



German Economic Team Moldova

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**Comments on Recent Research by the
National Bank of Moldova regarding an
Empirical Analysis of the Inflation
Process**

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About the German Economic Team Moldova ("GET Moldova")

The German Economic Team Moldova (GET Moldova) advises the Moldovan government and other Moldovan state authorities such as the National Bank on a wide range of economic policy issues. Our analytical work is presented and discussed during regular meetings with high-level decision makers. GET Moldova is financed by the German Federal Ministry of Economics and Technology under the TRANSFORM programme and its successor. Our publications are publicly available at our website (www.get-moldova.de).

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Comments on Recent Research by the National Bank of Moldova regarding an Empirical Analysis of the Inflation Process

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Contents

1. Introduction
2. Comments on Paper "The estimation of second round effects on core inflation"
3. Comments on Paper "Asymmetric Price Transmission from Exchange Rate Movements: Evidence from Republic of Moldova"
4. References

1. Introduction

Not long ago, the National Bank of Moldova has taken a fundamental decision when switching from exchange-rate targeting towards inflation targeting. The move towards inflation targeting is a fundamental shift in the way monetary policy operates and influences key economic variables.

One implication of directly targeting inflation rather than other objectives is that a deep understanding of the inflation process is required. As part of a broader research agenda on the monetary transmission mechanism, which analyses through which channels monetary policy operates, a detailed empirical analysis of inflation dynamics is required.

In this technical note, we will discuss and review two recent empirical contributions on the inflation process by the monetary policy and research department of the National Bank of Moldova. We hope that our comments may help to improve the technical and analytical capabilities of the research department's staff further.

2. Comments on Paper "The estimation of second round effects on core inflation"

This paper analyses the impacts of food and energy prices on domestic core inflation in Moldova. Two structural VARs are estimated. First, a system of domestic variables is extended by world food and oil prices. Second round effects are addressed by replacing the prices from international markets by domestic fuel and food prices. The latter exert important influences on core inflation, which is an interesting result for the conduct of monetary policy in Moldova. We recommend considering the following comments for further developing this line of research.

a. Structure of the paper

The abstract gives a good introduction into the research field, but it should rather describe in brief what is done in the underlying paper and how it contributes to the literature. Furthermore, the statement that the research question "requires developing a macroeconomic model based on a structural auto-regressive vector" is too specific; there are other models that might be appropriate, e.g. dynamic stochastic general equilibrium (DSGE) models.

The paper starts very abruptly. To give an example, presenting estimation results (impulse responses) already in the first section is indeed quite unusual in the literature. We recommend structuring the paper along the following lines:

1. Introduction (e.g. research topic, literature in the field, own contribution, outline)
2. Methods (e.g. structural VAR)
3. Data and empirical specification
4. Results
5. Conclusions

b. Data selection and empirical specification

The choice of variables in the VAR should be guided more explicitly by economic theory. For instance, typical monetary macro VARs contain GDP and an interest rate in addition to the considered set of variables. This would allow a more structured approach, e.g. by specifying a money demand relation.

The way the VARs were specified should be outlined. This would include lag selection and tests for no residual autocorrelation. Furthermore, cointegration tests should be conducted. Of course, this must be done with care due to the short sample period. Nonetheless, a cointegrated VAR would provide additional statistical parsimony and interpretability in economic terms.

Impulse responses should be presented together with confidence bands. These are generated by appropriate software, e.g. EViews or JMulTi. The latter can be recommended for multivariate time series analysis. Confidence bands would give us a better feeling for the statistical significance of the numerous impacts.

c. Individual comments and possible errors

- The cumulative response of core inflation to oil prices is given as 0.53 in the text (p. 2), but in Figure 8 it seems to be 0.053.
- The last paragraph on page 2 is unclear: Why do exchange rate and money “dissipate the effects of imported inflation on core inflation”? The goal should be to specify a theoretically and empirically appropriate model. In such a model, dynamics and interaction between the variables should paint a realistic picture.
- When displaying impulse responses, as in Figure 1, one should leave out those panels that are not needed for the interpretations given in the text. Here one would concentrate on the responses of core inflation to oil and food prices, possibly amended by a few additional cases.
- Section 2 tells that “monetary policy should be restricted as a result of exogenous shocks”. However, oil and food price shocks are likely to represent external supply shocks. Monetary policy should typically be tightened in response to domestic demand shocks.
- An additional model would be helpful, which contains oil and food prices, both external and domestic. Then the transmission from world markets could be analysed directly. This would provide a bridge between the models in section 1 and 2. Besides, are money and exchange rate also included in the second model?
- “Time series of the variables listed are included in the model as log-order difference, being independent variables with two lags. This model is based on the assumption of simultaneous functional equations, which means that all processes take place in the analyzed period.” These statements are unclear. What does “independent” mean? What does it mean for the model that “all processes take place in the analyzed period”?
- The general description of VAR models on page 4 should be provided before the first VAR is estimated.
- Page 4 (bottom) says that restrictions were imposed in the model. These restrictions should be made explicit. What type of restrictions is addressed

here? For identifying structural VARs, usually contemporaneous impacts are constrained. Long-run restrictions would be possible, too.

- It remains unclear why section 3 needs a bootstrap procedure. It first presents first-order autocorrelations, which can directly be calculated from the data together with usual confidence bands. If the VAR is correctly specified, it simply mirrors this autocovariance structure in a parametric way. The same holds for the contemporaneous cross-correlations. These can be calculated from the data and are reflected in the VAR by the dynamics and residual cross-correlations. A productive way of further analysis in the SVARs would be given by decomposing forecast error variances. Such variance decompositions would indicate the importance of the different shocks for the endogenous variables over various horizons.

3. Comments on Paper "Asymmetric Price Transmission from Exchange Rate Movements: Evidence from Republic of Moldova"

The paper conducts an empirical analysis of exchange rate transmission into domestic core inflation in Moldova. The focus is on the question whether appreciation and depreciation exert asymmetric influences. The research question is quite topical since Moldova as a small open economy with a high import share is especially susceptible to foreign exchange shocks. In the following, we outline several paths along which the paper may be further improved.

a. Data selection and empirical specification

The exchange rate is defined as an exogenous variable that impacts domestic inflation. Backward causation is likely to be present, for instance since an increase in inflation relative to the foreign country usually leads to depreciation of the exchange rate. This fact could be taken into account using a multiple equation model, but should at least shortly be addressed when laying out the concept of the paper.

The regression of core inflation on the exchange rate uses food and PPI inflation as control variables. Additional candidates are mentioned in the introduction: energy and regulated prices. These might be considered as further control variables.

In addition to the first differences, a cointegration approach should be pursued. The only important difference to the current model would be the presence of an error correction term, i.e. a stationary linear combination of the variables in levels. The adjustment to equilibrium deviations could be checked for asymmetry. We recommend the procedure of Enders and Siklos (2001), which is easy to implement. Furthermore, an additional type of asymmetry could be tested: While the current approach focuses on different impacts depending on the direction of exchange rate movements, one might specify asymmetry regarding the fact of being above or below equilibrium.

The specification of equation (3) should be discussed in more detail. In particular, results on tests for no residual autocorrelation would be informative.

The estimation used only five and a half years, which is very short for a macroeconometric analysis. It is understood that Moldovan data contain stronger

instabilities than usually found for industrialised countries. Nonetheless, efforts should be made to extend the sample, e.g. using explicit structural breaks as appropriate, for enhancing statistical significance and allowing more complex model specifications. However, the degree of intricacy (e.g. nonlinearity) still must be kept manageable since time series over decades, which enable accurate determination of coefficients in highly complex model structures, are not available for Moldova.

An explicit test for asymmetry should be conducted. In the current version, one can see that C(8) is a bit larger and individually a bit more significant than C(9). The crucial test hypothesis would be $H_0: C(8)=C(9)$, which can be checked by a standard t-test. This hypothesis is not likely to be rejected when considering the distance between the point estimates and the standard errors. In this case one might estimate a symmetric model, which would result in higher significance of the pass-through coefficient and would still deliver an interesting result for the Moldovan economy. Otherwise, one could try to extend the sample period in order to strengthen the power of the tests. Moreover, insignificant control variables, like PPI inflation in the current case, might be eliminated to save degrees of freedom.

b. Individual comments and possible errors

- p. 3 "This perception is based both on previous literature results": References should be provided.
- Equations (1) and (2) should use the dummy notation of equation (3). I.e., one would not define X' and X'' but rather use only X and multiply it by the dummy. Furthermore, residuals should be added to all equations.
- Before equation (3), "MDL/USD" must be changed to "MDL/EUR". The result that the euro rather than the US dollar is relevant for transmission effects to Moldovan prices could be expected in the light of the trade shares. This could be shortly explained. In addition, it might be worthwhile to employ an effective exchange rate, i.e. weighted by trade with different regions. This might best take into account effects through import prices.

4. References

Enders, W., Siklos, P.L. (2001): Cointegration and Threshold Adjustment. *Journal of Business and Economic Statistics*, 19, 166-176.

National Bank of Moldova (2010a): The estimation of second round effects on core inflation, Paper by the Monetary Policy and Research Department.

National Bank of Moldova (2010b): Asymmetric Price Transmission from Exchange Rate Movements: Evidence from Republic of Moldova, Paper by the Monetary Policy and Research Department.