

# EXCHANGE RATE PASS- THROUGH IN ALBANIA\*

OCTOBER, 2007

KLODIANA ISTREFI  
VALENTINA SEMI





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## ABSTRACT

This paper assesses the extent and the speed of exchange rate pass-through to consumers prices in Albania, using vector autoregressions models, VAR. Evidence shows that exchange rate pass-through for the period 1996-2006 is complete within a year. Meanwhile, a sub-sample analysis shows the incompleteness and the decline of pass-through to consumer prices after the year 2000. Developments in market structures, the stability of our currency, ALL, the low inflation environment and higher credibility in the Bank of Albania, rank as good justifiers to such behavior. Nevertheless, this does not mean that exchange rate developments have no longer an importance on consumer price formation. This paper shows that the effect of exchange rate on prices is not easily captured by direct analyses of data on exchange rate and consumer prices. Therefore, the monetary authority should be cautious, and choose the right reaction toward exchange rate movements. If the volatility of exchange rate increases in the future, there is no guarantee that the reaction of the economy and especially consumer prices will not change.

Classification: JEL:E31, E52, F41

Key words: Exchange rate, consumer prices, VAR, impulse response functions, Albania

# I. INTRODUCTION

Decades ago, many economists have tried to find a close link between changes in the exchange rate and the level of prices in a certain country. Initially based on Law of One Price there were models assuming a unitary link between them. Later on, monetary models of open economy were based on absolute (and later on relative) Purchasing Power Parity to identify the behavior of exchange rates. Nevertheless, many empirical tests did not support these assumptions, arguing that exchange rate changes are not completely reflected in the price level (incomplete exchange rate pass-through). Nowadays, numerous models/theories explain why the exchange rate pass-through is incomplete. Furthermore, there are various empirical works indicating incompleteness and the decline of exchange rate pass-through.

The aim of this paper is to provide empirical evidences on the degree of exchange rate pass-through to consumer prices in Albania. The motivation stems from the role of exchange rate in a small open economy, like the Albanian one. Based on the importance of the exchange rate in a small and open economy, the Bank of Albania has not ignored exchange rate movements in ALL<sup>1</sup>, despite being in a flexible exchange rate regime. Developments in the ALL exchange rate have been closely monitored and in some cases there have been interventions in the foreign currency market in order to smooth large volatilities in the exchange rate. In addition, the exchange rate is one of the main variables included in the process of inflation forecasting in the Bank of Albania.

To meet the aim of this paper we rely on the theoretical relationships that exist among our variables of interests and focus on the estimation of these relationships with vector autoregression models. Then, we quantify the degree of exchange rate pass-through in different periods by impulse response functions, where shocks are identified by a standard Cholesky decomposition. In this case, the ordering of the endogenous variables follows both theoretical and empirical considerations. Furthermore, we perform some robustness tests by using alternative identification schemes. As a last exercise, we perform a sub-sample analysis, in order to analyze the changes on the degree of exchange rate pass-through in time.

A quick look at the results indicates that they are in line with evidences found for other countries regarding pass-through. Exchange rate pass-through to consumer prices in Albania appears almost complete but decreasing. The results for the entire period show a relatively fast reaction of consumer prices in the presence of an exchange rate shock. Such a shock has a relatively high importance in explaining consumer price variance compared with other shocks. These results are robust to different identification schemes. The sub-sample analysis shows the incompleteness and the decline of pass-through.

The rest of the paper is organized in two chapters. Chapter 1 reviews the literature on exchange rate pass-through to prices. Here we pay a special attention to the literature on the role of exchange rate pass-through in countries with inflation targeting regime and on the role of exchange rate pass-through in new Member States and candidate countries to EU. Chapter 2 presents the empirical analyses on exchange rate pass-through in Albania. Sessions on this chapter cover data and methodology issues and present the analyses of the results. The final chapter presents main conclusions.

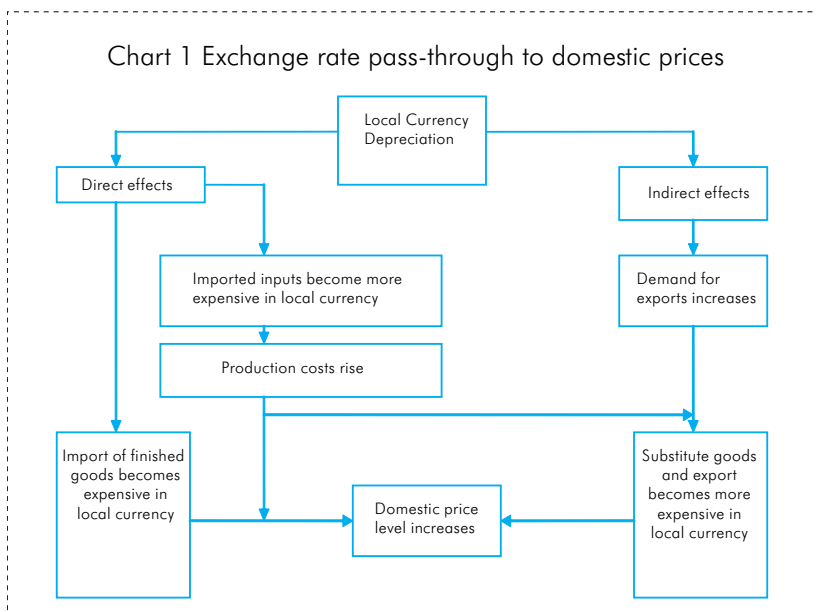
## II. LITERATURE REVIEW

In this chapter, initially a definition of the exchange rate pass-through is given. Then, we present a summary of the literature on exchange rate pass-through to prices with an emphasis on the role of exchange rate pass-through in countries with inflation targeting regime and on the role of the exchange rate pass-through in new Member States and candidate countries to EU.

### *DEFINITION*

In literature, the term “pass-through” is found with different definitions. Often, such definitions are arranged in two categories, according to stages of exchange rate pass-through. “First stage pass-through” refers to the sensitivity of country’s merchandise import prices to changes in its currency’s foreign exchange value, after properly controlling for other factors that may influence the

evolution of import prices. “Second stage pass-through” refers to the sensitivity of a country’s consumer prices to changes in its import prices. However, a lot of studies do not distinguish between these stages, defining the pass-through as the sensitivity of consumer prices of one country to changes in its currency’s foreign value.



*EXCHANGE RATE PASS-THROUGH (PTH)*

The relationship between consumer prices and exchange rates has been studied intensively during the 1960s and 1970s, when the monetary models of open economies were based on the Purchasing Power Parity (absolute and relative), to identify movements in the exchange rates. However, numerous empirical tests did not support these assumptions, which led into thinking that movements in the exchange rate are not completely reflected into the level of consumer prices of a country. Nowadays, many models and theories explain why this pass-through is incomplete.

Some economists emphasize the role of microeconomic factors in explaining the incomplete exchange rate pass-through into consumer prices. These factors depend on structural aspects of



international trade, such as: price-setting according to the market by firms in not fully competitive markets, domestic value added in the distribution of traded goods (Corsetti and Dedola 2002; Burstein, Neves, and Rebelo 2000), or the role of substitution among goods in response to changes in the exchange rate (Burstein, Eichenbaum, and Rebelo 2002). According to Froot and Klemperer (1989), the exchange rate pass-through might be lower when exchange rate fluctuations are high and exporters in a country endeavor to maintain their market share.

Krugman (1987) and Dornbusch (1987) proposed price-setting to the market as one of the reasons for the deviation from the Law of One Price. In order to understand the incomplete exchange rate pass-through in this model, the market should be thought of as oligopolistic, in which a firm can change its mark-up margin after a change in the exchange rate. Especially if the mark-up margin of a firm decreases while the prices of goods offered by it increase, then the exchange rate pass-through is not complete. This might be a reaction towards the perception of temporary foreign currency misalignments (Marston 1991) or in order to maintain market share (Hooper and Mann 1989; Kasa 1992; Froot and Klemperer 1989).

Campa and Goldberg (2002 and 2004) are often cited about their conclusions on the extent of exchange rate pass-through to import prices. According to them, a decrease in the extent of exchange rate pass-through has been observed in those countries where the composition of the imported goods basket has changed by shifting towards imported goods with relatively lower sensitivity to exchange rate developments (or shifting away from goods with relatively higher sensitivity to exchange rate developments, especially goods related to energy).

The decrease in the exchange rate pass-through can be explained by macroeconomic factors as well. Taylor (2000) has developed the hypothesis that a decrease in the extent of the exchange rate pass-through to prices of final goods has been observed after the decrease of mean inflation rates in developing countries. Consequently, *ceteris paribus*, low inflation has resulted

in lower exchange rate pass-through. The relationship between a stable monetary policy and exchange rate pass-through has been investigated in the recent studies of Devereux and Engel (2001), and Bacchetta and van Wincoop (2001). According to them, if exporters set their prices in the currency of the country with more stable monetary policy, even import prices in domestic currency would be such in countries with more stable monetary policy. Therefore, *ceteris paribus*, the exchange rate pass-through would be higher in countries with unstable monetary policy. Campa and Goldberg (2004) offered empirical evidence on exchange rate pass-through in 23 OECD countries. They found that the extent of exchange rate pass-through to consumer prices tends to be lower in countries with lower exchange rate volatility and inflation volatility.

#### *THE ROLE OF EXCHANGE RATE PASS-THROUGH UNDER THE INFLATION-TARGETING REGIME*

After the currency crises, during the late '90s and early '00s, a number of countries switched from fixed exchange rate regimes to combinations of flexible exchange rate regimes and inflation targeting. Consequently, the exchange rate lost its primary role in the economic policy debates, in the majority of developing countries. In spite of this, it does not mean that the exchange rate is no more part of such discussions. On the contrary, numerous questions have been raised regarding the role of the exchange rate, after the adoption of inflation targeting. Among these questions, the following can be identified and mentioned: questions related to the effectiveness of the exchange rate as shocks absorbent under inflation targeting; questions related to the effect of adopting inflation targeting on exchange rate volatility; and questions related to the role of exchange rate developments in monetary policy decision-making under inflation targeting (Eduards, 2006).

Furthermore, many advocates of inflation targeting advise emerging countries not to lose their interest in the exchange rate developments. Hunt, et al. (2000) emphasize that the authorities should improve their analysis and forecasts by developing analytical frameworks that capture the role of the exchange rate in the monetary policy transmission mechanism. For emerging countries, this requires the models to reflect the effect of exchange rate pass-

through in domestic prices, the effects of expenditure substitution in the aggregate demand, etc. According to Kara et al. (2005) the central banks that target inflation are much more into inflation forecasting. However, movements in the exchange rate might importantly and substantially affect forecasted inflation. In case a high exchange rate pass-through to inflation is observed, then the monetary authority should monitor the dynamics of exchange rate movements carefully.

Regarding the effect of exchange rate pass-through, literature claims that recently this effect has experienced a decrease in developing countries and that the effect of domestic currency's depreciation on inflation might not be as troublesome in countries that have adopted inflation targeting. However, the explanations offered so far have not been able to provide a strong relationship between this result and the adoption of inflation targeting. The explanations provided so far emphasize that central banks that adopt inflation targeting might intervene directly or indirectly in the FX market (fear of floating) in order to smooth or control the effect of sudden exchange rate movements on inflation. By means of such interventions, monetary authorities counteract to sudden movements in the exchange rate, thus breaking the relationship between inflation and a depreciation of the domestic currency.

Economic literature enumerates many research works that have addressed the above-mentioned issues of the exchange rate after the adoption of inflation targeting. Some of these research works are: Kumhof (2001), Gali and Monacelli (2002), and Parrado and Velasco (2001). Economists like Eichengreen (2002), Schmidt-Hebbel and Werner (2002), Berg et al. (2002), Minella et al. (2003), Reyes (2004), Ball and Reyes (2004a), Ball and Reyes (2004b), and Mishkin (2004) have emphasized that central banks under inflation targeting should take into consideration the relationship between the exchange rate and inflation and should accordingly adjust interest rates in order to offset deviations of inflation from the target, in case these are caused by movements in the exchange rate. Agenor (2002) pointed that the lack of such adjustments might lead to disorders.

According to Hausmann et al. (2001) and Reyes (2003) such adjustments have often been carried out by means of international reserves. Under the circumstances of a depreciation in the domestic currency, the higher the exchange rate pass-through, the bigger the extent of adjustment needed in order to achieve the inflation objective. Given that higher interest rates have a negative impact on output, the higher the exchange rate pass-through, the more costly and difficult it is to maintain monetary stability under inflation targeting. From this point of view, Calvo (2001), Mishkin and Savastano (2001), Eichengreen (2002) and Fraga et al. (2003) think that developing countries might experience great difficulties in managing inflation targeting because they might be more prone to currency crises, by being small and open economies. This point of view is in accordance with the argument of Fraga et al. (2003) and Minella et al. (2003) that, following an episode of pressures from the exchange rate, the inflation objective cannot be achieved without facing huge economic costs, under the circumstances of a high exchange rate pass-through in developing countries. A possible solution to this problem is the use of international reserves, instead of interest rates.

A general conclusion by the literature on issues of exchange rate pass-through is that it is very low or inexistent in developed countries, thus it does not create difficulties in conducting monetary policy. Regarding emerging countries, the coefficients of exchange rate pass-through have resulted to be positive and statistically important in most of the cases, indicating a high exchange rate pass-through, especially before changes of monetary policy regimes. It has been observed that the extent of exchange rate pass-through has decreased in a stable way for all countries, after the adoption of inflation targeting. In any case, even after the adoption of inflation targeting, the exchange rate pass-through remains higher in emerging countries than in developed countries.

According to Mishkin (2004), the exchange rate effect on the process of building expectations and setting prices by economic agents seems to decrease after a period of low inflation, achieved under inflation targeting. Therefore, inflation targeting seems to be of help in limiting the exchange rate pass-through to inflation.

## *EXCHANGE RATE PASS-THROUGH AND EU INTEGRATION*

The exchange rate plays an important role in controlling inflation both in the new member countries of the EU<sup>2</sup> and in the candidate countries<sup>3</sup>, Bitans (2005), Darvas (2001), Szapáry (2001). The objective of low inflation is of special importance to all these countries both because of the economic benefits that it brings and of their aspiration to fulfill the Maastricht criteria in order to be part of EMU.

According to Bitans (2005) achieving and maintaining low and stable inflation rates will become more difficult for the countries aspiring to adhere to the EU, because they will be more exposed to inflationary pressures. These pressures might result from the demand side, for instance due to low interest rates, or from the supply side, for instance due to differences among inter-sectorial productivities that might lead to higher inflation in the non-tradable sector. Under these circumstances, the effectiveness of using interest rates by the central banks will diminish because these countries will have to fulfill as well the interest rates convergence criterion. Therefore, the exchange rate is expected to become an important instrument of monetary policy, which can be used to facilitate nominal and real convergence.

Furthermore, the exchange rate receives a special importance as a monetary policy instrument from the implementation of the ERM II regime as well<sup>4</sup>, which comes before the adoption of the Euro. In any case, the effectiveness of the exchange rate under the framework of ERM II will largely depend on the relationship between movements in the exchange rate and inflation. The exchange rate is more effective in controlling inflation when the relationship between the two is strong and movements in the nominal exchange rate are quickly transmitted to domestic prices. In other words, a high exchange rate pass-through to domestic prices should exist. A high exchange rate pass-through means less concern about the parity rate with which the country enters the ERM II, as in this case deviations of the nominal exchange rate from the theoretical equilibrium level will have a smaller effect on the real exchange rate.

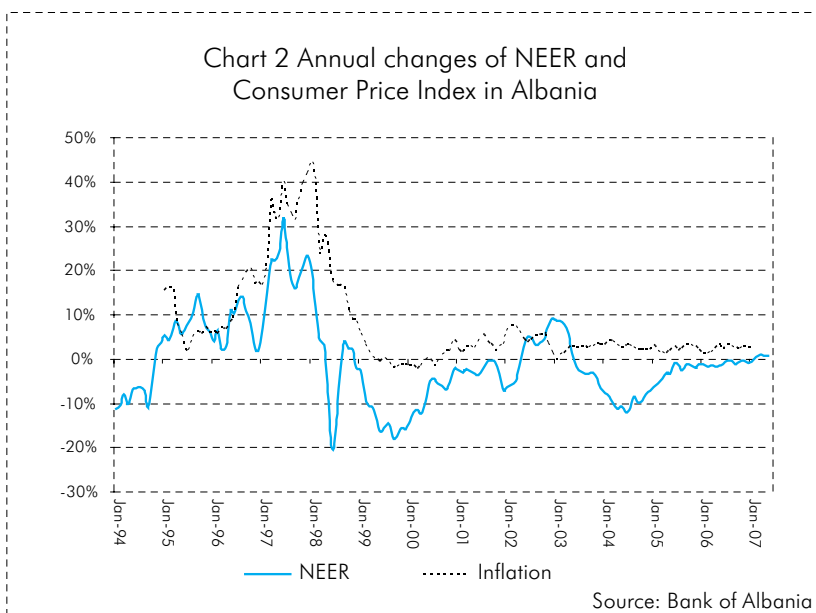
If these countries are characterized by a low exchange rate pass-through, then the exchange rate policy will not be much effective in strengthening nominal convergence, given that movements in the exchange rate will have a low impact on domestic inflation. In this case, changes in the nominal exchange rate will have a strong impact on the real exchange rate and therefore on the real economy. Consequently, the level with which a country enters ERM II becomes an important political variable. This is why, different levels of exchange rate pass-through, under different conditions, would require different treatments by these countries for as long as they are in their way towards ERM II.

Darvas (2001) studied the role of using the exchange rate in controlling the inflation process in the EU candidate countries. According to Darvas these countries share some common characteristics, which distinguish them from the countries currently inside the EMU. These characteristics are related to the fact that these countries are in the convergence process, which poses important implications regarding the issues of exchange rate pass-through. Domestic prices in these countries might change without any movements in the exchange rate. If substantial movements in the exchange rate happen, then the attribution of price changes as either due to the pass-through effect or the convergence effect should be done carefully.

### III. EXCHANGE RATE PASS-THROUGH IN ALBANIA

Starting from 1992, the Bank of Albania has pursued a monetary targeting regime, having price stability as the main objective. Monetary policy is conducted under a flexible exchange rate regime, a choice dictated mostly by weak developments of financial markets, lack of institutional experience and low level of international reserves (Themeli et al., 2006). Nevertheless, even though a monetary indicator was chosen to anchor low levels of inflation, the exchange rate channel is being considered as the main channel to explain inflationary developments in Albania, (Muça et al., 2004). Such a result is not surprising for a small and open economy like Albania.

Taking into account the importance of exchange rate in such economies, the Bank of Albania has not ignored the developments in the exchange rate. These developments have been closely monitored, and in some cases the Bank of Albania has intervened in order to smooth large volatilities considered as destabilizing. Furthermore, the exchange rate is one of the main variables included in the process of inflation forecasting, along with other factors.



Muça et al. (2004) concluded that exchange rate stability has played a crucial role in maintaining low levels of inflation during the transition period. According to these authors, the introduction of indirect instruments of monetary policy appears to have contributed to the decline of the importance of the exchange rate channel in the transmission mechanism of monetary policy. The presented empirical results for the period 2000-2003 suggest that the exchange rate has lost its position as the main variable explaining inflation variance compared with other variables. For the 1994-2003 period, exchange rate fluctuations explain about 24 percent of inflation variance while for the period 2000-2003 they explain only 1.7 percent of the variance.

Peeters (2005) extends the doubts whether the exchange rate is (still) the main channel of monetary transmission mechanism. Based on empirical evidences, this author describes the link between inflation and exchange rates as a changeable relationship. Depreciation periods of ALL exchange rate have been associated with increases of inflation while it is not observed a decline of inflation in the presence of ALL appreciation, especially during the last three or four years. The asymmetry in the pass-through of the exchange rate changes to prices has been also mentioned by other authors, as Mañçellari et al. (1999), Luçi et al. (2005), etc.

#### *EMPIRICAL MODEL*

This section presents the empirical analysis on evaluating the exchange rate pass-through to consumer prices in Albania. First, we give information on the necessary data which are available. Then, we present the methodology and some empirical qualities of the relationships between selected variables. At the end we present the identification scheme of the model.

#### *DATA*

The two most important data used in this paper are the nominal effective exchange rate (NEER) and the consumer price index (CPI). In the mean time, part of the model will be as well data on money supply (M3), interest rates, import prices, oil prices, etc. The frequency of the data<sup>5</sup> is monthly and in general, the period of observation is 1994:01-2006:12. Apart from the nominal effective exchange rate (NEER) and the interest rate, all other variables are seasonally adjusted with Census X-11. The source of the data are the Bank of Albania and the European Central Bank.

#### *METHODOLOGY*

The empirical literature identifies different methodologies to measure the exchange rate pass-through. For example, we mention Campa and Goldberg (2005) who used models with individual equations, evaluated by OLS method. Others as McCarthy (2000), Choudhri (2005), etc., have estimated the pass-through by vectors of autoregressions (VAR). We rely on VAR approach as well, because a recursive VAR model allows for simultaneous determinations of the exchange rate and prices, thus eliminating



possible problems relating to the endogeneity of the explanatory variables. Furthermore, VAR analyses provide an appropriate way to derive the effects of the exchange rate on prices through impulse response functions. Nevertheless, we should be cautious because for short series of data, the efficiency of VAR is reduced.

In order to apply the recursive VAR and impulse response functions, it is important that variables enter the model in a reasonable way. The ordering of the variables usually should be motivated by theoretical and empirical reasons. The usage of identification scheme means that shocks will affect simultaneously their corresponding variables and those variables ranking behind them but it will not affect the variables that rank before. Thus, it is reasonable to order first the most exogenous variables. A number of studies on the exchange rate pass-through rely on the ordering by McCarthy (2000). In general, McCarthy, assumes the ordering of prices based on the distribution chain and then for specific periods allows these prices to be shocked by supply factors, demand factors and exchange rate. In our case, the ordering of variables will be a simplified McCarthy case, due to data limitations.

The two important data used in this material are the nominal effective exchange rate  $e$  and the consumer price index (CPI). Other endogenous variables will be: a monetary aggregate, M3, to represent demand shocks and a short-term interest rate (interest rate of 3-month deposits in lek)  $i$ , to capture central bank reaction. Differently from McCarthy<sup>6</sup> we consider oil prices and import prices as exogenous variables.

Before proceeding with the estimation of the VAR model, we apply the test of Granger Causality<sup>7</sup> to judge upon the relationship between our variables. We use the result of this test as an empirical support for the ordering of the variables. In general, the results of the test show that the exchange rate leads the money supply variable and interest rate variable, and the latter leads money supply and consumer prices. In the mean time, some of the variables show feedback relationship. Such relationship is observed mostly between the exchange rate with consumer prices and interest rates and between money supply with consumer prices. The table below

presents the results of the test for our endogenous variables.

Table 1 Granger Causality test

Variables	$\Delta e$	$\Delta i$	$\Delta m$	$\Delta CPI$
$\Delta e$	°	→	→	→
$\Delta i$	-	°	→	→
$\Delta m$	-	-	°	→
$\Delta CPI$	→	-	→	°

→: variable in row granger causes variable in column.

- : variable in row does not granger cause variable in column.

The results in Table 1 support this ordering of the variables:

$$\Delta e \rightarrow \Delta i \rightarrow \Delta m \rightarrow \Delta CPI \quad (1)$$

where  $\Delta$  symbolizes the first difference operator.

Actually, such ordering is supported even theoretically, as for a small and open economy is suggested that foreign variables (in this case the exchange rate) it should be ranked first. Then, the interest rate being the second, means that the central bank decisions are forward looking, therefore it reacts ahead of expected changes in demand and in consumer prices. Based on these considerations, the model is presented as:

$$e_t = E_{t-1}(\Delta e_t) + \varepsilon_t^{\Delta e} \quad (a)$$

$$i_t = E_{t-1}(\Delta i_t) + \alpha_1 \varepsilon_t^{\Delta e} + \varepsilon_t^{\Delta i} \quad (b)$$

$$m_t = E_{t-1}(\Delta m_t) + \beta_1 \varepsilon_t^{\Delta e} + \beta_2 \varepsilon_t^{\Delta i} + \varepsilon_t^{\Delta m} \quad (c)$$

$$\pi_t = E_{t-1}(\Delta \pi_t) + \delta_1 \varepsilon_t^{\Delta e} + \delta_2 \varepsilon_t^{\Delta i} + \delta_3 \varepsilon_t^{\Delta m} + \varepsilon_t^{\Delta \pi} \quad (d)$$

where  $e$  is the first difference of log of NEER,  $i$  is the first difference of log of interest rates for 3-month ALL deposits,  $m$  is the first difference of log of M3 money supply, and  $\pi$  is the first difference of log of consumer prices.  $\varepsilon_t^{\Delta e}$   $\varepsilon_t^{\Delta i}$   $\varepsilon_t^{\Delta m}$   $\varepsilon_t^{\Delta \pi}$  are the shocks of the exchange rate, interest rates, money supply and consumer prices, respectively.  $E_{t=1}(\bullet)$  represent expectations for each variable based on all the available information at the end of period  $t-1$ . Assuming that the model captures the essential

dynamics of consumer prices, shocks are assumed uncorrelated and orthogonal between equations.

This identification scheme and this model represent the baseline specification that we will use in our analysis. Actually, such ordering represents only one of the possible alternatives in terms of identification and variables included in the model. After the empirical analysis of the baseline specification, we will do a sensitive analysis of the results, based on other orderings of the variables and a different specification of the variables included in the model.

### RESULTS

VAR is estimated in first differences (dlog)<sup>8</sup> with 7 lags as the optimal lag length according to LR. VAR system is stable as 7\*4 calculated roots are located within the unit circle. Normality test calculated by Cholesky (Lutkepohl) shows that residuals of the model are normal, therefore the results of the model are valid.

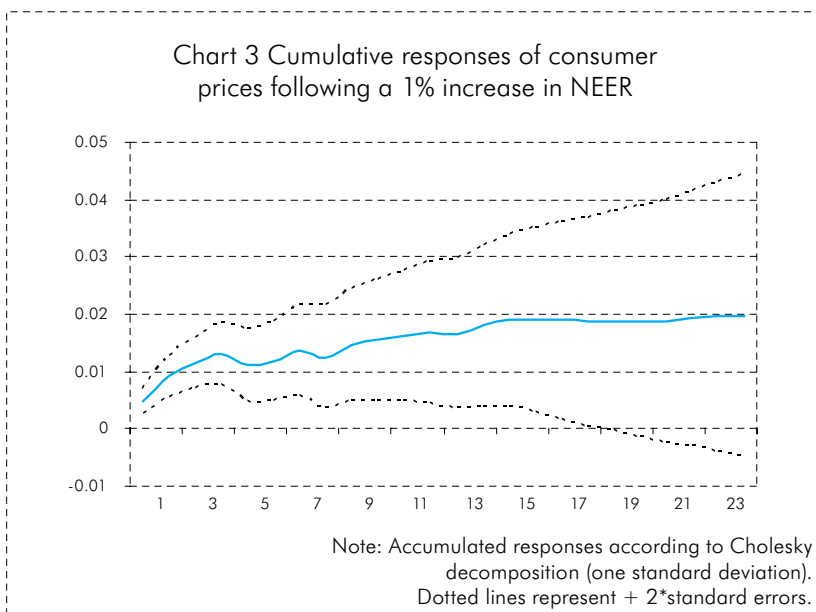
Table 2 Diagnostic tests of residuals

Components	Skewness (Prob.)		Kurtosis (Prob.)		Jarque-Bera (Prob.)	
M3	0.46	(0.037)	2.96	(0.925)	4.34	(0.114)
Int	-0.17	(0.418)	2.69	(0.489)	1.13	(0.568)
Neer	0.12	(0.583)	2.16	(0.058)	3.87	(0.144)
CPI	0.37	(0.096)	2.84	(0.714)	2.91	(0.234)
Joint		(0.089)		(0.380)	12.25	(0.140)

Note: Variables are in first differences. Null hypothesis, H0 implies that residuals are multivariate normal. Skewness and Kurtosis for a normal distribution are 0 and 3, respectively.

Based on the identified VAR model, we derive estimates of pass-through using impulse response functions<sup>9</sup>. Initially the system is shocked by structural innovations of the exchange rate variable. According to the model, this shock affects all the variables ordered following the exchange rate. In this case we are interested only in the impact of this shock on consumer prices, said differently, the pass-through of the exchange rate to consumer prices.

Chart 3 presents the estimated pass-through of exchange rate to consumer prices within 24 months. Shocks of variables in first differences are normalized to one, making possible to interpret the responses as approximate percentage point changes on consumer prices following a one percent shock on nominal effective exchange rates (pass-through elasticity). The dotted lines in Chart 3 represent confidence intervals, which indicate that responses are statistically different from zero until the 17th month. After this month, responses are not statistically different from zero, undermining the validity of the results after this period.

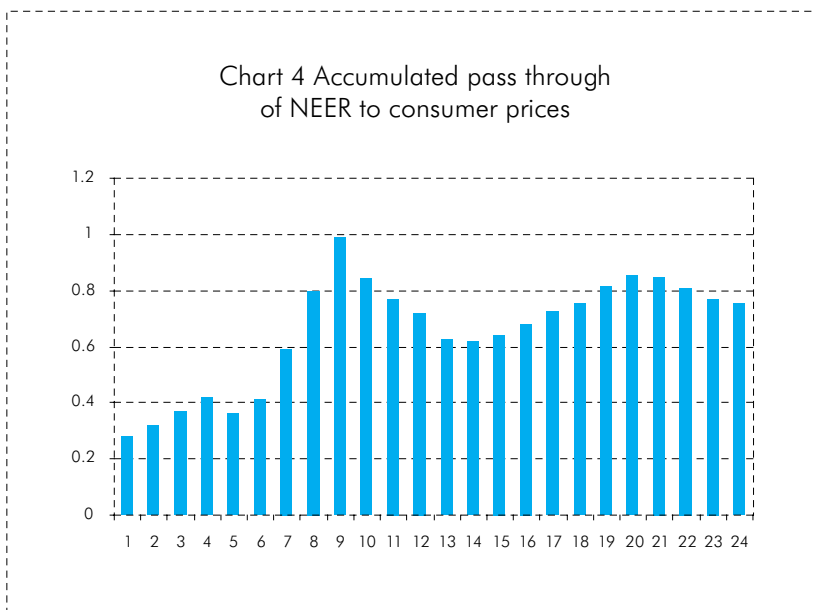


Additionally, we normalize cumulative responses of consumer prices with cumulative responses of exchange rate following Rabanal and Schwartz (2001). The pass-through coefficient is thus defined as:

$$PT_{t,t+j} = P_{t,t+j} / E_{t,t+j}$$

where  $P_{t,t+j}$  is the cumulative change in consumer prices and  $E_{t,t+j}$  is the cumulative change in the nominal effective exchange rate between months  $t$  and  $t+j$ .

The results presented in Chart 4 show that consumer prices react relatively fast following a shock on nominal effective exchange rate. The pass-through of a shock in the exchange rate amounts to 42 percent, in the first four months. Within the year, the exchange rate pass-through reaches the maximum, almost 99 percent. Based on this result we can conclude that the exchange rate pass-through to consumer prices is almost complete within one year.



From the design of the identification scheme, it is understandable that the above response of consumer prices to an exchange rate shock takes into account even the effect of other variables included in the model. In order to see more specifically the effect of an exchange rate shock on consumer prices we analyze the variance decomposition of consumer prices. In this case, variance decomposition informs us on the relative importance of every random shock on the variance of consumer prices. Results indicate that exchange rate shocks are relatively important in explaining the variance of consumer prices compared to other variables. Up to 24.5 percent of the consumer price variance is explained by exchange rate shocks. However, the largest part of consumer price variance is explained by its innovations.

Table 3 Variance decomposition of CPI

Period	M3	INT	NEER	CPI
1	1.804155	0.214940	16.36237	81.61853
2	2.993340	0.997743	24.42406	71.58486
3	5.536933	0.997603	23.95831	69.50715
4	5.326584	1.429128	23.67436	69.56993
5	5.830134	2.084928	24.48628	67.59866
6	9.159610	2.534139	23.39450	64.91175
7	9.439012	2.902078	23.79344	63.86547
8	9.088592	4.030080	23.34188	63.53945
9	10.95884	5.615340	23.34738	60.07844
10	10.65355	5.465520	22.97404	60.90688
11	10.66079	6.232994	22.89152	60.21470
12	11.50374	6.463702	22.67531	59.35725

Cholesky ordering: NEER INT M3 CPI

#### SENSITIVITY ANALYSIS

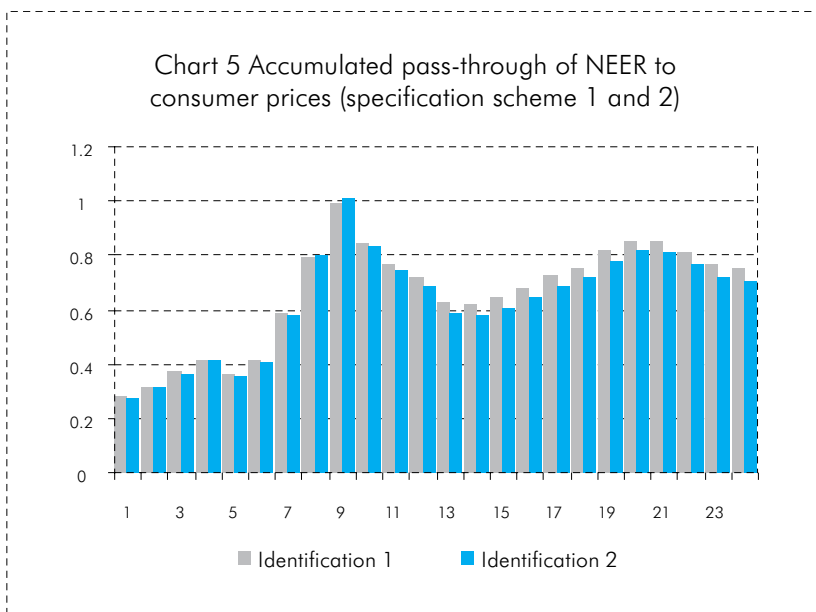
The results of the VAR model using Cholesky decomposition can be very sensitive to model specification. As such, in order to assess the robustness of the exchange rate pass-through coefficients we perform certain modifications on the baseline specification (1) and compare the results, respectively. Firstly, based on Granger Causality test we propose a reordering of the variables presented in the baseline specification (1). In this case, the nominal effective exchange rate will be ordered behind the interest rate, allowing it to react to domestic monetary conditions. The new identification scheme is presented as follows:

$$\Delta i \rightarrow \Delta e \rightarrow \Delta m \rightarrow \Delta CPI \quad (2)$$

where  $\Delta$ , symbolizes the first difference operator.

The results show that changes between coefficients of pass-through, estimated based on two different specifications are almost insignificant. These changes appear mostly in the long-term period but as previously said the pass-through coefficients in the long-term appear to be statistically insignificant. As such, we can say that the ordering of the nominal effective exchange rate variable does not matter for coefficients of the exchange rate pass-through to be stable.

Chart 5 Accumulated pass-through of NEER to consumer prices (specification scheme 1 and 2)



Now we propose another identification scheme, based on the Obstfeld-Rogoff-model. According to this model, nominal import prices are set in the producer currency (producer currency pricing). As a result, import prices react immediately to changes in the nominal exchange rate. This case assumes automatically a complete exchange rate pass-through to import prices, in the short run. Then, assuming that prices are set according to a distribution chain, the reaction of consumer prices to changes in import prices is observed.

According to Obstfeld-Rogoff-model (with sticky prices), short-run exchange rate pass-through on consumer prices equals the share of imported goods in the consumer basket. Applying this model for Albania<sup>10</sup>, the short-run pass-through to consumer prices is 36 per cent. However, we should keep in mind that this is an approximate rule, since it does not take into account possible effects of shocks from foreign prices on prices of domestic competitive goods (Stulz, 2006). Domestic firms can be induced to correct their prices as a response to changes on prices for the same imported goods. In this case, it is not surprising for the estimated pass-through to surpass

the ratio of imported goods on the total of consumer goods.

Based on the above considerations, in the new specification<sup>11</sup>, import prices<sup>12</sup> expressed in All will be part of endogenous variables. In this case, the exchange rate variable will not be included independently in the model. In this case the definition of the pass-through to consumer prices is extended as it comprises pressures coming from foreign import prices as well as pressures coming from the exchange rate. The new identification scheme is presented as follows:

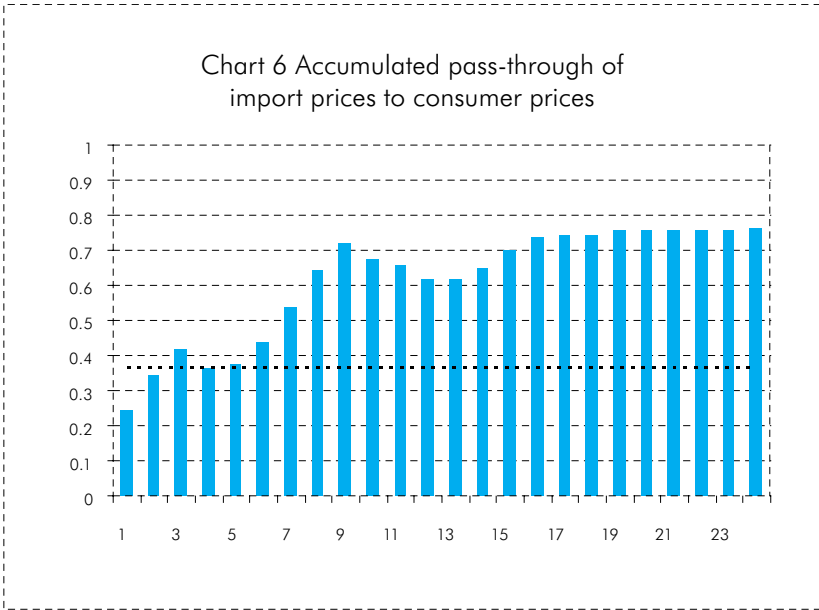
$$\Delta \text{impl} \rightarrow \Delta i \rightarrow \Delta m \rightarrow \Delta \text{CPI} \quad (3)$$

where impl represents import prices variable and  $\Delta$  symbolizes the first difference operator. Oil prices variable continues to be an exogenous variable.

Chart 6 presents the pass-through<sup>13</sup> of an import price shock to consumer prices. Import price pass-through seems to be relatively fast and coefficients of pass-through are statistically different from zero up to the 15th month. Results indicate that up to the third month, about 42 percent of the shock is transmitted to consumer prices. In addition, in this case, the pass-through is completed within the year, reaching its maximum at the 9th month, with a coefficient of pass-through equal to 72 percent. When analyzing this result we should keep in mind the ratio of imports in the consumer goods basket (0.36, horizontal dashed line). If a change in import prices would be completely transmitted to consumer prices, the coefficient of pass-through would be 36 percent in the short run (read the above discussion). Until the 5th month, the coefficients of pass-through are approximately similar to this ratio. Again the results after the 15th month are not valid because of the coefficients statistically not different from zero.

Variance decomposition shows that changes in the import price are relatively important in explaining the variance of consumer prices compared with other variables. In addition, it can be noticed that import prices shocks are slightly more important than nominal effective exchange rate shocks in explaining the variance of





consumer prices. Again, the largest part of consumer price variance is explained by its innovations.

Table 4 Variance decomposition of CPI

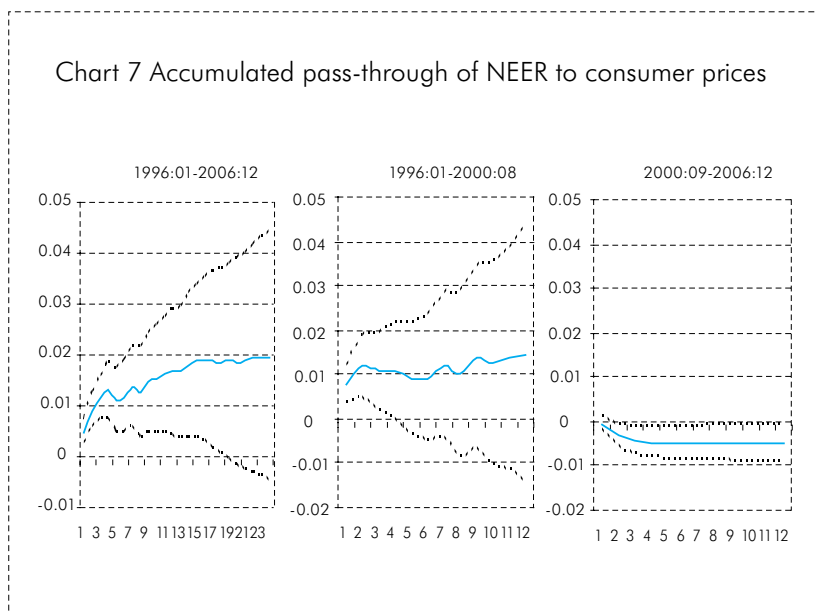
Period	IMPL	M3	INT	CPI
1	17.09072	3.489275	0.742850	78.67716
2	24.95524	3.321994	3.257255	68.46551
3	24.69508	6.066263	3.504580	65.73407
4	23.54748	6.280139	3.332755	66.83962
5	23.26698	6.475605	3.521658	66.73576
6	22.99106	10.19354	3.394064	63.42134
7	22.23523	10.55584	3.714680	63.49425
8	21.60903	10.35581	4.698408	63.33675
9	22.61008	13.02161	5.126944	59.24137
10	22.43206	12.90044	5.015025	59.65247
11	22.40501	12.85972	5.110228	59.62503
12	22.06778	13.98333	5.216354	58.73254

Cholesky ordering: IMPL INT M3 CPI

### CHANGES IN THE DEGREE OF PASS-THROUGH

A well-known and discussed fact in the literature on pass-through is that the exchange rate pass-through has been declining in developed and developing countries. Low inflation environment and increased credibility in the monetary authority are mentioned as some of the main factors contributing to such development. In a low inflation environment, firms are less willing to reflect shocks in their costs (exchange rate shocks or import prices shocks for example) to consumers, as they expect that the central bank will take the necessary measures to offset the effect of the shocks. This session presents the discussion of this issue for the case of Albania. The exchange rate pass-through is analyzed in two different sub periods, 1996:01-2000:08 and 2000:09-2006:12. This break<sup>14</sup> is based on the fact that September 2000 corresponds with the month the Bank of Albania switched from direct instruments to indirect instruments for conducting its monetary policy.

Chart 7 compares cumulative responses of consumer prices to a 1 percent increase in NEER in the total period and two sub sample periods (VAR<sup>15</sup> model based on the baseline specification 1). We notice that the reaction of prices is as expected for the first

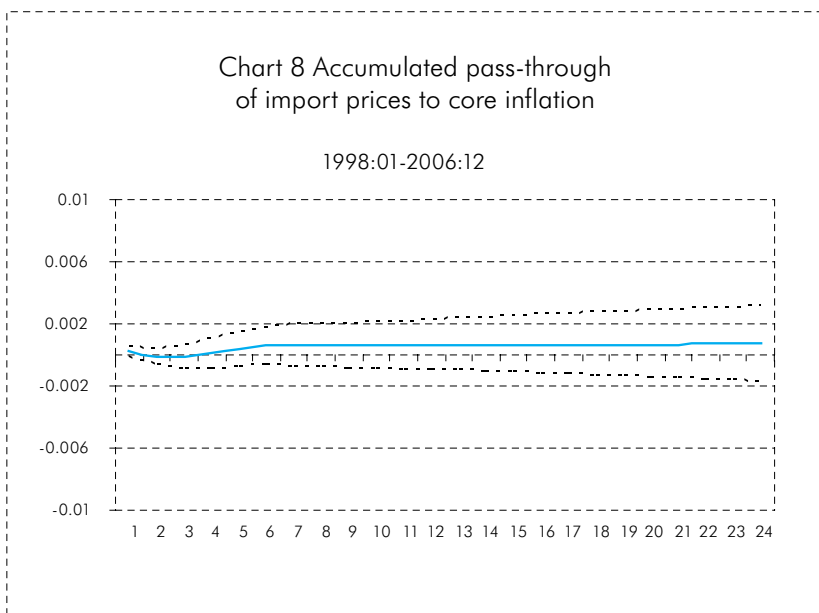


sub-period while for the second sub-period, the reaction is almost insignificant and negative.

The result for the second sub-period is surprising. In order to shed more light on the relationship between pass-through and consumer prices for the second sub-period we keep analyzing some alternative specifications. From these alternatives, we mention:

- i)  $\Delta e \rightarrow \text{gap} \rightarrow \Delta i \rightarrow \Delta m \rightarrow \Delta \text{CPI}$ , where gap represents the output gap;
- ii)  $\Delta \text{imp} \rightarrow \text{gap} \rightarrow \Delta i \rightarrow \Delta m \rightarrow \Delta \text{CPI}_{\text{imp}}$ , imp, where cpi\_imp represents consumer prices of imported goods;
- iii)  $\Delta \text{imp} \rightarrow \text{gap} \rightarrow \Delta i \rightarrow \Delta m \rightarrow \Delta \text{core}$ , where core represents core inflation and,
- iiii)  $\Delta \text{imp} \rightarrow \text{gap} \rightarrow \Delta i \rightarrow \Delta m \rightarrow \Delta \text{trade}$ , where trade represents inflation of tradable sector.

The outcomes of the VAR models for all above specifications show almost the same results. Responses of different representatives of consumer prices (CPI, trade, core) towards foreign shocks (import



prices, nominal effective exchange rate, nominal exchange rate, All/euro) continue to be mostly insignificant and negative. For example, we show the results for the specification iii, where the VAR model in statistical terms presents the best qualities. In this case, the observed period starts in 1998, in order to extend the number of observations. As it is shown in Chart 8, pass-through elasticities are almost zero, while pass-through coefficients do not go beyond 5 percent.

The variance decomposition shows that import prices keep on being the main factor explaining the variance of core inflation when compared with other factors. However, there is a decline compared with the explanation for the entire period. Again, the major part of core inflation variance is explained by its own innovations.

*Table 5 Variance decomposition of core inflation*

Period	S.E.	DIMPL	GAP	DINT	DM3	DCORE
1	0.001539	2.215126	0.828436	5.220947	0.179239	91.55625
2	0.001637	6.756949	0.879301	5.297578	0.926829	86.13934
3	0.001662	6.565890	1.718146	5.636945	1.495336	84.58368
4	0.001691	8.440145	1.795637	5.897588	1.446207	82.42042
5	0.001718	10.34945	2.010309	5.723915	1.980539	79.93579
6	0.001735	11.64222	2.022650	5.787371	2.157411	78.39034
7	0.001748	11.55436	2.062893	5.821326	3.085596	77.47583
8	0.001749	11.53630	2.105603	5.822906	3.151515	77.38367
9	0.001751	11.52644	2.199362	5.812754	3.225639	77.23580
10	0.001752	11.51847	2.252032	5.824012	3.223327	77.18216
Cholesky ordering: IMPL GAP INT M3 CORE						

Actually, the above results are in line with the conclusions drawn from Muça et al. (2004) relating to the weakness of the effect of the exchange rate on prices in Albania after the '90s. Empirical studies in other countries have also encountered such "indifference" of prices to exchange rate shocks. For example we mention the case of some East Asian countries (Thailand, Malaysia and Singapore), the case of Switzerland etc., where responses of consumer prices to exchange

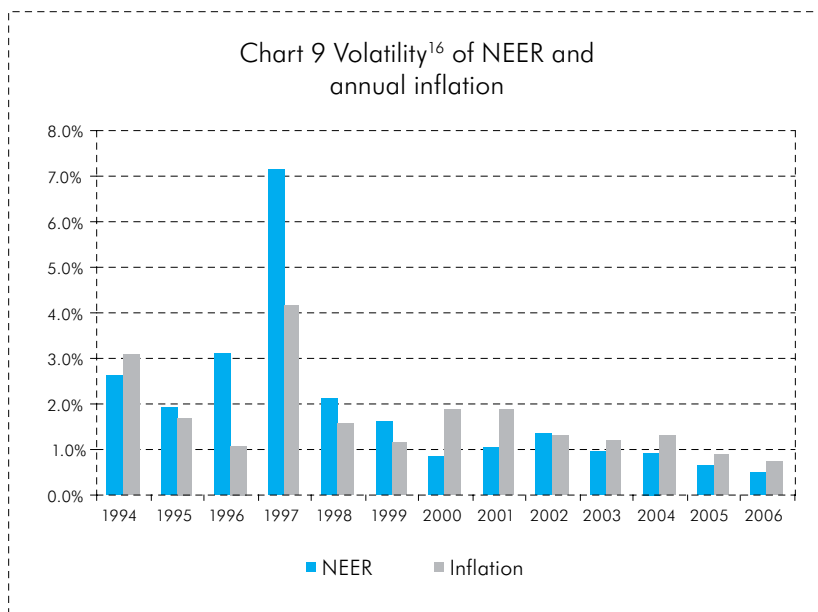
rate shocks have resulted very small and even negative. Tanzania represents another interesting case with no significant pass-through even though the country has experienced large depreciations of the domestic currency. The decline of the exchange rate pass-through is evidenced even in East and Central European countries for the period 1998-2003, compared with 1993-1997 (Bitans, 2004). The results for these countries show a decline by 50 percent in the degree of pass-through. Nevertheless, the exchange rate pass-through in these countries remains relatively high compared with the results for our country and developed countries.

Now we discuss the reasons lying behind the result for a decline in the exchange rate pass-through to consumer prices for the 1999-2006 period. First, the reasons may be related with the chosen empirical methodology. According to Mihailov (2005) the extent of exchange rate pass-through varies to (i) data frequencies, (ii) number of observations (time periods), (iii) econometric methods, (iv) chosen variables, (v) stages along the pricing chains (import prices, export and consumer prices), and (vi) time horizons (a month, a quarter, a year). Consequently, every generalization should be done carefully, taking into account special qualities of each case. However, even though different econometrical methods or proxy variables do matter for the exact extent and time patterns of pass-through, still they agree on general tendencies. In our case, the division of the whole period in sub-periods yields short periods of observations, being one of the factors which might have affected our results.

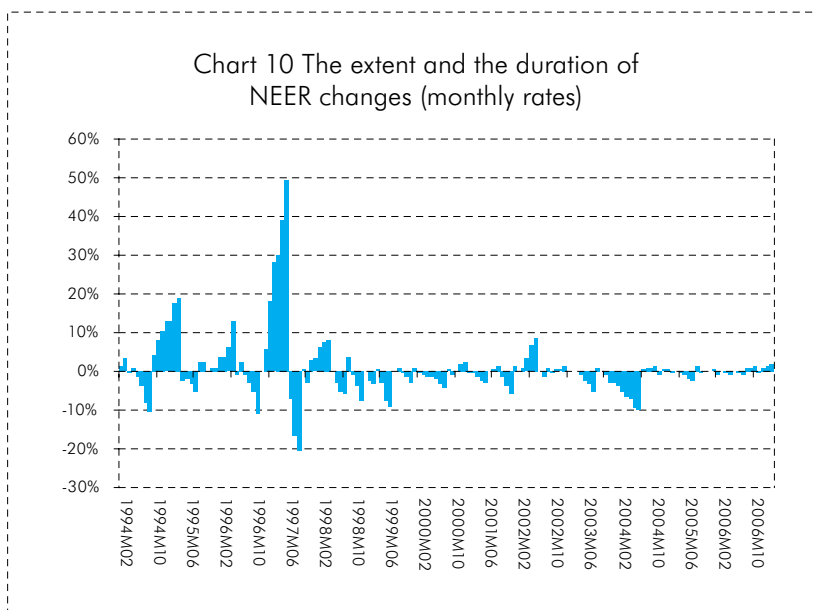
Second, there are a number of possible micro and macroeconomic reasons to explain the decline of exchange rate pass-through after the '90s. Albania is a small and open economy, and as such it is expected that import prices be determined in the producer currency. As such, the effects of the exchange rate are reflected in a high degree in import prices. However, taking into account additional costs (tax, transport, marketing, etc.) it is expected that the pass-through weakens through distribution chain up to consumer prices. Even though there is no empirical study, in the Bank of Albania periodicals it is often mentioned the increase of competition in our economy, a factor that helps in weakening the exchange rate pass-through.

Price stickiness could be another reason to explain the weak reaction of prices to changes in the exchange rate. However, consumer prices in Albania for the period 2002-2005 have presented a relatively low stickiness. According to Dushku et al. (2006), about 28 percent of the consumer prices in Albania are sticky, while in Euro zone price stickiness is at 85 percent of the consumer prices.

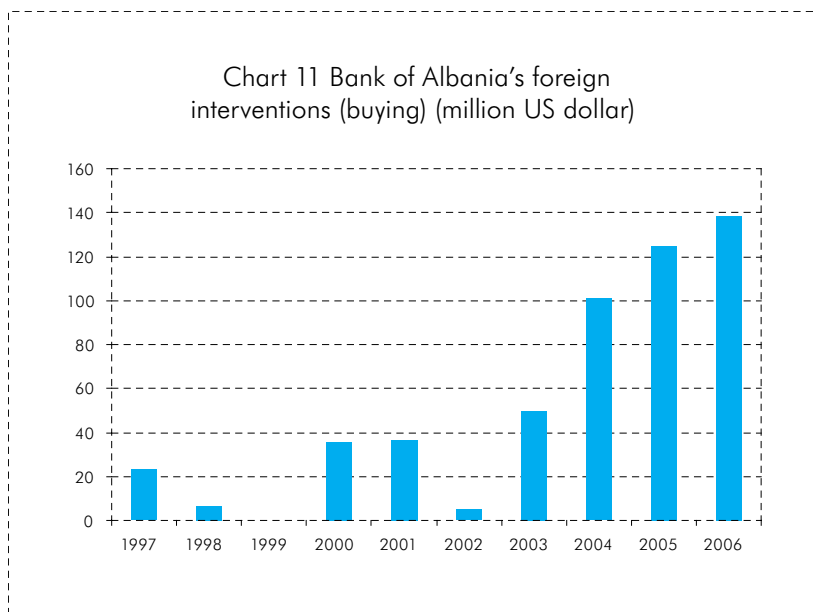
Low inflation environment and credibility in the Bank of Albania after the '90s seem as good "justifiers" for the decline of exchange rate pass-through to consumer prices. The period 1993-1999 is characterized by high levels of inflation and high inflation volatility compared with the 2000-2006 period. The average annual inflation rate for the first sub-period is 15 percent, while it is 2.6 percent for the second sub-period. Thus, a lower degree of the exchange rate pass-through in this period is in line with the overall admitted fact that, the role of the exchange rate in the process of expectations and price decisions of economic agents seem to decline in a low inflation environment.



Furthermore, the NEER itself has been relatively stable during 2000-2006, showing a decreasing volatility year after year (Chart 9). In this period, there have not been large depreciations of the ALL. On the contrary, this period has been characterized mostly by the appreciation of the ALL against both the USD and the Euro. Chart 10 shows the accumulated depreciation (appreciation) for consecutive periods accompanied by the depreciation (appreciation) of the NEER. This Chart enables the observation of the extent of the depreciation (appreciation) and its duration.



It is noticed that for the 1994-1998 period, there have been large depreciations extended in time. For example, the depreciation started in January 1997, lasted for 6 months, reaching up to 50 percent. Then, after this period depreciations have been in a lower degree and shorter in time. Mostly, this period has been characterized by extended appreciations, for example, the appreciation started in November 2003 lasted about 8 months. So, in times when ALL depreciations are considered low and not permanent, economic agents might have not reacted to temporary increases of their costs.



Furthermore, the Bank of Albania interventions may have indirectly affected the weakening of the relationship between inflation and changes in the exchange rates. During the period 1997-2006, the Bank of Albania has been positioned as a buyer of foreign currency in the FX market, in a certain extent to smooth high volatility in the exchange rate and to increase the level of Net International Reserves of the Bank of Albania, in order to fulfill the quantitative objective for these reserves. The Bank of Albania's presence in the FX market has helped in preserving stability of ALL to foreign currencies.

## IV. CONCLUSIONS

Despite being in a flexible exchange rate regime, the Bank of Albania has not ignored exchange rate movements in the ALL, taking into account the importance of exchange rate movements in a small and open economy. The literature on monetary policy in Albania has often considered the exchange rate channel as the most important channel to explain inflationary developments in Albania.



Again, this literature has observed the change in the relationship between the exchange rate and inflation after the '90s.

In this paper, we use VAR models and impulse response functions in order to shed light on the transmission of exchange rate movements to consumer prices. Being in line with the results found in other countries, the exchange rate pass-through in Albania appears almost complete but in decline. The results show that consumer prices react quickly to a shock in nominal effective exchange rate. The pass-through of an exchange rate shock amounts to 42 percent within the first four months. Within the year, the pass-through reaches its maximum in the 9th month, about 99 percent. Furthermore, the exchange rate shocks appear to be relatively important in explaining consumer price variance compared with other variables. Up to 25 per cent of consumer price variance is explained by shocks on the nominal effective exchange rate, while the major part of this variance is explained by its innovations. These results are robust to alternative specifications schemes.

The decline of the pass-through becomes evident when we divide the whole observation sample in two sub-periods. Even in this case, the results are in line with previous conclusions on the weakened effect of exchange rate developments in prices after the '90s. The result is in line even with the empirical results found for developed and emerging countries. Low inflation environment, ALL stability and credibility in the Bank of Albania monetary policy rank as good justifiers for a decrease in the exchange rate pass-through.

Nevertheless, this does not mean that developments in the exchange rate no longer account for consumer price formation in Albania. The performance of the results supports the idea for an asymmetry in the exchange rate pass-through: the pass-through is higher in case of an ALL depreciation and it is lower in case of an appreciation. As such, the monetary authority should be cautious to decide on the appropriate reaction to changes in the ALL exchange rate.

This analysis shows that the exchange rate effect is no more easily captured by direct analyses of data on consumer prices and

the exchange rate. During the last five years, the exchange rate volatility has been very low, making it hard to identify significant statistical relationships with other economic variables. If the volatility of ALL exchange rate increases in the future, we do not have any guarantees that the reaction of the economy will remain the same.

The Bank of Albania has publicly announced its intentions to review its monetary policy framework in the future, mostly toward an inflation-targeting regime. However, if the transition to this new regime is not clearly understood by the public, it will have an effect on the exchange rate volatility, which in turn might affect expectations. The literature shows that the implementation of inflation targeting can further reduce the exchange rate pass-through to prices. Nevertheless, inflation targeting advocates stress that the role of the exchange rate in price formation should not be ignored, especially in the case of a small and open economy, with dependence on imports of intermediary and final goods.

## ANNEX 1 DATA DESCRIPTIONS

Nominal effective exchange rate (NEER) - nominal effective exchange rate is calculated toward two currencies, Euro and US dollar, taking into account the share that they represent in trade balance, Euro (0.82 %) and USD (0.18 %). Base year = 2001. In our model, an increase of NEER means the depreciation of ALL. Period of observation: 1994:01 – 2006:12. Source: Bank of Albania.

Nominal exchange rate (Euro) - the nominal exchange rate of ALL to euro. Period of observation: 1994:01 – 2006:12. Source: Bank of Albania.

Consumer Price Index (CPI) - Consumer Price Index with base year December 2001. Seasonally adjusted using the Census X-11 method. Period of observation: 1994:01 – 2006:12. Source: INSTAT.

Broad money (M3) - Money supply in billion of ALL. Seasonally adjusted using the Census X-11 method. Period of observation: 1994:01 – 2006:12. Source: Bank of Albania.

Interest rate (Int) - 3-month deposit interest rate in ALL. Period of observation: 1996:01 – 2006:09. Source: Bank of Albania.

Import price (IMP) - import price (denominated in euro) is calculated based on price index/unit values of export of main partners from which Albania imports. Period of observation: 1994:01 – 2006:12. Source: Bank of Albania.

Core inflation (core) - Core inflation is calculated based on CPI basket, excluding the goods and services that cause temporary fluctuations of prices such as: goods and services with significant seasonal patterns, goods with administrative prices, prices of goods which are generally subject to fiscal policy; goods with prices strongly related to foreign conjunctures. The indicator is calculated using the permanent exclusion method. Period of observation: 1994:01 – 2006:12. Source: Bank of Albania.

Oil price (Oil) - oil price expressed in euro, as it is published in the international stock exchange market. Period of observation: 1994:01 – 2006:12. Source: ECB.

Output gap (Gap) - Output gap is calculated as the difference of real GDP with the trend according to Hodric-Prescott filter. The real GDP is calculated as nominal GDP divided by GDP deflator. The annual nominal GDP (Source: INSTAT) is transformed into monthly GDP by using the Lismans method. Source: Calculation of Research Department at the Bank of Albania.

## ANNEX 2 DATA AND VAR MODELS QUALITIES

Table 1 Granger Causality test results

	Lag length in month						
	1	2	3	4	5	6	7
<b>M3</b>							
Interest Rate	0.513	0.13	0.36	0.28	3.14**	2.22**	4.99**
NEER	0.05	0.03	0.43	0.72	0.94	2.02*	2.95***
CPI	4.70**	2.50*	1.41	1.58	2.54**	2.84**	1.73
Core Inflation	0.35	3.248**	0.78	0.49	0.38	0.58	
<b>Int</b>							
M3	6.67**	2.16	1.64	2.87**	2.61**	1.39	13.05***
NEER	3.20***	3.14***	3.78***	2.45**	3.20***	3.14***	3.78***
CPI	13.1***	17.4***	5.9***	5.48***	3.19**	3.72**	
Core Inflation	0.01	0.36	0.15	0.30	1.07	1.32	0.99
NEER							
<b>M3</b>	0.01	1.22	2.66*	3.45**	3.38***	3.17***	3.47**
Interest Rate	2.98***	3.92***	3.92***	6.47**	2.98**	3.92***	3.47***
CPI	13.05***	7.07***	5.22***	4.06***	2.62**	4.02***	4.11***
Core Inflation							
<b>CPI</b>							
M3	0.01	3.12**	2.36**	3.88***	3.58***	3.67***	4.88***
Interest Rate	13.1***	3.39**	0.17	2.4**	2.17*	2.19**	
NEER	4.99**	1.81	3.13**	3.45**	4.00***	4.18***	4.01***

Note: Numbers represent  $H_0$  of F-statistics, which means, "First variable no-granger causes second variable". 1, 2 and 3 stars indicate the rejection of null hypotheses with importance level, respectively 10, 5 and 1 per cent. Variables are in first differences. The number of observations for every result depends on data availability.

Table 2 Results of unit root test according to ADF method

Sample	Level	First difference	Level critical value	Differences critical value
	ADF	ADF	ADF	ADF
HCPI	-1.81	-3.30*		1%:-4.03, 5%:-3.45, 10%:-3.15
M3	-2.64	-1.47	1%:-4.02, 5%:-3.44, 10%:-3.14	1%:-3.48, 5%:-2.88, 10%:-2.58
NEER	-2.53	-7.90***	1%:-4.02, 5%:-3.44, 10%:-3.15	1%:-3.47, 5%:-2.88, 10%:-2.58
EURO	-2.36	-8.85***	1%:-4.02, 5%:-3.44, 10%:-3.14	1%:-3.47, 5%:-2.88, 10%:-2.58
Interest Rate	-3.19	-5.91***	1%:-4.03, 5%:-3.44, 10%:-3.15	1%:-3.48, 5%:-2.88, 10%:-2.58
IMP	-2.20	-8.31***	1%:-4.02, 5%:-3.44, 10%:-3.14	1%:-3.47, 5%:-2.88, 10%:-2.58
CPI	-1.02	-5.71***	1%:-4.02, 5%:-3.44, 10%:-3.14	1%:-3.47, 5%:-2.88, 10%:-2.57
oil	-2.21	-10.86***	1%:-4.02, 5%:-3.44, 10%:-3.14	1%:-3.47, 5%:-2.88, 10%:-2.58

Specification 2:  $\Delta i \rightarrow \Delta e \rightarrow \Delta m \rightarrow \Delta CPI$

Specification 3:  $\Delta impl \rightarrow \Delta i \rightarrow \Delta m \rightarrow \Delta CPI$

Specification iii:  $\Delta imp \text{ gap } \Delta i \Delta m \Delta core,$

Table 3 Lag length selection criteria of VAR for specification 2

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1195.989	NA	3.16e-14	-19.73315	-19.45440	-19.61995
1	1250.964	103.5355	1.65e-14	-20.38273	-19.73231*	-20.11859*
2	1271.380	37.09040	1.54e-14	-20.45634	-19.43426	-20.04127
3	1292.875	37.61610	1.41e-14	-20.54792	-19.15418	-19.98192
4	1311.737	31.74989	1.35e-14	-20.59561	-18.83020	-19.87867
5	1345.404	54.42934	1.01e-14	-20.89007	-18.75299	-20.02219
6	1367.684	34.53377	9.24e-15	-20.99474	-18.48599	-19.97592
7	1385.443	26.34197*	9.13e-15	-21.02405	-18.14364	-19.85430
8	1403.974	26.25314	8.94e-15*	-21.06624*	-17.81417	-19.74556

\* Lag selection according to criterion.  
 LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error  
 AIC: Akaike information criterion  
 SC: Schwarz information criterion  
 HQ: Hannan-Quinn information criterion

Table 4 Lag length selection criteria of VAR for specification 3

Endogenous Variables: DIMPI DINT DM3 DICK						
Exogenous Variables: C DOIL						
Sample: 1994M01 2006M12						
Included observations: 120						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	1197.961	NA	2.86e-14	-19.83268	-19.64684	-19.75721
1	1240.654	81.11723	1.84e-14	-20.27756	-19.72006*	-20.05116*
2	1252.142	21.06190	1.98e-14	-20.20237	-19.27320	-19.82503
3	1273.538	37.79999	1.82e-14	-20.29231	-18.99148	-19.76403
4	1290.257	28.42158	1.80e-14	-20.30428	-18.63179	-19.62507
5	1317.895	45.14242	1.50e-14	-20.49825	-18.45409	-19.66811
6	1336.791	29.60432	1.44e-14	-20.54652	-18.13070	-19.56545
7	1351.431	21.95933	1.50e-14	-20.52385	-17.73636	-19.39184
8	1372.805	30.63651*	1.40e-14*	-20.61342*	-17.45427	-19.33047

\* Lag selection according to criterion.  
 LR: sequential modified LR test statistic (each test at 5% level)  
 FPE: Final prediction error  
 AIC: Akaike information criterion  
 SC: Schwarz information criterion  
 HQ: Hannan-Quinn information criterion

Table 5 Lag length selection criteria for specification iii

Endogenous Variables: DIMPL GAP DINT DM3 DCORE						
Exogenous Variables: C DOIL						
Sample: 1998M01 2006M12						
Included observations: 96						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	1127.916	NA	5.28e-17	-23.28992	-23.02280	-23.18195
1	1303.420	325.4127	2.30e-18	-26.42541	-25.49049	-26.04750
2	1514.965	370.2044	4.75e-20	-30.31177	-28.70905	-29.66393
3	1573.479	96.30347	2.39e-20	-31.00997	-28.73945*	-30.09219*
4	1604.087	47.18880*	2.17e-20*	-31.12682*	-28.18851	-29.93911
5	1624.730	29.67407	2.47e-20	-31.03605	-27.42993	-29.57840

6	1652.783	37.40376	2.45e-20	-31.09965	-26.82574	-29.37206
7	1676.243	28.83610	2.73e-20	-31.06756	-26.12585	-29.07004
8	1703.812	31.01528	2.88e-20	-31.12109	-25.51158	-28.85363
* Lag selection according to criterion.						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Table 6 LM test for serial correlation of VAR errors, specification 2

H0: no serial correlation until lag h		
Sample: 1994M01 2006M12		
Included observations: 120		
Lag	LM-Stat	Prob
1	29.28016	0.0221
2	13.74905	0.6174
3	21.25715	0.1688
4	16.35370	0.4286
5	21.41205	0.1632
6	20.98297	0.1792
7	8.727606	0.9242
8	16.50558	0.4183
Probabilities for H2 with 16 freedom degrees.		

Table 7 LM test for serial correlation of VAR errors, specification 3

H0: no serial correlation until lag h		
Sample: 1994M01 2006M12		
Included observations: 120		
Lag	LM-Stat	Prob
1	29.28016	0.0221
2	13.74905	0.6174
3	21.25715	0.1688
4	16.35370	0.4286
5	21.41205	0.1632
6	20.98297	0.1792
7	8.727606	0.9242
8	16.50558	0.4183
9	10.74063	0.8252
Probabilities for H2 with 16 freedom degrees.		

Table 8 LM test for serial correlation of VAR errors, specification iii

H0: no serial correlation until lag h		
Sample: 1998M01 2006M12		
Included observations: 100		
Lag	LM-Stat	Prob
1	24.52600	0.4892
2	24.51227	0.4900
3	34.32383	0.1012
4	24.73718	0.4772
5	28.52036	0.2845
6	26.25691	0.3940
7	24.42930	0.4947

Probabilities for H2 with 25 freedom degrees.



## LITERATURE

1. Agenor, Pierre-Richard (2002). "Monetary policy under flexible exchange rates: An introduction to Inflation Targeting". In: Loayza and Soto, eds. *Inflation Targeting: design, performance, challenges*. Central Bank of Chile
2. Ariel T. Burstein, Joao C. Neves and Sergio Rebelo, May 2000. "Distribution Costs and Real Exchange Rate Dynamics During Exchange-Rate-Based-Stabilizations", Working Paper No. 473
3. Bacchetta, Philippe & Eric van Wincoop, 2001. "A Theory of the Currency Denomination of International Trade"
4. Ball, Christopher and Reyes, Javier (2004a). "Inflation Targeting or Fear of Floating in disguise: The case of Mexico". *International Journal of Finance and Economics*
5. Barry Eichengreen, 2002. "Can Emerging Markets Float? Should They Inflation Target?," Working Papers Series 36, Central Bank of Brazil, Research Department
6. Berg, A., et al. (2002). "An evaluation of monetary regime options for Latin America". *The North American Journal of Economics and Finance*
7. Betts, C.M. and T.J. Kehoe. 2001. "Real Exchange Rate Movements and the Relative Price of Nontraded Goods"
8. Burstein, A., M. Eichenbaum, and S. Rebelo. 2002. "Why Are Rates of Inflation So Low after Large Devaluations?" NBER Working Paper No. 8748
9. Bitans, M, 2005. "Pass-through of Exchange Rates to Domestic Prices in East European Countries and the Role of Economic Environment", Working Paper 4/2004
10. Campa, José Manuel & Goldberg, Linda S, 2002. "Exchange Rate Pass-Through into Import Prices," CEPR Discussion Papers 4391
11. Campa, José Manuel and Linda S. Goldberg (2004), "Exchange Rate Pass-Through into Import Prices: A Macro or Micro Phenomenon?", Federal Reserve Bank of New York
12. Campa, José Manuel & Linda S. Goldberg, 2005. "Exchange Rate Pass-Through into Import Prices," *The Review of Economics and Statistics*, MIT Press, vol. 87(4), pages 679-690, December

13. Calvo, Guillermo (2001). "Capital markets and exchange rate, with special reference to the dollarization debate in South-America". *Journal of Money, Credit and Banking*
14. Choudhri, E.U., Faruquee, H. and Hakura, D.S., 2005 "Explaining the Exchange Rate Pass-through in Different Prices," *Journal of International Economics*
15. Corsetti, G. and L. Dedola. 2002. "Macroeconomics of International Price Discrimination"
16. Darvas, Zsolt, 2001. "Exchange rate pass-through and real exchange rate in EU candidate countries," Discussion Paper Series 1: Economic Studies 2001,10, Deutsche Bundesbank
17. Devereux, Michael B., and Charles Engel (2001), "Exchange Rate Pass-Through, Exchange Rate Volatility, and Exchange-Rate Disconnect," Working Paper
18. Dornbusch, R., 1987, "Exchange Rate and Prices," *American Economic Review* 77
19. Dushku, Elona, Gent Hashorva and Marga Peeters "Some Stylized Facts of Goods and Services in the CPI-basket in Albania Are Prices Sticky or Flexible?" Hand-out for the Inflation Targeting Taskforce, January 2006
20. Edwards, Sebastian, 2006. "The Relationship Between Exchange Rates and Inflation Targeting Revisited," NBER Working Papers 12163, National Bureau of Economic Research, Inc.
21. Fraga, Arminio et al. (2003). "Inflation targeting in emerging market economies". In: Gertler, Mark, and Kenneth Rogoff, eds. *NBER Macroeconomics Annual*
22. Froot, Kenneth A. & Paul Klemperer, 1989. "Exchange Rate Pass-Through When Market Share Matters," NBER Working Papers 2542, National Bureau of Economic Research
23. Gali, Jordi and Tommaso Monacelli, 2002. "Monetary Policy and Exchange Rate Volatility in Small Open Economy"
24. Hakan Kara, et al. 2005. "Exchange Rate Pass-Through in Turkey: Has it Changed and what Extent?" . Central Bank of the Republic of Turkey, Working paper No 05/04
25. Hausmann, Ricardo, et al. (2001). "Why do countries float the way they float?" *Journal of Development Economics*"
26. Hooper, Peter, and Catherine L. Mann, 1989. "Exchange Rate Pass Through in the 1980s: The Case of U.S. Imports of

Manufacturers”

27. Jane E. Ihrig, Mario Marazzi, and Alexander D. Rothenberg , 2006. “Exchange-Rate Pass-Through in the G-7 countries”. Board of Governors of the Federal Reserve System International Finance Discussion Papers Number 851
28. Kasa, K. (1992) Adjustment Costs and Pricing-to-Market: Theory and Evidence, *Journal of International Economics*
29. Krugman P., 1987, “Pricing to Market When the Exchange Rate Changes,” in *Real-financial linkages among open economies*, Eds. S.W. Arndt and J. David Richardson. Cambridge, MA: MIT Press
30. Kumhof, Michael (2001). “A critical view of Inflation Targeting: crises, limited sustainability and aggregate shocks”. Central Bank of Chile. Working Paper no 127
31. Luci, E., Ibrahim F., 2005, “A review of Albanian monetary targeting regime with insights into the future”, Fifth Annual Conference of Bank of Albania
32. Maçellari, Ahmet, Hasan Mytkolli, Tonin Kola “Kurset e këmbimit dhe tranzicioni ekonomik” Tiranë, 1999
33. Marston, Richard C., 1991. “Pricing to Market in Japanese Manufacturing,” NBER Working Papers 2905, National Bureau of Economic Research, Inc.
34. McCarthy, Jonathan, 2000. “Pass-through of exchange rates and import prices to domestic inflation in some industrialized economies,” Staff Reports 111, Federal Reserve Bank of New York
35. Mihailov, Alexander (2005), “Exchange Rate Pass-Through on Prices in US, German and Japanese Macrodatta”, University of Essex
36. Minella, Andre et al. (2003). “Inflation targeting in Brazil: constructing credibility under exchange rate volatility”. *Journal of International Money and Finance*
37. Mishkin, Frederic (2004b). “Inflation Targeting or Fear of Floating in disguise: a broader perspective”. University of Arkansas Working Paper
38. Mishkin, Frederic S. (2004). “Can Inflation Targeting work in emerging market countries?” In: *Festschrift in Honour of Guillermo Calvo*, International Monetary Fund
39. Mishkin, Frederic S and Savastano, Miguel (2001). “Monetary

- policy strategies for Latin America". *Journal of Development Economics*
40. Muco, M; Sanfey P, and Anita Taci "Inflacioni, kursi i këmbimit dhe roli i politikës monetare në Shqipëri, Working paper No. 88, EBRD
  41. Parrado, Eric, and Andrés Velasco, 2001, "Alternative Monetary Rules in the Open Economy: A Welfare-Based Approach," in *Inflation Targeting: Design, Performance, Challenges*, ed. by Norman Loayza and Raimundo Soto (Santiago: Central Bank of Chile)
  42. Peteers, M (2005) "What about Monetary Transmission mechanism in Albania? Is the exchange rate pass-through (still) the main channel? Fifth Annual Conference of Bank of Albania
  43. Obstfeld, M. and K. Rogoff. 1995. Exchange rate dynamics redux. *The Journal of Political Economy* 103(3): 624-660
  44. Rabanal, P. and G. Schwartz (2001). "Exchange Rate Changes and Consumer Price Inflation: 20 Months After the Floating of the Real". IMF Country Report: Selected Issues and Statistical Appendix (Section V)
  45. Reyes, Javier (2003). "Exchange rate pass-through effect and Inflation Targeting in emerging economies: What is the relationship?" Working Paper, University of Arkansas
  46. Schmidt-Hebbel, Klaus and Werner, Alejandro (2002). "Inflation Targeting in Brazil, Chile and Mexico: performance, credibility and the exchange rate". Central Bank of Chile. Working Paper no 171
  47. Stulz, Jonas "Exchange Rate Pass-Through in Switzerland: Evidence from Vector Autoregressions", February 2006
  48. Stulz, Rene M., 2006. "Financial Globalization, Corporate Governance, and Eastern Europe," NBER Working Papers 11912, National Bureau of Economic Research, Inc.
  49. Szapáry, György. (2001) "Maastricht & the Choice of Exchange Rate Regime in Transition Countries during the Run-Up to EMU" ENEPRI Working Paper No. 6, May 2001
  50. Taylor, J. (2000), "Low Inflation, Pass-Through and the Pricing Power of Firms"
  51. Themeli, E.; Kolasi, G., 2006 "The IT case in Albania, A tentative road-map for implementing IT in Albania".

## NOTES

\* Klodiana Istrefi, Research Department, Valentina Semi, Monetary Policy Department, Bank of Albania, October 2007.

The views expressed in this publication are those of the author, and they do not necessarily reflect the views of the Bank of Albania. Special thanks to Ms. Oxana Babetskaia- Kukharchuk, Czech National Bank, CES-University of Paris 1, State University - HSE for the useful comments and suggestions given during the workshop "Economic Research in Southeastern Europe", November 2007, Tirana.

<sup>1</sup> Albanian Lek.

<sup>2</sup> New member countries that have not adopted the Euro: Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia.

<sup>3</sup> Countries like: Albania, Macedonia, Croatia, Turkey, Bosnia-Herzegovina, Montenegro.

<sup>4</sup> The second phase of monetary integration for the new member countries is participation in ERM II. The participation is voluntary and as such it does not require immediate entrance after EU membership. However, new member countries are expected to join this regime. Participation in ERM II is a necessary but not a sufficient condition for fulfilling the exchange rate convergence criterion.

<sup>5</sup> A detailed description of the data is found in Annex 1.

<sup>6</sup> McCarthy (2000) investigates the exchange rate pass-through and import prices pass-through to inflation for some industrialized countries following a VAR model with this ordering of the variables: oil prices (denominated in domestic currency), output gap, nominal exchange rate, import price inflation, producer price inflation, consumer price inflation, interest rates and a money supply indicator.

<sup>7</sup> Granger Causality test measures if something happens before something else and helps to predict it. A variable X is said to granger cause y, if values of x provide statistically significant information on future variables of y. This test does not provide information on simultaneous relationships between the variables but only on the effect of past observations.

<sup>8</sup> Stationarity of the variables is measured using unit root test according to Augmented Dickey Fuller (ADF). This test suggests that all variables are nonstationary and become stationary after first differencing (dlog). These results are presented in Table 2, Annex 2.

<sup>9</sup> Impulse responses trace out the response of current and future values of each of the variables to a one unit increase in the current value of one of the VAR errors, assuming that this error returns to zero in subsequent periods and that all other errors are equal to zero.

<sup>10</sup> According to INSTAT estimations, the ratio of imported goods in the basket of consumer goods is 36 percent.

<sup>11</sup> The VAR model is subject to all necessary diagnostic tests. These tests are shown in Annex 2.

<sup>12</sup> Official statistics in Albania do not provide data on import prices in Albania. In this paper, we use proxy data on import prices (denominated in euro). For more details, see Annex 1 and Shllaku, R "Index of foreign unit values/prices of Albanian imports" Discussion Paper, 2007

<sup>13</sup> Pass-through coefficient is defined as:  $PT_{t,t+j} = P_{t,t+j} / IMP_{t,t+j}$ , where  $P_{t,t+j}$  is the cumulative change in the consumer prices and  $IMP_{t,t+j}$  is the cumulative change in import prices between months t and t+j.

<sup>14</sup> The break point is in line with the break point in Muça et al. (2004).

<sup>15</sup> Statistical properties of VAR models in sub-periods do fulfill stability conditions but some of them do not fully fulfill the normality criteria for residuals. As such the results of these models should be interpreted with reserves.

<sup>16</sup> Volatility measured as standard deviation.



CIP Katalogimi në botim BK Tiranë

Istrefi, Klodiana  
Exchange rate pass-through in Albania /  
Klodiana Istrefi, Valentina Semi - Tiranë:  
Banka e Shqipërisë, 2009

-48 f; me il.; 15.3 x 23 cm.

Bibliogr.  
ISBN 978-99956-42-03-7  
Semi, Valentina  
336.748(496.5)

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