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УЛОГАТА НА КУРСОТ ВО ЗАПАДЕН БАЛКАН

THE ROLE OF EXCHANGE RATE IN THE WESTERN BALKANS

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Abstract: The purpose of this study is to examine the effect of exchange rate on real GDP and prices in a small open transition countries: Western Balkans. Based on the available theoretical and empirical evidence, we employ Panel Data in order to investigate the effect of exchange rate on real GDP and prices. The result shows that the direct channel of exchange rate changes has a strong effect on the rate of inflation, while the indirect channel of exchange rate changes shows no effect on real GDP. Moreover, the result reveals that the exchange rate is the main source of the inflationary pressures in the Western Balkan countries. The policy makers must weigh the relative costs and benefits associated with introducing a flexible exchange rate in small open economies because such regime is likely to incur more costs than benefits.

KEYWORDS:

Transition economies Western Ballkan country ,exchange rate, pass-trough effect, Panel Data, Fixed Effects, Random Effects, Hausman Taylor-IV, Hausman Test.

1. INTRODUCTION

The main objective in this study is to analyze empirically the effect of the exchange rate on real GDP and price in small open countries that are acceding to the EU during the period time 1996-2011. Based on variety of the theoretical and empirical evidence, the empirical investigation is carried out using Panel data model in order to investigate the effect of exchange rate real GDP and prices. Also, we have used more explanatory variables based on literature, as example Initial level of CPI-consumer index price, real GDP and short term lending interest rate.

In this research the fundamental goal is empiricalanalyzing of costs and benefits of adoption the European currency in Western Balkans countries or using of transitional period in adopting this currency. One of integration precondition of Western Balkans countries in European Union is adoption of European currency as national one. But these countries can use dual bond currency after their integration in European Union while using the European currency accepted from other member countries. Some of these Western Balkans countries use fixed exchange rate and some of them are using fluctuated but managed exchange rate, e.g. Macedonia uses fixed exchange rate, Albania managed fluctuated, and Serbia flexible exchange rate. Through this research I truly believe that we will conclude if these countries should apply the European currency or they need transitional period for adopting this currency. Transition period can be too long, eg. Bulgaria as EU member still continues to use Bulgarian Levi, while Slovenia, Hungaria, Czech Republic, Slovakia and Baltic countries are using Euro as national currency.

In other words, some of the countries with their EU membership act have used Euro as national currency, some of them have used transition period and now they are using Euro as national currency and many of EU countries are still in transition period. But, there are countries which didn't accept Euro as national currency and they continue to be members of the EU. Based on experience and empirical research, we will try to answer to the question related to costs and benefits of Western Balkans in case of adopting Euro as national currency, or they should use transposal period for adopting it.

Our aim in this paper is the use of one valuing technique which is already used from different authors. Concretely we will use techniques of Panel Data, respectfully Fixed Effects, Random Effects and Housman Taylor –IV, for testing the link between the exchanging rate real GDP and prices in 3 countries which are acceding to the European Union.

In this research I will be focused on identifying the effects of exchanging rate on prices in transition countries, also based on quarterlydata's from 1996 until 2011, using the Panel model of data, i will try to conclude the link between the stability of exchanging rate and effects reflected in real GDP and price.

2. REVIEW OF LITERATURE

While tracking the material we can find out that there is a considerable number of different models realized in USA and Western Balkan countries where are identified exchange rate effects on prices. But there is a small number of studies with Panel Data approach of transmiting mechanizm of exchange rate on inflation, GDP and interest rates during period of time.

First through observation of different models we can see that the effect of exchange rate in inflation doesn't show any conection in developed countries. Mc. Carthy (2000) using the VAR model analyzed 6 industrialized countries of OECD from 1976:1-1998:4. During his study of effects of exchange rate on prices fluctation of imports he concludes that the effect of exchange rate is higher in countries with high level of imports. According to him, we can see that in large and developed countries exchange rate doesn't play any important role in transmiting the monetary policy. Choudhri and Hakura (2001) through the panel approach analyzed 71 developing countries and developed countries during the period 1971-2000.

Empirical evidence suggests that the inflation enviroment has a positive effect on national prices in both groups of countries (developing countries and developed ones). Gagnon and Ihrig(while applying the panel approach of data found out relations between the effect of exchange rate CPI anf inflation stability for eleven industrialized countries during 1970-2000. Foundings show that the effect of exchange rate has fallen in 1990 during development of these countries, also conlcuded that theere is a correlation toward exchange rate variability and infaltion variability. Furthermore , results from this study show that in industrialized countries there doesn't exist systematic correlation between exchange rate and monetary policy. Holmes (2005) through a panel approach of data studied the effect of exchange rate in long term periods in EU countries starting from 1970. According to him for keeping the lower level of inflation doesn't have effect just the exchange rate, but the exchange rate should be combined in one credible mode of a monetary policy. In an another study, Bailliu and Fujii (2004) GMM panel data approach have made one research related to the effect of exchange rate and inflation in 11 developed countries. Their founding show positive relation between exchange rate and inflation , also they say that the effect of exchange rate falls when the economy moves in a enviroment with low inflation. Also Horvath and Maino (2006) have analyzed the dynamic effect of monetary policy in real GDP and prices in Belarus. In the model they include four variables: prices, money inventory, fixed exchange rate and real GDP. They found out that the exchange rate has a strong effect on prices but do not afect the real GDP. Ca'Zorzi et al (2007) confirmed the existence of a positive correlation between exchange rate and iflation for larger group of developin countries. Beirne (2009) also analyzed the effect of exchange rate in consumer prices for 14 developing countries. Using the panel model they showed the effect of exchange rate on national currency. Jimborean (2011) while testing new member countries in EU confrimed the correlation of exchange rate and inflation before acceding to EU and the loss of the effect of exchange rate after stabilization and integration in EU.. Fetai (2011) using the SWAR and VCM model reviewed the effect under different monetary policy regimes on real GDP. M1, consumer and production prices in Macedonia. According to him the changing of nominal exchange rate have effect on prices but doesn't have effect on real GDP Kazeroni

(2012) using the panel model of data has analyzed two groups of countries pooled accoriding to the IMF classification. He founded the effect of monetary regime (countries connected with exchange rate, and those with targeting inflation in changing the exchange rate during the period of 1999-2010. According to him, in countries with exchange rate regime, nominal exchange rate has a negative effect in prices, whereas in countries with targeting inflation has positive effect on prices.

From conclusions given above according to macroeconomic and econometric models, a large number of them conclude the effect of exchange rate on inflation and GDP for countries in transition and countries acceding to the EU. Most of studies are made using the econometric models VAR, ECM, and a very small number of studies are made using panel approach. That's why in this paper we will try to fullfill this part while using the Panel data approach where we are going to use it to conclude the relation between exchange rate chanels, inflation, GDP and M1, in Macedonia which use fixed exchange rate, Albania which uses managed fluctated exchange rate and Serbia which uses flexible exchange rate.

3. ECONOMETRIC MODEL OF TESTING THE EFFECT OF EXCHANGE RATE ON REAL GDP AND PRICES

Panel data, also called cross sectional time series data, are repeated observations on the same set of cross-section units. Two types of information are represented in cross sectional time series data: *the cross sectional information*, reflected in the differences between subjects, and *the time series or within subject information*, reflected in the changes within subjects over time. Panel data regression techniques allow researchers to take advantage of these different types of information.

3.1 ***Data description***

During our work we have explored the effect of exchange rate on prices and real GDP, highlighing the costs and benefits of adoption of different regimes of exchange rate, the case of Macedonia that uses fixed exchange rate, Albania managed exchange rate regime and Serbia managed flexible exchange rate regime . Using data for 15 years in quarters respectively for the period 1996: Q1 to 2011: Q4. Considering the limited access to the data for this model especially in the period of turmoil, I make interpolation of data in a timely manner. In the absence of exchange rate in Albania I have made interpolation of data from the first quarter of 1996 to the fourth quarter of 1998. For Serbia th interpolation of data is done by the exchange rate of the first quarter of 1996 to the third quarter of 2001. Whereas the interpolation of data for the CPI for Serbia is made from the first quarter of 1996 to the third quarter of 2001. Main data sources were: the World Bank, the National Banks of Macedonia , Albania and Serbia, Statistical Offices of the countries and the International Monetary Fund.

One of the most important issues in our analysis is the effect of exchange rate in maintaining stable prices as one of the requirements of the Maastricht criteria of countries acceding to the European Union. Relying on general literature and pursuing studies developed in the transition which concluded the highest effect of exchange rate on prices and the exchange rate channel is examined in two ways: the direct channel which affects the inflation through import prices which comes as a result of the change in the exchange rate which directly affects the prices of imports from where the local consumer prices rise. And indirect channel of exchange rate which affects real GDP through the balance of payments.

Following Corticelli, Jazbec, and Master (2004) with VAR model which uses the consumer price index CPI which is an indicator that explains the effect of exchange rate changes on prices. Fetai (2011) with SVAR model and VCM examined the effect of exchange rate change in real GDP ,M1, on the consumer price index and production rates in Macedonia. According to him the difference in exchange rate has a significant effect on prices, but does not affect real GDP. While interest rates in the short term showed no correlation with the exchange rate and prices. Fujji (2005) by panel data aproach model also confirmed the link between exchange rate and keeping inflation at a low level, where while testing 11 industrialized countries by methods of Fixed Effekt, random effect , from where we are based for testing our model.

Also, following other studies Beirne (2009) was confirmed the link by changing the exchange rate in consumer prices for 14 developing countries. With the help of panel model they showed the impact of exchange rate changes on prices. Jimborean (2011) while testing the new member countries of the EU confirmed the connection of the exchange rate and inflation before acceding to the EU and the loss of the exchange rate effect after stabilization and integration to the EU. Kazerooni (2011) from where is based our model tests the effect of exchange rate on prices by panel model in countries adopting monetary regime (case Albania after 2009).

In our model as a variable we will use the interest rate on short term loans to clarify their effect on price stability and keeping the exchange rate stable.

In order to provide a clearer picture of the data used in this empirical research, we created tables with statistical data for each country where are summarized all of variables used in the model.

3.1.1The estimated model

In this paper is used the model from Fixed Effects Model and 'Hausman-Taylor IV' model in order to evaluate the effect of exchange rate changes on prices and GDP for three Western Balkan countries acceding to the EU in the period from 1996-2011 . Also in the paper you will find the results in 'Poodel OLS', 'Fixed Effects' 'Random Effects' and 'Hausman-Taylor IV' model.

Based on the above assumption and supported by Hausman test results, the Hausman-Taylor IV and Fixed Effects Methods are considered to be more adeuquate than Random Effects model. In this model, as dependet variable we will take the consumer price index (CPI) whereas as independent variables we will take 'first lag' of CPI (inflation), the exchange rate in logarithm (lnexchange) and interest rates in the short term (lending interest rate) without logarithm. Some of the explanatory variables of the model are proposed to be defined as endogenous based on Beirne (2009) Jimborean (2011) Kazerooni (2012), where the endogenous variables in most cases are a problem, since the exchange rate factors may be determined by the exchange rate. Therefore, based on the effects of endogenous variables , we will take the logarithm of the endogeneous exchange rate in order to eliminate the side effects. Therefore, using the Hausman-Taylor model, the evaulation of this model will be presented through the following equation:

$$y_{it}=c+\beta_1(y_{it-1})+\beta_2 log(EXCH_{it})+\beta_3 (LIRr_{it})+u_{it} \quad \textbf{(4.16)}$$

where:

$\mathbf{y_{it}}$**-** index of consumption prices **CPI**

c – a constant

y_{it-1}-represents ‘’First Lag’’* of **CPI**

LnEXCHit –logarithm of exchange rate

Lend_IRr$_{it}$ – interest rate of short term loans(lending interes rate)

u_{it}-external effects (exogenous disturbances).

4. RESULTS

	OLS	***Fixed effects***	***Random effects***	***Hausman Taylor IV***
Variablat	***CPI***	***CPI***	***CPI***	***CPI***
cpiL1	***0.8588193***	***0.8353863***	***0.8588193***	***0.8515707***
	(0.0311345)	***(0.0345063)***	***(0,0311345)***	***(0.0329302)***
Log Exchange	***1.116882***	***2.128529***	***1.116882***	***1.792951***
	(0.864495)	***(1.121202)***	***(0.864495)***	***(1.103001)***
Lend_ir	***0.2048432***	***0.2078634***	***0.2048432***	***0.2092824***
	(0.0443571)	***(0.0448472)***	***(0.0443571)***	***(0.044994)***
ID country code	***/***	***/***	***/***	***0.5641789***
				(0.9698005)
Constant	***-7.115912***	***-11.27087***	***-7.115912***	***-11.17423***
	(4.098568)	***(5.221626)***	***(4.098568)***	***(6.341948)***
Observations	***191***	***191***	***191***	***191***
R-squared	***0.8825***	***0.8815***	***-***	***-***
F	***468.04***	***298.19***	***.***	***.***
Chi2	***.***	***.***	***1404.11***	***1134.08***
Model	***OLS***	***Fe***	***Re***	***.***
Comand	***Regress***	***xtreg***	***xtreg***	***Xthtaylor***

Number of ID	**.**	***3***	***3***	***3***

Through this regression we will try to quantify how much the independent variable, with special emphasis of exchange variable will affect the prices index of consumption, meaning increase or decrease of inflation for selected countries acceding to the European Union, where as a Mastriht condition is prices stability. As we mentioned above, in regression we will introduce also other controlling variables of interest rates of credits in short term, which have control above the variable of prices index of conspumption meaning an increasement or decreasement of interest rate will have positive or negative impact in inflation.

The results of above mentioned methods are being presented in graphicaly form (Table 4.1). Due to presence of unobservable individual heterogeneity, the pooled OLS estimator is biased. After estimating the proposed model using the fixed and random effects methods, Hausman Test (Table A5) compares the results of the fixed effects estimator, which is more consistent, with the results of the random effects estimator. Based on the statistical results of Hausman test (4.45) we can conclude that the random effects estimator, is inconsistent, implying that there is correlation between the included variables and the error term, and therefore the fixed effects estimator is a better choise than the random effects estimator.

Also, based on the proposal that endogeneity problems are present in the data used, we chose the method of Hausman-Tylor as the best method that will eliminate these problems via using a second test for Husman make comparisons between 'Fixed Effects' and Hausman Taylor. Of the two proposed alternatives, and based on the results of the same test result (2:36), we can conclude that the method 'HaumanTaylor-IV' is the best choice. So, the problems concerning the correlation between the variables included in the model and the 'error term' that present partially to preventor 'Random-Effects, are eliminated through the use of instrumental variables.

4.1 Results from the Model

In this scientific research we have followed the steps of Choudhri and Hakura (2001), Gagnon and Ihrig (2001), CORTICELLI (2004), Bailliu and Fujii (2005), Fetai (2010), Kazerooni (2012) from where I am consistent and in accordance with the change in the exchange rate that affects the prices. Unlike other authors who in maintaining price stability gave priority to economic growth and other monetary measures, in our model we have included the consumer price index, exchange rate and interest rates of short term loans Short in order to present the effect of prices stability.

Therefore, using the method Hausman-Taylor IV, variables like **Exch** (exchange rate), **Lend_Irr** (loan interest rates) which vary over the time, are considered to be exogenous and therefore we can use them as instruments and variables as (CPI_{it-1}) (consumer price index in the initial level) and lnEXCH (logarithm of the exchange rate) are also variables that vary over time, but are defined as endogenous.

In our model we have used CPI consumer price index with a lag of one year as a variable for controling the 'steady-state' convergence predicted by other models of the prices level. From the estimated coefficient (CPI_{it-1}) 0.8515708 (than 0.0329302), is shown a significant positive correlation between the initial level of CPI on prices. So the positive coefficient of the consumer price index in the initial level explains that the increasement of 1% of (CPI_{it-1}) will have a positive impact on inflation. Also, we can conclude that the level of inflation of these countries is considered to be in a higher level especially in different time periods, during the transitional period, the political and economic crises where inflation appears in two-digit numbers which can have impact in the future.

As noted above, to test the effect of exchange rate on prices as the dependent variable we take CPI, while as independent variables we have lnEXCH (the exchange rate) in logarithm. Havin in consideration that the data about the exchange rate were in absolute numbers, we put them in the logaritm, so that this variable is consistent with other variables in the model and to be easier for interpretation. As you can see in the table,from the results of the regression coefficient 1.792951 (s.e1.103001) we see that the exchange rate has a positive effect on prices. The result reflects the fact that 1% increase in the exchange rate will affect the average price increasement of 1.79% while keeping constant the other variables. From the results we can see that the exchange rate is a potential sourse which effects upon prices, from where I am consistent and compliance with most of the papers done by the authors regarding to small and open economies in transition such as Kuijs (2002) , Ganev et al (2002) Bailliu and Fujii (2005) Fetai (2010) Kazerooni (2012). Kuijs confirmed the effect of exchange rate on prices for Slovakia with coefficient 0.2, Ganev et al.confirmed the coefficient of (1.0) in some of the countries in transition (1.0) for the Czech Republic, Bulgaria, Romania, Slovakia etc.. Fetai also confirmed the coefficient of 0.52 of the effect of exchange rate on prices for the Republic of Macedonia. Besides McCarthy (2000) who explains that changing the exchange rate has a modest effect on prices, the rest of empirical evidence has the same stance on the impact of exchange rate on prices for countries in transition.

Therefore, based on the results of the empirical paper where the relationship between exchange rate and inflation is positive and significant, I can conclude that the stability of the exchange rate has a strong effect on the prices of countries involved in this research.

The exchange rate plays an important role in controlling inflation in the new EU member states and in countries qualified as potential candidates for EU case in our research (Republic of Macedonia, Albania and Serbia) where by Bitans (2005), Darvas (2001), Szapáry (2001) the objective for lower inflation has a special importance regarding to economic benefits and for their aspiration to meet the Maastricht criteria in order to be part of EMU.

As a variable in the model we have included Lend_IR (interest rate on short term loans) where according to the model we have the coefficient 0.2092824 (s.e0.044994) which enables us to understand that if interest rates rise by 1% we would have modest and positive effect on inflation which appears as inconsistent with the empirical theory. We are consistent with authors like Egert and McDonald (2006), Ganev et al. (2002), who explain that interest rates in the short term period for transition are functioning as weak channel for the transmission of monetary policy, while in Developed they are functioning as powerful channel. Kuijs (2002) clarifies that interest rates in Slovakia show a modest effect on economic activities due to the shallow level of financial intermediation in the financial sector, the lack of competition in the banking sector and a limited number of alternative sources of funding.

According to records and data from the model, interest rates in countries that are included in our model are determined by the National Bank for withdrawal of liquidity in the banking system or to increase the level of foreign reserves (Ribnikar and Bole 2006).As other factors for clarifying the results we have the high level of dollarization or Euroisation in these countries appearing from the limited areas for creating interest rates. While interest rates in the countries in transition are determined by the National Bank and are not created comform free market principles, i think that they do not have effect on prices for countries acceding to the EMU.

In the model we included the country code (contry code) for balancing the data in the model and sharing effects between countries, so that through such an instrument we have managed to find results for the three countries included in the model.

5. Conclusions

The main objective of this study was examination of the issue whether there is an impact of the exchange rate regime in prices for Western Balkan countries acceding to the European Union. Most authors in their studies have came up with conclusions that the overall stability of the exchange rate plays an important role and contributes to maintain the price level in countries with small and open economies.

In this paper we have included scientific data on the consumer price index (CPI), the exchange rate in relation to the euro (Exch) and interest rates of shortterm loans. Among this, we have applied advanced econometric techniques to assess the impact of exchange rate on prices. At the beginning, as a starting point for empirical analysis, we used pooled OLS, where his results we have compared with the results of other models, namely Fixed Effects, Random Effects, whereas based on the results of the Hausman test, the Hausman Taylor IV model is applied as the main model of interpreting the results.

Empirical results from the estimated model show that the exchange rate has a strong effect on maintaining price stability. To shed more light on the main objective of this study we confirm that the countries included in our model will have more benefits than costs for maintaining price stability by the use of fixed exchange rates. From the study I made separately for each country (Macedonia with a fixed exchange rate regime, Albania with managed flexible and Serbia with fluctated exchange rate) showed a strong effect of exchange rate on prices. Although all three countries have adopted different exchange rate regimes during the transition period, the effect of exchange rate on prices was positive and significant, also from the narrative analysis we see that the National Banks of the countries have repeatedly intervened in foreign exchange markets by aperciaton / depreciation of currency for maintaining price stability.

Now that the three Western Balkan countries are in the stage of acceding to the EU with maintaining price stability which is achieved especially by the regime of fixed exchange will have more benefits for both economic benefits, bringing their aspiration to meet the Maastricht criteria.

Appendix. A

T1.Description of variables

Nr	Variables:	Detaje	Kodi
1.	Inflation	Consumer prices idnex %	**CPI**
2.	Exchange rate	Exchange rate related to Euro	**EXCH**
3.	Interest rate	Interest rates of short term loans	**Lend_ir**
4.	Country code	Specifying number of each country	**ID**

T2.Data Summary

Variable	Observation	Mean	Std.deviation	Min	Max
CPI	192	12.02946	19.13718	-2.2	95.6
EXCH	192	87.08671	37.7593	5.9123	158.163
Lend_ir	192	19.4131	13.73786	8.8	80

T3.Description statistics according to countries

Countries		CPI	EXCH	Lend_ir
Albania	Min	-1.6	121.6914	11
	Max	39.3	158.163	26
	Mesatar	6.333125	133.515	16.3457
	Dev.Std	9.246017	9.068235	4.685841
Macedonia	Min	-2.2	56.1656	8.8
	Max	9.9	61.5577	21.55
	Mesatar	2.381031	60.6325	14.72891
	Dev.Std	2.758036	1.362089	4.74174
Serbia	Min	4	5.9123	10.3
	Max	95.6	123.2622	80
	Mesatar	27.37422	67.11266	27.16469
	Dev.Std	25.50477	30.53591	20.85299

T4.Results of Hausman testing

Results of Housman testing	***Chi 2***	***Prob> Chi 2***	***Results***
Fixed Effect vs Random Effects	*4.45*	*0.2168*	***Declaiment of Ho***

Fixed Effects vs Tylor	*2.36*	*0.5011*	***Accepted Ho***

Apendix B

Hausman Taylor

```
. xthtaylor icpi infllag1 lniexchange lend_inter code, endog(lniexchange)

Hausman-Taylor estimation                       Number of obs      =       191
Group variable: code                            Number of groups   =         3

                                                Obs per group: min =        63
                                                               avg =      63.7
                                                               max =        64

Random effects u_i ~ i.i.d.                     Wald chi2(4)       =     42.45
                                                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
        icpi |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
TVexogenous  |
    infllag1 |   -.134982   .1020662    -1.32   0.186    -.3350281    .0650641
  lend_inter |   .5844067   .1493129     3.91   0.000     .2917587    .8770546
TVendogenous |
 lniexchange |   .5465703   3.412863     0.16   0.873    -6.142518    7.235658
TIexogenous  |
        code |   9.162812   8.710377     1.05   0.293    -7.909213    26.23484
             |
       _cons |  -6.051962   22.39092    -0.27   0.787    -49.93736    37.83344
-------------+----------------------------------------------------------------
     sigma_u |  7.3687931
     sigma_e |  19.335253
         rho |   .1268223   (fraction of variance due to u_i)
------------------------------------------------------------------------------
Note:  TV refers to time varying; TI refers to time invariant.

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Fixed effect

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. xtreg icpi infllag1 lniexchange lend_inter, fe

Fixed-effects (within) regression               Number of obs      =       191
Group variable: code                            Number of groups   =         3

R-sq:  within  = 0.1801                         Obs per group: min =        63
       between = 0.0786                                        avg =      63.7
       overall = 0.1236                                        max =        64

                                                F(3,185)           =     13.55
corr(u_i, Xb)  = -0.4057                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        icpi |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    infllag1 |  -.1559131    .102324    -1.52   0.129    -.3577851    .0459588
 lniexchange |   1.369075   3.431089     0.40   0.690    -5.400017    8.138167
  lend_inter |   .5550394   .1496015     3.71   0.000     .2598951    .8501836
       _cons |   11.24212   18.34043     0.61   0.541    -24.94117    47.42541
-------------+----------------------------------------------------------------
     sigma_u |  14.384703
     sigma_e |  19.491395
--more--
```

Ramdom effect

```
. xtreg icpi infllag1 lniexchange lend_inter, re

Random-effects GLS regression                   Number of obs      =       191
Group variable: code                            Number of groups   =         3

R-sq:  within  = 0.1647                         Obs per group: min =        63
       between = 0.9996                                        avg =      63.7
       overall = 0.2584                                        max =        64

                                                Wald chi2(3)       =     65.14
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
        icpi |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    infllag1 |  -.0174064   .0340826    -0.51   0.610     -.084207    .0493942
 lniexchange |  -4.493529   3.230254    -1.39   0.164    -10.82471    1.837651
  lend_inter |   .7595951   .1356215     5.60   0.000     .4937818    1.025408
       _cons |   19.35868   17.83999     1.09   0.278    -15.60705    54.32442
-------------+----------------------------------------------------------------
     sigma_u |           0
     sigma_e |  19.491395
```

Pool OLS

```
. regress icpi infllag1 lniexchange lend_inter

      Source |       SS       df       MS              Number of obs =     191
-------------+------------------------------           F(  3,   187) =   21.71
       Model |  27212.0628     3  9070.68762            Prob > F      =  0.0000
    Residual |  78115.2206   187  417.728452            R-squared     =  0.2584
-------------+------------------------------           Adj R-squared =  0.2465
       Total |  105327.283   190  554.354123            Root MSE      =  20.438

------------------------------------------------------------------------------
        icpi |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    infllag1 |  -.0174064   .0340826    -0.51   0.610    -.0846421    .0498294
 lniexchange |  -4.493529   3.230254    -1.39   0.166    -10.86595    1.878892
  lend_inter |   .7595951   .1356215     5.60   0.000     .4920503     1.02714
       _cons |   19.35868   17.83999     1.09   0.279    -15.83482    54.55218
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Hausman Test-fixed vs random

```
. hausman fixed random

                 ---- Coefficients ----
                 (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                 fixed        random         Difference          S.E.
-------------+----------------------------------------------------------------
    cpilag1  |    .8353863     .8588193      -.0234329        .0148769
  lnexchange |    2.128529     1.116882       1.011647        .7139622
    lend_ir  |    .2078634     .2048432       .0030202        .0066118
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =          4.45
                Prob>chi2 =        0.2168
                (V_b-V_B is not positive definite)
```

Hausman test-fixed vs taylor

```
. hausman fixed .
```

	Coefficients (b) fixed	(B) xtaylor	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
cpilag1	.8353863	.8515707	-.0161844	.0103095
lnexchange	2.128529	1.79295	.3355788	.2012018
lend_ir	.2078634	.2092824	-.001419	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xthtaylor

Test: Ho: difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 2.36
Prob>chi2 = 0.5011
(V_b-V_B is not positive definite)

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