Construction and Assessment of a Mixed Exchange Policy Indicator: Explanation of Polish Inflation

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Abstract

The impact of exchange rate policy on macroeconomic targets (growth, inflation…) is rather difficult to assess empirically. There is a lack of accurate quantitative tools to define the strategy used, then a dummy variable (fixed or floating rate) is generally used in econometric studies. This paper tries to provide an indicator to measure the trade-off between *nominal anchor* and *real target* strategies in open economies. Unlike traditional dummies, it allows for a mixed strategy (generally observed) in the management of the exchange rate, according to external and internal constraints. The analysis of Poland's exchange policy since 1990 shows this trade-off, since monetary authorities have softened their nominal anchor policy to avoid excessive real appreciation. An econometric estimation of Polish inflation is used to test the validity of the indicator suggested. The results confirm not only the classical determinants of inflation, but also the validity of our mixed exchange policy indicator.

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Introduction

Central and Eastern European Countries (CEEC) have opened widely since their transition towards a market economy, and exchange policy has become increasingly important. Thus it is very interesting to assess its impact on the economy using, among other techniques, econometric analysis. We need quantitative tools to characterise the strategy observed. Building an economic policy indicator is always problematic, and this is particularly true for exchange policy because of the great diversity of exchange rate regimes (often mixed and unofficial). The distinction fixed rate / floating rate is generally used, but does not reflect this diversity of operational rules practised by monetary authorities. This paper tries to provide an exchange rate policy indicator more suited than traditional dummies to econometric studies.

As in developing countries, two exchange-rate strategies can be distinguished in transition economies (CORDEN, 1993) : the real target approach and the nominal anchor approach. In the former, the exchange rate is constantly depreciated in order to maintain (or

improve) national price-competitiveness of tradable goods when domestic inflation is higher than foreign inflation (especially in countries who are export customers and competing producers). This policy endeavours to keep the real exchange rate in line with its equilibrium level after internal and external shocks. The strategy seems to be the best response to shocks experienced by developing countries (particularly decreases in raw materials prices), and the Bretton-Woods institutions widely advocated it during the eighties. The alternative approach (nominal anchor) is more contested for developing countries, since it imposes harsh constraints on economy, particularly when the exchange-rate is initially in disequilibrium[1]. However, the higher is the inflation, the more useful is the nominal anchor on exchange rate, especially when the monetary authority is subject to a lack of credibility (which is the case in transition economies). However, a fixed exchange rate with a hard currency is sustainable only if internal macroeconomic policy is consistent (thus deflationary). Moreover, devaluation (even for small adjustments) is generally perceived as a political failure, and so avoided by governments. Therefore the choice of the exchange rate as a nominal anchor should strengthen the credibility of stabilisation policy (since the political cost of an expansive monetary policy is increased by the inevitable failure of the fixed exchange rate). The whole mechanism is the following: the government makes a credible pre-commitment to pegging, so private agents set decreasing inflation expectations (used for setting wage claims, selling prices), this diminishes money velocity and therefore the ex-post inflation. Both policies use the same tool (exchange rate) with two different goals: competitiveness for the former, price stabilisation for the latter. Thus, monetary authorities in transition economies have to make a trade-off between the two goals.

Of course, the strategies defined by CORDEN (1993) are in theory in competition with one another and thus mutually exclusive. Nevertheless, according to internal and external shocks, a government may consider it useful to pay attention to the goal which is not predominant in its policy. For instance, to adjust its fixed exchange rate when firm competitiveness is threatened by an excessive real appreciation. An indirect positive effect of a more flexible policy is to mitigate the calls for protection by domestic producers (DRABEK and BRADA, 1998). Therefore the strategy chosen is generally an evolving trade-off between the two short-run targets (competitiveness and stabilisation), and not a clear-cut choice of one policy. Of course, long run constraints can not be ignored; given that these countries have to catch-up with industrialised economies, exchange rate policy must promote capital inflows (needed to improve productivity). Nevertheless, during the first years, short-run problems

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clearly took the priority, since inflation was over 100 % after price liberalisation, and competitiveness had to be quickly improved to benefit from the strategy of opening. Policies observed in transition countries globally show the need to consider mixed strategies, as such countries have integrated both targets in their policies with evolving weights during the period. With a view to measuring the proportioning of each target, we try to use implications of each one on nominal and real exchange rate evolutions. A mixed exchange policy indicator is built by comparing nominal and real variation. The main goal of this paper is not to assess which equilibrium between the strategies is optimal (as regards growth or inflation), but to test the relevance of the strategy indicator suggested. For this purpose, we will estimate an inflation equation using this indicator.

In order to asses the usefulness of the mixed exchange policy indicator, we must choose a country with an evolving policy during the period 1985-1996. Poland experienced a dramatic increase in inflation after price liberalisation (1989-1990), but quickly got it under control (40% in 1993, and 20% in 1995). As far as exchange policy is concerned, the implicit real target strategy used in the eighties was abandoned after the collapse of the external value of the Zloty in 1989. A nominal anchor policy was chosen, and the exchange rate was pegged to the Dollar on January 1st, 1990. On May 17th 1991 the peg on the Dollar was replaced by a peg on a basket of currencies, and on October 14th a pre-announced crawling-peg (a *tablita* system) on this basket was set. From May 16th 1995 more flexibility was allowed in exchange rate management, the Zloty could fluctuate freely within a band of ± 7% (± 10% from February 1998[2]) around the central rate. The strategy of Poland may thus be defined as a nominal anchor policy, initially strict, then softened to avoid excessive real appreciation (from 4.5% a month during the Dollar pegging, to 0.5 % per month with the *tablita* system). Therefore, Poland fulfils the condition presented earlier of an evolving exchange policy, while being one of the most successful countries in transition (shorter recession and stronger recovery than in other countries in the region).

This paper proceeds as follows: section 1 focuses on indicator building, section 2 presents the inflation model tested, and section 3 contains econometric methodology and results.

I – Measurement of exchange policy : building a Mixed Indicator of Exchange Policy

In order to represent exchange rate policy, empirical literature traditionally uses a dummy variable which distinguishes fixed and floating rates, or in our case nominal anchor and real target strategies (announced[3] or observed). The first problem of this way of modelling is that it may capture the effects of all policy modifications that occurred during the period (especially in transition countries, many reforms are carried out simultaneously), and not only the exchange rate one. Moreover, with a dummy variable, we assume that the strategy change is a switch, instantaneous and perfectly dichotomous. Thus it can not describe more progressive and partial evolutions of strategies. In particular, we are not able, by definition, to bring out a possible trade-off between internal and external targets. Therefore it seems interesting to look for a quantitative definition of exchange policy, to assess this mix between the two goals.

Subsequently, the nominal exchange rate is defined as the foreign currency value expressed in national currency units, and the real exchange rate is defined as follows: RER = NER.p*/p, where p* and p are foreign and domestic price levels. The real target logic is maintaining a stable real exchange rate (RER), while nominal anchor logic is nominal exchange rate (NER) stability. Note that each stability, which defines the strategy, allows very short-term variations (seasonal fluctuations, small shocks...), and must be considered over at least one year. The observation of the *annual rate of variation*[4] of exchange rates variations (nominal and real, respectively g_{NER} and g_{RER}) should "reveal" the strategy used by the monetary authorities, according to the predominance of the former or the latter. A real target strategy induces a positive g_{NER} (nominal depreciation of the national currency), while an anchor strategy induces a negative g_{RER} (real appreciation). So the rate of variation of each exchange indicator, expressed in absolute value leads to the following Mixed Exchange Policy Indicator : $MEPI_t = \frac{|g_{RER,t-1}|}{|g_{RER,t-1}| + |g_{NER,t-1}|}$, where rates of variation are lagged.

The closer to unity it is, the more the authority accepts real variation relative to nominal variation. A high value of MEPI should be distinctive of a nominal anchor policy, which tries

to stabilise the nominal exchange rate, while accepting a high real appreciation ($\left|g_{RER}\right| >> 0$). On the other hand, a real target policy should lead to high nominal variation($\left|g_{NER}\right| >> 0$) and small real variation (close to zero if the policy is strictly implemented, with a PPP rule), and thus give a very low value of the indicator.

However this indicator is not valid if the authority wants to obtain a real depreciation, or allows a nominal appreciation of the exchange rate. In the first case $\left|g_{RER}\right| > 0$ while it is not an anchor policy, and in the second one $\left|g_{NER}\right| > 0$ although it is not a real target policy. So, when a real depreciation or a nominal appreciation are observed, the values are set to 0 and 1, indicating respectively a "pure" strategy of real target or nominal anchor[5].

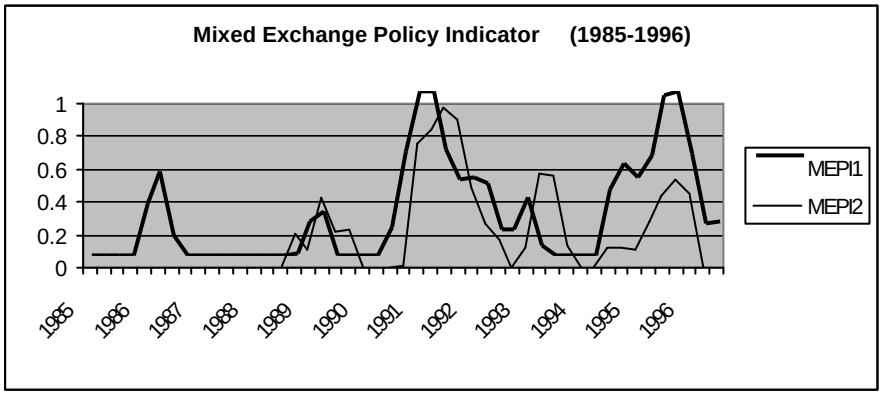
Then we must indicate the nominal exchange-rate used. Two exchange rates are known by agents and can be used as reference to measure nominal and real variation: the bilateral exchange rate against the dollar, and the effective nominal exchange rate computed by the IMF. The bilateral exchange rate against the dollar is widely known by polish private agents, since the Polish economy was submitted to a significant dollarization (circulation of Dollars for internal transactions) during this period. The bilateral exchange rate is observed immediately, and perfectly "readable" (everyone knows what it means), so it seems to be the most relevant reference. Nevertheless, it neglects the evolution of western European currencies (which represent an important share of Polish trade), thus the corresponding real exchange rate does not measure precisely competitiveness movements.

On the other hand, the IMF-index is more suited to measure competitiveness (since it is an average exchange rate weighted by trade shares), but has several weaknesses: (i) observation with delay, (ii) the fast evolution of the Polish commercial structure since the beginning of the eighties (particularly since the transition), introduced with delay in the weighting (1980-82 base up to 1990, 1988-90 base then), (iii) the lack of explanations about potential corrections made for rubble's inconvertibility, since this currency was used for all settlements within the CMEA scheme before 1991, (iv) the potential inclusion of economies suffering hyperinflation in the group of reference countries (such as competing exporters of raw materials), which will bias the index (in spite of a small weight in the index). This last problem should not be really important for Poland which is not specialised in raw materials exports. Therefore, its evolution may be not very representative or "readable" for agents. In

spite of these drawbacks, building a more accurate effective exchange rate would not solve the problem since this new index would not be observable by agents. Thus both the IMF index and the bilateral exchange- rate against the Dollar could be considered *a priori* as acceptable references of the nominal exchange rate. Both variables are tested to determine whether they give similar results.

In order to reveal the evolution of the monetary authorities strategy in the short term, we calculate the Mixed Exchange Policy Indicator on a quarterly basis. The annual rate of variation of the exchange rate (nominal and real, g_{NER} and g_{RER}) is computed, for each quarter (t), as an exponential trend rate of variation estimated[6] on the last four quarters (from t-4 to t-1). Then the indicator is calculated according to its definition (equation p.5). For Poland, the Mixed Exchange Policy Indicator gives the following evolution (where MEPI 1 uses the bilateral exchange rate against Dollar and MEPI 2 uses the IMF index):

Figure 1



As we can see in Figure 1, there is clearly a breakpoint in 1990. The first period (1986-90) is essentially characterised by a real target strategy, with some years of "pure" implementation of this strategy (*i.e* perfect stability of the RER or real depreciation), while the nominal anchor policy is predominant during the second period (1991-1996). During the latter phase, the Dollar-index exhibits two "peaks" of strict anchorage (indicator close to one) in 1991 (because of the pegging to the Dollar[7]) and 1995, while the IMF index-indicator shows two periods of moderate anchorage (1993 and 1995) after 1991's peak. In both cases (MEPI 1 and MEPI 2), between these peaks and the periods where real target strategy is strong, the actual policy is mixed. This modulated (and alternated) anchorage policy shows clearly the trade-off between disinflation and competitiveness made by the Polish government during the period.

Exchange rate policy indicator and inflation

The use of MEPI in an inflation equation merits closer examination. Indeed, one might think that there is an identity relationship between our exchange policy indicator (MEPI) and domestic inflation, so that the use of MEPI in an inflation equation is thus not relevant. Indeed, when the two conditions: $g_{RER} \leq 0$ and $g_{NER} \geq 0$ are fulfilled, one could express MEPI (without taking account of any computation lag) as: $MEPI = g_{RER} / \left(g_{RER} - g_{NER} \right)$. Therefore, if the rate of variation of the real exchange rate is defined as:, $g_{RER} = g_{NER} + p^* - p$, where p and p^* represent domestic inflation and the reference inflation rate respectively (United States or average rate of foreign inflation, weighted with the same coefficients as the NER), then we have: $MEPI = g_{RER} / (p^* - p)$. In this case there would exist an algebraic link between p and MEPI, so we could not use it directly to explain inflation.

Actually, our indicator MEPI is not the result of this identity relationship, since it is different from the above form on three important points: (i) the real exchange rate is computed with *past* inflation rates, (ii) we use *estimated* exchange rate variations, instead of actual ones, so we instrumentalize these variables (even if the instrument, a trend, is quite poor). Besides this way of computing is closer to the theoretical concept (measuring private agents' inflation expectations for the next period), (iii) when real depreciation is observed, real exchange rate trend variations are replaced by zero.

Therefore, the statistical link between the above simplified form and the actual MEPI is broken (partial correlation with inflation is respectively –0.19 and –0.16 for MEPI1 and MEPI2) and allows us to use it in an inflation equation. Of course, even if there is not an algebraic link, there might exist a simultaneity problem for these variables, this point will be addressed in the empirical section.

2- Inflation model

In this second section, we present the inflation model needed to assess exchange policy impact on inflation and the relevance of the mixed exchange policy indicator built in section 1. We follow the framework developed by COOREY, MECAGNI, and OFFERDAL (1996), but we have modified and complemented it[8]. We consider a two-sector model, with

non-tradable goods (NT) and tradable goods (T). All variables are expressed as growth rates. The growth rate of prices (π) is a weighted average of tradable and non-tradable inflation:

$$p = a_1 . p_T + a_2 . p_{NT} \qquad (1)$$

Tradable inflation is exogenous and determined by the law of one price, then we add foreign inflation (π^*) and the appreciation rate of foreign currency ($\dot{NER}$), ie. growth rate of foreign currency value expressed in national currency units:

$$p_T = p^* + \dot{NER} \qquad (2)$$

Non-tradable inflation is derived from the equilibrium condition in the (NT) market and the monetary market. The (NT) goods demand (y^D_{NT}) is an increasing function of difference between (π_T) and (π_{NT})[9], and an increasing function of the real income of the economy (y):

$$y^D_{NT} = b_1 . (p_T - p_{NT}) + b_2 . y \qquad (3)$$

The (NT) goods supply is a decreasing function of real wages (in terms of (NT) goods, *ie.* the gap between growth rates of nominal wages (w) and selling price of (NT) goods).and a decreasing function of the difference ($\pi_T - \pi_{NT}$) :

$$y^S_{NT} = d_1 . (w - p_{NT}) + d_2 . (p_T - p_{NT}) \qquad (4)$$

In a shortage economy, rationing (R) is added to supply to clear demand :

$$y^D_{NT} = y^S_{NT} + R \qquad (5)$$

The rationing is a decreasing function of liberalisation of the economy, assessed by a synthetic index (l), then:

$$R = h . l \qquad (6)$$

Substituting equations (3), (4) and (6) in (5), we obtain:

$$p_{NT} = \frac{d_1 . w + (d_2 - b_1) . p_T + h . l + b_2 . y}{(d_1 + d_2 - b_1)} \qquad (7)$$

Monetary equilibrium of the economy is given by the quantity theory of money equation, where (m) is the money growth and (v) the change of money velocity:

$y = m + v - \pi$ then, from (1) we have: $\mathbf{y = m + v - a_1.p_T - a_2.p_{NT}}$ **(8)**

From equations (7) and (8), we can express inflation in the non tradable sector without the growth of real income (endogenous):

$$p_{NT} = \frac{d_1}{(d_1 + d_2 - b_1 + b_2.a_2)}.(w) + \frac{(d_2 - b_1 - b_2.a_1)}{(d_1 + d_2 - b_1 + b_2.a_2)}.(p_T)$$
$$+ \frac{b_2}{(d_1 + d_2 - b_1 + b_2.a_2)}.(m) + \frac{h}{(d_1 + d_2 - b_1 + b_2.a_2)}.(l) + .\frac{b_2}{(d_1 + d_2 - b_1 + b_2.a_2)}(v) \quad \textbf{(9)}$$

The change in money velocity is a function of inflation expectations[10], generally expressed as a function of past inflation(π_{t-1}) .The specific assumption of our model is that expectations are based not only on past inflation, but also on exchange rate policy, according to the existence and the severity of a nominal anchor policy. Therefore, the money velocity is given by:

$$\mathbf{v} = m_1.p_{t-1} + m_2.\mathbf{MEPI}_t \quad \textbf{(10)}$$

Substituting equations (2) (9) and (10) in (1), the global inflation rate is:

$$p = \frac{a_2.d_1}{(d_1 + d_2 - b_1 + b_2.a_2)}.(w) + \frac{(d_2 - b_1 - b_2.a_1).a_2 + a_1}{(d_1 + d_2 - b_1 + b_2.a_2)}.(p_T)$$
$$+ \frac{b_2.a_2}{(d_1 + d_2 - b_1 + b_2.a_2)}.(m) + \frac{h.a_2}{(d_1 + d_2 - b_1 + b_2.a_2)}.(l) \quad \textbf{(11)}$$
$$+ .\frac{b_2.a_2.m_1}{(d_1 + d_2 - b_1 + b_2.a_2)}(p_{t-1}) + \frac{b_2.a_2.m_2}{(d_1 + d_2 - b_1 + b_2.a_2)}.(\mathbf{MEPI})$$

The linear equation estimated is then:

$$p = l_1.(w) + l_2.(p_T) + l_3.(m) + l_4.(l) + l_5.(p_{t-1}) + l_6.\mathbf{MEPI}_t$$
$$(+) \quad (+) \quad (+) \quad (-) \quad (+) \quad (-)$$

where the signs in brackets denote the expected effect of the variable.

Compared with the COOREY et al. model, the imported inflation (exogenous) replaces the real exchange rate (determined by inflation thus with a simultaneity problem)

among explanatory variables, and the variability of relative prices of the two sectors is not introduced[11]. Last but not least, exchange policy is integrated in inflation expectations.

All the data set are taken from the International Financial Statistics (IFS) except the liberalisation index. We use end of period quarterly data, and growth rates are computed by comparing one quarter to the same quarter of the previous year, thus we avoid seasonality problems. Most of the variables are standard ones (see table 1 for definitions), but two of them merit closer examination. The liberalisation level of economic structures (l) is measured through the annual liberalisation index defined by DE MELO, DENIZER and GELB (1996). This index is computed as the average of three components: internal markets, external markets and private sector development. In each field, the assessment is made by cross-checking of experts opinions. The utilisation of a unique index makes the statistical treatment easier, but it mixes very different transmission channels of economic liberalisation. Imported inflation is proxied by the growth rate of exports and imports unit values expressed in domestic currency, then alternatively by using only import unit values.

3 – Empirical results

We try to estimate the impact of exchange policy on Polish inflation between 1986 and 1995, by estimating an inflation equation on this period.

a) Methodological problems

In transition countries, economic data is scarce and its reliability is weak before 1990 (different accounting methods). As regards Poland, monthly data was available from 1988, but the range of variables was not wide enough. It seems important to use the longest period and to keep the turning point of the transition (1989-90) in the sample, so we have chosen to use quarterly data from the period 1986-95.

In time series analysis, it is crucial to know how variables react when they face shocks. Particularly we must know whether shocks have a permanent or transitory effect on their evolution, in other words if the series are stationary or not. We must note that all existing unit root tests have very low power, thus they cannot discern with certainty ambiguous series. Therefore, we have to be cautious with the interpretation of the results. We test unit roots with the augmented Dickey-Fuller (ADF) t-test, which deals with potential autocorrelation in the error term. Table 1 presents all the variables and p-values of the unit roots tests.

Table 1 :Unit root tests

* *growth rate*	Level	First difference	Status
(π) Inflation (CPI)	0.10	0.01	I(0)
(m) Broad money (M2)*	0.10	0.01	I(0)
(w) Nominal wage * (1)	0.10	0.01	I(0)
(π_T) Tradable goods price*	0.01		I(0)
(π_T) Imports price *	0.01		I(0)
(MEPI 1) Exchange Rate Policy	0.01		
(MEPI 2) Exchange Rate Policy	0.01		
(l) Liberalisation index (annual)			
(π_{-1}) Past inflation			

(1) Average earnings of salaried workers, private and public sectors

At the 10% level[12], all variables may be considered stationary, thus we can estimate the relationships with standard procedures by using variables expressed in level (instead of the first difference).

b) Econometric tests

The main econometric issue of the empirical study is the potential simultaneity of several variables included in the inflation equation. Firstly, as mentioned in section 2, we might suspect our exchange policy indicator to be endogenous (an acceleration of inflation could lead the government to implement a stronger nominal anchor policy, and a deceleration could lead to relax it). The same simultaneity problem can not be *a priori* excluded for money growth rate (money demand pressure on money supply when inflation rises), wages growth rate (implicit or explicit linking on inflation), and past inflation (if there is auto-correlation among error-terms). Therefore, Hausman exogeneity tests have been carried out on these variables by using the Augmented Regression Method suggested by Davidson and MacKinnon (1989)[13]. We use all exogenous variables of the inflation equation as instruments (*ie*. tradable goods price or imports price, and liberalisation index), and we add the ratio (change in foreign reserves/M2), the growth rate of narrow money (M1), and the lagged values of all these variables. Except for the wages growth rate (in all regressions) and money growth (in regressions (3) and (4)), we can not reject the simultaneity hypothesis[14]. Thus we estimate all equations with the Two-Stage Least Square procedure[15].

The model gives an excellent global explanation of Polish inflation (R^2=99.8%) for the four regressions. This high level of R^2 is not surprising for an inflation equation introducing money growth which traditionally explains the main part of price evolution. The Breusch-Godfrey test rejects the null hypothesis of absence of autocorrelation and thus the error-term autocorrelation is corrected. The stability of coefficients is assessed through a Chow test ; it indicates a breakpoint in the first quarter of 1990, corresponding to the shock therapy implemented by the Balcerowicz government. Additive and multiplicative dummies (equal to 0 up to 1989-4, and to 1 from 1990-1) are introduced, and the multiplicative dummy associated with wages growth is significant. The Bera-Jarque tests accept the null hypothesis of error-term normality in all regressions. Regressions are presented in table 2.

c) Traditional factors of inflation

Regressions 1 to 4 strengthen the relevance of traditional explanatory variables. Money growth has the expected effect, a significant and strong positive impact on inflation (close to unity). The coefficient of wages growth is also significantly positive and high (close to ½) but only from 1990 ; this means that wage increases led to inflationary pressures solely after price liberalisation (implemented for the major part at the beginning of 1990), which

Table 2 : Estimations

		Regression (1)	**Regression (2)**	**Regression (4)**	**Regression (5)**
	Intercept	0.03 (0.43)	0.03 (0.44)	0.04 (0.92)	0.04 (0.97)
m	**Money growth**	0.98*** (10.84)	0.99*** (10.41)	0.99*** (14.72)	0.99*** (14.50)
w	**Wages growth**	0.07 (0.80)	0.06 (0.66)	0.03 (0.36)	0.03 (0.39)
w	**Wages growth . Dummy 1990**	0.47*** (16.68)	0.47*** (16.30)	0.48*** (17.84)	0.48*** (17.45)
p_T	**Tradable prices growth**	-0.01 (-1.00)		0.003 (0.41)	
p_T	**Imports prices growth**		-0.01 (-1.09)		0.003 (0.31)
l	**Liberalisation index**	-0.21* (-1.99)	-0.21* (-2.08)	-0.33*** (-5.16)	-0.33*** (-5.18)
p_{t-1}	**Past Inflation**	0.05*** (3.33)	0.05*** (3.09)	0.05*** (4.60)	0.05*** (4.58)
MEPI 1	**Exchange Policy (Dollar)**	-0.27** (-2.90)	-0.26** (-2.77)		
MEPI 2	**Exchange Policy (FMI index)**			-0.04 (-0.58)	-0.04 (-0.60)
	Adjusted R^2	99.8%	99.8%	99.8%	99.8%

* implies that the null hypothesis is rejected at the 10% level, ** at the 5% level, and *** at the 1% level.

seems to be consistent. Imported inflation is not significant either with the tradable goods price index (regression 1 and 3) or with the import price index (regressions 2 and 4). Past inflation has a low (but robust) impact (0.05) which seems to confirm the weakness of inflation inertia in Poland during this period. The liberalisation index has a significant negative effect, but its disinflationist impact might be transitory since most of market mechanisms had already been introduced in 1995 (end of the rationing phenomenon).

d) Exchange Strategy Indicator

The strategy variable MEPI has a significant negative impact on inflation, thus strengthens the assumption of inflation expectations based on the observed exchange policy. According to the size of the coefficients estimated (-0.26/-0.27)[16], one year of "pure " nominal anchor policy leads to a sharp reduction of inflation (26 percentage points), and we can think this calculation probably overestimates the impact of exchange rate policy on inflation. Nevertheless, one should note that given the way of computing of MEPI, one year of strict nominal anchor policy corresponds to almost two years of pegging on the Dollar (longer than the actual period of pegging of the Zloty on the Dollar). Anyway, even if the actual impact is weaker than estimated, this result clearly indicates that a mixed exchange policy may be efficient. Moreover, since the strategy indicator remains significant while past inflation is introduced simultaneously in the regressions, the nominal anchor policy acts independently from past inflation: it gives to agents a signal of faster reduction of inflation in the future than the reduction observed in past periods.

Regressions (3) and (4), using the strategy indicator based on the effective exchange rate computed by the IMF, give results equivalent to (1) and (2) as regards traditional variables, but the strategy indicator (MEPI) is not significant. Expectations based on a bilateral exchange rate against the dollar thus seem more relevant than those based on the IMF index. In spite of the big share of western European countries in Polish foreign trade, and given that the Zloty was pegged to the dollar at the beginning of the transition, the dollar remains a privileged reference (which have been expected, since Polish economy was dollarized).

Conclusion

The main purpose of this paper was to improve exchange policy measurement, in order to consider mixed strategies. A "revealing" indicator of the strategy used is suggested to assess the trade-off between stabilisation and competitiveness in transition countries (which suffered from both problems in the early nineties). The more the countries have mixed the two goals (and successively re-assessed their respective importance) in the managing of the exchange rate, the more relevant is our indicator. The descriptive analysis of Poland shows this trade-off since this country has softened its initial strict nominal anchor policy to avoid an excessive real appreciation.

An inflation equation based on a two-sector model (tradable goods and non-tradable goods) and monetary equilibrium of the economy is then used to assess the empirical relevance of this indicator. The nominal anchor policy should reduce inflation expectations thus, through money velocity, induce a decrease of ex-post inflation. Utilisation of a dummy variable would have given us relatively poor information: can we reduce inflation with a pegged exchange rate? The answer is probably yes, but few countries can sustain such a restrictive policy when they suffer from high inflation. Results as a whole are consistent with expected theoretical factors. The model estimated has confirmed the predominant impact of monetary growth. But its first interest is to assess the exchange policy impact: even a "less-than-pure" nominal anchor policy has a significant negative effect on inflation through inflation expectations, and this effect is distinct from the past inflation impact. An efficient exchange rate-based policy is thus not inevitably a strict pegging to a hard currency. A pre-announced crawling peg, which implies a moderate real appreciation, might be sufficient. Clearly the crawling peg should be a transitional system for countries that aim to join the European Union, and eventually the European Monetary Union (like transition economies). However, during the transition, it can contribute importantly to maintaining competitiveness, moderating inflation and establish credibility (SZAPARY and JAKAB, 1998).

These results suggest that it is relevant to consider and measure mixed exchange policies to determine the threshold of a partial anchorage. After the setting up of the European Monetary Union, it would be interesting to test this method of "revealed" strategy by using the bilateral exchange rate against the Euro (since Euroland represents an important share of Polish foreign trade). The Euro should be the most efficient currency reference. It also seems useful to estimate this relationship between inflation and exchange policy with other transition

economies in order to test the robustness of the results and the relevance of the indicator in a more general context.

Endnotes

[1] According to Desai (1998), "the adoption of exchange rate management as a weapon for exerting downward pressure on inflation can play only a limited role in disequilibrium situations in which exchange-rate deviate sharply from their PPP valuations".

[2] Gomulka (1998).

[3] Coorey, Mecagni and Offerdal (1996).

[4] Subsequently, we will compute these annual growth rates with a quarterly frequency.

[5] The nominal appreciation case is theoretically possible, but unrealistic because it leads to high real appreciation if the country experiences a higher rate of inflation than in foreign countries. This case is not observed in the sample.

[6] The linear regression estimated is then: $\ln(NER_t) = \hat{a} + \hat{b}\,.(t) + \hat{e}_t$, where $g_{NER} = e^{\hat{b}} - 1$.

[7] Given the way of computing of MEPI (trend rate of variation over the last four quarters), this period of perfect nominal anchor policy is shorter than the actual period of pegging on the dollar.

[8] They are explained at the end of the section.

[9] Note that (π_T -π_{NT}) is the definition of the internal RER, while we used the external RER (RER=NER.p*/p) in our calculations.

[10] One of the channels of raising money velocity is the increasing dollarization of the economy.

[11] Adjustment of relative prices between sectors is not theoretically integrated in the model, moreover data is not available. See Coorey et al.(1996) for an assessment of this variability and its impact on inflation in transition countries.

[12] If we set a lower p-value for the unit root tests, several variables (including inflation) are non-stationary. A co-integration relationship and an error-correction model (ECM) have been tested, but given that the co-integration error-term stationarity was weak and the value of the error-term coefficient in the ECM was not stable (both indicating a weak cointegrating relation), utilization of an ECM does not seem relevant.

[13] This procedure is strictly equivalent to an Hausman test (Dormont, 1999).

[14] The null hypothesis of exogeneity is rejected when the error-term coefficient of the instrumental regressions are significant (observed t-value higher than theoretical value, at the 20% level). If we set a lower p-value for exogeneity (*ie*. if we are less strict than we actually are), money growth and MEPI can be considered as exogenous. Regressions (1) and (2) have been carried out while considering these variables as exogenous, and results were not altered.

The following table presents t-values corresponding to exogeneity tests.

Exogeneity Tests (Augmented Regression method)					
		Regression (1)	**Regression (2)**	**Regression (3)**	**Regression (4)**
	Money growth	1.40*	1.64*	0.82	0.94
	Wages growth	0.21	-0.07	0.56	0.45
	Past Inflation	1.34*	1.36*	2.11**	2.06**
	Exchange Policy	2.01**	1.84**	2.91***	2.86***

* implies that the null hypothesis is rejected at the 20% level, ** at the 10% level, and *** at the 5% level.

[15] We use the same instruments than in exogeneity tests, but we add wages growth rate in all regressions, and broad money growth rate replaces narrow money growth in regressions (3) and (4), since these variables appeared to be exogenous.

[16] We actually do not test the size of the impact itself, but only its sign.

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