German Advisory Group

Institute for Economic Research and Policy Consulting

Policy Paper Series [PP/05/2008]

Inflation in Ukraine: Results and Policy Implications of an Empirical Study

Robert Kirchner, Enzo Weber, Ricardo Giucci

Berlin/Kyiv, October 2008

About the Institute for Economic Research and Policy Consulting

Institute for Economic Research and Policy Consulting (IER) is the leading Ukrainian analytical think tank focusing on economic research and policy advice. The IER was founded in October 1999 by top-ranking Ukrainian politicians and the German Advisory Group on Economic Reforms.

The mission of IER is to present an alternative point of view on key problems of social and economic development of Ukraine. In frame of the mission IER aims at providing top quality expertise in the field of economy and economic policy-making; acting as real leader of public opinion through organisation of open public dialog; contributing to the development of economic and political sciences as well as promoting development of Ukrainian research community.

Institute for Economic Research and Policy Consulting
Reytarska 8/5-A,
01034 Kyiv, Ukraine
Tel: +38 044 / 278 63 42
Fax: +38 044 / 278 63 36
institute@ier.kiev.ua
http://www.ier.kiev.ua

About the German Advisory Group

The German Advisory Group on Economic Reforms, which is active in Ukraine since 1994, advises the Ukrainian Government and other state authorities such as the National Bank of Ukraine on a wide range of economic policy issues and on financial sector development. Our analytical work is presented and discussed during regular meetings with high-level decision makers. The group is financed by the German Federal Ministry of Economics and Technology under the TRANSFORM programme and its successor.

German Advisory Group
c/o Berlin Economics
Schillerstr. 59
D-10627 Berlin
Tel: +49 30 / 20 61 34 64 0
Fax: +49 30 / 20 61 34 64 9
info@beratergruppe-ukraine.de
www.beratergruppe-ukraine.de

Inflation in Ukraine: Results and Policy Implications of an Empirical Study

Executive Summary

The paper presents the results of empirical models of inflation dynamics in Ukraine over 1999 – 2008. Its objective is to shed light on the sources of inflation during this period, as there is widespread disagreement among policy makers and analysts about the concrete underlying reason(s). This disagreement is not surprising, however, since without a proper empirical assessment based on statistical analysis this issue cannot be solved fundamentally. This is turn implies that policy responses geared at fighting inflation might lack sound empirical justification and might therefore be not fully efficient or even wrong-directed. However, especially in the recent period of very high inflation - which is one of the macroeconomic imbalances which Ukraine currently faces - it seems absolutely necessary to respond quickly and with correctly targeted measures.

Our analysis demonstrates that it is in principle possible to empirically model the inflation process in Ukraine in a theory-consistent way, which further carries important implications for policy makers. Policies to constrain aggregate demand like a tightening of monetary policy are well founded in the established long-run relationship between money and prices in Ukraine. At the same time, the influence of fiscal policy is more difficult to detect empirically, and more restricted to a temporary influence. However, this does not imply that fiscal policy carries no responsibility for fighting inflation, but rather points at difficulties in correctly assessing its inflationary impact given limited data on fiscal coverage. The crucial impact of credible fiscal policy measures on inflation via expectations formation, which is out of the focus of our empirical analysis, is a key factor in dampening price pressure.

The strong influence of external factors like commodity prices and changes in the exchange rate on inflation can further be firmly established; a fact that does not come as a surprise in Ukraine's open economy context. The policy of limiting exchange rate changes by avoiding sharp and massive depreciations seems thus appropriate with regard to fighting inflation. Of course, such a strategy corresponds well to the concept of reliably restraining monetary and fiscal policy.

However, also supply-side explanations of inflation could clearly be established. These findings point to the necessity to supplement short-term demand management with long-term aggregate supply-side measures. Structural and institutional reforms to make supply more flexible are equally necessary to encourage response in quantities rather than prices when meeting strong demand pressures.

Authors

Robert Kirchner	kirchner@berlin-economics.com	+49 30 / 20 61 34 64 2
Enzo Weber	enweber@mail.uni-mannheim.de	+49 621 / 181 18 44
Ricardo Giucci	giucci@berlin-economics.com	+49 30 / 20 61 34 64 1

Acknowledgements

The authors would like to express their gratitude to Veronika Movchan, Alla Kobylyanskaya, Vitaliy Kravchuk and Oksana Betliy for providing excellent assistance in compiling the dataset used in this paper. The usual disclaimer applies.

Contents

1. Introduction

There is widespread agreement among policy makers and analysts about several issues regarding inflation in Ukraine. First, inflation is far too high. With CPI inflation currently (September 2008) at 24.6% yoy und PPI inflation at 42.7% yoy, this consensus is hardly surprising. Second, such a high level of inflation is very dangerous from an economic and very harmful from a social point of view. High inflation creates macroeconomic risks and can destabilise systematic economic development by shortening planning horizons of agents. Besides, inflation hits mainly the poor and is thus very unjust. Third, the reasons for high inflation are multiple. The most commonly identified culprits are monetary, exchange rate, fiscal and wage policies as well as international price spill-overs. Fourth, the authorities have to fight inflation quickly and in a decisive manner, to avoid so-called "second round"-effects: Higher prices for goods (inflation) can lead to higher wages (wage inflation) and thus increase production costs. As a result, entrepreneurs raise the prices for their goods, thus creating a second round of inflation. It is a well-known fact that such a dynamic is difficult to stop once it got started, while policy makers are at risk of losing their credibility by ineffective delays in response measures.

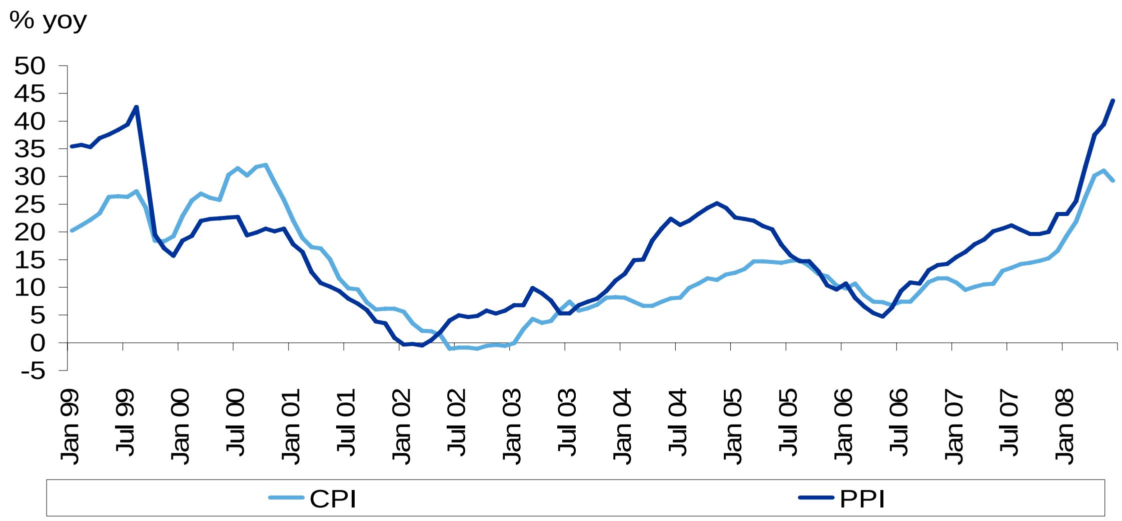
Without doubt, this consensus is an important prerequisite for combating inflation. But at the same time there is little agreement about the relative importance of different sources of inflation. While some policy makers and analysts identify exchange rate policy as the main factor leading to high inflation, other focus strongly on fiscal and wage policy, while a further group puts the blame on international commodity markets. Part of this disagreement can be certainly explained by the wish to shift responsibility away from one's own institution. But in our view, the reason for the disagreement is more profound and quite simple: Due to the lack of recent empirical studies, nobody really knows what the main reasons for inflations are. Confronted with this uncertainty regarding the true causes of inflation, policy makers can only make best guesses, without knowing for sure whether these guesses are backed by solid empirical foundations. As a consequence of this wide disagreement on the sources of inflation, there is also no consensus on how inflation should be fought. Thus, the lack of knowledge about inflation carries also strong policy implications.

In order to try to fill this gap, we conducted an empirical study on inflation in Ukraine, whose results are presented in this paper. Empirical research can deliver crucial insights, which can find their way into the formulation of policy measures. Nevertheless, given significant data problems, the further evolving transition process and other constraints, caution is advised in interpreting the results, since comprehensive and universally valid clarification about the relative importance of potential drivers of inflation remains an unrealistic task. In Part 2 we present some stylized facts on inflation in Ukraine over 1999-2008. In Part 3 the modelling framework is presented. Part 4 presents the empirical results of the model estimation. In Part 5 we draw policy recommendations based on the results of the study.

2. Stylized facts of inflation in Ukraine

Ukraine has a very mixed track-record over the last 10 years regarding price stability, as shown in Figure 1. In the aftermath of the balance of payments crisis in 1998, inflation rose quickly, partly due to the large depreciation of the hryvnia. But from mid-2000 onwards, i.e. from the time during which the peg to the US dollar was introduced, the country managed to embark upon a path of disinflation and enjoyed a period of relative price stability from 2002 to 2004. During 2005 inflation picked up again, mainly due to increases in food prices, but came down again in 2006. From the summer of 2007 to May 2008, CPI inflation increased very rapidly and hit a massive 31.1% yoy in May 2008. PPI inflation rocketed to even greater highs, peaking at 46.9% yoy in August 2008. As a reaction to rampant inflation, the NBU decided to weaken the link to the US dollar in February/March 2008 and the hryvnia has ever since fluctuated widely. Starting from May 2008, inflation decreased and currently amounts to a still threatening 24.6% (September 2008). The strong crop harvest in the summer 2008 has clearly contributed to such a decrease in the rate of inflation currently observed.

Figure 1
Inflation developments in Ukraine, 1999-2008



Source: Derzhkomstat

Looking at the past 10 years, we can draw several conclusions from inflation dynamics in Ukraine. First, CPI inflation has been extremely volatile, as can be seen from its standard deviation of 8.9% over the period January 1999 to September 2008. One reason for this volatility is the heavy weight of food products in the consumer basket used to measure CPI inflation, which currently amounts to 57.7%[1]. For example, just one food item (meat and poultry) was responsible for almost half of the inflation rate in March 2005, which amounted to 14.7% yoy[2]. Second, the average level of inflation has been relatively high. The average rate of CPI inflation from January 1999 to September 2008 amounts to 12.6%, and thus prevails in double-digit territories. In this concern, Ukraine shares a common experience with several Post-Soviet transition economies, such as Russia and Kazakhstan. Third, CPI and PPI developments can diverge in the short-term, but in the long-term both indicators move in tandem.

3. Modelling framework

In a first step, several long-run theoretical hypotheses about the inflation process will be tested individually. This allows detecting different sources of inflation, which is seen as being influenced by the respective excess demand in different sectors (e.g. the money market, the labour market or the external sector). In a second step, the significant results obtained will be included in a combined model of inflation, which further incorporates lagged inflation and other lagged explanatory variables to fully account for the inflation dynamics in the data. The final form of this equation is then found by applying a "general-to-specific" methodology which sequentially eliminates factors which turned out to be insignificant. This general two-step methodology, which is commonly used in inflation analysis in transition contexts[3], allows obtaining significant and relatively robust results while coping with the problem of the lack of long high-quality time series.

The following sections provide some theoretical underpinnings for the long-run relationships that will be estimated in the following chapter.

---

[1] Back in 2000 this weight was even higher and amounted to 67%.

[2] See Giucci/Bilan (2005).

[3] See Oomes and Ohnsorge (2005) and the references quoted there for an application of this approach.

3.1. Money market

A potential well-specified and stable relationship between money and prices serves as a starting point for the formulation of theoretical hypotheses. The establishment of a long-run (cointegrating) relationship between real money balances, real GDP as scale variable and the nominal interest rate reflecting opportunity cost of money holdings[4], which can be interpreted as a long-run money demand function, is the first step. On the basis of such a long-run demand function, we can then calculate the monetary overhang, i.e. excess money supply over its steady-state demand. In a further step, we can analyse the impact of this disequilibrium adjustment on driving inflation.

The approach of using multivariate cointegration analysis and specifying a dynamic error-correction mechanism for the money market is in line with previous empirical work by Leheyda (2005) and Lissovolik (2003) for the case of Ukraine.

3.2. Fiscal policy

A large part of the current discussion among policy makers and analysts about the underlying forces of inflation deals with fiscal policy. In previous work, Piontkivsky (2001) et al. showed a small but significant effect of the budget deficit on inflation over the period 1995-2000 by applying a vector autoregression (VAR) model. From our dataset, we choose the following variables representing fiscal policy:

a) government expenditure,
b) government debt stock,
c) consolidated budget balance,
d) minimum wage, as well as public sector wages (administration, education and health sector)
e) minimum pension,
f) social transfers (i.e. the household income due to social aid and current transfers)

In order to detect their potential explanatory power for inflation dynamics, these variables will enter VAR models in different specifications (see Part 4.2 for details).

3.3. Phillips curve

A Phillips curve relationship can be empirically specified for examination of the long-run inflation-unemployment trade-off[5]. If cointegration between unemployment and inflation is found, this points to the existence of a long-run non-vertical Phillips curve, or equivalently to a time-varying non-accelerating inflation rate of unemployment (NAIRU). The disequilibrium adjustments between real variables (unemployment) and nominal variables (inflation) can then be studied, i.e. if inflation reacts to changes in the employment situation, or vice versa. This can carry important implications for potential demand-side policy options.

3.4. Mark-up pricing

The idea underlying the long-established theory of mark-up pricing is that firms determine the prices of the goods they produce by applying a certain (profit) mark-up over their production costs (domestic and import costs). In the long run, stable relationships between output prices and

---

[4] In a transition context, there are often two other measures of opportunity costs included in empirical work. This can be the expected exchange rate change, as foreign assets (i.e. foreign cash) are the main alternative to holding domestic money, or the expected rate of inflation.

[5] See Schreiber and Wolters (2007) for such an approach and an empirical application to German data.

variables representing or influencing production costs, i.e. wages[6], commodity prices (raw materials) or exchange rates should exist according to this supply-side hypothesis.

The search for stable mark-up relationships between output prices and variables representing input factors is in line with previous empirical studies by Leheyda (2005) and Lissovolik (2003).

3.5. Combined model

In order to examine the short-run dynamics of inflation, the individual error-correction terms from the long-run relationships estimated above will be included into a general error-correction model of inflation, which also entails lagged first differences of all explanatory variables, including past changes of inflation itself. Starting with a relatively broad and unrestricted specification, we follow a general-to-specific approach in eliminating insignificant lags of the variables in order to arrive at the final form of our inflation equation.

4. Results of the model estimation

We estimate our inflation model with monthly data for the period January 1999–June 2008, i.e. our sample starts after the crisis in 1998 and extends until the recent past. The variables used in our estimations and their respective sources can be found in Table 1 (Appendix A). All series (apart from interest rates and the unemployment rate) are used in logs. Inflation rates are calculated as twelve-month differences of the logged price indices. The seasonal adjustment was done by adding respective dummy variables to the estimated equations. All estimations were performed with the econometrics software package EViews 5.0.

Before we proceeded with the estimations, statistical tests were conducted in order to confirm the time series properties of the data. The results of the Augmented Dickey-Fuller (ADF) unit-root test, which determines the degree of integration of each variable, are shown in Table 2 (Appendix A). The results show that in general for the levels of the variables the null hypothesis of non-stationarity cannot be rejected, while first differences of the variables are stationary. Therefore, they are integrated of order one, or I(1)[7]. Given the limited sample size, this outcome is surprisingly robust.

The following results were obtained for the several theoretical hypotheses that we presented in the previous chapter:

4.1. Money market

As was written in the previous chapter, we first test for a long-run relationship between real money balances (both for M1 and M3), real GDP[8] and a nominal interest rate. The Johansen

---

[6] However, wages play a double role in influencing price dynamics, both as cost-push (when nominal wage growth exceeds productivity growth) and demand-pull factors. Especially in Ukraine, with a relatively high share of wages in household income, the effect on domestic demand should be kept in mind.

[7] A note on the time-series properties of the price indices (consumer and producer prices) is of order here. While the levels of both series are I(1), their first difference (i.e. the month-over-month growth) is I(0), i.e stationary. However, looking at year-over-year growth rates, which is the indicator for inflation used in this paper, the result is also I(1 This mirrors the unclear character of prices and inflation usually encountered in empirical work. Similar findings were presented, for instance, by Oomes and Ohnsorge (2005) for the case of Russia.As a data-coherent modelling device, both the index level and the inflation rate measured year-over-year will enter the respective long-run equations as non-stationary variables, or are first-differenced in order to achieve stationarity.

[8] We deflated monthly nominal GDP by the CPI. While the problems of this indicator at monthly frequency are well-know, using other deflators, additional information given in more reliable quarterly GDP data, or other scale variables (industrial production) didn't improve our results.

procedure[9] has been used for determining the number of cointegrating vectors and their coefficients.

As a result, we are indeed able to establish one cointegrating relationship for each monetary aggregate, which can be interpreted as a long-run money demand equation. The estimation output of the respective vector error correction models (VECM) is shown in Table 3 & 4 in Appendix B.

The dynamic response of inflation to a monetary overhang can be analysed using the impulse response functions of the VECM. Assuming an increase of the money supply by 10%, we find that in both cases (i.e. for M1 and M3) a ca. 1 percentage point increase in the permanent inflation rate results. The median lag of this adjustment is 4-6 months.

Results: For both M1 and M3, a long-run money demand relationship can be identified. Inflation reacts to an increase in the money supply of 10% by permanently rising ca. 1 percentage point.

4.2. Fiscal policy

The general result of VAR modelling in different specifications is that the data on

a) government expenditure,
b) government debt stock,
c) consolidated budget balance

show no significant influence on inflation. Similarly, using econometric methods we failed to uncover evidence that the

d) minimum wage, as well as public sector wages (administration, education and health sector),
e) minimum pension

drive inflation. While it could be firmly established that there exists a cointegrating relationship between inflation and each one of these wage variables, it is only the latter variables that adjusts to disequilibrium.

However, using above VAR approach, the impact of

f) social transfers (i.e. the household income due to social aid and current transfers)

on inflation is established, at least transitory. An increase in social transfers by 10% temporarily raises inflation by 0.5 percentage points after 2-3 years, but dies out in the following.

Results: Given the available data representing fiscal and incomes policy, only a weak temporary impact of social transfer on inflation can be found.

4.3. Phillips curve

Using the series on inflation and unemployment (according to the ILO-concept), we found a cointegration relationship between them, i.e. we established a long-run connection between these variables. The output of the VECM can be found in Table 5 in Appendix B.

The analysis of disequilibrium adjustment reveals a strong negative effect of unemployment on inflation, i.e the adjustment burden is bearded by the latter (and not reverses). This indicates that pressure from the labour market indeed influences inflation. A drop in unemployment by 1 percentage point implies an increase in inflation of around 2 percentage points (median lag: 12 months).

[9] See Kirchgässner and Wolters (2007) for a general textbook reference on the different econometric techniques applied in this paper.

Results: The results confirm that also real-side factors like unemployment are driving inflation in Ukraine. However, this is not valid vice-versa, i.e. inflation is not found to influence unemployment. This is an important result for policy makers, as "surprise inflation" to lower unemployment (e.g. during a recession) will fail to achieve its intended result.

4.4. Mark-up pricing

Using data for CPI and PPI separately, we tried to establish long-run relations between those indices and wages (including minimum and public sector wages), nominal effective exchange rates (NEER), and commodity prices.

In the model containing the CPI, cointegration tests (and further likelihood ratio testing on the cointegrating coefficients – see the Appendix) identified 2 long-run relationships:
1) CPI – wages
This relationship can be found in Table 6 in Appendix B (the vector is "CointEq2"). A clear causation between the variables in the sense that wages are driving inflation is not found.

2) CPI – commodity prices – NEER
The output of this estimation is given in Table 6 in Appendix B (the vector is "CointEq1"). Here, the pass-through of changes in NEER and commodity prices as well as the variance decomposition is interesting:

a) NEER: A depreciation of 1 percent raises consumer prices by 0.3-0.5 percent in the long run. Shocks to the NEER explain 35% of the total forecast error variance of CPI.
b) Commodity prices: A general increase in commodity prices of 1 percent raises consumer prices by only 0.1-0.15 percent in the long run. Shocks to commodity prices explain 45% of the total forecast error variance of consumer prices.

Before prices arrive at these pass-through values, their reaction reaches a maximum after one year, which nearly doubles the long-run effects.

The corresponding model for the PPI showed the presence of one cointegrating vector:

3) PPI – wages – commodity prices – NEER
The estimation output is given in Table 7 in Appendix B. Again, the pass-through and the variance decomposition are of interest for us:

a) NEER: A depreciation of 1 percent raises producer prices by 0.85 percent, i.e. the relationship is almost "1 to 1". The median lag is 18 months. Shocks to the NEER explain less than 10% of the total forecast error variance of PPI.
b) Commodity prices: A general increase in commodity prices of 1 percent raises PPI by 0.75 percent. The median lag is 9 months. Shocks to commodity prices explain 40% of the total forecast error variance of producer prices.
c) Wages: A wage increase of 1 percent raises PPI by 0.1 percent. Shocks to wages explain below 5% of the total forecast error variance of producer prices.

In a further step, we examined the long-run relationships between several wage variables, and tried to answer the question if politically-determined wages (e.g. the minimum wage or certain public sector wages) influence overall wages in the economy. Table 8 in Appendix B shows that indeed a cointegrating relationship between the overall wage level and the politically-determined minimum wage could be established ("1 to 1" relation in the long-run), which also holds for other official wages (not shown). However, causality runs in both directions, and a stronger influence from overall wages to the public wages is recorded.

Results: Several mark-up relationships could be detected, which support the relevance of this hypothesis for explaining inflation dynamics in Ukraine. The following results are of particular importance:
1) Exchange rates: There is a high pass-through of changes in the NEER on CPI (in the order of

0.3-0.5) and an even higher on PPI (0.85).
2) Commodity prices: The pass-through of changes in commodity prices on CPI is quite low (in the order of 0.1-0.15) while again very high on PPI (0.75).
3) Prices and wages are cointegrated, but the latter not driving the former.
4) Wages and minimum wages (as well as other public sector wages) are cointegrated, but the latter not driving the former.

4.5. Combined model

For the single equation error-correction model representing the dynamics of inflation in Ukraine, we take into account the previous estimations by including the respective error-correction terms (i.e. the deviations from long-run equilibrium) as explanatory variables in the model. This concerns the monetary overhang (Part 4.1), the Phillips curve relationship (4.3), and the markup-relations (4.4). Additionally, a variable representing the stance of the business cycle (i.e. the output-gap) was included[10].

Explanatory variables, which enter the model in lagged form, are:
- average wage
- nominal effective exchange rate (NEER)
- commodity prices
- lending rate
- unemployment
- social transfers
- real GDP
- real money
- inflation in main trading partners (EU, Russia)
- lagged inflation (representing inertia)

We include in the estimation of the final inflation equation 2 lags for each explanatory variable. After eliminating insignificant variables in a general-to-specific approach, we obtain a parsimonious specification of the short-run inflation equation, which is quite sensible with the estimated coefficients having the right sign. The estimation output can be found in Table 9 in Appendix B for the monetary aggregate M3 and in Table 10 in Appendix B for the monetary aggregate M1. Looking at the goodness-of-fit indicators presented there, both models perform quite similar, which is expected after the discussion in Part 4.1. Above models passed the usual diagnostic tests (autocorrelation, normality, ARCH), as well as tests for parameter stability (Chow forecast test, recursive coefficient estimates)[11].

The overall conclusion from the combined model can be summarised as follows:
a) Significant long-run sources of inflation are:
1. Markup-relation (commodity prices, nominal effective exchange rate)
2. Phillips curve
3. Monetary overhang

b) Significant short-run sources of inflation are:
1. Commodity prices
2. Unemployment
3. Foreign inflation (Russia)
4. Own inflation (pointing to persistence/inertia)

c) Insignificant factors are:
1. Output-gap (i.e. the stance of the business cycle)
2. Markup-relation (wages)
3. Selected variables representing fiscal policy

[10] This cylical component has been obtained by applying the Hodrick-Prescott filter to real GDP.

[11] The results of these tests are not shown, but available upon request from the authors.

However, while our estimations show that it is indeed possible to model inflation in Ukraine relatively successfully in a simple theoretical and empirical set-up, some words of caution are of order. The limits of the performed analysis need to be kept clearly in mind. First, this relates to data problems like short samples, limited available series and low quality of data, where the latter point is quite common in transition contexts. Second, the administrative interference into prices formation, especially at the CPI level, is still relatively high. Third, the modelling of expectations, which can also be a key driver of inflation dynamics, has not been performed in the current study.

These shortcomings, as well as more general considerations, show at the same time some interesting directions for future research. First, the explicit inclusion of inflation expectations (e.g. obtained by survey data) in inflation equations might lead to interesting new insights, once the quality of the data improves and longer time-series become available[12]. The contribution of Siliverstovs and Bilan (2005), who use devaluation expectations in their work, is an interesting step in this direction. Second, a more disaggregate analysis of CPI inflation might provide interesting results, as the behaviour of different sub-groups (food, non-food and services) shows very different dynamics in Ukraine. Third, the impact of fiscal policy on inflation should be further studied. Fiscal coverage (which forms the basis for the data used in this study) is relatively limited in Ukraine, with many quasi-fiscal activities not properly accounted for. There are strong a-priori beliefs that such activities are also a potential source for inflation, which should thus be analysed.

5. Policy implications

After having presented the results of our empirical study, we now focus on its relevance for policy making. Turning to aggregate demand management first, the implications of the study for monetary and exchange rate policy are unambiguous. Since monetary growth clearly influences the rate of inflation, the NBU can contribute to reducing inflation by restricting the growth of money supply. This implies that the NBU has been right in tightening monetary policy since end-2007 while increasing the necessary flexibility of the exchange rate starting in 2008, and that it should continue doing so. This long-term conclusion does not exclude the possibility of providing banks with additional liquidity in the short-term in order to stabilise the financial system in the context of the international financial crisis. In the following though, the curse of money supply should be geared to the determinants of money demand and stance of the business cycle. Pronounced pass-through from the nominal effective exchange rate to producer and even consumer prices was empirically established. Simply pegging the hryvnia to the US dollar thus exposes Ukraine to shocks that can hardly be absorbed before hitting the real economy. Even more important, the connection between domestic prices and the exchange rate calls for avoiding large and continuous depreciation, an important message that policy makers are rightly aware of. Most effectively, confidence in the value of the currency can be supported by conducting policy aimed at reducing nominal pressures and triggering sustainable economic growth.

The policy implications regarding fiscal policy are much less straightforward. Our results imply a transitory upward shift of inflation due to social transfer payments, which is likely to reflect immediate demand effects on the goods market. However, we were not able to obtain any further significant impact of fiscal policy on inflation, despite having checked for several fiscal variables such as government expenditure, government debt stock, politically determined wages and pensions and the consolidated budget balance. But these findings do not automatically mean that there is no link between fiscal policy and inflation. In particular, we should emphasize considerable problems in assessing the true stance and inflationary impact of fiscal policy correctly by the given dataset, which makes it naturally difficult to obtain clear-cut results. Consequently, it would be wrong to conclude that fiscal policy plays no role for inflation or that the concrete drafting of the Budget 2009 will be of no relevance for combating inflation in Ukraine. On the contrary, the Budget 2009 will play a crucial role in combating or nourishing the establishment of a dangerous wage-price-nexus, which would cement high inflation for many years to come.

[12] See Kirchner et al. (2008) on this specific issue.

As shown by the study, inflation is not only determined by demand, but also by supply factors. Especially the use of mark-up practices by companies for setting prices undoubtedly influences inflation. This finding suggests a widespread use of mark-up methods by Ukrainian companies and points to the dominance of oligopolistic structures in the economy. Consequently, also policies to tackle supply-side constraints like competition policy, or structural/institutional reforms in general have a major role to play in fighting inflation in Ukraine by discouraging price-driving behaviour; furthermore, increasing flexibility in general bears the clear potential of reducing marginal production costs hand in hand with supply prices. This conclusion supports our long-held view that inflation has to be tackled from both the demand and the supply side, if Ukraine wishes to achieve long-term price stability.

Finally, our Phillips curve estimation implies persistent effects of the dynamics of unemployment on the curse of inflation. Ukraine's success in lowering unemployment thus gradually abandons the transition period where high unemployment might still have reduced pressure in the inflationary environment. Ukrainian decision makers are strongly encouraged to back these improvements in the employment situation by sound economic and monetary policy in order to create a climate of stability and confidence, which is crucial for prosperity of developed economic systems.

References

- Giucci, Ricardo and Olena Bilan (2005): "High inflation in Ukraine: Roots and remedies", Policy Paper U1 by the German Advisory Group and the Institute for Economic Research.
- Isakova, Asel (2007): "Modeling and Forecasting Inflation in Developing Countries: The Case of Economies in Central Asia", CERGE-EI Discussion Paper 2007-174, Charles University Prague.
- Kirchgässner, Gebhard and Jürgen Wolters (2007): "Introduction to Modern Time Series Analysis", Springer.
- Kirchner, Robert, Ricardo Giucci, Yaroslava Suchok, Oksana Kuziakiv and Veronika Movchan (2008): "Inflation Expectations: Importance and Measurement", Policy Paper 02 by the German Advisory Group and the Institute for Economic Research.
- Leheyda, Nina (2005): "Determinants of Inflation in Ukraine: A Cointegration Approach", Mimeo, Centre for Doctoral Studies in Economics and Management (CDSEM), University Mannheim.
- Lissovolik, Bogdan (2003): "Determinants of Inflation in a Transition Economy: the Case of Ukraine", IMF Working Paper No. 03/126. Washington, D.C.
- Oomes, Nienke and Franziska Ohnsorge (2005): "Money Demand and Inflation in Dollarized Economies: The Case of Russia", IMF Working Paper No. 05/144, Washington, D.C.
- Piontkivsky, Ruslan, Artem Bakun, Maksym Kryshko and Tetyana Sytnyk (2001): "The Impact of the Budget Deficit in Ukraine", Research report commissioned by INTAS, Kiev: International Center for Policy Studies (ICPS).
- Schreiber, Sven and Jürgen Wolters (2007): "The long-run Phillips curve revisited: Is the NAIRU framework data-consistent?", Journal of Macroeconomics, Vol. 29, pp. 355–367.
- Siliverstovs, Boris and Olena Bilan (2005): "Modeling Inflation Dynamics in Transition Economies: The Case of Ukraine" DIW Discussion Paper 476, also published in: Eastern European Economics, Vol. 43, No. 6, pp. 66-81.
- Zavkiev, Zavkidjon (2005): "Estimating a Model of Inflation in Tajikistan", CAMA Working Papers No. 2005-27, Australian National University.

Annex A: Data issues

Table 1
Data used in the estimation

Variable	**Mnemonic**	**Unit**	**Source**
Monetary Aggregate M3	M3	UAH m	NBU
Monetary Aggregate M1	M1	UAH m	NBU
Gross Domestic Product (Nominal)	GDP	UAH m	Derzhkomstat
Lending Rate	RATELEND	Percent per annum	IFS
Deposit Rate	RATEDEP	Percent per annum	IFS
Consumer Price Index	CPI	Index	Derzhkomstat
Producer Price Index	PPI	Index	Derzhkomstat
Unemployment Rate	U_ILO	Percent (ILO Methodology)	Derzhkomstat
Commodity Price Index	COMMOD	Index (US-Dollar Basis)	IMF
Nominal Effective Exchange Rate	NEER	Index	IFS
Average Wage	WAGE	UAH	Derzhkomstat
Minimum Wage	MINWAGE	UAH	Derzhkomstat
Minimum Pension	MINPENSION	UAH	Derzhkomstat
Fiscal Expenditures	(not reported)	UAH m	Derzhkomstat
Claims on Central Government	(not reported)	UAH m	IFS
Consolidated Fiscal Balance	(not reported)	UAH m	Derzhkomstat
Consumer Price Index Russia	CPI_RU	Index	IFS
Social Income	SOC_INC	UAH m	Derzhkomstat

Table 2
Tests for stationarity: Results of Augmented Dickey-Fuller (ADF) unit-root tests

Variable	ADF test statistic	Lags	Deterministic components
M3R	-1.83	3	c,t
D(M3R)	-4.45***	2	c
M1R	-3.04	3	c,t
D(M1R)	-4.61***	2	c
GDPR	-0.38	12	c,t
D(GDPR)	-4.27***	12	c
INFC	-1.71	3	c
D(INFC)	-4.58***	2	
INFP	-1.58	1	c
D(INFP)	-6.12***	0	
RATELEND	-1.21	8	c,t
D(RATELEND)	4.24***	7	c
RATEDEP	-1.59	8	c,t
D(RATEDEP)	-14.64***	0	c
CPI	0.02	3	c,t
D(CPI)	-3.02**	2	c
PPI	3.35	1	c,t
D(PPI)	-2.58*	0	c
U_ILO	-2.49	10	c,t
D(U_ILO)	-7.07***	4	c
COMMOD	2.81	0	c,t
D(COMMOD)	-7.87***	0	c
NEER	-1.85	5	c
D(NEER)	-3.70***	4	
REER	-1.78	5	c
D(REER)	-4.05***	4	
WAGE	3.39	5	c,t
D(WAGE)	-14.25***	1	c,t
MINWAGE	0.25	2	c,t
D(MINWAGE)	-9.69***	1	c
SOC_INC	1.09	5	c,t
D(SOC_INC)	-7.09***	4	c

Notes: 1) * ,** and *** means rejection of the null hypothesis of a unit root at 10%, 5% and 1% significance level, respectively. The lag structure was based on Akaike's Information Criterion (AIC),
2) c denotes a constant; c, t includes a constant and a trend,
3) M3R and M1R denote real monetary aggregates, and GDPR real GDP. These were constructed using the consumer price index (CPI) as deflator.

Annex B: Estimation results

Table 3
Money demand based on M1 (VECM)

Vector Error Correction Estimates				
Sample (adjusted): 1999M01 2008M04				
Included observations: 112 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Cointegration Restrictions:				
B(1,1)=1				
B(1,3)=0				
Convergence achieved after 22 iterations.				
Restrictions identify all cointegrating vectors				
LR test for binding restrictions (rank = 1):				
Chi-square(1)	5.794781			
Probability	0.016074			
Cointegrating Eq:	CointEq1			
LOG(M1R(-1))	1.000000			
LOG(GDPR(-1))	-1.171460			
	(0.13831)			
	[-8.46997]			
INFC(-1)	0.000000			
RATELEND(-1)	0.017575			
	(0.00298)			
	[5.89269]			
C	0.523909			
Error Correction:	D(LOG(M1R))	D(LOG(GDPR))	D(INFC)	D(RATELEND)
CointEq1	-0.035104	0.307300	2.003355	-0.237422
	(0.02355)	(0.09823)	(1.21929)	(2.09834)
	[-1.49053]	[3.12830]	[1.64305]	[-0.11315]
D(LOG(M1R(-1)))	0.067350	0.319237	-3.912876	-4.820719
	(0.11768)	(0.49083)	(6.09235)	(10.4847)
	[0.57232]	[0.65040]	[-0.64226]	[-0.45979]
D(LOG(M1R(-2)))	-0.089394	-0.970274	2.739389	7.341616
	(0.11749)	(0.49004)	(6.08252)	(10.4678)
	[-0.76086]	[-1.97998]	[0.45037]	[0.70135]
D(LOG(GDPR(-1)))	-0.019485	-0.404111	0.476696	-3.568406
	(0.02832)	(0.11812)	(1.46619)	(2.52325)
	[-0.68800]	[-3.42107]	[0.32513]	[-1.41421]
D(LOG(GDPR(-2)))	-0.028480	-0.167328	1.207859	1.264079
	(0.02356)	(0.09826)	(1.21960)	(2.09888)
	[-1.20892]	[-1.70295]	[0.99037]	[0.60226]
D(INFC(-1))	-0.001474	-0.005227	0.538687	-0.291462
	(0.00220)	(0.00918)	(0.11391)	(0.19604)
	[-0.66970]	[-0.56953]	[4.72896]	[-1.48676]
D(INFC(-2))	0.001674	0.010414	-0.096213	0.087050
	(0.00222)	(0.00927)	(0.11507)	(0.19803)
	[0.75332]	[1.12333]	[-0.83612]	[0.43958]

D(RATELEND(-1))	0.000893	-0.005215	-0.057646	0.260638
	(0.00121)	(0.00503)	(0.06247)	(0.10751)
	[0.73977]	[-1.03609]	[-0.92273]	[2.42424]
D(RATELEND(-2))	0.000900	0.000127	0.037405	-0.276204
	(0.00113)	(0.00473)	(0.05875)	(0.10110)
	[0.79276]	[0.02693]	[0.63671]	[-2.73195]
C	0.051338	0.270066	0.145110	-0.421508
	(0.00878)	(0.03661)	(0.45444)	(0.78207)
	[5.84849]	[7.37640]	[0.31932]	[-0.53896]
R-squared	0.717356	0.827452	0.338665	0.257438
Adj. R-squared	0.655236	0.789529	0.193316	0.094237
Sum sq. resids	0.054020	0.939759	144.7835	428.8048
S.E. equation	0.024364	0.101622	1.261360	2.170747
F-statistic	11.54798	21.81949	2.330018	1.577434
Log likelihood	268.7457	108.7942	-173.2986	-234.1013
Akaike AIC	-4.424031	-1.567753	3.469618	4.555380
Schwarz SC	-3.914312	-1.058035	3.979337	5.065098
Mean dependent	0.015761	0.008029	0.072602	-0.388482
S.D. dependent	0.041495	0.221509	1.404388	2.280877
Determinant resid covariance (dof adj.)		3.29E-05		
Determinant resid covariance		1.43E-05		
Log likelihood		-11.10419		
Akaike information criterion		1.769718		
Schwarz criterion		3.905681		

Note: seasonal dummies not shown

Table 4
Money demand based on M3 (VECM)

Vector Error Correction Estimates
Sample (adjusted): 1999M01 2008M04 Included observations: 112 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
B(1,1)=1
B(1,3)=0
Convergence achieved after 19 iterations. Restrictions identify all cointegrating vectors.
LR test for binding restrictions (rank = 1):

Chi-square(1)	2.355789
Probability	0.124819

Cointegrating Eq:	CointEq1
LOG(M3R(-1))	1.000000
LOG(GDPR(-1))	-1.712976
	(0.15051)
	[-11.3811]
INFC(-1)	0.000000
RATELEND(-1)	0.012420
	(0.00334)
	[3.72297]

C	5.100787			
Error Correction:	D(LOG(M3R))	D(LOG(GDPR))	D(INFC)	D(RATELEND)
CointEq1	-0.005495	0.327058	1.432614	1.613194
	(0.01577)	(0.08237)	(1.04545)	(1.77383)
	[-0.34840]	[3.97054]	[1.37034]	[0.90944]
D(LOG(M3R(-1)))	0.174707	-0.026395	-1.412364	-10.65634
	(0.11428)	(0.59684)	(7.57509)	(12.8528)
	[1.52870]	[-0.04422]	[-0.18645]	[-0.82910]
D(LOG(M3R(-2)))	0.005524	-0.896081	-1.376544	9.839859
	(0.11443)	(0.59763)	(7.58506)	(12.8697)
	[0.04827]	[-1.49939]	[-0.18148]	[0.76457]
D(LOG(GDPR(-1)))	-0.002442	-0.286565	0.614795	-1.481445
	(0.02462)	(0.12860)	(1.63220)	(2.76939)
	[-0.09918]	[-2.22832]	[0.37667]	[-0.53494]
D(LOG(GDPR(-2)))	-0.012154	-0.115252	1.263480	2.275932
	(0.01913)	(0.09991)	(1.26803)	(2.15149)
	[-0.63534]	[-1.15358]	[0.99641]	[1.05784]
D(INFC(-1))	-0.000260	-0.007712	0.563331	-0.343097
	(0.00170)	(0.00890)	(0.11295)	(0.19165)
	[-0.15248]	[-0.86653]	[4.98722]	[-1.79020]
D(INFC(-2))	0.000359	0.011157	-0.126230	0.060497
	(0.00174)	(0.00910)	(0.11545)	(0.19589)
	[0.20623]	[1.22647]	[-1.09335]	[0.30883]
D(RATELEND(-1))	0.000199	-0.006391	-0.048613	0.246863
	(0.00092)	(0.00479)	(0.06084)	(0.10322)
	[0.21669]	[-1.33323]	[-0.79908]	[2.39158]
D(RATELEND(-2))	0.000786	0.001306	0.028865	-0.307854
	(0.00086)	(0.00451)	(0.05721)	(0.09707)
	[0.91018]	[0.28972]	[0.50453]	[-3.17141]
C	0.048252	0.299177	0.097204	-0.301828
	(0.00675)	(0.03524)	(0.44720)	(0.75878)
	[7.15170]	[8.49086]	[0.21736]	[-0.39778]
R-squared	0.664508	0.832533	0.328893	0.267540
Adj. R-squared	0.590774	0.795727	0.181397	0.106560
Sum sq. resids	0.033442	0.912085	146.9227	422.9713
S.E. equation	0.019170	0.100115	1.270644	2.155930
F-statistic	9.012176	22.61958	2.229846	1.661942
Log likelihood	295.6001	110.4680	-174.1199	-233.3342
Akaike AIC	-4.903573	-1.597644	3.484285	4.541682
Schwarz SC	-4.393855	-1.087925	3.994003	5.051401
Mean dependent	0.019364	0.008029	0.072602	-0.388482
S.D. dependent	0.029967	0.221509	1.404388	2.280877
Determinant resid covariance (dof adj.)		2.19E-05		
Determinant resid covariance		9.54E-06		
Log likelihood		11.70580		
Akaike information criterion		1.362396		
Schwarz criterion		3.498360		

Note: seasonal dummies not shown

Table 5

Phillips Curve: Cointegration between inflation and unemployment (VECM)

Vector Error Correction Estimates

Sample (adjusted): 1999M05 2008M01

Included observations: 105 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:

B(1,1)=1

A(1,1)=0

Convergence achieved after 39 iterations.

Restrictions identify all cointegrating vectors

LR test for binding restrictions (rank = 1):

Chi-square(1)	0.016609	
Probability	0.897455	
Cointegrating Eq:	CointEq1	
U_ILO(-1)	1.000000	
INFC(-1)	0.530335	
	(0.34041)	
	[1.55792]	
C	-15.18524	
Error Correction:	D(U_ILO)	D(INFC)
CointEq1	0.000000	-0.046597
	(0.00000)	(0.02343)
	[NA]	[-1.98871]
D(U_ILO(-1))	0.543626	-0.635886
	(0.09322)	(0.52260)
	[5.83161]	[-1.21677]
D(U_ILO(-2))	0.041665	-0.543394
	(0.11154)	(0.62529)
	[0.37354]	[-0.86902]
D(U_ILO(-3))	-0.501536	0.957352
	(0.09432)	(0.52877)
	[-5.31735]	[1.81053]
D(INFC(-1))	0.034456	0.513375
	(0.01823)	(0.10222)
	[1.88975]	[5.02247]
D(INFC(-2))	-0.045707	-0.155104
	(0.02050)	(0.11495)
	[-2.22911]	[-1.34931]
D(INFC(-3))	0.007417	0.251864
	(0.01801)	(0.10096)
	[0.41183]	[2.49472]

C	0.149839	-0.208986
	(0.07718)	(0.43265)
	[1.94152]	[-0.48303]
Adj. R-squared	0.696789	0.237451
Sum sq. resids	3.834145	120.4998
S.E. equation	0.211147	1.183706
F-statistic	14.27754	2.799151
Log likelihood	24.78718	-156.2171
Akaike AIC	-0.110232	3.337469
Schwarz SC	0.370008	3.817710
Mean dependent	-0.043810	-0.031307
S.D. dependent	0.383454	1.355533
Determinant resid covariance		0.040844
Log likelihood		-130.0879
Akaike information criterion		3.239769
Schwarz criterion		4.250801

Note: seasonal dummies not shown

Table 6

Mark-up relationships I: CPI-wages-commodity prices-NEER (VECM)

Vector Error Correction Estimates

Sample (adjusted): 1999M01 2008M03

Included observations: 111 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:

B(1,1)=1

B(2,1)=1

B(1,4)=0

B(2,2)=0

B(2,3)=0

Convergence achieved after 14 iterations.

Restrictions identify all cointegrating vectors

LR test for binding restrictions (rank = 2):

Chi-square(1)	0.406484
Probability	0.523759

Cointegrating Eq:	CointEq1	CointEq2
CPIL(-1)	1.000000	1.000000
COMMODL(-1)	-0.559207	0.000000
	(0.05872)	
	[-9.52289]	
NEER1L(-1)	-1.209560	0.000000

	(0.27310)			
	[-4.42898]			
WAGEL(-1)	0.000000	-0.348248		
		(0.01262)		
		[-27.6039]		
C	2.541185	-3.268289		
Error Correction:	D(CPIL)	D(COMMODL)	D(NEER1L)	D(WAGEL)
CointEq1	-0.051930	-0.022508	-0.003470	-0.074905
	(0.01023)	(0.05353)	(0.02503)	(0.02439)
	[-5.07596]	[-0.42044]	[-0.13865]	[-3.07142]
CointEq2	-0.014345	-0.181140	-0.077353	0.201987
	(0.01558)	(0.08150)	(0.03810)	(0.03713)
	[-0.92101]	[-2.22249]	[-2.03030]	[5.44018]
D(CPIL(-1))	0.347634	0.033244	0.121773	-0.524862
	(0.10496)	(0.54923)	(0.25674)	(0.25020)
	[3.31211]	[0.06053]	[0.47430]	[-2.09777]
D(CPIL(-2))	-0.192129	-0.317142	-0.265963	-0.033497
	(0.10488)	(0.54881)	(0.25655)	(0.25001)
	[-1.83191]	[-0.57787]	[-1.03670]	[-0.13398]
D(COMMODL(-1))	-0.008665	-0.022813	0.047194	0.033579
	(0.02080)	(0.10883)	(0.05088)	(0.04958)
	[-0.41663]	[-0.20961]	[0.92764]	[0.67728]
D(COMMODL(-2))	-0.040899	-0.122090	-0.019571	-0.073092
	(0.02043)	(0.10691)	(0.04998)	(0.04870)
	[-2.00181]	[-1.14198]	[-0.39159]	[-1.50077]
D(NEER1L(-1))	0.001813	0.191413	0.191045	0.117541
	(0.04195)	(0.21952)	(0.10262)	(0.10000)
	[0.04321]	[0.87197]	[1.86174]	[1.17539]
D(NEER1L(-2))	-0.030715	-0.202258	-0.020866	0.089105
	(0.04082)	(0.21361)	(0.09985)	(0.09731)
	[-0.75244]	[-0.94687]	[-0.20896]	[0.91570]
D(WAGEL(-1))	0.035529	0.419699	0.062519	-0.324736
	(0.03952)	(0.20679)	(0.09667)	(0.09420)
	[0.89903]	[2.02956]	[0.64674]	[-3.44713]
D(WAGEL(-2))	0.009216	0.238677	-0.174646	-0.398655
	(0.04053)	(0.21206)	(0.09913)	(0.09660)
	[0.22740]	[1.12550]	[-1.76177]	[-4.12665]
C	0.016138	-0.000194	0.024415	0.138828
	(0.00331)	(0.01734)	(0.00810)	(0.00790)
	[4.87146]	[-0.01118]	[3.01294]	[17.5798]
R-squared	0.644350	0.181126	0.279326	0.936160
Adj. R-squared	0.560432	-0.012092	0.109280	0.921096

Sum sq. resids	0.005340	0.146221	0.031952	0.030345
S.E. equation	0.007746	0.040533	0.018948	0.018465
F-statistic	7.678367	0.937418	1.642646	62.14799
Log likelihood	394.2820	210.5830	294.9915	297.8568
Akaike AIC	-6.707784	-3.397892	-4.918766	-4.970393
Schwarz SC	-6.170760	-2.860868	-4.381742	-4.433369
Mean dependent	0.009990	0.013115	0.003382	0.019834
S.D. dependent	0.011683	0.040290	0.020076	0.065735
Determinant resid covariance (dof adj.)		9.86E-15		
Determinant resid covariance		4.08E-15		
Log likelihood		1208.900		
Akaike information criterion		-20.05225		
Schwarz criterion		-17.70887		

Notes: 1) seasonal dummies not shown

2) NEER1 is the inverse of the officially reported NEER. An increase in NEER1 equals an effective nominal depreciation of the hryvnia.

Table 7

Mark-up relationships II: PPI-wages-commodity prices-NEER (VECM)

Vector Error Correction Estimates

Sample (adjusted): 1999M01 2008M03

Included observations: 111 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1			
PPIL(-1)	1.000000			
COMMODL(-1)	-0.170067			
	(0.07388)			
	[-2.30203]			
NEER1L(-1)	0.705016			
	(0.17873)			
	[3.94448]			
WAGEL(-1)	-0.402030			
	(0.03461)			
	[-11.6166]			
C	-5.502499			
Error Correction:	D(PPIL)	D(COMMODL)	D(NEER1L)	D(WAGEL)
CointEq1	0.006516	0.011880	-0.068094	0.207726
	(0.01740)	(0.08245)	(0.03640)	(0.03246)
	[0.37444]	[0.14409]	[-1.87066]	[6.39978]
D(PPIL(-1))	0.348512	0.029967	0.528199	-0.098243

	(0.12592)	(0.59661)	(0.26339)	(0.23486)
	[2.76763]	[0.05023]	[2.00542]	[-0.41831]
D(PPIL(-2))	0.033108	-0.444260	-0.231646	-0.396235
	(0.12673)	(0.60043)	(0.26508)	(0.23636)
	[0.26124]	[-0.73990]	[-0.87389]	[-1.67638]
D(PPIL(-3))	0.113541	0.450552	0.075371	-0.514387
	(0.10366)	(0.49111)	(0.21681)	(0.19333)
	[1.09534]	[0.91741]	[0.34763]	[-2.66070]
D(COMMODL(-1))	0.090942	0.046504	0.074689	0.066200
	(0.02365)	(0.11204)	(0.04946)	(0.04410)
	[3.84570]	[0.41508]	[1.51003]	[1.50099]
D(COMMODL(-2))	0.024281	-0.119810	-0.039714	-0.066537
	(0.02488)	(0.11790)	(0.05205)	(0.04641)
	[0.97574]	[-1.01620]	[-0.76301]	[-1.43364]
D(COMMODL(-3))	0.062244	0.146475	0.058290	0.108378
	(0.02527)	(0.11972)	(0.05285)	(0.04713)
	[2.46323]	[1.22348]	[1.10287]	[2.29964]
D(NEER1L(-1))	0.020762	0.345061	0.113151	-0.076068
	(0.05412)	(0.25641)	(0.11320)	(0.10094)
	[0.38362]	[1.34573]	[0.99957]	[-0.75362]
D(NEER1L(-2))	0.007026	-0.179509	0.044542	0.046042
	(0.04852)	(0.22988)	(0.10149)	(0.09049)
	[0.14481]	[-0.78087]	[0.43889]	[0.50878]
D(NEER1L(-3))	-0.023388	0.080569	-0.208404	-0.008244
	(0.04249)	(0.20132)	(0.08888)	(0.07925)
	[-0.55042]	[0.40021]	[-2.34489]	[-0.10403]
D(WAGEL(-1))	0.074016	0.316862	0.084014	-0.360049
	(0.04799)	(0.22739)	(0.10039)	(0.08951)
	[1.54217]	[1.39348]	[0.83691]	[-4.02232]
D(WAGEL(-2))	0.059636	0.058773	-0.184059	-0.465607
	(0.04944)	(0.23426)	(0.10342)	(0.09222)
	[1.20613]	[0.25089]	[-1.77976]	[-5.04910]
D(WAGEL(-3))	-0.016420	-0.058249	-0.099036	-0.139244
	(0.05334)	(0.25271)	(0.11157)	(0.09948)
	[-0.30783]	[-0.23050]	[-0.88769]	[-1.39970]
C	0.005012	-0.003695	0.019804	0.144556
	(0.00387)	(0.01831)	(0.00809)	(0.00721)
	[1.29661]	[-0.20178]	[2.44936]	[20.0508]
R-squared	0.491171	0.161014	0.341443	0.951159
Adj. R-squared	0.349172	-0.073122	0.157660	0.937528
Sum sq. resids	0.006674	0.149812	0.029198	0.023215
S.E. equation	0.008809	0.041737	0.018426	0.016430

F-statistic	3.458974	0.687693	1.857855	69.78325
Log likelihood	381.9052	209.2363	299.9940	312.7198
Akaike AIC	-6.430725	-3.319574	-4.954847	-5.184140
Schwarz SC	-5.820470	-2.709319	-4.344593	-4.573886
Mean dependent	0.011460	0.013115	0.003382	0.019834
S.D. dependent	0.010920	0.040290	0.020076	0.065735
Determinant resid covariance (dof adj.)		9.07E-15		
Determinant resid covariance		3.27E-15		
Log likelihood		1221.186		
Akaike information criterion		-20.12948		
Schwarz criterion		-17.59082		

Note: 1) seasonal dummies not shown

2) NEER1 is the inverse of the officially reported NEER. An increase in NEER1 equals an effective nominal depreciation of the hryvnia.

Table 8
Wage and minimum wage

Vector Error Correction Estimates
Sample (adjusted): 1999M01 2008M03
Included observations: 111 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
B(1,1)=1
B(1,2)=-1
Convergence achieved after 1 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 1):

Chi-square(1)	9.16E-05
Probability	0.992362

Cointegrating Eq:	CointEq1	
WAGEL(-1)	1.000000	
LOG(MINWAGE(-1))	-1.000000	
@TREND(91M01)	-0.002776	
	(0.00037)	
	[-7.51203]	
C	-0.549815	
Error Correction:	D(WAGEL)	D(LOG(MINWAGE))
CointEq1	-0.234160	0.323648
	(0.07032)	(0.06408)
	[-3.32980]	[5.05030]
D(WAGEL(-1))	-0.412379	-0.028050
	(0.10859)	(0.09895)

	[-3.79771]	[-0.28346]
D(WAGEL(-2))	-0.346470	-0.042582
	(0.11206)	(0.10212)
	[-3.09179]	[-0.41698]
D(WAGEL(-3))	-0.008355	-0.066983
	(0.11563)	(0.10537)
	[-0.07226]	[-0.63569]
D(WAGEL(-4))	-0.075481	-0.004740
	(0.11331)	(0.10326)
	[-0.66616]	[-0.04590]
D(WAGEL(-5))	-0.001781	-0.076177
	(0.10777)	(0.09821)
	[-0.01652]	[-0.77568]
D(WAGEL(-6))	-0.045988	-0.177301
	(0.09483)	(0.08642)
	[-0.48495]	[-2.05165]
D(LOG(MINWAGE(-1)))	-0.262029	0.080467
	(0.10284)	(0.09372)
	[-2.54799]	[0.85863]
D(LOG(MINWAGE(-2)))	-0.157995	0.099404
	(0.10469)	(0.09540)
	[-1.50919]	[1.04194]
D(LOG(MINWAGE(-3)))	0.046579	0.150258
	(0.10505)	(0.09573)
	[0.44340]	[1.56957]
D(LOG(MINWAGE(-4)))	-0.111737	0.094791
	(0.10539)	(0.09604)
	[-1.06022]	[0.98697]
D(LOG(MINWAGE(-5)))	0.195118	0.103852
	(0.10507)	(0.09575)
	[1.85710]	[1.08466]
D(LOG(MINWAGE(-6)))	-0.211838	0.108403
	(0.09920)	(0.09040)
	[-2.13553]	[1.19918]
C	0.048256	0.015137
	(0.01150)	(0.01048)
	[4.19695]	[1.44463]
R-squared	0.487081	0.360198
Adj. R-squared	0.419728	0.276183
Sum sq. resids	0.243805	0.202472
S.E. equation	0.049625	0.045224
F-statistic	7.231769	4.287329

Log likelihood	186.5007	196.9967
Akaike AIC	-3.053110	-3.238879
Schwarz SC	-2.715204	-2.900973
Mean dependent	0.019849	0.019965
S.D. dependent	0.065146	0.053156
Determinant resid covariance (dof adj.)		5.00E-06
Determinant resid covariance		3.84E-06
Log likelihood		383.9286
Akaike information criterion		-6.246523
Schwarz criterion		-5.498302

Table 9
Combined model (M3)

Dependent Variable: D(INFC)
Method: Least Squares
Sample (adjusted): 1999M06 2008M02
Included observations: 105 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MARKUP(-1)	-4.630831	1.409759	-3.284838	0.0015
MARKUPWAGE(-1)	0.735724	2.838292	0.259213	0.7961
OVERHANG_M3(-1)	1.386493	0.769301	1.802276	0.0751
PHIL(-1)	-0.085254	0.025235	-3.378481	0.0011
CYCLEHPRSA(-1)	0.000139	0.000816	0.170271	0.8652
C	-0.042195	0.348772	-0.120981	0.9040
D(INFC(-1))	0.334680	0.095127	3.518256	0.0007
D(COMMODL(-2))	-7.026915	2.811916	-2.498978	0.0144
D(U_ILO(-1))	-1.094125	0.388684	-2.814948	0.0061
D(RU_INFC(-1))	0.096469	0.037431	2.577235	0.0117
D(RU_INFC(-2))	-0.100597	0.038319	-2.625252	0.0103

R-squared	0.522797	Mean dependent var	-0.034218
Adjusted R-squared	0.402059	S.D. dependent var	1.350642
S.E. of regression	1.044406	Akaike info criterion	3.108702
Sum squared resid	90.53512	Schwarz criterion	3.664770
Log likelihood	-141.2069	F-statistic	4.330009
Durbin-Watson stat	1.957647	Prob(F-statistic)	0.000001

Note: seasonal dummies not shown

Table 10
Combined model (M1)

Dependent Variable: D(INFC)
Method: Least Squares
Sample (adjusted): 1999M06 2008M02
Included observations: 105 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MARKUP(-1)	-4.843768	1.394757	-3.472841	0.0008

MARKUPWAGE(-1)	0.899893	2.864075	0.314200	0.7542
OVERHANG_M1(-1)	1.741046	0.983269	1.770671	0.0803
PHIL(-1)	-0.083344	0.025604	-3.255167	0.0016
CYCLEHPRSA(-1)	0.000111	0.000814	0.135761	0.8923
C	-0.041834	0.349002	-0.119867	0.9049
D(INFC(-1))	0.337252	0.095098	3.546366	0.0006
D(COMMODL(-2))	-7.104865	2.820401	-2.519098	0.0137
D(U_ILO(-1))	-1.071382	0.388172	-2.760070	0.0071
D(RU_INFC(-1))	0.098254	0.037507	2.619600	0.0105
D(RU_INFC(-2))	-0.098454	0.038452	-2.560458	0.0123

R-squared	0.522171	Mean dependent var	-0.034218
Adjusted R-squared	0.401275	S.D. dependent var	1.350642
S.E. of regression	1.045091	Akaike info criterion	3.110012
Sum squared resid	90.65381	Schwarz criterion	3.666080
Log likelihood	-141.2756	F-statistic	4.319165
Durbin-Watson stat	1.969584	Prob(F-statistic)	0.000001

Note: seasonal dummies not shown

List of Recent Policy Papers

- The Housing Construction Sector in Ukraine: Reasons for the Current Recession and Policy Implications, by Ricardo Giucci, Robert Kirchner, Roman Voznyak, Policy Paper 04, October 2008
- The Policy Interaction between the Government and the National Bank of Ukraine: Assessment of the Current Framework and Policy Recommendations, Robert Kirchner, Ricardo Giucci and Vitaliy Kravchuk, Policy Paper 03, August 2008
- Inflation Expectations: Importance and Measurement, by Robert Kirchner, Ricardo Giucci, Yaroslava Suchok, Oksana Kuziakiv and Veronika Movchan, Policy Paper 02, June 2008.
- Learning to float: Recommendations on exchange rate policy in Ukraine during the transition period towards inflation targeting, by Ricardo Giucci, Robert Kirchner, Vitaliy Kravchuk, Policy Paper 01, June 2008.
- Public Private Partnerships for Ukrainian Highways: Key Principles for Success, by Ferdinand Pavel, Policy Paper W16, February 2008.
- Postal sector reforms in Ukraine. Improving postal services but not the post office, by Lars Handrich, Sven Heitzler, Policy Paper W15, February 2008.
- How you pay is what you get! Reforming hospital reimbursement in Ukraine, by Lars Handrich, Oleksandra Betliy, Policy Paper W14, February 2008.
- The international financial crisis: Risks and policy implications for Ukraine, by Ricardo Giucci, Robert Kirchner and Veronica Movchan, Policy Paper W13, February 2008.
- Ukraine and the UEFA EURO 2012 How to secure its economic potential, by Ferdinand Pavel, Natalia Sysenko, Policy Paper W12, December 2007.
- Should I stay or should I go? Ukrainian migration in economic perspective, by Danzer and Lars Handrich, Policy Paper W11, December 2007.
- High Inflation in Ukraine: Analysis and Policy Recommendations, by Ricardo Giucci, Robert Kirchner and Vitaliy Kravchuk, Policy Paper W10, December 2007.
- Private foreign borrowing and credit growth in Ukraine: Trends and policy recommendations, by Ricardo Giucci, Robert Kirchner and Yulia Poletaeva, Policy Paper W9, December 2007.
- Breakthrough for Electricity Sector Privatization? The Proposal of the Ministry of Fuel and Energy, by Ferdinand Pavel, Oleh Krykavsky and Inna Yuzefovych, Policy Paper W8, October 2007.
- The Crisis of the German social health Insurance System - Lessons for Ukraine, by Lars Handrich, Oleksandra Betliy, Policy Paper W7, September 2007.
- Changing the Status of Government debt to the NBU: Budgetary Implications, by Ricardo Giucci, Robert Kirchner and Vitaliy Kravchuk, Policy Paper W6, September 2007.
- Primary Dealer Contracts for Government Securities. International Comparison and Lessons for Ukraine, by Christoph Trebesch, Ricardo Giucci, Policy Paper W5, August 2007.
- Housing prices in Ukraine: Trends, analysis and policy implications, by Ricardo Giucci, Robert Kirchner, Inna Yuzefovych and Yaroslava Suchok, Policy Paper W4, August 2007.

All papers can be downloaded free of charge under http://www.ier.kiev.ua/English/papers/papers_eng.phtml. For more information on subscription to our regular email-distribution, please contact Ms Alina Dolya by email: dolya@ier.kiev.ua.