cuaresma et al (2006). The authors showed that the long-run pass-through from the policy rate to the short-term deposit and lending rates is generally high, ranging from 63% to 91%. There are no significant differences between the pass-through for household and corporate deposits (around 90% for both categories), while the pass-through for household lending rates is slightly lower than that for corporate lending rates (circa 60% vs 70%). Their results further indicate that the pass-through of the policy rate into lending and deposit rates may have fallen in recent years. Still, these results allow the assumption that the above-mentioned simplifications applied in the ECMOD do not critically influence its results.

Exchange rate channel

In the ECMOD framework the exchange rate channel represents the integral part of the influence that monetary policy exerts on inflation through shifts in the short-term interest rate.⁴ The exchange rate in the ECMOD is endogenous and corresponds to the floating exchange rate regime currently in force in Poland. The long-term path of the real exchange rate is determined by the fundamentals, encompassing differences of potential output between Poland and its main trading partners. It is assumed that the convergence of GDP levels at home and abroad is accompanied by the convergence of the price levels. In this context, the long-term exchange rate path can be considered as a relative version of the purchasing power parity theory. According to this theory, the potential growth rate in Poland, which exceeds the one observed in economies of the main Polish trading partners, results in the appreciation of the long-term path of the real exchange rate. Deviations of the real exchange rate from its long-term path depend on three factors: the level of net foreign assets, the real interest rate disparity and the risk premium. An increase in net foreign assets

⁴ There are various studies singling out the influence of the exchange rate on inflation and examining the pass-through effect in Poland. They do not, however, deliver any coherent results. For example, Coricelli et al (2006), applying a structural VECM model on the 1993–2002 sample, estimate that a long-run pass-through of the exchange rate to consumer prices is 80%. Darvas (2001), applying a single-equation approach, estimates on the basis of the 1993–2000 sample that the long-run pass-through of the exchange rate to consumer prices is around 20%. The IMF (2004), applying the structural VAR approach, estimates that the pass-through of the effective exchange rate to consumer prices in a 12-month period amounts to 22% (for the 1996–2003 sample), 58% (for the 1996–1999 sample), and 20% (for the 2000–2003 sample).

results in exchange rate appreciation. Such a mechanism prevents excessive accumulation of receivables and liabilities with respect to foreign entities. The other factor which leads to the deviation of the exchange rate from its long-term path is the real interest rate disparity – its increase results in the appreciation of the zloty exchange rate, while its decrease translates into depreciation of the zloty. Finally, deviations of the real exchange rate from its long-run path given by fundamentals depend on the risk premium approximated by the general government deficit.

Import and export prices are determined following the price-taker/price-maker approach. Exporters and importers set export and import prices taking into account both the prices on their domestic market (meaning that they make prices on goods they export (import)) and prices on markets of their trading partners (meaning that they take prices existing on markets to (from) which they export (import) as given). In other words, import and export prices are weighted averages of prices in Poland and prices abroad expressed in Polish currency.

A tightening of monetary policy leads to an appreciation of the domestic currency due to a change in the interest rate disparity. The appreciation of the exchange rate leads to a drop in the growth rate of both export and import prices. As the behaviour of the long-run consumer price index is driven by production costs (unit labour costs and import prices), a reduction in import prices translates into a decrease in consumer prices. Moreover, a monetary policy tightening leads to the widening of the trade gap as export profitability falls and imports become more competitive as compared to domestic production. A lower trade balance reduces GDP, causing a fall in the demand for labour and a subsequent increase in the unemployment rate. Further developments are in line with those described in the interest rate channel.

According to the current specification of the ECMOD, a hike in short-term interest rates of 100 basis points sustained for 4 quarters (operating through both the interest rate and the exchange rate channel) results in a reduction in GDP growth of 0.3 percentage points. after 4 quarters and a reduction in inflation of 0.2 percentage points. after 8 quarters. However, the specified strength of the response to the interest rate shock might vary, as the relative importance of the transmission channels might change. The ECMOD model is being developed constantly to capture structural changes affecting the Polish economy. Structural factors such as EU accession, the deepening of the international division of labour and the increasing openness of the Polish economy might have exerted a strong impact on the behaviour of economic agents, which cannot be fully reflected in the model estimated on the basis of past data series.

III. Some other research results on monetary transmission channels in Poland

This section presents some separate research results on monetary transmission channels in Poland which might be important for the conduct of monetary policy. They have not been included in the core forecasting model framework for various reasons. First of all, their relevance for the conduct of monetary policy as compared to the interest rate channel (including the exchange rate impact) is presumably weaker. Secondly, in some cases the possibility of incorporating the channels in the forecasting process is heavily constrained by data availability. Thirdly, some research, as well as anecdotal evidence, seems not to yield any clear results. Finally, a model which could contain all channels of monetary transmission would be far too complicated, and the sole forecasting process could lose in terms of transparency and would be too difficult to operate smoothly.

Credit channel

The necessary condition for the credit channel to operate is the significant role of banks as a source of capital for the corporate sector. If some borrowers do not have easy access to the capital market, their investment expenditure will depend on bank credit. Monetary tightening results in a reduction of loan supply due to worsening demand prospects and to deterioration in the creditworthiness of households and firms, which in turn affects the consumption and investment of the private sector and output growth. Some banks can be in a better position than others to offset monetary policy tightening. Owing to the asymmetric information problem, small banks may find it more difficult to raise non-deposit funds to keep loans at the desired level. The same is true for poorly capitalised banks.

In Poland banks dominate the financial market, so a necessary condition for the credit channel to operate is fulfilled. Empirical studies on the bank-level data produce ambiguous results. For the period 1997–2001 Pawłowska (Wróbel and Pawłowska (2002)) shows that the credit channel in Poland operates and that small as well as less capitalised banks tend to reduce credit supply after a monetary tightening. Chmielewski (2005) also provides some evidence that less capitalised banks are more prone to react to a monetary tightening. However, the most recent evidence (Grabek (2006)) performed on an extended sample does not confirm these results. All in all, taking into account these findings, it is hard to assess the importance of the credit channel in monetary transmission in Poland.

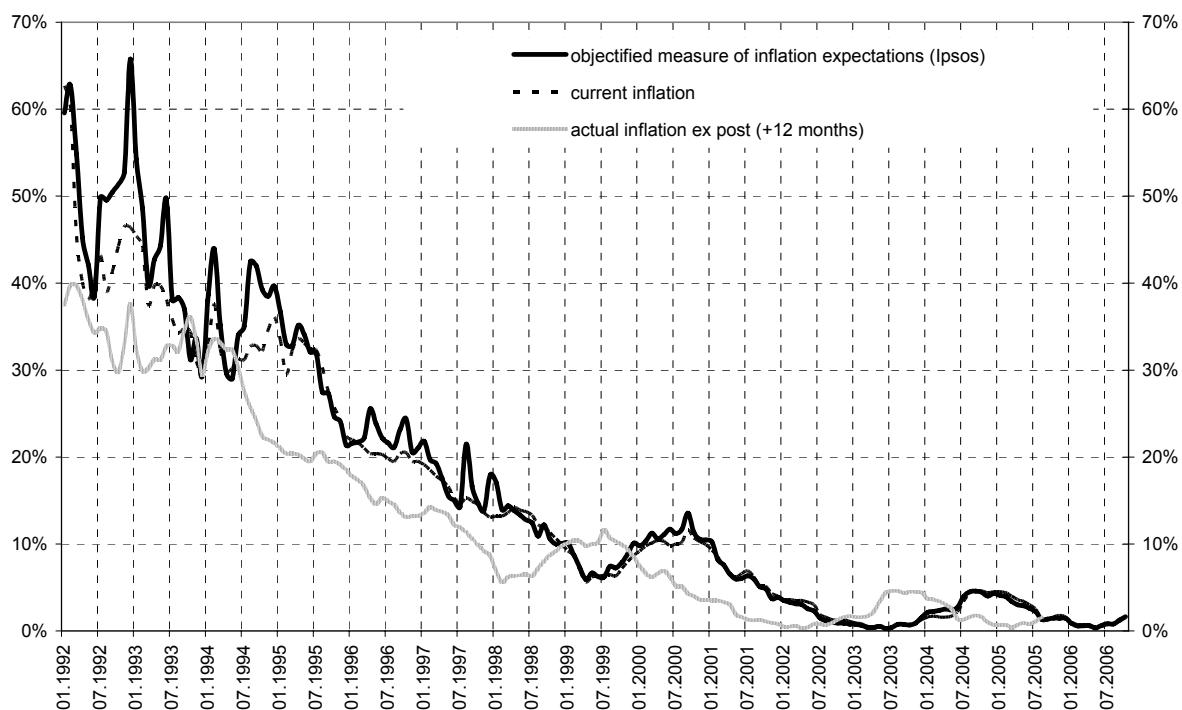
Inflation expectations channel

Inflation expectations play a pivotal role in various channels of the monetary policy transmission mechanism, as they influence real interest rates, the exchange rate, aggregate demand, wages and prices. In theory it is commonly assumed that expectations are rational, ie that they fulfil unbiasedness and macroeconomic efficiency conditions. However, numerous empirical studies suggest that inflation expectations are characterised by different propensities to look forward and backward. The more forward-looking they are, the more efficient the central bank is in influencing inflation and inflation reduction is less costly in terms of output.

Figure 1 presents the expected rate of inflation in 1992–2006, compared to the current rate of inflation (known at the moment the surveys were carried out) and actual inflation ex post (with reference to which the expectations were formed). It can be easily seen that they are usually close to the current rate of price change. However, in 1992–1997 there were periods when inflation expectations were even higher and much more volatile than current inflation, which might have resulted from a coincidence of economic, political and social events. Since April 2001 (except for the period November 2003–August 2004, when respondents' opinions were heavily influenced by the EU accession shock) consumer inflation expectations have been lower than the current inflation rate.

Various studies on the process of formation of Polish consumers' inflation expectations indicate that they might not fulfil requirements of the rational expectations hypothesis, since unbiasedness and macroeconomic conditions are not met (eg Łyziak (2005); Kokoszczyński et al (2006)). This assessment suggests that Polish consumers commit systematic forecasting errors and do not incorporate all relevant information available at the time that their expectations are formed. Some other empirical findings (Łyziak (2003)) suggest that consumers' inflation expectations are characterised by a significant degree of backward-looking and remain in the long-run relationship with the current rate inflation. In the short run, the reaction of inflation expectations to changes in current inflation is asymmetric, ie it is stronger in the case of rising inflation and weaker in the case of falling inflation.

Figure 1
**Polish consumers' inflation expectations, current inflation rate
and actual inflation ex post from 1992 to 2006**



Source: NBP calculations based on Ipsos and Polish Central Statistical Office (GUS) data.

The assumption of the backward-looking character of Polish consumers' inflation expectations would mean that the NBP's monetary policy had an indirect impact on consumer inflation expectations mainly through changes in the current rate of inflation. Therefore, even if inflation expectations did well in explaining price dynamics, as suggested by estimates of the New Keynesian Phillips curve presented in Kokoszczyński et al (2006), the NBP monetary policy seemed to have a limited impact on them directly, and this would impose constraints on the effectiveness of the monetary transmission mechanism.

However, the results obtained might be critically dependent on the econometric methods applied. Aside from the results of econometric studies available so far, some anecdotal evidence could indicate that at least in some situations Polish households react quite rationally and in a forward-looking manner. Moreover, a study examining the rationality of the inflation expectations of Polish entrepreneurs, though a novel approach taking into account the entire distribution of these expectations, shows that corporate expectations in Poland are indeed rational (Czogała et al (2005)).

In addition, it should be stressed that the central bank can influence the formation of economic agents' expectations not only through interest rate changes, but also by its transparency and external communication. This mechanism has been acknowledged by the monetary authorities in Poland and some measures have been taken to increase transparency and improve communication techniques (for a review of changes in the NBP's transparency and communication, see, for instance, Czogała et al (2005)). It is not yet possible to assess unanimously the effects of these steps on the formation of expectations due to short data series.

Monetary channel

There are two main issues to be mentioned in the context of a desirable development of the monetary analysis at the NBP. The first one refers to the relationship between money and asset prices. The second one concerns the link between money and inflation. Both issues reflect the use of monetary aggregates in the strategy of the ECB, the growing role of money in analysing inflation and financial stability, as emphasised by some other central banks, and an increasing general interest in the topic of monetary analysis.

The first issue concerns the role of monetary data in signalling tensions in the asset markets. This involves important challenges for the conduct of monetary policy, including the central question just around the corner – should central banks take “extra action” measures and react to excessive asset price growth in advance, or “mop up after” (see Blinder and Reis (2005), Kohn (2006)). The debate on this topic is one of the hottest in central banking nowadays and firm conclusions have not been reached so far. For instance, White (2006) advocates that under pure inflation targeting, central banks may tend to ignore imbalances building up on the asset markets. A sudden adjustment of such imbalances could pose serious risks to economic growth and send the economy into a period of bad or even ugly deflation. To avoid this, central banks could act in advance, and the timing of such “extra action” can be based – among other things – on the growth of money, which can be a good indicator of asset-market imbalances. Also, Christiano et al (2006) point out that monetary policy that not only targets inflation, but also “leans against the wind” by tightening its stance when credit growth is strong, has the potential to reduce the costs of boom-bust cycles in the asset markets.

The Monetary Policy Council acknowledged the above issues in its Monetary Policy Guidelines for 2007, where it states that in the pursuit of monetary policy it is necessary for central banks to make allowances for asset prices, since their rapid growth during an unstable boom may be accompanied by a rising risk of their violent and considerable slump. This, in turn, poses a threat to the stability of the financial system and the real economy. The MPC states further that, in assessing the risk of emergence of disruptions in the asset market and the inflation outlook, it may be useful in the longer run to account for the paths of monetary aggregates (MPC (2006). As for now, work is in progress at the NBP on constructing reliable measures of real estate prices that could help trace the imbalances in this market in Poland.

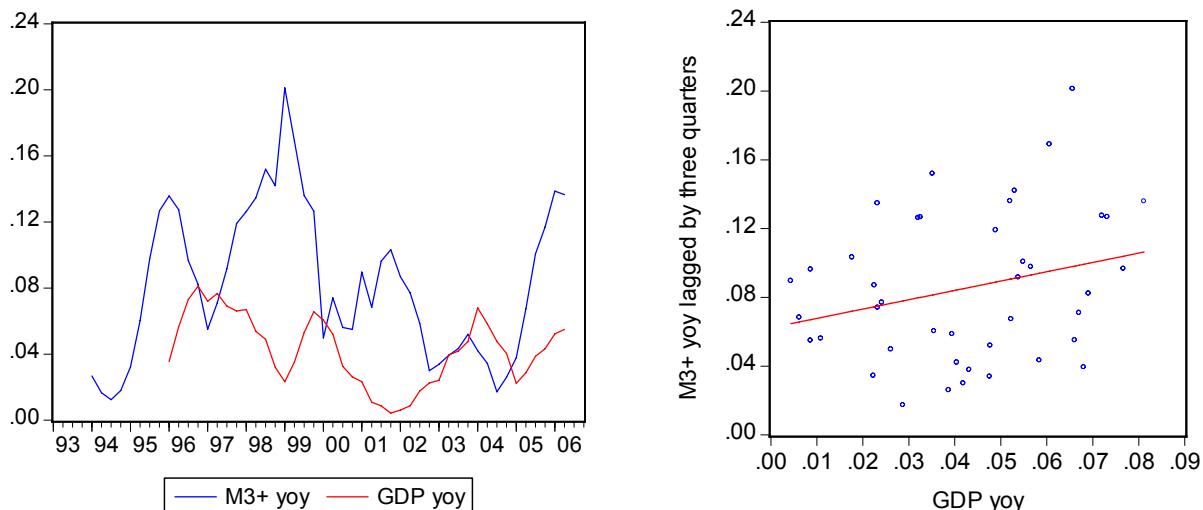
The second issue concerns the role of monetary data in signalling future inflation. The important argument in this context is offered by the ECB’s two-pillar framework, which seems to be supported by recent evidence on the link between low-frequency components of monetary series and inflation fluctuations (Gerlach (2003), Gerlach (2004), Neumann (2003), Bruggeman et al (2005)). In this approach the monetary pillar can be perceived as a way to predict changes in steady-state inflation, while output gap or cost factors are highly correlated with short- and medium-term inflation fluctuations. Against this background it seems desirable to construct a money-enhanced Phillips curve-like equation, describing the developments of inflation as a function of standard MTM factors like output gap or the exchange rate along with monetary measures, eg monetary aggregates filtered with spectral analysis tools. Recently it has been pointed out on theoretical grounds that the money-enhanced Phillips curve specification does not provide any additional information as compared to the typical “new Keynesian” Phillips curve model and that money is redundant there (Woodford (2006)). From the empirical point of view, however, it might still be considered as one of the important inputs to the monetary policy decision-making process, especially in view of the ECB’s experience, which indicates that allowing for money provides more accurate inflation forecasts (Fisher et al (2006)). The latter might be reflected in increasing interest outside the euro area in the problem of monetary analysis as a potential input into monetary policy.

In addition, there is an issue of potential inclusion of money in the utility function in the general equilibrium approach. If money comes into the utility function as a non-separable

argument, then money may matter for inflation and the real economy. It should, however, be mentioned that several studies do not support the non-separability hypothesis (Swofford and Whitney (1987); Andres, Lopez-Salido and Valles (2006)).

Some of the studies reported above, as well as encouraging results for the euro area, suggest that monetary aggregates might bear relevant information about long-run price developments. Preliminary results for the Polish economy are encouraging and seem to support the view that there exists a money-inflation link. For instance, some preliminary estimations of the Phillips-curve augmented with money gap measures indicate the statistical significance of the money gap and a delayed impact of money on price changes. At the same time, the GDP gap has proved not to have a bearing on the development of consumer prices, which might be consistent with the findings on the growing role of external factors in explaining domestic inflation in Poland (eg Allard (2006)). In addition, a tentative analysis of correlations between changes in money and GDP seems to point to possible relationships holding between the two, with monetary aggregates acting as a leading proxy for GDP (see Figure 2). In any case, what is apparent in the view of the research studies cited, is that more thorough research on the money-inflation relation, with plausible use of frequency filters, might be required before some final conclusions can be reached. A short data series for Poland may, however, constitute a serious obstacle to reaching robust results.

Figure 2
Broad money M3+ (real) and GDP (both in yoy terms).
 Left panel: developments over time;
 right panel: scatter of GDP and M3+ lagged by three quarters



Source: Own calculations based on NBP data.

Apart from the potential studies on links between money and inflation, further in-depth analysis of the credit aggregates would seem to be very useful as a supporting tool of economic analysis. A purely qualitative assessment of credit dynamics might be particularly helpful in the assessment of the current state of the economy and, consequently, potential pressures on prices. For example, in 2004 there was a very fast acceleration of economic activity with GDP growth reaching 5.3%, as compared to 3.5% in 2003. Individual consumption and accelerated and fixed capital investments turned positive after a long period of stagnation. However, this was not accompanied by any significant rise in lending to households. Moreover, the rate of growth in lending to enterprises remained negative. This could be a signal that the rise in domestic demand might have been fuelled mainly by the one-off demand shock connected with the EU accession. In fact, it turned out that the fast

acceleration of economic growth in 2004 was not sustainable, as economic activity slowed significantly in 2005 and GDP growth decreased to 3.5%. In contrast, the acceleration of GDP growth observed in 2006 was accompanied by a significant rise in lending to both households and enterprises. This might be a sign of consolidation of the high domestic demand growth and a build-up in inflation pressures due to a closing output gap.

IV. Conclusion

The interest rate and exchange rate channels are recognised as the most important monetary transmission mechanisms in Poland. For this reason both channels are embedded in the core forecasting model of the NBP, ie the ECMOD. However, they should be monitored closely, as the ongoing structural changes in the Polish economy might change their relative importance. For example, in the wave of integration, global factors such as a slowdown or revival of the global economy seem increasingly to have a bearing on the development of prices or the domestic market. This should be taken into account in future versions of the ECMOD.

A high degree of uncertainty concerns some other channels of monetary policy transmission that are not explicitly included in the ECMOD: the credit channel and the expectations channel. It is hard to assess the importance of the credit channel in monetary transmission in Poland by relying on some empirical studies. According to some other research results, consumer expectations seem to a large degree to be backward-looking, whereas some anecdotal evidence might suggest the contrary.

Some of the monetary transmission channels remain unexplored, mainly because of a lack of appropriate data or sufficiently long data series. The poor data problem concerns mainly the assets channel and, in particular, real estate prices. Apart from the need for studies of the links between broad money and inflation, some more in-depth analysis of credit aggregates might prove very useful as a supporting tool for the economic analysis used in the conduct of monetary policy.

References

- Allard C (2006): "Inflation in Poland: How much can globalisation explain?", paper presented during the CEPR/ESI 10th Annual Conference on "Globalisation and Monetary Policy", 1–2 September, Warsaw, National Bank of Poland.
- Borio C and A Filardo (2006): "Globalisation and inflation: New cross-country evidence in the global determinants of domestic inflation", BIS, presented at "The CEPR/ESI 10th Annual Conference on Globalisation and Monetary Policy", NBP, Warsaw, September 2006.
- Blinder A and R Reis (2005): "Understanding the Greenspan standard", Fed Kansas City symposium, "The Greenspan era: Lessons for the future", Jackson Hole, Wyoming, August 2005.
- Bruggeman A, G Camba-Mendez, B Fischer and J Sousa (2005): "Structural Filters for Monetary Analysis: the Inflationary Movements of Money in the Euro Area", ECB Working Paper, no 470.
- Chmielewski T (2005): "Bank Risks, Risk Preferences and Lending", mimeo.
- Chmielewski T and A Kot (2006): "Impact of globalization? Changes in the MTM in Poland", mimeo.

Christiano L J, R Motto and M Rostagno (2006): "Monetary policy and stock market boom-bust cycles", paper presented at the Fourth ECB Central Banking Conference, Frankfurt, November.

Coricelli F, B Jazbec and I Masten (2006): "Exchange rate pass-through in EMU acceding countries: Empirical analysis and policy implementations", *Journal of Banking and Finance*, vol 30, pp 1375–1391.

Crespo-Cuaresma J, E Balazs and T Reininger (2006): "Interest rate pass-through in Central and Eastern Europe: Reborn from ashes merely to pass away?", in *Focus on European Economic Integration*, Oesterreichische Nationalbank.

Czogała A, A Kot, A Sawicka (2005): "Inflation expectations of Polish entrepreneurs – does transparency matter?", mimeo.

Crespo-Cuaresma J, E Balazs, T Reininger (2006): "Interest rate pass-through in Central and Eastern Europe: reborn from ashes merely to pass away?", in *Focus on European Economic Integration*, Oesterreichische Nationalbank.

Darvas Z (2001): "Exchange rate pass-through and real exchange rate in EU Candidate countries", *Bundesbank Discussion Paper* 10/01.

Dhar S and S Millard (2000): "A limited participation model of the monetary transmission mechanism in the United Kingdom", *Bank of England working paper* no 116.

Dhar S and S Millard (2000): "How well does a limited participation model of the monetary transmission mechanism match the UK data?", *Bank of England Working Paper* no 117.

Fic T, M Kolasa, A Kot, K Murawski, M Rubaszek and Tarnicka M (2005): "ECMOD model of Polish economy", *Materiały i Studia* no 36.

Fisher B, M Lenza, H Pill and L Reichlin (2006): "Money and monetary policy: The ECB experience 1999–2006", paper presented at Fourth ECB Central Banking Conference, November.

Gerlach S (2003): "The ECB's two pillars", *CEPR Discussion Paper* no 3689.

Gerlach S (2004): "The two pillars of the European Central Bank", *Economic Policy* 40, pp 386–439.

Grabek G (2006): "Credit channel in Poland", mimeo.

IMF Country Report no 04/218, Republic of Poland, Selected Issues.

Kohn D (2006): "Monetary policy: a journey from theory to practice", a European Central Bank Colloquium held in honor of Otmar Issing, Frankfurt, Germany, March 16, 2006.

Kokoszczyński R, T Łyziak, E Stanisławska (2006): "Consumer inflation expectations. Usefulness of survey-based measures – a cross-country study", Paper presented during the NBP Workshop "The role of inflation expectations in modelling and monetary policy-making", Warsaw, 9–10 February 2006, www.nbp.pl.

Łyziak T (2003): "Consumer inflation expectations in Poland", *ECB Working Paper* no 287, European Central Bank.

Łyziak T (2005): "Inflation targeting and consumer inflation expectations in Poland. A success story?", *Journal of Business Cycle Measurement and Analysis* 2(2), 185–212.

Nelson E (2000): "Direct effect of base money on aggregate demand: theory and evidence", *Bank of England Working Paper* no 122.

Neumann M (2003): "The European Central Bank's first pillar reassessed", mimeo.

Svensson L E O (2006): "Optimal inflation targeting: further developments in inflation targeting", paper presented at the Central Bank of Chile Conference on "Monetary policy under inflation targeting", Santiago, 20–21 October 2005, version August 2006.

White W.R. (2006): "Is price stability enough?", BIS Working Papers no 205, April 2006.

Woodford M (2006): "How important is money in the conduct of monetary policy?", paper presented at the Fourth ECB Central Banking Conference, "The Role of Money: Money and Monetary Policy in the Twenty-First Century", November 9–10, 2006.

Wróbel E and M Pawłowska (2002): "Monetary transmission in Poland: some evidence on interest rate and credit channels", Materiały i Studia, no 24.