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**ASYMMETRIC EFFECTS IN THE POLISH
MONETARY TRANSMISSION MECHANISM**

Summary of PhD dissertation

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1. Justification of the reasons for dissertation topic selection

Most studies on the Polish monetary transmission mechanism (MTM) show that increase in reference rate leads to increase in lending and deposit rates in commercial banks, initial appreciation and subsequent depreciation of the zloty exchange rate, decrease in investment and consumption, and in turn to decrease in inflation rate. The MTM is a matter of paramount importance for a central bank, because it enables to foresee the most probable effects of a given policy. Also the process is important for bank analysts and other economists, because it allows for better forecasts and expectations.

In the majority of studies linear models are applied, however, there is a large group of papers that concentrate on asymmetric models. The adjustment is asymmetric when the strength or the speed of adjustment of one economic variable to another depends on certain regimes, for example the adjustment of lending rates is stronger at times of decreases in the reference rate than in times of increases in the reference rate. The MTM is a complex process and it seems that linear models might be too simple and that asymmetric effects should be incorporated in the relevant models. Thus, it is important to investigate what, if any, asymmetries are present in a given economy and whether they are statistically and economically significant.

The thesis concerns asymmetric effects in the Polish MTM. I concentrate on the following relations of the MTM: the transmission from money market rates to retail bank lending and deposit rates, the transmission from interest rate disparity to the zloty exchange rate, the pass-through from output gap and exchange rate to inflation, and the monetary policy response function. These relations are the key elements of two most effective monetary policy channels in Poland: the interest rate channel and the exchange rate channel (see Demchuk et al. 2012). Moreover, although there are both theoretical and empirical studies for other countries that underline the importance of the asymmetric effects, as far as the studies for the Polish economy are concerned the topic is not particularly well explored in the literature.

Below I show some of the reasons for asymmetric adjustment, which partly justify the analysis of the selected relations. The speed and the magnitude of the pass-through from money market rates to retail bank rates may not only depend on the direction of change in money market rate, but also on the level of economic activity or the level of liquidity in the banking sector. During periods of low economic growth, banks may be unwilling to decrease their lending rates, because they may require higher compensation for greater credit risk. While during periods of high economic growth, banks may be more willing to increase the lending

rates, because then the demand for credit is higher and potential debtors are in better financial condition. Whereas relatively high level of liquidity in the banking sector may cause upward stickiness of deposit rates and easing of collateral requirements. This may cause stronger decreases than increases of the retail bank rates.

The influence of interest differential on exchange rate may differ depending on the size of disparity, for instance it may be stronger when Sharpe ratios are high, then the benefits from adopting an optimal investment strategy should be higher than necessary to pay transaction costs. Furthermore, the asymmetric effect may be caused by time-varying risk premium, that seems to be positively related to the level of interest differential.

The Phillips curve, applied as a model of inflation, is a crucial tool for conducting monetary policy with inflation targets. When the Phillips curve is nonlinear, it means that the cost of disinflation depends on the phase of business cycle. Thus, it shows whether there exist stronger or weaker incentives for monetary authorities for preemptive policy tightening to counteract inflationary pressures. Therefore, the effectiveness of monetary policy may depend on the phase of business cycle and the optimal monetary policy actions may be nonlinear with respect to inflation and output gaps.

The Phillips curve might be convex due to downward nominal wage rigidities. At times of low level of economic activity it may be difficult to cut wages, while at times of high inflation it may be enough to keep the nominal wages constant for some time to decrease the real wages. The other reason for convex curve are capacity constraints, that in the short run restrict firms to increase output and may force them to increase prices.

Finally, the monetary policy rule should be nonlinear because of nonlinearities in the other stages of the transmission process, or because of the asymmetric preferences of monetary authorities. We can distinguish two types of asymmetric preferences of the central bank. The first are inflation avoidance preferences, that may characterize central banks that need to build credibility after implementing an inflation targeting strategy. The second are recession avoidance preferences, that may characterize banks that face some social or political pressures.

2. The main objective of the dissertation

The main aim of the study is to investigate the existence, the significance, and the nature of asymmetries in the selected relations of the MTM in Poland. The revealed asymmetries are compared with results of similar studies for other countries.

The dissertation contains description of many reasons for asymmetric effects and reviews the most important studies. It reports the results of many statistical tests, which allow to assess the statistical significance of observed asymmetries.

3. The dissertation thesis and hypotheses

The general thesis of my dissertation is the following:

Asymmetric effects appear in certain relations of the Polish MTM and they are important enough to be incorporated in the models of the transmission mechanism and in the design and implementation of the monetary policy in Poland.

Four groups of detailed hypotheses can be distinguished. The majority of them state that the transmission in the selected relations is stronger or faster during certain time periods and weaker or slower in the others.

The first group of hypotheses concerns the transmission to lending and deposit rates. The interest rate pass-through may depend on some exogenous and endogenous drivers. I consider the following four exogenous drivers: the direction of change in money market rate, level of economic activity, level of liquidity in the banking sector, expectations concerning money market rate. I test the following hypotheses: deposit rates react more strongly to decreases of the money market rate, while lending rates react more strongly to increases of the money market rate; the adjustment of retail bank rates is faster and stronger when the level of economic activity is high and/or when the level of liquidity is low; the adjustment is weaker and faster, when the changes in the money market rate are expected.

As far as the endogenous drivers are concerned, it seems that in the long term the pass-through from the money market rates to retail bank rates is relatively faster, when the changes in deviations from long-term equilibrium are relatively large and/or when the levels of deviations are large (small) for deposit (lending) rates.

The second group consists of two hypotheses that concern exchange rate equations. I expect that interest differential affects exchange rate more strongly, when the levels of interest differential are relatively high. Or that interest differential affects exchange rate more strongly, when the levels of economic activity are relatively high.

The third group of hypotheses is devoted to modelling the inflation rate. When the level of economic activity is high, the impact of output gap on inflation is expected to be stronger and/or the impact of exchange rate on inflation is expected to be stronger. Moreover, I expect that the exchange rate pass-through is asymmetric with respect to the characteristics of

exchange rate movements, including depreciations versus appreciations, larger versus smaller changes in exchange rate, and lower versus higher volatility of exchange rate.

The last group of hypotheses concerns the monetary policy reaction function. I expect that the Polish monetary authorities react more strongly to inflation when the level of inflation is relatively high or that the Polish monetary authorities react more strongly to the level of economic activity, when the output gap is relatively low.

4. Structure of the dissertation

The dissertation consists of four chapters. Chapter one describes the monetary transmission mechanism. I present the stages of the MTM, that seem to be a natural classification of transmission process, as they are based on the time course of actions. Also I describe the channels of the MTM, that seem to be a more theoretical classification. The channels are divided into traditional and non-standard ones.

Chapter two concerns asymmetric effects in the MTM. It presents the selected relations of the MTM. The chapter discusses the reasons for asymmetric effects and contains literature review.

Chapter three addresses some features of the Polish economy, that are important in the analysis of the MTM. It briefly presents the monetary policy in Poland both in current and historical perspective. Moreover, chapter three presents my dataset.

In chapter four I discuss the empirical results of my research. It is the most important part of the dissertation. The chapter consists of four sections. The first deals with the interest rate pass-through from money market rates to retail bank rates. This section has two parts, one that presents the results of testing for symmetric and asymmetric cointegration and the other that presents the results of estimating threshold error correction models. The second section concerns the relation between exchange rate and interest differential. The relations that I estimate are inspired by the uncovered interest rate parity. In the third section I describe the results for the Phillips curve, while in the fourth section for the monetary policy rule. The two last sections are closely interlinked, because they are based on the same econometric methodology. Each of the four sections ends with summary of the results and their comparison to other studies.

Finally, the last part of dissertation contains conclusions and five appendixes. Appendix E includes tables with description of the most important studies on asymmetric effects in the chosen relations of the MTM, which supplements the literature review.

5. Sources and research methods

The theoretical part of the dissertation, namely chapter one and two, is based on a thorough literature overview. While the empirical part, mainly analysis in chapter four, is based on my own calculations for a number of different time series and various models.

The sample starts in January 1998 and ends in December 2012. Therefore, the sample is homogenous in terms of monetary policy regime. Because of data availability in some cases the sample starts later. The historical data are obtained from many sources, the most important are the National Bank of Poland, the Polish Central Statistical Office, the European Central Bank, the Eurostat and the Reuters EcoWin. I use monthly and quarterly data.

All calculations were carried out using Eviews 8 program and Gauss 10 program. I wrote the relevant programs for estimating the models in Eviews, whereas for Gauss I modified the programs written by Dick van Dijk, which are available online.

In order to analyse asymmetric effects I apply the following methods: asymmetric cointegration, asymmetric error correction models, threshold regressions, and logistic and exponential smooth transition models. In the majority of cases I estimate the threshold value, in a way that enables to obtain the lowest sum of squared errors for the relevant asymmetric equations. Next to assess the statistical significance of the observed asymmetric effects I use Wald tests, Enders and Siklos (2001) tests, LR statistics, and sup-Wald tests (see Caner and Hansen, 2004).

6. Results and conclusions of the dissertation

The analyses presented in my dissertation confirm the main thesis. Asymmetric effects appear in the selected relations of the monetary transmission mechanism. They seem to be economically and statistically important. Thus, they should be incorporated in the models of the transmission mechanism and in the design and implementation of the monetary policy in Poland.

Firstly, in the long term the interest rate pass-through from money market rates to retail bank rates is faster, when large changes in the deviations from long term equilibrium appear. It may be because high menu costs make bank reluctant to introduce small changes.

Moreover, the pass-through seems to be faster and stronger at times of relatively low level of liquidity in the banking sector. This may result from little incentives for banks to

follow changes in the money market rates during periods of high liquidity. In such periods banks may not be interested to raise their deposit and lending rates and may accept lower loan collaterals. Thus, the adjustment to raising reference rate may be weaker.

The majority of interest rates seem to react more strongly to increases in the market rate, which may be somehow surprising for deposit rates, but it reflects high competition for them during the recent crisis. Lending rates can be rigid downwards because, other things being equal, it is more profitable for banks to increase than decrease their lending rates.

What is more, the transmission from money market rates to retail bank rates is stronger when changes in money market rates are expected. This implies that even if the Polish banks correctly anticipate the policy rate change, they do not adjust the retail rates in advance.

Next I turn to the relation between exchange rate and interest differential. The relation is difficult to model as empirical studies soundly reject the standard uncovered interest rate parity. The analysis suggests that exchange rate is more strongly influenced by interest differential when it is relatively low. The result may stem from differences in risk assessment. Strong macroeconomic fundamentals and low level of risk premium are usually reflected in low interest differentials and relatively stable exchange rate. Therefore, during periods of relatively low interest differential, the differential may have more influence on exchange rate.

The estimations for the Phillips curve show that the influence of monetary policy on inflation is stronger during periods of high economic growth. Then, either the output gap coefficient or the forward-looking inflation coefficient increases.

These results depend on the measure of inflation and the version of the curve, but they do not depend on the frequency of data. In the case of CPI inflation and in the case of backward-looking curve for base inflation, the impact of output gap on inflation is stronger when the level of economic activity is relatively high. But it is not true for the hybrid version of the curve with base inflation or survey-based inflation expectations. In these cases, the weight of forward-looking inflation expectations becomes higher in the regime of high economic activity.

As far as the exchange rate pass-through is concerned, the results show weak evidence in favor of stronger pass-through at times of larger changes in exchange rate and weaker pass-through at times of very low volatility of exchange rate. The results may be justified by menu costs of possible price changes. They point out that small changes of exchange rate are not passed to prices.

The analysis of the monetary policy rule shows that the Polish monetary authorities react more strongly to inflation when the inflation gap is relatively high. The results are robust to alternative measures of inflation target. Also it does not confirm that they react more strongly

to the output gap when the output gap is relatively low. This may be the evidence of inflation avoidance preferences of the central bank. It seems that the NBP needed to build credibility after implementing inflation targeting strategy. On the other hand, the policymakers could take into account convexity of the Phillips curve and therefore respond more strongly when facing excess demand to avoid severe recessions to lower the inflation generated when the level of economic activity is high. Also expected inflation caused by a higher output gap is larger than in a linear specification, so anticipating this policymakers could react more forcefully.

The results somehow suggest that the monetary transmission mechanism is more effective during periods of relatively high levels of economic activity, especially during a recovery phase. Nevertheless, further analysis is needed to see how relevant are the asymmetric effects when incorporated in the models of the MTM. Moreover, it would be useful to carry out a similar analysis when more data becomes available, that would help to obtain higher power of statistical tests.

To sum up, the study calls attention to an important aspect of the monetary transmission mechanism, namely the presence of asymmetric effects. There are a number of reasons to suspect that the transmission process is asymmetric. Moreover, a number of theoretical and empirical studies, among them my study for the Polish economy, show significant asymmetric effects. Therefore, asymmetries should be acknowledged both in the models of the MTM and in the monetary authorities actions.