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Foreign Exchange Pressure in Two South-East European Economies

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Abstract

In this thesis, the determinants of foreign exchange market pressure on two South East European Economies (Albania and Romania), is explored. An Exchange Market Pressure Index is constructed for each of these countries and its relation to five critical economic indicators (domestic credit, budget deficit, real exchange rate, reserves adequacy ratio and current account) is assessed using Autoregressive Distributed Lag (ARDL) bounds testing methodology. Results indicate a long run cointegration relationship between the variables in both countries. Granger causality analysis indicates that the EMP is mostly influenced by the real exchange rate (in Albania), budget deficit (in Romania) and the reserves adequacy ratio (in both countries).

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Introduction: Balkan Countries and European Integration

After the fall of communism, the countries of Eastern Europe began their long and arduous task of transformation from socialist to market economies. The transitional period was characterized for almost all of them by economic instability, visible in all economic indexes. It took the better part of the 90's for these countries to modernize their society and stabilize their economy.

The countries of the Balkan region, in particular, form a distinct group among Eastern European economies, due to their common heritage as former provinces of the Ottoman Empire. This characteristic and its distinct sociopolitical implications made the economic transition of these countries more turbulent than the rest of Eastern Europe. Most of them experienced wars (like the countries of the former Yugoslavia) or pronounced sociopolitical turmoil (like the 1997 Albanian Rebellion) during the 90's which added to the mix, and in many instances fully unbalanced the economic indicators both of those countries and of their neighbors. Economic crises, capital flight, exchange rate depreciation, immigration or explosive inflation was common.

The advent of the new decade saw economic and political stabilization in the former communist bloc Balkan countries. The prospect of joining the EU was a decisive factor that pushed for modernization and reorganization. Bulgaria and Romania joined the EU in 2007, and Croatia in 2013. Serbia and FYROM are formally EU candidate countries, with Albania having also applied for candidacy status and Bosnia having formally expressed its wish to join the EU in the future.

The shared European ambitions of the Balkan countries are coupled with a long term wish to adopt the Euro. Adoption of the euro requires, among other preconditions, entry to the Exchange Rate Mechanism (ERM). This means that countries entering the ERM will have to operate a managed float of their exchange rate around a narrow (+/- 2,25%) or wider (+/- 15%) band for at least two years.

Irrespective of their long term wish to join the EU and Eurozone, the Balkan countries already have a strong relation with the Euro, conducting the majority of their bilateral trade and transactions with the Eurozone. Consequently, most of them have already tied, one way or the other, their national currencies to the Euro. Some countries use the Euro as their national currency, (Greece, Kosovo, Montenegro, Slovenia), others maintain currency pegs (Bosnia, Bulgaria, and FYROM) and Croatia operates a managed float on a stable range around the euro.

The current and future prospective associations of the exchange rates of the Balkan economies with the euro require active intervention from the monetary authorities in order to alleviate the foreign exchange market pressure on their currencies and so maintain their national currencies peg or band around the euro. So it is of great interest to study the nature of the exchange market pressure experienced by the Balkan countries in relation to the euro, starting from euro's introduction in 1999. The relative economic and political stability that the Balkan countries experienced during the last decade, compared to the troubled and transitional decade of the 90's, is an additional factor that makes this a suitable period in order to assess the causes of the exchange market pressure that they face and its relation to their fundamentals.

The Exchange Market Pressure Index

1) Formulation and Development

The idea for an exchange market pressure index was first born when it was realized that the market forces pushing for a depreciation or appreciation of a currency are fully reflected on the exchange rate only when a country operates a free float. Otherwise, when a country operates a managed float or a currency peg, the exchange rate movement, alone, does not constitute a full reflection of the underlying depreciating or appreciating pressure exercised on the currency by the market.

This fact was highly problematic, since the exchange rate alone could not be trusted any more as a reliable source of information about the true relation between the supply and demand for the currency in the market, and since these forces were not fully reflected on the exchange rate, one could not reliably study the relation of economic fundamentals with the exchange rate, for as long as these rates were manipulated by the monetary authorities.

The first concept of exchange market pressure appeared at Girton & Roper (1977) when they derived the first *Exchange Market Pressure (EMP)* index as a byproduct of a macro model analysis of the balance of payments.

Girton & Roper's introduced a new way of understanding exchange rate dynamics: If the change on the exchange rate under a free float can be considered as a full reflection of the market pressure applied on the currency then, under a managed or "dirty" float, when the exchange rate only partially reflects this pressure, the part of the pressure that is not reflected by the exchange rate can be portrayed by the corresponding change in the policy tools used by the monetary authorities in order to alleviate this pressure.

So a full representation of the exchange market pressure experienced by a currency under a "dirty" float could be conceptualized as:

Exchange Market Pressure	=	*Change in Exchange Rate*	+	*Change in policy tools used to alleviate the pressure*

Consequently, in the extreme case of a currency peg where a change in the exchange rate would be non-existent, the exchange market pressure will be represented 100% by the change in the policy tools used to alleviate the pressure.

The most direct tool that a monetary authority has in order to manipulate the exchange rate is the *foreign exchange reserves*. So Girton and Roper's EMP index was the simple sum of the change in the exchange rate and the change in foreign reserves.

$$EMP = \frac{E_t - E_{t-1}}{E_{t-1}} - \frac{R_t - R_{t-1}}{M_{t-1}} = \frac{\Delta E_t}{E_{t-1}} - \frac{\Delta R_t}{M_{t-1}} \qquad (1)$$

$EMP = Exchange\ Market\ Pressure, E_t = Exchange\ Rate,\ R_t = Foreign\ Reserves,$

$M_t = Base\ Money$

A notable observation made by Roper & Turnovsky (1980) is that this simple measure assigns equal weights to the change in the exchange rate and the change in the international reserves, regardless of the true extend of the intervention. In order to alleviate this they introduced, for the first time, a weighting scheme:

$$EMP = \beta_1 \frac{\Delta E_t}{E_{t-1}} - \beta_2 \frac{\Delta R_t}{M_{t-1}} \tag{2}$$

with the weights β_1, β_2 estimated by the underlying macro model.

Roper & Turnovsky's idea greatly increased the applicability of the exchange market pressure index, since with the introduction of a weighting scheme the EMP Index can accommodate the study of any kind of exchange rate regime, be it a free float or a currency peg.

The standardization of the model dependent version of the EMP index came with Weymark (1995, 1997a, 1997b, 1998). She defined, for the first time explicitly, the EMP index as:

"The exchange rate change that would have been required to remove the excess demand for the currency in the absence of exchange market intervention, given the expectations generated by the exchange rate policy actually implemented (Weymark 1995, p.278).

and she created a more generalized macro model basis for the derivation of the EMP, which is estimated in order to produce the weights in such a way that they transform the change in international reserves to equivalent exchange rate units.

The next notable contribution to the EMP theory came by Eichengreen et al (1996) in two fronts:

(a) they argued that the international reserves are not the only policy tool used by the monetary authorities in order to control the exchange rate. They pointed out that *interest rates* are also used for this purpose, and so they would have to be incorporated as a third element in the EMP index, after the change in the exchange rate and the change in international reserves and

(b) they proposed a *model independent* weighting scheme, assigning the weights based on the variance of the EMP components (more specifically the inverse of variance) in order to prevent volatile components from dominating the index.

$$EMP = \frac{1}{Var\left(\frac{\Delta E_t}{E_{t-1}}\right)}\frac{\Delta E_t}{E_{t-1}} + \frac{1}{Var((i_t - i_t^*))}(i_t - i_t^*) - \frac{1}{Var\left(\frac{\Delta R_t}{M_{t-1}}\right)}\frac{\Delta R_t}{M_{t-1}} \qquad (3)$$

Eichengreen et al's arguments introduced, for the first time, a radically different point of view on the EMP research: that the EMP index is not a monetary model-dependent construct, as it was exclusively perceived up to that point, and that the notion of exchange market pressure that does not always manifest in the exchange rate is a theoretically independent idea that can stand on its own. Thus, the structural components of the EMP index should not necessarily be constricted to the exchange rate and foreign reserves, as EMP's derivation from the monetary model dictates, but the functional form of the EMP index can be considered as a versatile and modifiable concept.

Ever since, the EMP empirical literature and theoretical research has split between Weymark's model-dependent approach, and Eichengreen et al's model independent approach, with the two camps maintaining conflicting views on the nature of the EMP Index.

Weymark's approach has the advantage of being theoretically more consistent and meaningful in the estimation of the weights. On the other hand different macro-models will produce different weights, and there are many models, none of which is universally accepted. Moreover, different models may be suitable for different countries, making comparisons difficult, or different models may be suitable for different time periods in the same country.

Eichengreen et al's approach has the advantage that is model-independent, it is more easily calculated, it is more suitable for comparisons between countries and, most important of all, it is easily modifiable. For example, it allows for the inclusion of the interest rates in the EMP index which, especially after the 1992-1993 ERM crisis, have been an increasingly important exchange rate control mechanism.

Other approaches to the identification of the specific weights of the EMP index can be found with Pentecost et al (2001) who used principal component analysis to identify the weights, and Klaasen (2012) who presented a method based on instrumental variable estimation.

Finally, an important contribution to the theory of EMP is the work of Klaasen & Jager (2011), who introduced a novel, model-independent derivation of the EMP Index using considerably less constrictive assumptions than those of the traditional monetary model, and thus providing Eichengreen et al's (1996) original idea of a model-less EMP with a theoretical basis. They also identified flaws on commonly used specifications of the EMP Index, especially in the construction of the interest rate component, and showcased the improved performance of the EMP Index after the correction of these flaws.

Contrary, though, to the recent trend of including an interest rate component in the EMP Index, Klaasen & Jager (2011) noted that interest rates are not always used by authorities as an exchange rate manipulation tool, and therefore the inclusion of an interest rate component in the EMP index should be considered only in a case by case basis and not as a principle, less it produces misleading results.

2) Advantages

A particular advantage of the EMP index compared to other types of analysis is that it is not "crisis" based: Up until the invention of the EMP index, exchange market pressure could only be ex post detected. Market pressure could build up on the currency, undetected, until the monetary authorities could no longer sustain a currency peg due to diminishing foreign reserves, and the currency suddenly crushed. So, only events of exchange market pressure that resulted in successful speculative attacks could be analyzed, while instances of increasing but not critical market pressure or unsuccessful speculative attacks were passing unnoticed.

Furthermore, and due to its "crisis based" nature, the pre-EMP study of the market pressure was, by default, based on the analysis of short term shocks. But in reality, exchange market pressure can also be a long term condition, where a currency can conceivably be in a long term low intensity pressure by the market. Such a long term pressure either manifests itself as a steady long term appreciation/depreciation of the currency, or can be successfully absorbed for years by monetary authorities well stocked in foreign reserves and active in interest rate manipulation. With the EMP index, the exchange market pressure could now be mapped in continuous time and in the long term, and so its association with other economic variables assessed on a broader temporal basis.

3) Empirical Literature

Since its inception, the EMP index has been used to assess the determinants and the impact of exchange market pressure in various countries and with various techniques. Its ability to accommodate any kind of exchange rate regime using a weighted scheme resulted in a notable increase to the usage and popularity of the EMP, both in academic circles as well in economic institutions, and even the press. For example, IMF (2007) and The Economist (2010) use the EMP index to analyze capital movements, and IMF (2009) incorporates the EMP index as one of the five elements of its financial distress index.

There are two kinds of research usually conducted and involving the EMP Index.

The first and more general include simple mappings of the EMP index for various countries as a crisis identification and policy determination tool. See for example Funke(1996), Blankson (2003), Hallwood(2003), Van Horen et al (2006), Haile & Pozo (2006) Horvath (2007), Stavarek (2007, 2010), Bertoli et al (2008), Frankel & Wei (2008), Frankel & Xie (2010), McFarlane (2010), Kemm & Lyakir (2011), Gilal (2011), Grabowski (2011), Hall (2011), Klaassen & Jager (2011), Klaassen (2012), Li et al (2012), Ziaei (2012).

The second kind of research moves a step further and attempts to identify the specific determinants of exchange market pressure for a country or a set of countries. Table A presents a collection of empirical research that moves in this direction, as well as the left hand variables that each paper identified as statistically significant in the majority of countries studied.

Empirical applications of the EMP have primarily concentrated on the application of VAR techniques and panel data with a relative lack of classic cointegration techniques. The choice of VAR is due to the fact that VAR helps to avoid the endogeneity problems commonly found between EMP and certain monetary variables (like domestic credit). The relative absence of classic co-integration has to do with the fact that EMP is always found to be I(0). This is also the reason that ARDL has become the most recent “trend” in EMP literature, due to its ability to analyze not only short term but also long term co-integrational relationships between I(0) and I(1) variables.

TABLE A: Exchange Market Pressure Empirical Research – Part I				
Papers	**Countries**	**EMP Model Dependence**	**Methodology**	**Significant Variables**
Girton & Roper (1977)	Canada	Dependent	Cochrane-Orcutt	Domestic Credit, Domestic Income, Foreign Income
Konolly & Silveira (1979)	Brazil	Dependent	Cochrane-Orcutt	Domestic Credit
Hodgson & Schneck (1981)	Canada, France, West Germany, Belgium, Netherlands, Switzerland, UK	Dependent	2SLS	Domestic Credit, Domestic Money Multiplier
Kim (1985)	Korea	Dependent	OLS	Domestic Credit, Real Wage Income
Wohar & Lee (1992)	Japan	Dependent	Cochrane-Orcutt	Domestic Credit, Domestic Income
Mah (1998)	Korea	Dependent	Hildreth-Lu	Domestic Credit, Foreign Prices, Real Income, Money Multiplier
Shiva & Bahmani (1998)	Iran	Dependent	OLS	Domestic Credit, Money Multiplier
Karfakis(1999)	Greece	Independent	VAR	Real Exchange Rate, Reserve Adequacy Ratio, Current Account, Net Capital Movement
Mathur (1999)	India	Dependent	OLS	Domestic Credit, Domestic Income
Pollard (1999)	Barbados, Guyana, Jamaica, Trinidad & Tobago	Dependent	OLS	Domestic Credit, Money Multiplier, PPP, Real GDP
Kamaly (2000)	Egypt, Tunisia, Turkey	Dependent	VAR	Domestic Credit
Tanner (2001) (2002)	32 Emerging Economies	Dependent	VAR	Domestic Credit, Interest Rate Differential
Pentecost et al (2001)	Belgium, France, Italy, Spain, Finland	Dependent	OLS	Money Supply, Interest Rate Differential, Competitiveness, Current Account, Budget Deficit
Karfakis (2004)	Czech Republic, Poland	Independent	PROBIT	Reserve Adequacy Ratio, Domestic Credit, Real Exchange Rate
Macedo (2004)	Macau	Dependent	GARCH	Interest Rate Differential, Budget Deficit
Tudela (2004)	20 OECD Economies	Independent	Duration Analysis	Current Account, Domestic Credit, Public Debt, Foreign Portfolio Investments, Real Exchange Rate
Modeste (2005)	Guyana	Dependent	ECM	Foreign Debt, Oil Price
Chung (2005)	Korea	Dependent	2SLS	Domestic Credit, Interest Rate Differential
Younus(2005)	Bangladesh	Dependent	ECM	Domestic Credit, Foreign Inflation

TABLE A: Exchange Market Pressure Empirical Research – Part II				
Papers	**Countries**	**EMP Model Dependence**	**Methodology**	**Significant Variables**
Bird & Mandilaras (2007)	Latin America & Caribbean	Independent	Panel	Public Debt, Domestic Credit, Interest Rate Differential
Khawaza (2007)	Pakistan	Dependent	VAR	Domestic Credit, Interest Rates
Maceda (2007)	Angola, Cape Verde, Guinea-Bissau, Mozambique, Sao Tome & Principe	Independent	GARCH	Domestic Credit
Mody & Taylor (2007)	Thailand,Indonesia,Philippines, Malaysia, Singapore, Korea	Independent	Dynamic Factor Analysis	Foreign Debt, Domestic Credit, Stock Market Prices
Poek et al (2007)	Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia	Independent	Panel	Domestic Credit, Current Account
Jayaraman & Choong (2008)	Fiji	Independent	ARDL Bounds Testing	Domestic Credit, Budget Deficit, External Debt, Uncertainty
Feridun (2009)	Turkey	Independent	ARDL Bounds Testing	Banking Sector Fragility, Reserves Adequacy, Real Exchange Rate
Fiess & Shankar (2009)	14 Latin American & East Asian Countries	Independent	Panel Data	External Debt, GDP Growth
Lin & Juan (2009)	China	Dependent	VAR	Domestic Credit, Interest Rate Differential
Aizenman & Hutchison (2010)	26 Emergent Economies	Independent	OLS	External Debt
Hegerty (2010)	Brazil, Chile, Colombia, Mexico, Peru	Independent	ARDL	GDP Growth, Inflation, Oil Price
Gunsel et al (2010)	Argentina, Brazil, Mexico, Malaysia, Philippines, Korea,Thailand, Russia, Turkey	Independent	LOGIT	Real Interest Rate, Inflation, GDP Growth, Budget Deficit, Real Exchange Rate, Reserves Adequacy
Panday (2011)	Nepal	Dependent	IIS (Impulse Indicator Saturation)	Domestic Credit, GDP Growth
Rochester (2012)	Jamaica	Independent	VAR	Portfolio Investments

The Autoregressive Distributed Lag Bounds Testing Methodology

1) Reasoning

This study will attempt to identify the determinants of the EMP in the two countries of interest by using the Autoregressive Distributed Lag methodology (Pesaran et al 1996; Pesaran 1997; Pesaran et al 1998; Pesaran and Shin 1999) and in particular its bounds testing variant as proposed and developed by Pesaran et al (2001).

The reasons are simple. As we it was mentioned before, the exchange market pressure index maps the pressure in the exchange rate in continuous time, and presents the opportunity to study exchange market pressure not only in a short term "crisis" based point of view, but also in the long term. So it would be of great scientific interest if it would be possible to apply co-integration techniques on the study of EMP, like those of Engle & Granger (1987) and Johansen & Juselius (1990) and Johansen (1995).

But for anyone who would like to apply co-integration analysis on the EMP index, there is a problem: By its nature and construction, EMP tends almost always to be I(0). This automatically excludes the classic co-integration techniques, since they require all the underlying variables to be I(1). Thus, the study of the EMP from a co-integrational point of view is highly problematic due to its very nature, which conflicts with many of the most critical determinants of exchange market pressure (like domestic credit), that tend to be I(1) variables. Furthermore, pre-testing the order of integration of the underlying variables that the classical co-integration techniques requires adds an uncomfortable level of uncertainty in the study of level relationships and is prone to pre-test specification error (for example Cavanagh et al 1995).

Pesaran et al (2001) identified this problem, and devised a methodology for the study of the relationship between level variables which accommodates both I(0) and I(1) variables (and so does not involve pretesting), and is able to ascertain the existence of a long run relation irrespective of the order of integration of the underlying regressors.

2) Description

In the framework of an unrestricted Error Correction Model (ECM), the F-statistic of a generalized Dickey-Fuller type regression is used to test the significance of lagged levels of the variables:

$$\Delta y_t = \beta_0 + \sum_{\kappa=1}^{p} \beta_{1k} \Delta y_{t-k} + \sum_{\lambda=1}^{q} \beta_{2\lambda} \Delta \chi_{1t-\lambda} + \sum_{\mu=1}^{r} \beta_{3\mu} \Delta \chi_{2t-\mu} + \cdots$$
$$\ldots + \theta_0 y_{t-1} + \theta_1 x_{1t-1} + \theta_2 x_{2t-1} + \cdots + u_t \quad (4)$$

Pesaran et al showed that performing an F-test under the null of no relationship in the levels between variables, and irrespective of whether these variables are I(0), I(1) or mutually co-integrated, the asymptotic distribution of this particular F-Statistic is non-standard.

Then they provide critical values for the two polar cases which assume that (a) all regressors are I(0) and (b) all regressors are I(1). This set of critical values constitute *critical value bounds* that classify the regressors into purely I(0) ,purely I(1) or mutually co-integrated.

So they created a bounds testing procedure, where if the critical F-statistic falls outside the critical value bounds, then a conclusive inference can be drawn without needing to know the exact integration status of each regressor.

If, on the other hand, the F-statistic happens to fall in between the two critical bound values, then inference is inconclusive, and only then the identification of the specific integration status of the regressors is required prior to any conclusions.

More specifically, they showed that

(a) for an F-statistic greater than a specific upper bound, the underlying variables of the regression are classified as purely I(1)
(b) for an F-statistic smaller than a specific lower bound the underlying variables of the regression are classified as purely I(0)
(c) for all the values of the statistics between these two bounds, the variables of the regressions are classified as a mix of I(0) and I(1) variables.

Then, they constructed tables indicating the upper and lower critical bounds of the F-test for any number of regressors.

So, Pesaran et al established the following bounds testing procedure: in the previously mentioned conditional unrestricted ECM model

$$\Delta y_t = \beta_0 + \sum_{\kappa=1}^{p} \beta_{1k} \Delta y_{t-k} + \sum_{\lambda=1}^{q} \beta_{2\lambda} \Delta \chi_{1t-\lambda} + \sum_{\mu=1}^{r} \beta_{3\mu} \Delta \chi_{2t-\mu} + \cdots$$

$$\ldots + \theta_0 y_{t-1} + \theta_1 x_{1t-1} + \theta_2 x_{2t-1} + \cdots + u_t$$

an F-test is performed on the null hypothesis of no-level relationship between the levels: $H_0\colon \theta_0 = \theta_1 = \theta_2 = \cdots = 0$ and the alternative $H_1\colon \theta_0 \neq \theta_1 \neq \theta_2 \neq \cdots \neq 0$.

The result of the F-test is then compared to the critical bounds indicated in the tables provided by Pesaran et al (2001).

(a) If the computed F-Statistic is higher than the upper bounds value indicated in the tables (and thus falling into the “purely I(1) zone”), the null is rejected and we conclude that there is a long run equilibrium relationship between the variables.
(b) If the computed F-Statistic is lower than the lower bounds value (and thus falling into the “purely I(0) zone”), then we cannot reject the null of no long run equilibrium relationships
(c) If the computed F-Statistics is between the lower and upper bounds value, then the result is inconclusive.

Then, per Granger’s (1986) work, the identification of a long run equilibrium relationship should be followed by an associated VECM in order to distinguish between long term and short term effects, and establish causality.

Finally, Narayan (2004, 2005) supplemented Pesaran et al’s work on the ARDL bounds testing procedure by producing tables for critical values optimized for small samples (30-80 observations).

3) Advantages

The advantages of the ARDL bound testing compared to normal co-integration are important.

(a) It is able to analyze level relationships of a mix of I(0) and I(1) variables.

(b)It is considered more reliable for small samples than the traditional Johansen Co-integration method (Pesaran et al 2001). It is notable that Narayan's (2004) demonstration of the suitability of the ARDL procedure for small samples uses an example of just 31 observations.

(c) It can analyze both the short run and long run relationships among the variables simultaneously, therefore avoiding problems associated with omitted variables and autocorrelation.

(d) It allows for different lag structure for each variable of interest (compared, for example, to VAR, which requires the same lag length for all the variables under study).

Data

This study does not constitute the first time that the ARDL bounds testing procedure has been used to analyze exchange market pressure. Jayaramann & Choong (2008), Feridun (2009) and Hegerty (2010), all have used Pesaran's ARDL bounds testing procedure to analyze the EMP, following a standardized methodology that it will also be used here.

Though most of the SE European Countries maintain a currency peg with the euro, it was decided that for reasons of simplicity, investigative interest and comparability with past studies, to focus testing on the two SE European Economies that operate a managed float: Albania and Romania, and use the US dollar as a reference currency.

Review of the EMP literature shows that, despite of the fact that there are some prominent elements between studies on the determinants of EMP, the nature of exchange market pressure can vary significantly between different countries depending on the period, the region, internal policies, the local or global situation at the time. The main interest of this study is not to prove (or disprove) previous findings and theories, but to identify the unique exchange market pressure profile of the two countries under study.

Taking this into consideration, the choice of the variables was made based on the evidence of previous findings on EMP literature (see Table A), and also taking account of the availability of data in the countries of interest.

The EMP Index is calculated and its relation to five economic indicators is analyzed*:* *Domestic Credit* (and more specifically *Banking Claims on Private Sector*), *Budget Deficit*, *Current Account*, *Real Exchange Rate* and *Reserves Adequacy Ratio*.

Domestic Credit(DC) *(or Banking Claims on Private Sector)* is the most widely used monetary aggregate by the models associated with exchange market pressure. It is used as a proxy of monetary growth, but also as an indicator of expansion and stability of the banking sector. Feridun (2009), in his study of the exchange market pressure in Turkey, splits domestic credit in three separate banking fragility indicators, showcasing the dual importance of this measure in exchange market pressure determination.

Current Account (CA), representing a country's transactions with the foreign world, is a traditional theoretical determinant of exchange rate movement. A classic dilemma in research is whether to use the current or the financial account in regressions to better represent this impact of external transactions in the exchange rate. Since Balkan countries had more complete data for the current account than financial account, the choice fell on the first one.

Budget Deficit (DEFICIT) is a variable that only relatively recently has been shown to have an impact on exchange market pressure. Though hints of its influence were present before, like in Pentecost et al (2001), the breakthrough publication on this was Bird & Mandilaras (2006), who showcased the importance of budget deficit on exchange market pressure in Latin American economies. Theoretically, budget deficit can negatively affect the currency due to massive external borrowing and gradual inflation of external debt, a channel that Bird & Mandilaras (2007) also showed to be valid. First generation currency crisis models also indicate (see Eichengreen 1999), that as long as budgetary imbalances can have inflationary consequences, they can lead either to a devaluation or loss of competitiveness (in the case of a currency peg), resulting in current account imbalances, loss of reserves and, eventually, currency crisis.

Real Exchange Rate (RER) is also a classic theoretical source of exchange market pressure. Theory suggests that PPP (Purchased Power Parity) should hold in the long term, and that it should compel exchange rates to, eventually, adjust in response to perceivable gaps in the price levels between countries, thus a drifting real exchange rate compared to nominal would, in time, create pressure on the currency towards realignment.

Finally, *Reserves Adequacy Ratio (RAR)*, expressed as the ratio of M2 to foreign reserves, constitutes an objective measure of a country's ability to manipulate its exchange rate using foreign reserves. A low reserves adequacy ratio can create expectations in the market that the government cannot maintain a currency peg or a managed float for much longer, thus triggering speculative pressure on the currency.

Data accumulation proved to be a considerably difficult task, so much as to transform entirely the range and the scope of this particular study from its original conception as an all-encompassing Balkan analysis. Low frequency and a limited variety of data was endemic among the Balkan countries for many of the variables of interest, presenting a considerable obstacle in order to produce a meaningful sample size and sufficient temporal depth common for all countries. It also explains the relative absence of previous regional multivariable comparative economic analysis for the region. This particular obstacle was also one of the most important reasons that the ARDL bounds testing methodology was selected for this study, since there was a need for a method with good small sample behavior that could produce both short term and long term results and could also accommodate both I(0) and I(1) variables.

It was soon realized that monthly data covering the whole of the previous decade was out of the question, and so quarterly data starting from 2003 had to be used. Data were sourced from the IMF International Financial Statistics database, except for domestic credit (Banking Claims on Private Sector), which was sourced from the central bank databases of the respective countries.

All variables are in logs, except for the EMP, current account and budget deficit. The last two are seasonally adjusted. Budget balance data were used for the Budget Deficit, so positive values of the DEFICIT data series indicate a surplus and the negative indicate a real deficit. The Real Exchange Rate was constructed as $RER = E_{USD} \times \frac{CPI_{US}}{CPI_D}$ where E_{USD} is the exchange rate (units of national currency per US Dollar), CPI_{US} is the US Consumer Price Index, and CPI_D is the domestic Consumer Price Index.

Testing Steps

1) Calculation of the EMP Index

Eichengreen et al's (1996) model independent variant of the EMP index is implemented, excluding an interest rate term and using the inverse of variance for the calculation of the specific weights.

$$EMP_t = \frac{1}{Var\left(\frac{\Delta E_t}{E_{t-1}}\right)}\frac{\Delta E_t}{E_{t-1}} - \frac{1}{Var\left(\frac{\Delta R_t}{M_{t-1}}\right)}\frac{\Delta R_t}{M_{1t-1}}$$

The exchange rate E_t conveys units of national currency per US dollar. The formula is structured in such a way that an *increase (decrease)* in EMP_t should be understood as a *depreciating (appreciating)* pressure on the currency.

2) ARDL Bounds Testing Unrestricted ECM & Lag Length Selection

Following Pesaran et al (2001) the following unrestricted ECM is formulated

$$\begin{aligned}\Delta EMP_t = \beta_0 &+ \sum_{i=1}^{p} \beta_{EMPi} \Delta EMP_{t-i} + \sum_{j=1}^{q} \beta_{CAj} \Delta CA_{t-j} + \sum_{k=1}^{r} \beta_{DCk} \Delta DC_{t-k} \\ &+ \sum_{\lambda=1}^{s} \beta_{BD\lambda} \Delta BD_{t-\lambda} + \sum_{\mu=1}^{u} \beta_{RER\mu} \Delta RER_{t-\mu} + \sum_{\nu=1}^{w} \beta_{RAR\nu} \Delta RAR_{t-\nu} \\ &+ \theta_{EMP} EMP_{t-1} + \theta_{CA} CA_{t-1} + \theta_{DC} DC_{t-1} + \theta_{BD} BD_{t-1} \\ &+ \theta_{RER} RER_{t-1} + \theta_{RAR} RAR_{t-1} + u_t\end{aligned} \tag{5}$$

Lag length selection in the ARDL bounds testing procedure is of particular interest, since the flexibility of different lag lengths among the variables is allowed, and the method is particularly sensitive to lag length selection. In this particular study, dealing with six variables and considering a maximum lag length of four (and a minimum of zero), this means that there are $6^5 = 7776$ possible lag structures to choose from. So, usually, selection is done using automated information selection criteria.

However, certain other considerations apart from information criteria are usually taken in account during lag length selection, like the condition of no serial correlation in the residuals. In this particular study, an additional decision factor were the technical and over-parameterization difficulties of testing a lag length of 4 lags in a

30-40 observations sample size, which is not always possible (or wise), as well as the ability to perform diagnostic tests.

So the final model was chosen primarily by using automated information criteria selection for all the models of up to 3 lags with confirmation of no serial correlation and a general-to-specific approach was applied to the models with 4 lags by elimination of most non-significant regressors.

3) Estimation of ARDL Unrestricted ECM & F-Test

If the result of the F-test is above the upper value indicated in the tables provided by Pesaran et al (2001), and as improved by Narayan (2005), then a long term co-integrational relationship among the variables has been established. If it falls below a certain lower bound, the hypothesis of no level relationship cannot be rejected. If it falls in the middle, assessment of the exact integration status of each variable is needed before coming to any conclusions.

4) Estimation of Long Run Levels Regression

Conditional on the discovery of a long run equilibrium relationship, the long run equilibrium -“level’s”- regression is estimated

$$EMP_t = a_0 + a_{CA}CA_t + a_{DC}DC_t + a_{BD}BD_t + a_{RER}RER_t + a_{RAR}RAR_t + \varepsilon_t \qquad (6)$$

5) Estimation of the Vector Error Correction Model

Under the assumption of a long run cointegration relationship having been established in step 4, a Vector Error Correction Model is estimated in order to analyze short term relations and establish possible causality with the application of appropriate F-tests:

$$\begin{aligned}\Delta EMP_t = \gamma_0 &+ \sum_{i=1}^{p} \beta_{EMPi}\Delta EMP_{t-i} + \sum_{j=1}^{q} \beta_{CAj}\Delta CA_{t-j} + \sum_{k=1}^{r} \beta_{DCk}\Delta DC_{t-k} \\ &+ \sum_{\lambda=1}^{s} \beta_{BD\lambda}\Delta BD_{t-\lambda} + \sum_{\mu=1}^{u} \beta_{RER\mu}\Delta RER_{t-\mu} + \sum_{\nu=1}^{w} \beta_{RAR\nu}\Delta RAR_{t-\nu} \\ &+ \varphi ECT_{t-1} + \delta_t\end{aligned} \qquad (7)$$

where the error correction term (ECT) is:

$$ECT_{t-1} = EMP_{t-1} - \mathrm{a}_0 - \mathrm{a}_{CA}CA_{t-1} - \mathrm{a}_{DC}DC_{t-1} - \mathrm{a}_{BD}BD_{t-1} - \mathrm{a}_{RER}RER_{t-1} - \mathrm{a}_{RAR}RAR_{t-1} \tag{8}$$

The a's are the OLS estimates of the α's in equation (7) . A negative and significant error correction term coefficient is expected as a confirmation of the long term co-integrational relationship established in step 4.

6) Stability Tests

Application of QUSUM and QUSUMSQUARE tests to assess the stability of the regressions.

Results

The Microfit 4.1 package was used for the estimations. All models were initially tested with the inclusion of a trend, with no significant trend found, so it was removed. QUSUM and QUSUM Square stability tests were also performed at the end of all regressions, and all were found to be stable. Concise excerpts of the results and the most relevant diagnostic tests are provided below, while Microfit templates of the full results and the stability tests can be found in Appendices B (for Albania) and C (for Romania). Regression data length is 35 observations for Albania (2003Q4-2012Q2) and 38 observations for Romania (2003Q1-2012Q2)

Albania

1) General

Albania, in the first years after the end of communism, was one of the most impoverished countries of SE Europe, characterized by mass outward migration and being a major recipient of food aid.

Nevertheless, and after a first initial explosive phase, inflation stabilized at one digit levels and growth was high until 1995, when the economy started stagnating, inflation rose and budget deficit exploded, culminating in the 1997 collapse of a financial pyramid scheme which caused an armed rebellion in much of the country, fully unbalancing all economic indicators.

Chart I: Albania
Consumer Price Index

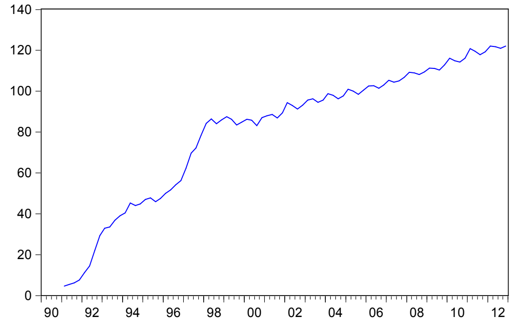
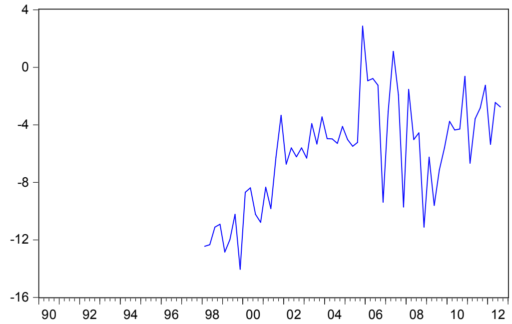


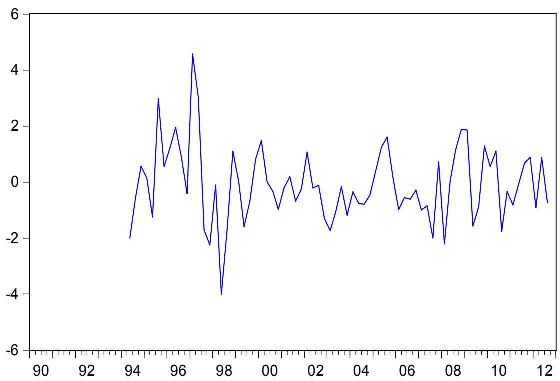
Chart II: Albania
Deficit % of GDP



The economy stabilized after this incident and under the guidance of the IMF and World Bank, Albania has taken considerable steps to modernize. Expatriate remittances constitute an important stabilizing element of Albania's balance of payments and its economy in general, which is also characterized by a large unofficial sector.

Chart III: Albania
LEK/USD Exchange Rate
(No. of Leks/US Dollar)

Chart IV: Albania
Exchange Market Pressure



2) <u>ARDL Bounds Testing</u>

The lag length selection for the main ARDL bounds testing regression produced an ARDL (3,3,3,2,3,3) model with results shown on Table B.

The ARDL Bounds Testing F-Statistic is 12,18 $(x^2[6] = 73{,}09[0{,}00])$ which is well above the 4,43 limit designated by the critical values at Narayan (2005), for six variables and 1% level of significance, indicating the existence of a long run association between the EMP and the variables of interest.

Table B: Albania

ARDL (3,3,3,2,3,3) Bounds Testing
Unrestricted Error Correction Model Results

Regressor	Coefficient	T-Ratio[Prob]
ΔEMP(-1)	.63369	2.7279[.034]**
ΔEMP(-2)	.14615	.63251[.550]
ΔEMP(-3)	-.13714	-1.1925[.278]
ΔCA	-.0054861	-.21686[.836]
ΔCA(-1)	-.021927	-.35749[.733]
ΔCA(-2)	-.071085	-2.0532[.086]*
ΔCA(-3)	-.019756	-.81430[.447]
ΔDEFICIT	-.0091143	-2.5145[.046]**
ΔDEFICIT(-1)	-.027403	-2.1165[.079]*
ΔDEFICIT(-2)	-.018137	-1.8454[.115]
ΔDEFICIT(-3)	-.0077976	-1.4648[.193]
ΔCREDIT	-121.409	-2.5025[.046]**
ΔCREDIT(-1)	.17544	.038772[.970]
ΔCREDIT(-2)	72.583	1.3224[.234]
ΔRER	265.345	8.8474[.000]***
ΔRER(-1)	418.460	3.4837[.013]**
ΔRER(-2)	318.464	4.6070[.004]***
ΔRER(-3)	188.303	2.3771[.055]*
ΔRAR	76.751	1.2122[.271]
ΔRAR(-1)	332.038	2.2045[.070]*
ΔRAR(-2)	145.622	1.5848[.164]
ΔRAR(-3)	50.780	.65431[.537]
Constant	-1.071.397	-1.5275[.177]
EMP(-1)	-26.598	-6.0300[.001]*
CA(-1)	-.011902	-.19679[.850]
DEFICIT(-1)	.018736	1.1720[.286]
CREDIT(-1)	-61.762	-1.9481[.099]*
RER(-1)	-193.578	-1.7142[.137]
RAR(-1)	-390.415	-1.6858[.143]

Notes: “Δ” prefix indicates first difference, “*” Indicates 10% level of significance, “**” Indicates 5% level of significance, “***” Indicates 1% level of significance. LM Test for Serial Correlation: F(4,2)=1.1046[.526], Heteroscedasticity F-Test: F(1,33)=1.0001[.325]. See Appendix B for complete results and diagnostic tests.

Long run equation coefficients can be seen on Table C.

Table C: Albania

Levels Regression

Regressor	Coefficient	T-Ratio[Prob]
CA	-.6724E-3	-.029096[.977]
DEFICIT	-.0087779	-1.7159[.096]*
CREDIT	22.562	3.9496[.000]***
RER	88.876	3.5596[.001]***
RAR	179.052	3.8712[.000]***
Constant	521.112	2.9103[.006]***

Notes: "*" Indicates 10% level of significance, "**" Indicates 5% level of significance, "***" Indicates 1% level of significance.
LM Test for Serial Correlation: F(4,29)=.37579[.824], Heteroscedasticity: F(1,37)=.35827[.553]. See Appendix B for complete results and diagnostic tests.

Using the long term regression to derive the error correction term, the final vector error correction model is constructed to study the short term effects (Table D) and Granger causality results are produced (Tample E).

Results seem to indicate that the real exchange rate and the reserves adequacy ratio are the main short term shocks driving the exchange market pressure in Albania. The error correction term is significant and negative, which is what we would expect if there is a long term co-integrational relationship among the variables.

3) Conclusions

Findings suggest that, though all five variables together appear to be in a long term equilibrium with the exchange market pressure, real exchange rate and reserves adequacy ratio appear to be the main short term shocks that drive exchange market pressure in Albania during the period of interest.

Table D: Albania

ARDL (3,3,3,2,3,3) Bounds Testing

Vector Error Correction Model

Regressor	Coefficient	T-Ratio[Prob]
ΔEMP(-1)	.36514	1.0178[.331]
ΔEMP(-2)	.055093	.18441[.857]
ΔEMP(-3)	.034433	.18162[.859]
ΔCA	.014165	.48965[.634]
ΔCA(-1)	-.031468	-1.0856[.301]
ΔCA(-2)	-.026987	-.92255[.376]
ΔCA(-3)	.029094	.97489[.351]
ΔDEFICIT	-.0040066	-.80831[.436]
ΔDEFICIT(-1)	.0068915	1.0067[.336]
ΔDEFICIT(-2)	.0055177	.80558[.438]
ΔDEFICIT(-3)	.0082767	1.5204[.157]
ΔCREDIT	56.161	.87917[.398]
ΔCREDIT(-1)	19.396	.40072[.696]
ΔCREDIT(-2)	-40.449	-.73941[.475]
ΔRER	188.082	5.3297[.000]***
ΔRER(-1)	-95.461	-2.1386[.056]*
ΔRER(-2)	58.917	1.0648[.310]
ΔRER(-3)	-92.953	-1.5108[.159]
ΔRAR	141.063	3.5302[.005]***
ΔRAR(-1)	-185.556	-2.5339[.028]**
ΔRAR(-2)	-28.093	-.35718[.728]
ΔRAR(-3)	-97.608	-1.4465[.176]
Constant	-.27898	-1.0357[.323]
ECT(-1)	-10.819	-2.1213[.057]*

Notes: "Δ" prefix indicates first difference, "*" Indicates 10% level of significance, "**" Indicates 5% level of significance, "***" Indicates 1% level of significance.LM Test for Serial Correlation: F(4,7)=2.0369[.193],Heteroscedasticity:F(1,33)=2.0195[.165].See Appendix B for complete results and diagnostic tests.

Table E: Albania

Granger Causality (ΔEMP)

Regressor Group	F-Test
ΔCA	0,742
ΔDEFICIT	1,190
ΔCREDIT	0,454
ΔRER	9,169***
ΔRAR	6,301***

Notes: "Δ" prefix indicates first difference "*" Indicates 10% level of significance, "**" Indicates 5% level of significance, "***" Indicates 1% level of significance. See Appendix B for Microfit χ^2 results.

Romania

1) <u>General</u>

Romania's transition to a capitalist economy during the 90's was characterized by a reluctance to implement the necessary modernizing reforms. That, coupled with the questionable economic policies of the Ceausescu regime during the 80's, resulted in persistent and explosive inflation and constant devaluation of the Romanian currency. It is notable that, for a brief time in 2005, the Romanian leu was probably the least valued currency in the world (individual banknotes of 1 billion leu nominal value were in circulation).

Chart V: Romania
Consumer Price Index

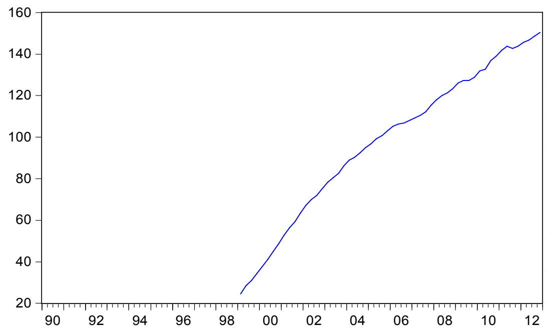
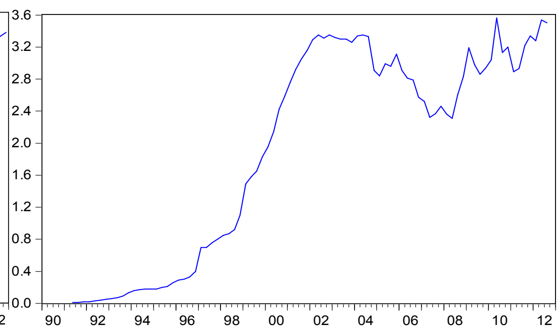
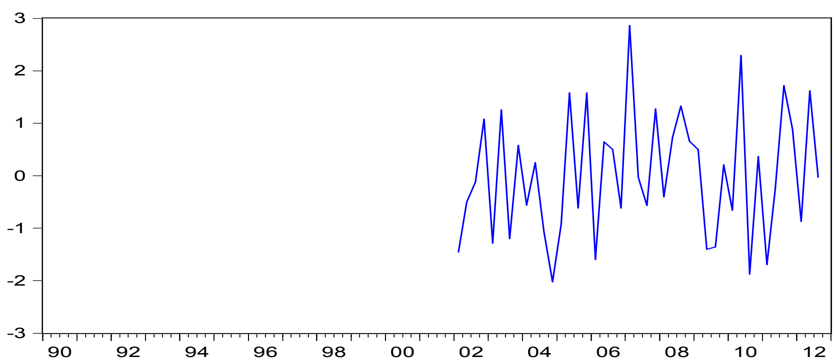


Chart VI: Romania
Leu Exchange Rate
(No. of Leu/US Dollar)



Due to the implementation of extensive reforms in the beginning of the 2000's, the economic indicators started stabilizing, and a reformation of the currency was implemented when the new leu was introduced in 2005. Romania joined the EU in 2007 actively pursuing the monetary and economic targets for the adoption of

Chart VII: Romania
Exchange Market Pressure



the Euro, with the entry in the ERM and the maintenance of a stable band around the Euro appearing to be the greatest challenge. However, budget deficit started worsening considerably after accession, prompting an IMF bailout in 2009 and the implementation of severe fiscal measures.

2) ARDL Bounds Testing

The lag length selection for the main ARDL bounds testing regression produced an ARDL (3,2,3,0,0,2) model (Table F).

Table F: Romania

ARDL (3,2,3,0,0,2) Bounds Testing
Unrestricted Error Correction Model Results

Regressor	Coefficient	T-Ratio[Prob]
ΔEMP(-1)	.77962	2.6585[.017]**
ΔEMP(-2)	.54402	2.3243[.034]**
ΔEMP(-3)	.50319	4.4330[.000]***
ΔCA	.7990E-3	4.4504[.000]***
ΔCA(-1)	-.5025E-3	-2.7985[.013]**
ΔCA(-2)	-.5709E-3	-2.7421[.014]**
ΔDEFICIT	-.3441E-4	-.51603[.613]
ΔDEFICIT(-1)	-.2801E-3	-2.4346[.027]**
ΔDEFICIT(-2)	-.2333E-3	-2.6299[.018]**
ΔDEFICIT(-3)	-.2012E-3	-2.9227[.010]**
ΔCREDIT	108.354	3.7367[.002]***
ΔRER	-.065492	-.12768[.900]
ΔRAR	72.133	2.7881[.013]**
ΔRAR(-1)	38.422	1.0010[.332]
ΔRAR(-2)	86.924	2.6294[.018]**
Constant	119.407	.56314[.581]
EMP(-1)	-22.119	-6.5342[.000]***
CA(-1)	.3661E-3	2.5060[.023]**
DEFICIT(-1)	.1509E-3	.87240[.396]
CREDIT(-1)	15.144	1.7519[.099]*
RER(-1)	.13015	.16607[.870]
RAR(-1)	27.932	.75597[.461]

Notes: "Δ" prefix indicates first difference, "*" Indicates 10% level of significance, "**" Indicates 5% level of significance, "***" Indicates 1% level of significance. LM Test for Serial Correlation: F(1,15)=1.4221[.252], Heteroscedasticity F-Test: F(1,36)=.056157[.814]. See Appendix C for complete results and diagnostic tests.

The ARDL Bounds Testing F-Statistic is 13,79 ($x^2[6] = 82{,}79[0{,}00]$) which is well above the 4,43 upper limit designated by the critical values at Narayan (2005) for 6 variables and 1% level of significance, indicating the existence of a long run association between the EMP and all the variables of interest.

Results of the level's relationships are presented on Table G.

Table G: Romania

Levels Regression

Regressor	Coefficient	T-Ratio[Prob]
CA	-.7239E-4	-.60245[.551]
DEFICIT	.8322E-4	.96467[.341]
CREDIT	.52030	1.1761[.247]
RER	-.034338	-.054142[.957]
RAR	35.552	1.3205[.195]
Constant	208.532	1.2661[.214]

Notes: "*" Indicates 10% level of significance, "**" Indicates 5% level of significance, "***" Indicates 1% level of significance. Serial Correlation LM Test: F(1,34)=4.0769[.051],Heteroscedasticity:F(1,39)=.57971[.451].See Appendix C for complete results and diagnostic tests.

Using the long term regression to derive the error correction term, we construct the final error correction model to study the short term effects (Table H) and Granger Causality results are also presented (Table I).

Table H: Romania

ARDL (3,2,3,0,0,2) Bounds Testing

Vector Error Correction Model

Regressor	Coefficient	T-Ratio[Prob]
ΔEMP(-1)	.80410	2.2037[.039]**
ΔEMP(-2)	.72354	2.5437[.019]**
ΔEMP(-3)	.48479	3.1512[.005]***
ΔCA	.2747E-3	1.2636[.220]
ΔCA(-1)	-.2228E-3	-1.0286[.315]
ΔCA(-2)	-.1127E-3	-.48548[.632]
ΔDEFICIT	.8302E-4	1.0736[.295]
ΔDEFICIT(-1)	-.1132E-3	-1.1248[.273]
ΔDEFICIT(-2)	.6517E-5	.068757[.946]
ΔDEFICIT(-3)	.5340E-5	.067720[.947]
ΔCREDIT	13.701	.45557[.653]
ΔRER	-.070429	-.16136[.873]
ΔRAR	76.090	2.5266[.020]**
ΔRAR(-1)	-29.109	-.92043[.368]
ΔRAR(-2)	46.355	1.4801[.154]
Constant	-.15330	-.64309[.527]
ECT(-1)	-21.449	-4.9065[.000]***

Notes: "Δ" prefix indicates first difference, "*" Indicates 10% level of significance, "**" Indicates 5% level of significance, "***" Indicates 1% level of significance. LM Test for Serial Correlation: F(1,20) = 0.039470[.845],Heteroscedasticity:F(1,36)=0.91023[.346].See Appendix C for complete results and diagnostic tests.

Table I: Romania

Granger Causality (ΔEMP)

Regressor	F-Test
ΔCA	.895
ΔDEFICIT	2.416**
ΔCREDIT	.207
ΔRER	.026
ΔRAR	4,93***

Notes: "Δ" prefix indicates first difference "*" Indicates 10% level of significance, "**" Indicates 5% level of significance, "***" Indicates 1% level of significance. See Apendix C for Microfit χ^2 results.

Results seem to indicate that reactions to the reserves adequacy ratio and budget deficit influences are the main short term shocks driving the exchange market pressure in Romania. Also of interest are the t- significant lagged first difference EMP values in the VECM, indicating a considerable self-reinforcing element in the character of exchange market pressure experienced by Romania in the period of study. The error correction term is significant and negative, as expected.

3) Conclusions

Findings suggest that, though all five variables together appear to be in a long term co-integrational relationship with the EMP, it is the reserves adequacy ratio and budget deficit that appear to be the main short term shocks affecting exchange market pressure in Romania.

Conclusions

The Exchange Market Pressure Index, since its initial inception in 1978 and subsequent improvements, has become an important new tool in order to understand the nature and causes of exchange rate movements. Since it is extremely difficult to find a genuinely free floating currency, any analysis of exchange rate movements that does not take into consideration state intervention in currency markets is bound to be either flawed or difficult at best. The EMP and other similar approaches give us an opportunity for deeper and more reliable economic analysis and policy recommendations.

Though an important innovation, the EMP Index still suffers as a tool of limited scope, and non-standardization. Exchange Market Pressure does not manifest itself only as exchange rate movement, change in foreign reserves and/or interest rates. During the recent financial crises, many countries showed a certain reluctance to use foreign reserves and opted, instead, to use central bank swap lines and/or the use of liquid assets in their sovereign wealth funds to control their currencies, while capital controls are still used in many countries to that effect. Eichengreen et all (1996) showed that the EMP index can be a flexible tool, modifiable to include additional manifestations of exchange market pressure, and research to that effect has already taken place, like Li (2012), but more needs to be done.

Standardization is also an issue. Every researcher uses slightly or entirely different versions of the EMP index, making comparisons of measurements among different publications impossible. A more commonly accepted structural form for the EMP Index would greatly improve comparative analysis.

Concerning the determinants of exchange market pressure on the two SE European Economies that maintain a free (or managed) float, Albania and Romania, the strong F-Test signals of the unrestricted ECMs indicate that all regressors (current account, budget deficit, domestic credit, real exchange rate and reserve adequacy ratio) are indeed in a long term equilibrium relationship with the Exchange Market Pressure, a fact that is also corroborated by the significant and negative error correction terms.

Identification of the directionality of this association using Granger causality analysis, though, shows that reserves adequacy is the main common element affecting the exchange market pressure experienced by both countries, which is indicative of speculative incentives. In Albania, reserves adequacy ratio was coupled with the real exchange rate in significance, which brings the country closer to the speculative pressure model of Sachs et al (1996). On the other hand, the identification of budget deficit as a significant factor in Romania is a positive nod to Bird & Mandilaras' (2006) findings, and an interesting result, since Romania experienced budgetary derailment and a subsequent IMF bailout stabilization programme during the period of study. Since the size of a country's budget deficit can be considered as an important indicator of this country's future economic stability, it would not be totally inappropriate to hypothesize that the common motive behind the foreign exchange pressure applied by the markets on the two countries is characterized, probably, by stability concerns.

Of interest is, also, the non-significance (in Granger causality terms) of domestic credit, one of the most noted determinants of EMP in the literature. On the other hand, the effect of domestic credit on the EMP always appeared, in literature, to be of mixed origin and somewhat bidirectional in nature (due to sterilized interventions), so the identification of a long term association without, necessarily, causation should not be particularly alarming. Finally, the absence of significant evidence on the part of the current account may also be explainable by the significant stabilizing elements in both countries' balance of payments, like expatriate remittances in the case of Albania and Romania's strong oil industry.

As the time passes and Balkan countries data series lengthens, more meaningful research can be eventually conducted, both in terms of data frequency as well as in terms of temporal depth and number of countries. Analysis of euro-centric currency pegs and stability of ERM bands will probably require the use of the euro as a reference currency to better study exchange market pressure in these conditions.

The inclusion of an interest rate component to the EMP Index would also greatly help in the analysis of the EMP experienced by small countries (like FYROM) that, due to the small size of their economies, lack the capacity to build sizable foreign exchange reserves to withstand a determined speculative attack, and thus increasingly resort to interest rates manipulation in order to more effectively manage their exchange rate.

Finally, this particularly study chose to focus on the impact of various variables on the EMP and not the other way around, which also carries with it a certain amount of interest: to see how an economy reacts to foreign exchange pressure. Such an undertaking, though, would definitely profit from the choice of a more suitable and fitting model specification and choice of parameters.

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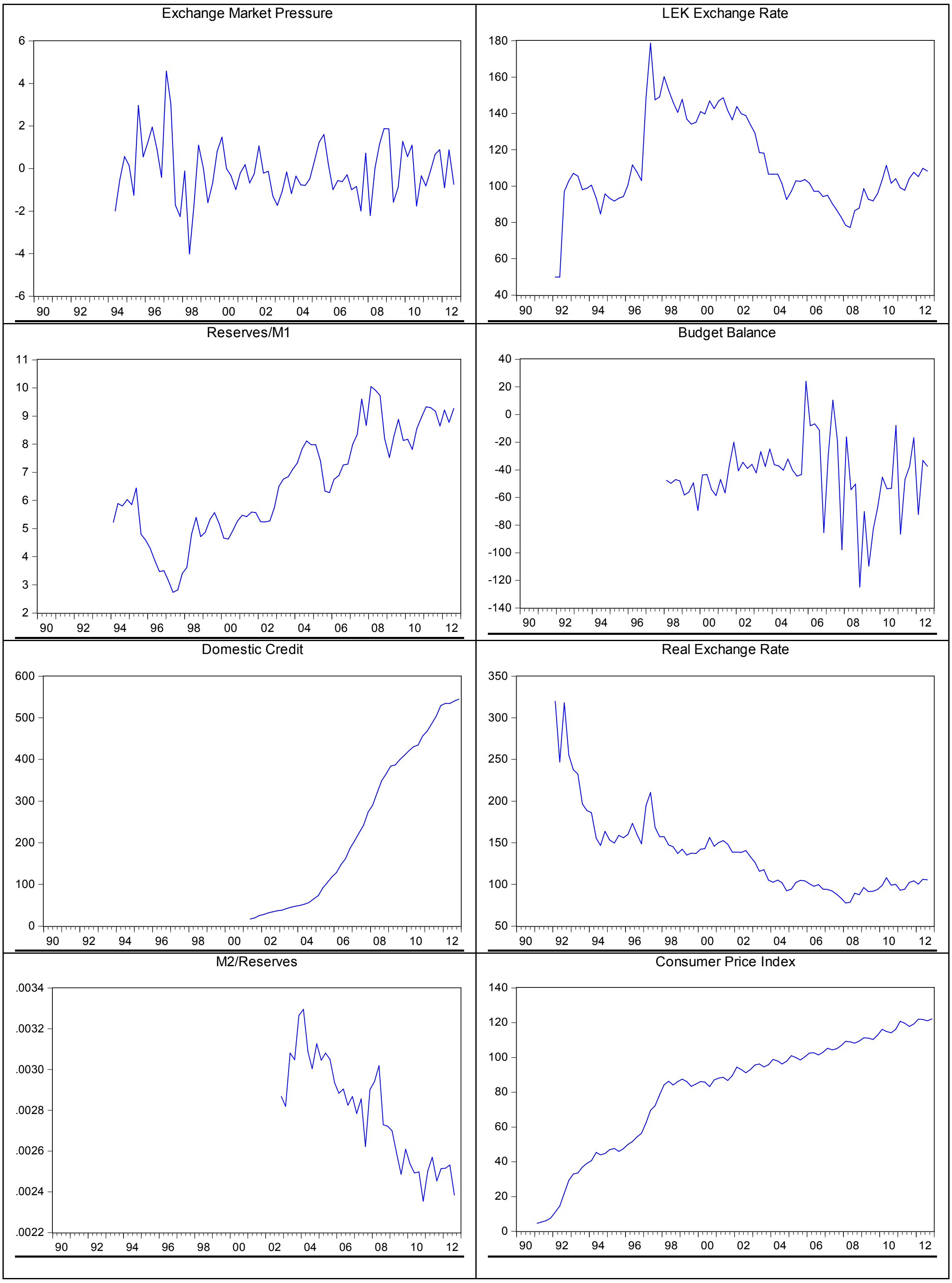
Appendix A: Charts

<u>ALBANIA</u>



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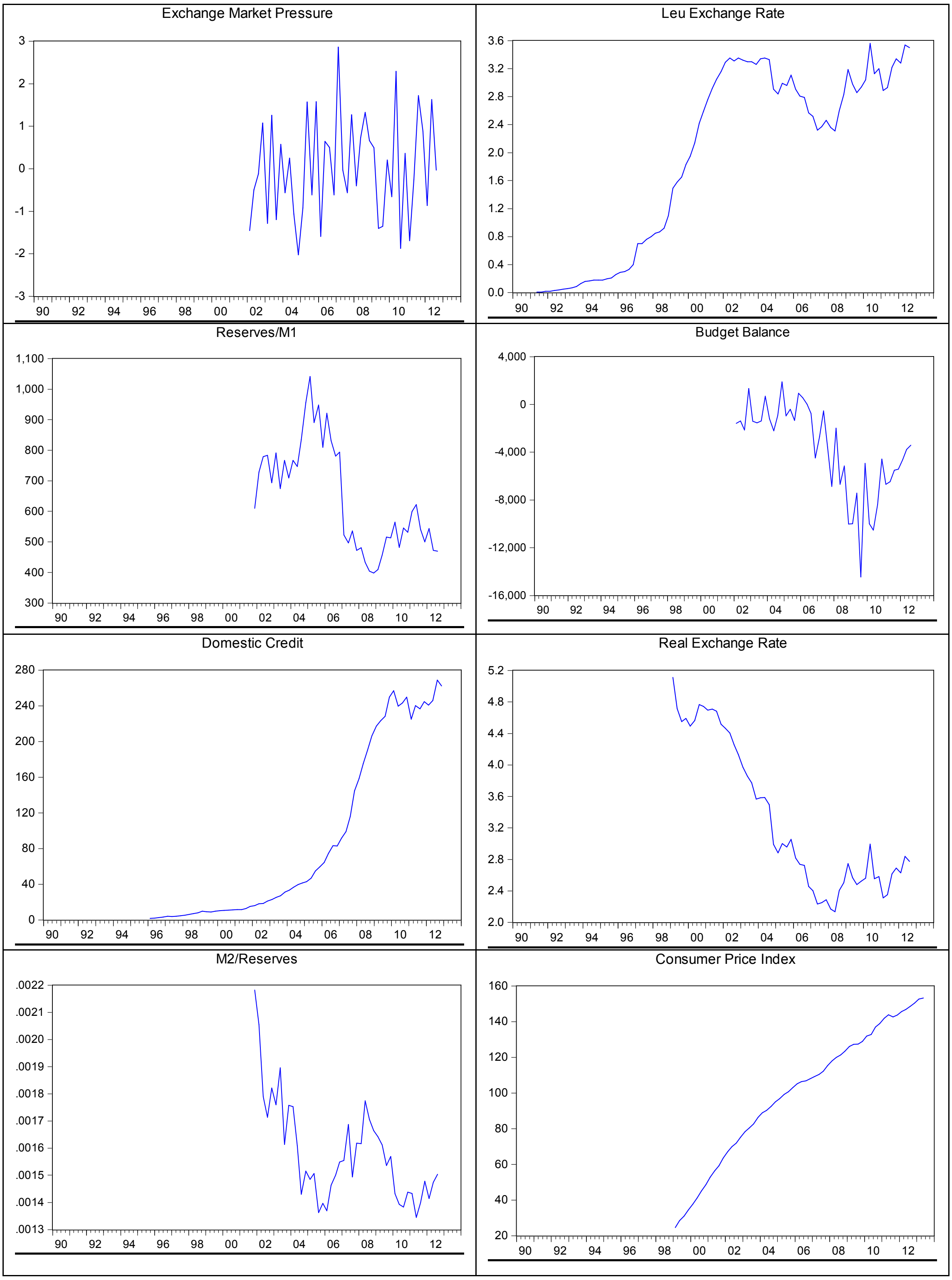
ROMANIA



Note: Charts present the entire available data length of each time series. Data are unloged.

Appendix B: Microfit Results - Albania

Table J: Unit Root Tests

Time Series	Level		1st Difference	
	ADF T-Stat(Prob)	PP T-Stat(Prob)	ADF T-Stat(Prob)	PP T-Stat(Prob)
DEFICIT	-0,81(0,35)	-2,20(0,02)	-8,16(0,00)	-44,42(0,00)
CREDIT	1,05(0,92)	3,26(0,99)	-2,79(0,00)	-1,96(0,04)
RER	-1,64(0,09)	-1,98(0,04)	-7,24(0,00)	-11,27(0,00)
RAR	0,76(0,87)	1,16(0,93)	-8,13(0,00)	-8,17(0,00)
CA	0,67(0,85)	-0,60(0,45)	-4,12(0,00)	-12,41(0,00)
EMP	-6,75(0,00)	-6,75(0,00)	-10,19(0,00)	-27,54(0,00)

Notes: Testing performed using the Eviews package.
Automatic lag length selection based on Schwarz Info Criterion.
All time series are in logs, except DEFICIT and CA.

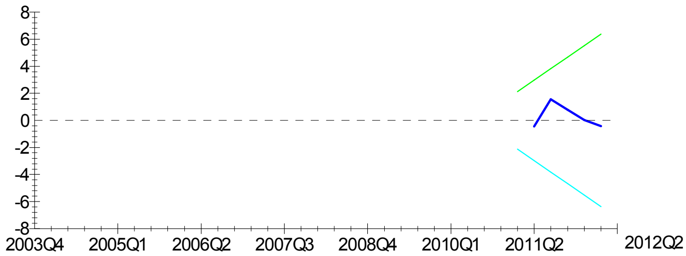
Microfit Result Template for ARDL(3,3,3,2,3,3) Bounds Testing
Unrestricted ECM

```
                 Autoregressive Distributed Lag Estimates
      ARDL(3,3,3,2,3,3) selected based on Akaike Information Criterion
******************************************************************************
 Dependent variable is DEMP
 35 observations used for estimation from 2003Q4 to 2012Q2
******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 DEMP(-1)                    .63369               .23230            2.7279[.034]
 DEMP(-2)                    .14615               .23107            .63251[.550]
 DEMP(-3)                   -.13714               .11501           -1.1925[.278]
 DCA                     -.0054861              .025298           -.21686[.836]
 DCA(-1)                   -.021927              .061337           -.35749[.733]
 DCA(-2)                   -.071085              .034622           -2.0532[.086]
 DCA(-3)                   -.019756              .024262           -.81430[.447]
 DDEFICIT                 -.0091143             .0036247           -2.5145[.046]
 DDEFICIT(-1)              -.027403              .012947           -2.1165[.079]
 DDEFICIT(-2)              -.018137             .0098281           -1.8454[.115]
 DDEFICIT(-3)             -.0077976             .0053233           -1.4648[.193]
 DCREDIT                   -12.1409               4.8515           -2.5025[.046]
 DCREDIT(-1)                 .17544               4.5248           .038772[.970]
 DCREDIT(-2)                 7.2583               5.4887            1.3224[.234]
 DRER                       26.5345               2.9991            8.8474[.000]
 DRER(-1)                   41.8460              12.0119            3.4837[.013]
 DRER(-2)                   31.8464               6.9126            4.6070[.004]
 DRER(-3)                   18.8303               7.9214            2.3771[.055]
 DM2RES                      7.6751               6.3316            1.2122[.271]
 DM2RES(-1)                 33.2038              15.0621            2.2045[.070]
 DM2RES(-2)                 14.5622               9.1889            1.5848[.164]
 DM2RES(-3)                  5.0780               7.7608            .65431[.537]
 CON                      -107.1397              70.1401           -1.5275[.177]
 EMP(-1)                    -2.6598               .44110           -6.0300[.001]
 CA(-1)                    -.011902              .060479           -.19679[.850]
 DEFICIT(-1)                .018736              .015987            1.1720[.286]
 CREDIT(-1)                 -6.1762               3.1703           -1.9481[.099]
 RER(-1)                   -19.3578              11.2926           -1.7142[.137]
 M2RES(-1)                 -39.0415              23.1586           -1.6858[.143]
******************************************************************************
 R-Squared                     .99298   R-Bar-Squared                    .96025
 S.E. of Regression            .28128   F-stat.    F( 28,   6)   30.3322[.000]
 Mean of Dependent Variable   .029632   S.D. of Dependent Variable       1.4108
 Residual Sum of Squares       .47470   Equation Log-likelihood         25.5947
 Akaike Info. Criterion       -3.4053   Schwarz Bayesian Criterion     -25.9579
 DW-statistic                  2.0573
******************************************************************************
```

Note: The M2RES variable refers to the Reserve Adequacy Ratio (M2/Reserves)

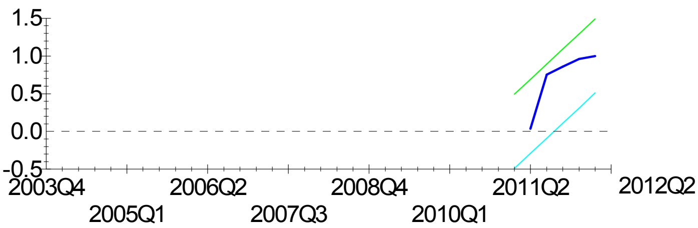
```
                                Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                     *                           *                           *
* A:Serial Correlation*CHSQ(   4)=  24.0938[.000]*F(   4,    2)=   1.1046[.526]*
*                     *                           *                           *
* B:Functional Form   *CHSQ(   1)=  19.3591[.000]*F(   1,    5)=   6.1886[.055]*
*                     *                           *                           *
* C:Normality         *CHSQ(   2)=   .74338[.690]*       Not applicable       *
*                     *                           *                           *
* D:Heteroscedasticity*CHSQ(   1)=   1.0295[.310]*F(   1,   33)=   1.0001[.325]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Microfit Result Template for ARDL(3,3,3,2,3,3) Bounds Testing F-Statistic

```
Wald test of restriction(s) imposed on parameters
*******************************************************************************
 Based on ARDL regression of DEMP on:
 DEMP(-1)         DEMP(-2)         DEMP(-3)         DCA              DCA(-1)
 DCA(-2)          DCA(-3)          DDEFICIT         DDEFICIT(-1)     DDEFICIT(-2)
 DDEFICIT(-3)     DCREDIT          DCREDIT(-1)      DCREDIT(-2)      DRER
 DRER(-1)         DRER(-2)         DRER(-3)         DM2RES           DM2RES(-1)
 DM2RES(-2)       DM2RES(-3)       CON              EMP(-1)          CA(-1)
 DEFICIT(-1)      CREDIT(-1)       RER(-1)          M2RES(-1)
 35 observations used for estimation from 2003Q4 to 2012Q2
*******************************************************************************
 Coefficients A1 to A29 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A24=0; A25=0; A26=0; A27=0; A28=0; A29=0
*******************************************************************************
 Wald Statistic               CHSQ( 6)=  73.0998[.000]
```

Microfit Result Template for ARDL(3,3,3,2,3,3) Bounds Testing Levels Regression

Ordinary Least Squares Estimation

Dependent variable is EMP
39 observations used for estimation from 2002Q4 to 2012Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
CA	-.6724E-3	.023111	-.029096[.977]
DEFICIT	-.0087779	.0051156	-1.7159[.096]
CREDIT	2.2562	.57126	3.9496[.000]
RER	8.8876	2.4968	3.5596[.001]
M2RES	17.9052	4.6252	3.8712[.000]
CON	52.1112	17.9059	2.9103[.006]

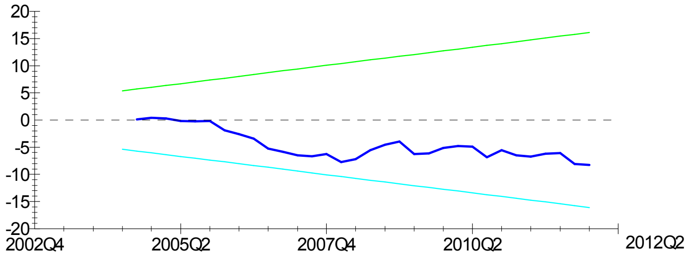
R-Squared	.40326	R-Bar-Squared	.31285
S.E. of Regression	.90876	F-stat. F(5, 33)	4.4602[.003]
Mean of Dependent Variable	-.21198	S.D. of Dependent Variable	1.0963
Residual Sum of Squares	27.2526	Equation Log-likelihood	-48.3496
Akaike Info. Criterion	-54.3496	Schwarz Bayesian Criterion	-59.3402
DW-statistic	1.6988		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(4)= 1.9219[.750]	F(4, 29)= .37579[.824]
B:Functional Form	CHSQ(1)= 2.1384[.144]	F(1, 32)= 1.8563[.183]
C:Normality	CHSQ(2)= .95568[.620]	Not applicable
D:Heteroscedasticity	CHSQ(1)= .37401[.541]	F(1, 37)= .35827[.553]

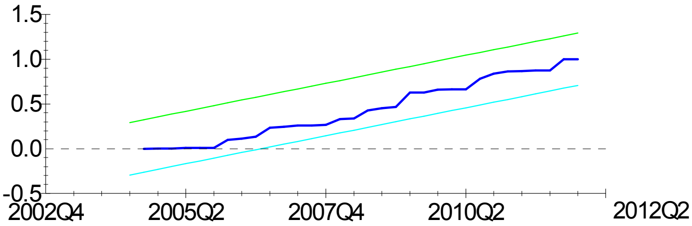
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

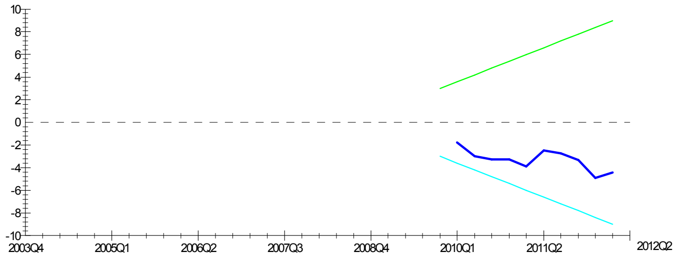
Microfit Result Template for ARDL Bounds Testing
VECM Regression

```
                        Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is DEMP
 35 observations used for estimation from 2003Q4 to 2012Q2
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 DEMP(-1)                    .36514              .35874            1.0178[.331]
 DEMP(-2)                   .055093              .29875            .18441[.857]
 DEMP(-3)                   .034433              .18959            .18162[.859]
 DCA                        .014165             .028928            .48965[.634]
 DCA(-1)                   -.031468             .028988           -1.0856[.301]
 DCA(-2)                   -.026987             .029253           -.92255[.376]
 DCA(-3)                    .029094             .029843            .97489[.351]
 DDEFICIT                 -.0040066            .0049567           -.80831[.436]
 DDEFICIT(-1)              .0068915            .0068453            1.0067[.336]
 DDEFICIT(-2)              .0055177            .0068494            .80558[.438]
 DDEFICIT(-3)              .0082767            .0054438            1.5204[.157]
 DCREDIT                     5.6161              6.3879            .87917[.398]
 DCREDIT(-1)                 1.9396              4.8403            .40072[.696]
 DCREDIT(-2)                -4.0449              5.4705           -.73941[.475]
 DRER                       18.8082              3.5289            5.3297[.000]
 DRER(-1)                   -9.5461              4.4638           -2.1386[.056]
 DRER(-2)                    5.8917              5.5330            1.0648[.310]
 DRER(-3)                   -9.2953              6.1528           -1.5108[.159]
 DM2RES                     14.1063              3.9958            3.5302[.005]
 DM2RES(-1)                -18.5556              7.3230           -2.5339[.028]
 DM2RES(-2)                 -2.8093              7.8652           -.35718[.728]
 DM2RES(-3)                 -9.7608              6.7478           -1.4465[.176]
 CON                        -.27898              .26938           -1.0357[.323]
 Z(-1)                      -1.0819              .51002           -2.1213[.057]
*******************************************************************************
 R-Squared                      .93437   R-Bar-Squared                   .79713
 S.E. of Regression             .63542   F-stat.    F( 23,  11)    6.8086[.001]
 Mean of Dependent Variable    .029632   S.D. of Dependent Variable      1.4108
 Residual Sum of Squares        4.4413   Equation Log-likelihood       -13.5357
 Akaike Info. Criterion       -37.5357   Schwarz Bayesian Criterion    -56.1999
 DW-statistic                   2.0287
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   4)=  18.8258[.001]*F(   4,    7)=   2.0369[.193]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .30134[.583]*F(   1,   10)=  .086844[.774]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.1186[.572]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   2.0184[.155]*F(   1,   33)=   2.0195[.165]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

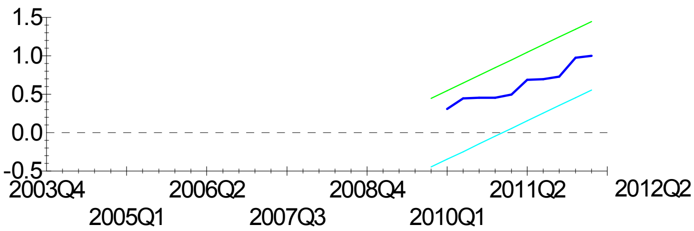
Note: The Z(-1) variable refers to the Error Correction Term, ECT(-1).

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Microfit Result Templates for Granger Causality F-Statistics

```
Wald test of restriction(s) imposed on parameters (CA)
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DCA(-3)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)
 DDEFICIT(-3)    DCREDIT         DCREDIT(-1)     DCREDIT(-2)     DRER
 DRER(-1)        DRER(-2)        DRER(-3)        DM2RES          DM2RES(-1)
 DM2RES(-2)      DM2RES(-3)      CON             Z(-1)
 35 observations used for estimation from 2003Q4 to 2012Q2
*******************************************************************************
 Coefficients A1 to A24 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A4=0; A5=0; A6=0; A7=0
*******************************************************************************
 Wald Statistic                CHSQ( 4)=   2.9684[.563]
*******************************************************************************

Wald test of restriction(s) imposed on parameters   (DEFICIT)
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DCA(-3)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)
 DDEFICIT(-3)    DCREDIT         DCREDIT(-1)     DCREDIT(-2)     DRER
 DRER(-1)        DRER(-2)        DRER(-3)        DM2RES          DM2RES(-1)
 DM2RES(-2)      DM2RES(-3)      CON             Z(-1)
 35 observations used for estimation from 2003Q4 to 2012Q2
*******************************************************************************
 Coefficients A1 to A24 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A8=0; A9=0; A10=0; A11=0
*******************************************************************************
 Wald Statistic                CHSQ( 4)=   4.7623[.313]
*******************************************************************************
```

```
           Wald test of restriction(s) imposed on parameters  CREDIT
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DCA(-3)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)
 DDEFICIT(-3)    DCREDIT         DCREDIT(-1)     DCREDIT(-2)     DRER
 DRER(-1)        DRER(-2)        DRER(-3)        DM2RES          DM2RES(-1)
 DM2RES(-2)      DM2RES(-3)      CON             Z(-1)
 35 observations used for estimation from 2003Q4 to 2012Q2
*******************************************************************************
 Coefficients A1 to A24 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A12=0; A13=0; A14=0
*******************************************************************************
 Wald Statistic                CHSQ( 3)=   1.3620[.714]
*******************************************************************************

Wald test of restriction(s) imposed on parameters RER
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DCA(-3)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)
 DDEFICIT(-3)    DCREDIT         DCREDIT(-1)     DCREDIT(-2)     DRER
 DRER(-1)        DRER(-2)        DRER(-3)        DM2RES          DM2RES(-1)
 DM2RES(-2)      DM2RES(-3)      CON             Z(-1)
 35 observations used for estimation from 2003Q4 to 2012Q2
*******************************************************************************
 Coefficients A1 to A24 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A15=0; A16=0; A17=0; A18=0
*******************************************************************************
 Wald Statistic                CHSQ( 4)=  36.6790[.000]
*******************************************************************************

  Wald test of restriction(s) imposed on parameters  RAR
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DCA(-3)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)
 DDEFICIT(-3)    DCREDIT         DCREDIT(-1)     DCREDIT(-2)     DRER
 DRER(-1)        DRER(-2)        DRER(-3)        DM2RES          DM2RES(-1)
 DM2RES(-2)      DM2RES(-3)      CON             Z(-1)
 35 observations used for estimation from 2003Q4 to 2012Q2
*******************************************************************************
 Coefficients A1 to A24 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A19=0; A20=0; A21=0; A22=0
*******************************************************************************
 Wald Statistic                CHSQ( 4)=  25.2055[.000]
*******************************************************************************
```

Appendix C: Microfit Results – Romania

Table K: Unit Root Tests

Time Series	Level ADF T-Stat(Prob)	Level PP T-Stat(Prob)	1st Difference ADF T-Stat(Prob)	1st Difference PP T-Stat(Prob)
DEFICIT	-0,88(0,32)	-1,39(0,14)	-11,86(0,00)	-14,03(0,00)
CREDIT	2,35(0,99)	3,08(0,99)	-2,38(0,01)	-3,41(0,00)
RER	-1,77(0,07)	-1,94(0,05)	-7,50(0,00)	-7,50(0,00)
RAR	-1,35 (0,15)	-1,53(0,11)	-8,21(0,00)	-8,37(0,00)
CA	-1,17(0,21)	-1,37(0,15)	-7,81(0,00)	-7,80(0,00)
EMP	-6,28(0,00)	-6,28(0,00)	-5,31(0,00)	-28,87(0,00)

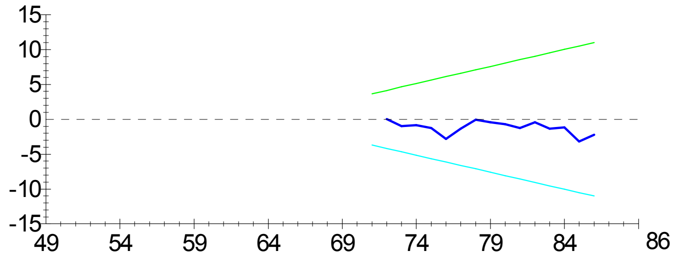
Notes: Testing performed using the Eviews package.
Automatic lag length selection based on Schwarz Info Criterion.
All time series are in logs, except DEFICIT and CA.

Microfit Result Template for ARDL(3,2,3,0,0,2) Bounds Testing Unrestricted ECM

```
                   Autoregressive Distributed Lag Estimates
        ARDL(3,2,3,0,0,2) selected based on Schwarz Bayesian Criterion
*******************************************************************************
 Dependent variable is DEMP
 38 observations used for estimation from   49 to   86
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 DEMP(-1)                    .77962              .29326            2.6585[.017]
 DEMP(-2)                    .54402              .23405            2.3243[.034]
 DEMP(-3)                    .50319              .11351            4.4330[.000]
 DCA                       .7990E-3            .1795E-3            4.4504[.000]
 DCA(-1)                  -.5025E-3            .1795E-3           -2.7985[.013]
 DCA(-2)                  -.5709E-3            .2082E-3           -2.7421[.014]
 DDEFICIT                 -.3441E-4            .6668E-4           -.51603[.613]
 DDEFICIT(-1)             -.2801E-3            .1150E-3           -2.4346[.027]
 DDEFICIT(-2)             -.2333E-3            .8870E-4           -2.6299[.018]
 DDEFICIT(-3)             -.2012E-3            .6886E-4           -2.9227[.010]
 DCREDIT                    10.8354              2.8997            3.7367[.002]
 DRER                      -.065492              .51295           -.12768[.900]
 DM2RES                      7.2133              2.5872            2.7881[.013]
 DM2RES(-1)                  3.8422              3.8383            1.0010[.332]
 DM2RES(-2)                  8.6924              3.3058            2.6294[.018]
 CON                        11.9407             21.2038            .56314[.581]
 EMP(-1)                    -2.2119              .33851           -6.5342[.000]
 CA(-1)                    .3661E-3            .1461E-3            2.5060[.023]
 DEFICIT(-1)               .1509E-3            .1730E-3            .87240[.396]
 CREDIT(-1)                  1.5144              .86444            1.7519[.099]
 RER(-1)                     .13015              .78372            .16607[.870]
 M2RES(-1)                   2.7932              3.6949            .75597[.461]
*******************************************************************************
 R-Squared                      .96133   R-Bar-Squared                    .91057
 S.E. of Regression             .59439   F-stat.    F( 21,  16)   18.9398[.000]
 Mean of Dependent Variable    .014401   S.D. of Dependent Variable       1.9876
 Residual Sum of Squares        5.6528   Equation Log-likelihood        -17.7164
 Akaike Info. Criterion       -39.7164   Schwarz Bayesian Criterion     -57.7298
 DW-statistic                   2.4345
*******************************************************************************
```

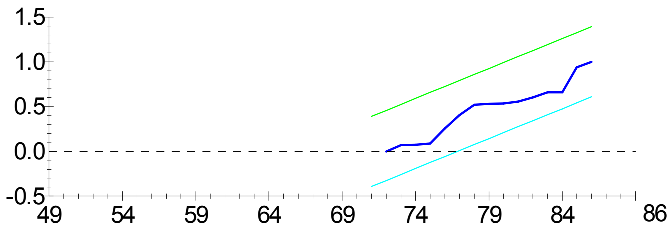
```
                                    Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version          *         F Version        *
*******************************************************************************
*                     *                            *                          *
* A:Serial Correlation*CHSQ(   1)=   3.2908[.070]*F(   1,  15)=   1.4221[.252]*
*                     *                            *                          *
* B:Functional Form   *CHSQ(   1)=  11.1644[.001]*F(   1,  15)=   6.2404[.025]*
*                     *                            *                          *
* C:Normality         *CHSQ(   2)=  .068768[.966]*       Not applicable       *
*                     *                            *                          *
* D:Heteroscedasticity*CHSQ(   1)=  .059185[.808]*F(   1,  36)=  .056157[.814]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
         D:Based on the regression of squared residuals on squared fitted values
```

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

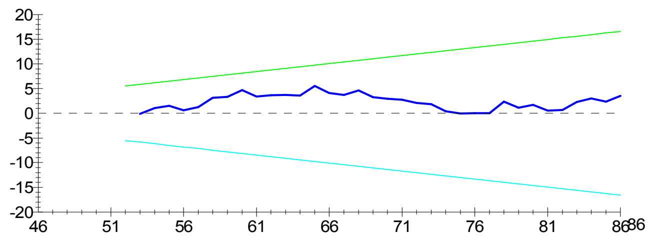
Microfit Result Template for ARDL(3,2,3,0,0,2) Bounds Testing F-Statistic

```
       Wald test of restriction(s) imposed on parameters
*******************************************************************************
 Based on ARDL regression of DEMP on:
 DEMP(-1)         DEMP(-2)         DEMP(-3)         DCA              DCA(-1)
 DCA(-2)          DDEFICIT         DDEFICIT(-1)     DDEFICIT(-2)     DDEFICIT(-3)
 DCREDIT          DRER             DM2RES           DM2RES(-1)       DM2RES(-2)
 CON              EMP(-1)          CA(-1)           DEFICIT(-1)      CREDIT(-1)
 RER(-1)          M2RES(-1)
 38 observations used for estimation from   49 to   86
*******************************************************************************
 Coefficients A1 to A22 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A22=0; A21=0; A20=0; A19=0; A18=0; A17=0
*******************************************************************************
 Wald Statistic                CHSQ( 6)=  82.7962[.000]
*******************************************************************************
```

Microfit Result Template for ARDL Bounds Testing
Levels Regression

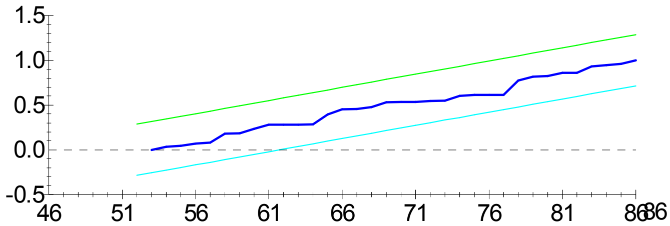
```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is EMP
 41 observations used for estimation from   46 to   86
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CA                      -.7239E-4          .1202E-3             -.60245[.551]
 DEFICIT                  .8322E-4          .8627E-4              .96467[.341]
 CREDIT                    .52030            .44239               1.1761[.247]
 RER                     -.034338            .63422             -.054142[.957]
 M2RES                     3.5552            2.6922               1.3205[.195]
 CON                      20.8532           16.4707               1.2661[.214]
*******************************************************************************
 R-Squared                     .10622   R-Bar-Squared                   -.021459
 S.E. of Regression            1.2185   F-stat.    F(  5,  35)    .83193[.536]
 Mean of Dependent Variable   .056191   S.D. of Dependent Variable        1.2056
 Residual Sum of Squares      51.9661   Equation Log-likelihood         -63.0354
 Akaike Info. Criterion      -69.0354   Schwarz Bayesian Criterion      -74.1761
 DW-statistic                  2.5964
*******************************************************************************
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version          *         F Version        *
*******************************************************************************
*                     *                            *                          *
* A:Serial Correlation*CHSQ(   1)=   4.3899[.036]*F(   1,  34)=   4.0769[.051]*
*                     *                            *                          *
* B:Functional Form   *CHSQ(   1)=   1.0656[.302]*F(   1,  34)=   .90726[.348]*
*                     *                            *                          *
* C:Normality         *CHSQ(   2)=   1.7109[.425]*       Not applicable       *
*                     *                            *                          *
* D:Heteroscedasticity*CHSQ(   1)=   .60051[.438]*F(   1,  39)=   .57971[.451]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Microfit Result Template for ARDL Bounds Testing
VECM Regression

Ordinary Least Squares Estimation

Dependent variable is DEMP
38 observations used for estimation from 49 to 86

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DEMP(-1)	.80410	.36489	2.2037[.039]
DEMP(-2)	.72354	.28445	2.5437[.019]
DEMP(-3)	.48479	.15384	3.1512[.005]
DCA	.2747E-3	.2174E-3	1.2636[.220]
DCA(-1)	-.2228E-3	.2166E-3	-1.0286[.315]
DCA(-2)	-.1127E-3	.2321E-3	-.48548[.632]
DDEFICIT	.8302E-4	.7733E-4	1.0736[.295]
DDEFICIT(-1)	-.1132E-3	.1007E-3	-1.1248[.273]
DDEFICIT(-2)	.6517E-5	.9479E-4	.068757[.946]
DDEFICIT(-3)	.5340E-5	.7885E-4	.067720[.947]
DCREDIT	1.3701	3.0075	.45557[.653]
DRER	-.070429	.43647	-.16136[.873]
DM2RES	7.6090	3.0116	2.5266[.020]
DM2RES(-1)	-2.9109	3.1626	-.92043[.368]
DM2RES(-2)	4.6355	3.1320	1.4801[.154]
CON	-.15330	.23838	-.64309[.527]
Z(-1)	-2.1449	.43715	-4.9065[.000]

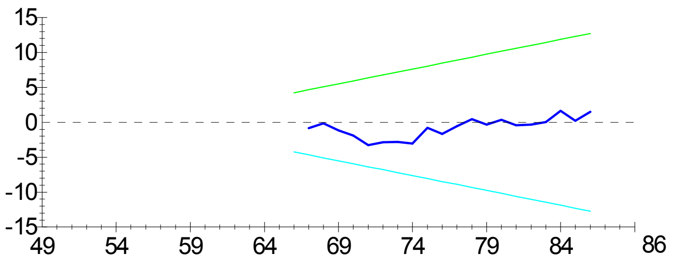
R-Squared	.88875	R-Bar-Squared	.80398
S.E. of Regression	.87999	F-stat. F(16, 21)	10.4849[.000]
Mean of Dependent Variable	.014401	S.D. of Dependent Variable	1.9876
Residual Sum of Squares	16.2621	Equation Log-likelihood	-37.7935
Akaike Info. Criterion	-54.7935	Schwarz Bayesian Criterion	-68.7129
DW-statistic	1.8865		

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= .074844[.784]	F(1, 20)= .039470[.845]
B:Functional Form	CHSQ(1)= .80183[.371]	F(1, 20)= .43111[.519]
C:Normality	CHSQ(2)= .24969[.883]	Not applicable
D:Heteroscedasticity	CHSQ(1)= .93711[.333]	F(1, 36)= .91023[.346]

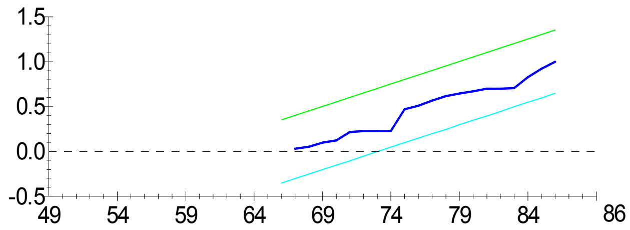
A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level

Microfit Result Templates for Granger Causality F-Statistics

```
       Wald test of restriction(s) imposed on parameters   CA
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)    DDEFICIT(-3)
 DCREDIT         DRER            DM2RES          DM2RES(-1)      DM2RES(-2)
 CON             Z(-1)
 38 observations used for estimation from   49 to   86
*******************************************************************************
 Coefficients A1 to A17 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A4=0; A5=0; A6=0
*******************************************************************************
 Wald Statistic                  CHSQ( 3)=    2.6878[.442]
*******************************************************************************

          Wald test of restriction(s) imposed on parameters   DEFICIT
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)    DDEFICIT(-3)
 DCREDIT         DRER            DM2RES          DM2RES(-1)      DM2RES(-2)
 CON             Z(-1)
 38 observations used for estimation from   49 to   86
*******************************************************************************
 Coefficients A1 to A17 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A7=0; A8=0; A9=0; A10=0
*******************************************************************************
 Wald Statistic                  CHSQ( 4)=    9.6653[.046]
*******************************************************************************

           Wald test of restriction(s) imposed on parameters    CREDIT
*******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)    DDEFICIT(-3)
 DCREDIT         DRER            DM2RES          DM2RES(-1)      DM2RES(-2)
 CON             Z(-1)
 38 observations used for estimation from   49 to   86
*******************************************************************************
 Coefficients A1 to A17 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A11=0;
*******************************************************************************
 Wald Statistic                  CHSQ( 1)=    .20755[.649]
```

```
Wald test of restriction(s) imposed on parameters  RER
******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)    DDEFICIT(-3)
 DCREDIT         DRER            DM2RES          DM2RES(-1)      DM2RES(-2)
 CON             Z(-1)
 38 observations used for estimation from   49 to   86
******************************************************************************
 Coefficients A1 to A17 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A12=0;
******************************************************************************
 Wald Statistic                 CHSQ( 1)=  .026037[.872]
```

```
          Wald test of restriction(s) imposed on parameters      RAR
******************************************************************************
 Based on  OLS regression of DEMP on:
 DEMP(-1)        DEMP(-2)        DEMP(-3)        DCA             DCA(-1)
 DCA(-2)         DDEFICIT        DDEFICIT(-1)    DDEFICIT(-2)    DDEFICIT(-3)
 DCREDIT         DRER            DM2RES          DM2RES(-1)      DM2RES(-2)
 CON             Z(-1)
 38 observations used for estimation from   49 to   86
******************************************************************************
 Coefficients A1 to A17 are assigned to the above regressors respectively.
 List of restriction(s) for the Wald test:
 A13=0; A14=0; A15=0
******************************************************************************
 Wald Statistic                 CHSQ( 3)=  14.7947[.002]
******************************************************************************
```