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Dynamic Relationships between Macroeconomic Variables: An Empirical Application for Turkey

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Abstract

This study investigates the causal relationships among macroeconomic variables such as output growth, money supply, inflation and exchange rate in Turkey for the period 2005Q1-2015Q2. Especially, it examines the impact of monetary policy on macroeconomic variables to sustain economic growth by using Johansen Cointegration Test, Vector Error Correction Model (VECM) approach, Granger Causality Test, Impulse-Response Functions and Variance-Decompositions of VECM and the simplified Ordinary Least Squared(OLS) Regression. The findings of the study indicate that a long term relationship exists among output growth (GDP), money supply (M1), inflation (INF) and exchange rate (EXCR). Furthermore, money supply (M1) has a significant effect on output growth (GDP). According to the results of causality test, there is a unidirectional long term causality relationship from money supply (M1) to output growth (GDP), from output growth (GDP) to inflation (INF), from exchange rate (EXCR) to inflation (INF). Furthermore, results show that there is bidirectional causality relationship between money supply (M1) and inflation (INF). Consequently, the findings of the study indicate that if the main object of the government policy is to maintain high economic growth, an economic reform including monetary policy and inflation targeting will be the most available step.

Keywords: VECM model, the johansen cointegration, the granger causality, impulse-response functions, variance decomposition, macroeconomic variables

1. Introduction

There are many factors and policies affecting economic growth. Especially, monetary policy has an important role on economic growth of countries, and it is one of the major factors used by the governments for achieving macroeconomic goals. The role of monetary policy reflects on economy politics of countries. In this reason, it is significant to manage monetary policy in such a subject that affecting economic growth positively. Recently, the causal relationships among monetary variables and other macroeceonomic indicators such as output growth, price, interest rate, exchange rate, stock exchange have examined by the most of economists, practitioners, policy makers, academicians and researchers. The usage of corrective policies depends on describing of relationships between monetary variables and other macroeconomic variables. The causality relationships among money supply, prices, inflation and exchange rate are still a controversial subject between monetarists and keynesians (Al-Fawwaz & Al-Sawai'e 2012; Olatunji *et al.* 2012). The existing of this paradigm indicates that the causality relationships among monetary variables and macroeconomic variables are unresolved. The keynesians and monetarists agree that monetary shocks positively affect output growth, and a positive monetary shock will increase both price level and economic activity by means of investments and interest rates, but, they disagree on the nature of these positive effects (Olatunji *et al.* 2012; Shams 2012; Sadeghi & Alavi 2011).

Turkish economy has a high growth potential, however, it has a fragile growth structure because of problems encountered in sustaining growth. In this context, the relationships between monetary policy and other macroeconomic variables such as growth, inflation, exchange rate have importance for Turkish economy. The monetary policy in Turkish economy has affected economic growth level through key macroeconomic variables such as interest rate, exchange rate and inflation. Especially, the activity of monetary policy remains limited in financial crises. Therefore, monetary policies and other structural economic politics can be applied for sustainable economic growth and financial stability coordinately.

As a consequence of conflicting theoretical debate, the causality relationships among these variables extensively examine in empirical literature by researchers and practitioners. There are a lot of empirical studies with various econometric methods for both developed and developing countries over different sample periods in the world. For example; Nibeza & Tumusherure (2015) examined the impact of monetary policy on Rwonda's economy by using Vector Error Correction Model for the period 1980-2006. They displayed that monetary policy had a significant influence in maintaining price stability of Rwanda's economy. Şen & Kaya (2015) analyzed that the

relative effectiveness of monetary and fiscal policies on growth for Turkey over the period 2001:Q1-2014:Q2. They obtained that both monetary and fiscal policies had significant effects on growth. Bozkurt (2014) investigated money, inflation and growth relationship in Turkey by using cointegration test. He found that money supply and velocity of money was a main determinant of inflation in the long term in Turkey. Kılınç & Tunç (2014) examined the monetary policy shocks in Turkey during the expicit inflation targeting period starting from 2006 using a structural VAR approach. They found that Turkey was significantly affected by global shocks, and a positive price shock increased inflation in Turkey. Ihsan & Anjum (2013) analyzed the relationships among GDP, interest rate, CPI and inflation rates by using regression analysis for Pakistan in the period 2000-2011. They observed that CPI and interest rate had a significant impact on GDP and inflation rate. Sadeghi & Alavi (2013) examined the effect of money supply on inflation and GDP in Iran, and they found that money supply had no meaningful effect on these variables.Olatunji *et al.* (2012) examined the dynamic causality among money and output, interest rate, exchange rate and prices in Nigeria from 1960 to 2011. They found that one standard deviation shock in broad money and exchange rate had positively effects on all variables. Nwasa & Oseni (2012) investigated the relationships monetary policy, exchange rate and inflation rate in Nigeria for the period 1986 to 2010. They revealed that changes in macroeconomic variables such as exchange rate and inflation rate granger caused a change in monetary policy. Ahmed and Suliman (2011) investigated the long-run relationships between real gross domestic product, money supply and price level in Sudanese. They showed that there wasn't causality relationship between money supply and real gross domestic product, but, price level, real GDP and money supply indicated a cointegration relationship. Senbet (2011) examined the relative effectiveness of the two policies, and he found that monetary policy affected the real output better than fiscal policy. Chimobi & Uche (2010) examined the causality relationships among money, inflation and output by using cointegration and granger causality test analysis in Nigeria for the period of 1970 to 2005. They found that money supply (M2) has a strong causal effect on the real output and prices. Karagöz *et al.* (2009) analyzed long-term equilibrium relationship between macroeconomic factors such as interest rate, inflation, industrial production index, money supply, growth and real exchange rate in Turkey for the period 1998:1 and 2008:12. They found that these macroeconomic variables were cointegrated, and all variables had a statistically meaningful impact on the stock index except the real economic activity. Saatçioğlu & Korap (2008) examined the long run relationships between monetary aggregates, prices and real output level for Turkish economy in the period of 1994 and 2001 economic crisis. They displayed that given the endogenous characteristics of the monetary variables, monetary authority followed an accommodative monetary policy inside the crisis period. Çetin & Çetin (2007) examined the effects of monetary and exchange rate politics on some macroeconomic variables such as GDP, interest rate. They found that monetary politics had an important effect on macroeconomic variables through interest rate. Peker (2007) investigated real impacts of monetary politics for Turkish economy. He obtained that there were both foreseen and unforeseen effects of monetary politics. Berument & Pasaogulları (2003) investigated the effects of real depreciation on the economic performance of Turkey for the period 1987:I to 2001:III.

The purpose of this study is to determine by using Vector Error Correction Model (VECM), Johansen Cointegration Analysis, Granger Causality Test, Impulse-Response Functions and Variance Decomposition of VECM and Ordinary Least Square Regression Model approach the dynamic relationships among money supply, economic growth, inflation and exchange rate for Turkey.

2. Methodology and Empirical Analysis

The study includes Johansen Cointegration Analysis, Granger Causality Tests within the error correction model (VECM), Impulse-Response and Variance Decomposition Analysis and Least Square Regression Estimates to evaluate the causal relationships between monetary variable and macroeconomic variables. The data used are output growth measured by gross domestic product (GDP), money supply measured by (M1), wholesale price index used as a proxy for inflation (INF), US Dollar exchange rate (EXCR) for the period of 2005:Q1-2015:Q2 in Turkey. Gross domestic product (GDP) series was adjusted seasonally and all variables were transformed into logarithms namely LGDP, LEXCR, LINF and LM1. The data for these variables were obtained from the Central Bank of Republic of Turkey. All empirical tests had been carried out by using the Eviews-8.

2.1 Unit Root Tests and the Johansen Cointegration Analysis

In this part of the study, the Augmented Dickey Fuller (ADF) Test, Phillips-Perron (PP) Test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) Test are used to determine the stationary of time series of GDP, M1, INF, EXCR. The time series of GDP, M1, INF, EXCR are presented in Figure 1. From Figure 1, it has been seen that all variables are not stationary. Stationary series can be described as one series with a constant mean, constant

variance and constant autocovariance for each lag during time[1]. Unit root tests are employed to analyze the stationarity are offered in Table 1. According to Table 1; the results of the stationary tests indicate that all variables are stationary at first level in ADF, PP and KPSS tests. In other words, all variables are integrated of order one I(1). Because the variables are integrated with order I(1), it is tested whether there is a long term relationship among these variables by using the Johansen Cointegration test. If cointegration relationship exists among LGDP, LM1, LINF and LEXCR, VECM approach will be used to determine long term relationships. Prior to the Johansen cointegration test, the lag order selection criteria for standard VAR are presented in Table 2. The results of the cointegration analysis depend on the lags of the model. According to Table 2, one lag lenght is more appropriate for the model.

In the VECM, all variables are endogenous, and provided that there is cointegration relationship, the variables correct in the long-term from short-term deviations. The equation of VECM system is specified as follows:

$$X = \phi(L)X_t + X_t^{/}\partial + \varepsilon_t \qquad (1)$$

where, $X=(GDP_t, M1_t, INF_t, EXCR_t)$, $\phi(L)$ is the coefficient matrices for lag operators L, and ∂ is the cointegrating vectors capturing the long-run relationships among the variables in the system.

The findings of the Johansen Cointegration Analysis with one lag order are indicated in Table 3. According to Table 3, the results of the Johansen Cointegration test display the rejection of null hypothesis that there isn't any cointegration relationship at 5% critical level. Accordingly, it can be said that a long-run relationship exist among these macroeconomic variables in terms of trace and maximum eigenvalue statistics.

2.2 The Granger Causality Test

The findings of Granger Causality based on VECM (1) model are reported in Table 4.

According to Table 4, the significant Chi-square statistics imply that the excluded variables are granger cause of the dependent variables. Therefore, the findings of the tests present that there is a unidirectional long-run causality relationship from money supply (M1) to output growth (GDP), from output growth (GDP) to inflation (INF), from exchange rate (EXCR) to inflation (INF). Furthermore, results indicate that there is a bidirectional causality relationship between money supply and inflation. The long-run causality relationships among the variables display that money supply has a significant effect on economic growth. There is a significant effect on inflation of money supply. If the money supply grows faster than output growth , it will cause inflation. Similarly, inflation is affected by output growth and exchange rate in long term. This result indicates that exchange rate targeting keeps inflation under control. The findings show that there are significant causality relationships among macroeconomic variables.

2.3 The Impulse-Response Functions and the Variance Decomposition

The impulse-response functions of impact of variables by one standard deviation shock on each other are plotted for ten quarter horizon in Figure 2. It can be seen from these figures that one standard deviation shock in money supply (M1) has a positive impact on output growth (GDP), and that one standard deviation shock in inflation (INF) has a negative effect on money supply (M1), and that one standard deviation shock in output growth (GDP) and money supply (M1) have a positive effect on inflation (INF) while one standard deviation shock in exchange rate (EXCR) has a negative effect on inflation (INF).

One standard deviation shock in money supply (M1) has positive effects on all variables except exchange rate in the first and second period. A shock in inflation (INF) has persistence negative impacts on the other variables. One standard deviation shock in output growth (GDP) has positive impacts on inflation (INF) and money supply (M1) except exchange rate (EXCR). In addition, the variance decomposition results of VECM(1) model are presented in Table 5. According to Table 5, the variance decomposition results show 100% of GDP variance can be clarified by current GDP in the first period, and the percentage is continuing at the end of the tenth periods by 96.51%. At the end of the tenth periods, money supply (M1) and exchange rate (EXCR) affect the variation in the forecast error of GDP by 2.06% and 1.23% respectively, while there isn't any relationship between inflation and the variation of GDP.

The variance decompositions of money supply (M1) at the end of the tenth periods indicate that 96.45% of M1 variance can be explained by current M1. GDP and EXCR contribute by 1.24% and 2.02% to variance of M1 respectively. Finally, money supply (M1) are not significantly affected by inflation.

The variance decompositions of inflation (INF) display that about 18.22% of the variance of current inflation

[1] After being differentiated once is said to be integrated of order 1. It has been showed by I(1). In Table 1, variables integrated of order I(1) are presented by D(.)

(INF) is explained by its own shocks at the end of the tenth periods. Output growth (GDP), exchange rate (EXCR) and money supply (M1) contribute for 66.96%, 13.23% and 1.59% to variance of inflation (INF) respectively.

Finally, the variance decompositions of exchange rate (EXCR) indicate that 23.88% of the forecast error variance of exchange rate is explained by current exchange rate at the end of the tenth periods. In addition, GDP, M1 and INF contribute for 33.42%, 27.75%, 14.95% variation of exchange rate (EXCR).

2.4 Single Equation Model: The Least Square Regression Model

Using Ordinary Least Square Regressions, the study relates dependent variables to other variables as set of independent variables as follows:

$$LY=\alpha+\beta X_t+\delta Y_{t-1}+\varepsilon_t \qquad (2)$$

where; Y is the dependent variable

X is a vector of independent time varying variables

ε is the error term

Y_{t-1} is one period lagged variable of dependent variables

The estimates of least squares regression models are reported to explain the relationships among GDP, M1, INF and EXCR in short term in Table 6 in short run.

Output Growth Equation

$$LGDP=2.646691+0.794922LGDP_{t-1}-0.073329LINF+0.120352LM1-0.099168LEXCR$$
(1.161185)* (0.117495)* (0.101538) (0.044051)* (0.031671)*

Exchange Rate Equation

LEXCR=-0.922667-0.005888 LGDP-0.021123 LINF+0.077774 LM1+0.958695 LEXCR1
(3.730981) (0.378986) (0.326500) (0.143706) (0.125439)*

Inflation Equation

LINF=-1.932677+0.081303 LM1+0.106060 LGDP+0.816389 LINF1-0.023453 LEXCR
(0.745354) (0.021176) (0.036864)* (0.049491)* (0.022147)*

The results of Output Growth model demonstrate that output growth is determined by the lag of output growth (GDP), and money supply (M1) with a positive relationship. This finding supports that Turkey's economic growth has been directly affected by monetary variables (M1) in short term. In addition, exchange rate (EXCR) is significant in describing output growth (GDP) in Turkey. According to exchange rate model, exchange rate is only determined by the lag of its. Furthermore, the results of inflation model indicate that money supply (M1), economic growth (GDP) directly are related by inflation (INF).

3. Conclusion

The main object of the study is to investigate the dynamic causality relationships between monetary variable (M1) and macroeconomic variables such as output growth (GDP), inflation (INF) and exchange rate (EXCR) in Turkey for the period 2005:Q1-2015:Q2. The methodology used in the study includes unit root tests based on Augmented Dickey Fuller (ADF), Phillip-Perron(PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) Tests, the Johansen Cointegration Test, The Granger Causality Test in a vector error correction model (VECM), Impulse-Response and Variance Decomposition Analysis and the estimates of Least Square Regression Models to evaluate the relationships among variables.

The results of the Johansen Cointegration Test display that a long term relationship exists among GDP, M1, INF and EXCR. The findings of the Granger Causality Test in VECM model indicate that money supply (M1) has a significant effect on output growth (GDP), and inflation (INF) has a significant effect on money supply (M1), and output growth (GDP), money supply (M1) and exchange rate (EXCR) have a significant impacts on inflation (INF). In generally, impulse-response functions and variance-decompositions of VECM(1) support these relationsips among GDP, M1, INF, EXCR. Money supply (M1) contributes for the variation in the forecast error

of all macroeconomic variables. Furthermore, the estimates of least square regression model indicate that money supply (M1) has a significant impact on economic growth (GDP), and money supply (M1), output growth (GDP) are directly related by inflation (INF) in short term.

According to findings in the study, if the main object of the government policy is to maintain high economic growth, an economic reform including monetary policy and inflation targeting can be the most available step.

References

Ahmed, A.E.M. & Suliman, S.Z. (2011), "The Long–Run Relationship Between Money Supply, Real GDP, and Price Level: Empirical Evidence From Sudan", *Journal of Business Studies Quarterly*, **2(2)**, 68-79.

Al-Fawwaz1, T. M. & Al-Sawai'e, K. M. (2012), "Output, Money, and Prices: The Case of Jordan", *International Business Research* **5(12)**, 223-229.

Berument, H. & Paşaoğulları, M. (2003), "Effects of the Real Exchange Rate onOutput and Inflation: Evidence from Turkey", *Developing Economies*, **41(4)**, 401–35.

Bozkurt, C. (2014), "Money, Inflation and Growth Relationship: The Turkish Case", *International Journal of Economics & Financial Issues (IJEFI)*, **4(2)**, 309-322.

Çetin, A. & Çetin, B. (2007), "Alternatif Para Politikası Değişkenlerinde Maliye Politikası, Döviz Kuru Enflasyonunun Büyüme Üzerindeki Etkisi", *İktisat-İşletme ve Finans*, **22(252)**, 123.

Chimobi, O. P. & Uche, U. C. (2010), "Money, Price and Output: A Causality Test for Nigeria", *American Journal of Scientific Research,* **XI(8)***,* 78-87.

Ihsan, I. & Anjum, S. (2013), "Impact of Money Supply (M2) on GDP of Pakistan", *Global Journal of Management and Business Research Finance*, **13(6)**, 1-8.

Karagöz, K., Ergün S. & Karagöz, M. (2009), "Impact of Macroeconomic Factors on Stock Market: Evidence from Istanbul Stock Exchange", *1. International Symposium on Sustainable Development*, June 9-10, Sarejevo, 122-130.

Kılınç, M. & Tunç, C. (2014), "Identification of Monetary Policy Shocks in Turkey: Astructural VAR Approach", *The Central Bank of the Republic of Turkey*, Working paper No:14/23, 1-31.

Nwosa, P. I. & Oseni, I.O., (2012), "Monetary Policy, Exchange Rate and Inflation Rate in Nigeria A Co-integration and Multi-Variate Vector Error Correction Model Approach", *Research Journal of Finance and Accounting,* **3(3)**, 62-69.

Nibeza, S. & Tumusherure, W. (2015), "The Impact of Monetary Policy on Rwanda's Eonomy: Analysis of Vector Error Correction Model (1980-2006)", International Journal of Contemporary Applied Sciences, **2(5)**, 12-28.

Olatunji, T.M., Sunday, A.A. & Omolara, Y.J. (2012), "The Dynamic Causality Between Money and Macro Economic Activity: Empirical Evidence from Nigeria Based on VECM Approach (1960-2011)", *Prosiding Perkem* **VII(1),** 509-524.

Peker, O. (2007), "Para Politikası Etkilerinin Ölçümü: Türkiye Örneği", *Yönetim ve Ekonomi*, **14(1)**, 181.

Saatçioğlu, C. & Korap, L. (2008), " Long-Run Relations Between Money, Prices and Output: The Case of Turkey", *ZKÜ Sosyal Bilimler Dergisi,* **4(7)***, 33-54.*

Sadeghi, M. & Alavi, S.Y. (2013), "Modeling the impact of money on GDP and inflation in Iran: Vector-error-correction-model (VECM) approach", *African Journal of Business Management*, **7(35),** 3423 - 3434.

Senbet, D. (2011), "The relative impact of Fiscal versus monetary actions on output: VAR approach", *Bus. Econ. J.*, 1-11.

Shams, N. (2012). "Money, Income, and Prices in Bangladesh: A Cointegration and Causality Analysis", *Journal of Economics and Sustainable Development*, **3(7)**, 82-88.

Şen, H. & Kaya, A. (2015), "The relative effectiveness of Monetary and Fiscal Policies on growth: what does long-run SVAR model tell us?", *Munich Personal RePEc Archive*, MPRA Paper No. 65903, 1-24.

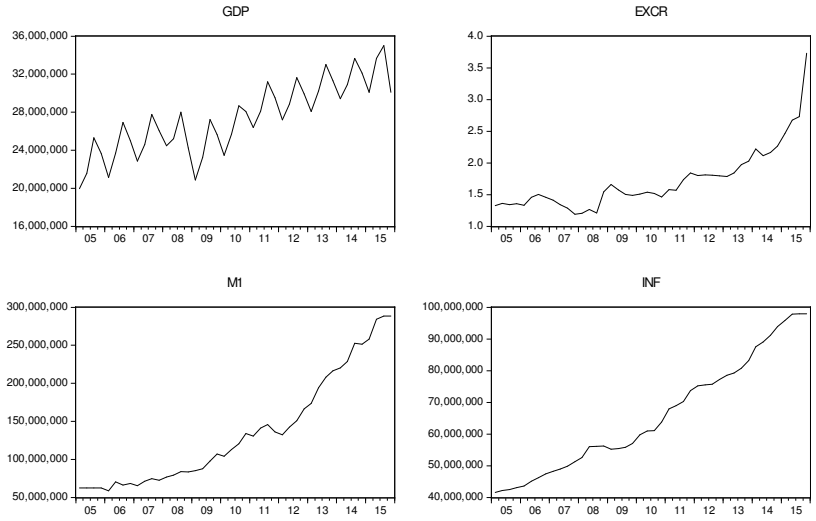

Figure 1. The Time Series of GDP, M1, INF and M1

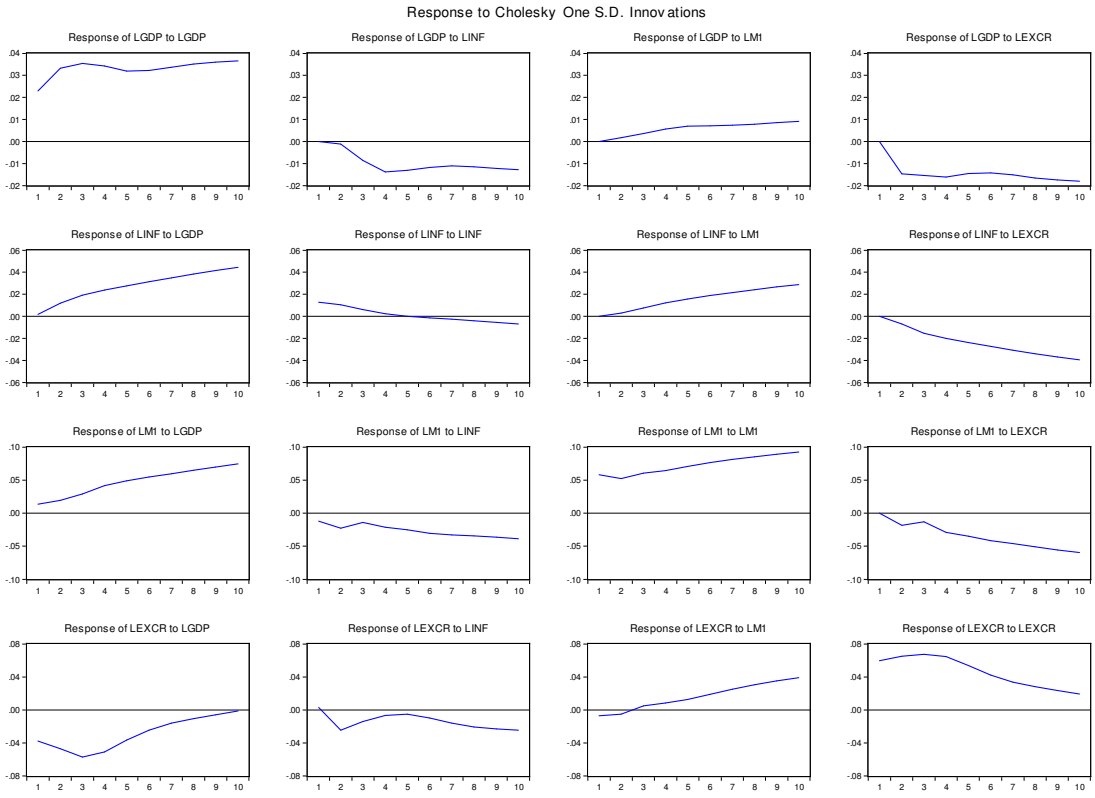

Figure 2. The Impulse-Respose Functions

Table 1. The Results of Unit Root Tests Based on ADF, PP and KPSS

Variables	**ADF**	**Test Critical Values 5%**	**PP**	**Test Critical Values 5%**	**KPSS**	**Test Critical Values 5%**
LGDP	-2.558900	-3.520787	-1.787493	-3.518090	0.795747	0.463000
DLGDP	-4.437504*	-2.933158	-4.425410*	-2.933158	0.109624*	0.463000
LM1	-3.107670	-3.518090	-3.038582	-3.518090	0.826817	0.463000
DLM1	-8.017788*	-2.933158	-8.140221*	-2.933158	0.257660*	0.463000
LINF	-3.243557	-3.520787	-2.385495	-3.518090	0.838477	0.463000
DLINF	-4.857580*	-2.933158	-4.692274*	-2.933158	0.052738*	0.463000
LEXCR	0.003959	-3.518090	0.003959	-3.518090	0.770325	0.463000
DLEXCR	-4.432232*	-2.933158	-4.487733*	-2.933158	0.423978*	0.463000

Table 2. The Results of Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	329.7980	NA	1.81e-12*	-15.68990*	-15.01435*	-15.44564*
2	344.3850	23.33916	1.98e-12	-15.61925	-14.26815	-15.13073
3	357.4296	18.26244	2.42e-12	-15.47148	-13.44483	-14.73871
4	368.7705	13.60910	3.42e-12	-15.23853	-12.53632	-14.26149

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion

Table 3. The Results of Johansen Cointegration Test

Hypothesis		Variables: LGDP, LM1, LINF, LEXCR			
Null	Alternative	Eigenvalue	Trace Statistic	Critical Value 5%	p-Value
r=0	**r=1**	**0.653424**	**76.17536***	**54.07904**	**0.0002**
r≤1	r≥2	0.310745	31.66997	35.19275	0.1143
r≤2	r≥3	0.242651	16.03992	20.26184	0.1725
r≤3	r≥4	0.098749	4.366788	9.164546	0.3603
Null	Alternative	Eigenvalue	Max-Eigen Statistic	Critical Value 5%	p-Value
r=0	**r=1**	**0.653424**	**44.50538***	**28.58808**	**0.0002**
r≤1	r≥2	0.310745	15.63005	22.29962	0.3253
r≤2	r≥3	0.242651	11.67313	15.89210	0.2058
r≤3	r≥4	0.098749	4.366788	9.164546	0.3603

* r value indicates the number of cointegrating vectors. (*) indicates rejection at the 5% critical value.

Table 4. VECM Granger Causality/Block Exogeneity Wald Test

Dependent Variable: DLGDP			
Excluded	Chi-sq	df	Prob.
DLM1	**3.733545***	**1**	**0.0533**
DLINF	1.084452	1	0.2977
DLEXCR	0.650677	1	0.4199
Dependent Variable: DLM1			
Excluded	Chi-sq	df	Prob.
DLGDP	0.582754	1	0.4452
DLINF	**4.562135***	**1**	**0.0327**
DLEXCR	0.151955	1	0.6967
Dependent Variable: DLINF			
Excluded	Chi-sq	df	Prob.
DLGDP	**7.742508***	**1**	**0.0054**
DLM1	**14.79392***	**1**	**0.0001**
DLEXCR	**8.636146***	**1**	**0.0033**
Dependent Variable: DLEXCR			
Excluded	Chi-sq	df	Prob.
DLGDP	0.062346	1	0.8028
DLM1	1.672104	1	0.1960
DLINF	0.229073	1	0.6322
* indicates significance at 5% level			

Table 5. The Variance-Decomposition of VECM(1) Model

Variance Decomposition of LGDP:					
Period	S.E.	LGDP	LM1	LINF	LEXCR
1	0.025785	100.0000	0.000000	0.000000	0.000000
2	0.043834	97.58882	1.02E-05	0.214852	2.196316
3	0.057580	97.29674	0.045167	0.157679	2.500410
4	0.068909	97.16543	0.325192	0.168524	2.340855
5	0.078168	97.06217	0.673444	0.190452	2.073938
6	0.085936	96.92710	1.041307	0.200930	1.830668
7	0.092653	96.79271	1.373383	0.204907	1.629000
8	0.098658	96.67444	1.654295	0.203651	1.467616
9	0.104171	96.58106	1.880731	0.200089	1.338122
10	0.109340	96.51080	2.060509	0.195673	1.233021
Variance Decomposition of LM1:					
Period	S.E.	LGDP	LM1	LINF	LEXCR
1	0.055630	1.169323	98.83068	0.000000	0.000000
2	0.073198	2.108163	93.22207	0.835003	3.834760
3	0.086175	2.046928	93.77812	0.693486	3.481464
4	0.095343	2.152422	93.95326	0.566648	3.327667
5	0.103381	1.998941	94.48991	0.487457	3.023695
6	0.110398	1.814674	94.99369	0.427834	2.763800
7	0.116919	1.635221	95.45551	0.381583	2.527688
8	0.123064	1.481433	95.84448	0.344503	2.329580
9	0.128949	1.351342	96.17217	0.314015	2.162472
10	0.134607	1.241478	96.44717	0.288578	2.022774
Variance Decomposition of LINF:					
Period	S.E.	LGDP	LM1	LINF	LEXCR
1	0.013258	7.592636	3.003334	89.40403	0.000000
2	0.022862	41.98960	1.172120	53.19995	3.638328
3	0.034150	55.07627	1.938403	34.06182	8.923508
4	0.045515	60.00020	2.271009	26.21828	11.51051
5	0.056060	62.66061	2.228576	22.49840	12.61241
6	0.065486	64.28659	2.085440	20.55907	13.06890
7	0.073824	65.34535	1.930218	19.48766	13.23677
8	0.081232	66.06845	1.792650	18.86490	13.27400
9	0.087897	66.58201	1.679297	18.48057	13.25812
10	0.093985	66.95906	1.588647	18.22714	13.22515
Variance Decomposition of LEXCR:					
Period	S.E.	LGDP	LM1	LINF	LEXCR
1	0.066827	31.66077	0.624452	0.089445	67.62534
2	0.099543	38.99698	0.749840	6.803030	53.45015
3	0.126123	43.07545	4.215400	8.944608	43.76454
4	0.145273	43.34875	8.108700	10.69602	37.84654
5	0.159926	41.91711	12.41782	11.91471	33.75036
6	0.171678	39.94973	16.47336	12.87216	30.70475
7	0.181666	37.98239	20.06683	13.57741	28.37338
8	0.190510	36.21793	23.10517	14.13049	26.54640
9	0.198622	34.70333	25.63863	14.57606	25.08198
10	0.206248	33.42402	27.74477	14.94927	23.88194

Table 6. The Least Square Estimates of Regression Models

Dependent Variable: LGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.646691	1.161185	2.279302	0.0284
LGDP1	0.794922	0.117495	6.765567	0.0000
LINF	-0.073329	0.101538	-0.722182	0.4746
LM1	0.120352	0.044051	2.732118	0.0095
LEXCR	-0.099168	0.031671	-3.131157	0.0033
R-squared	0.966718	Akaike info criterion		-4.653518
Adjusted R-squared	0.963215	Schwarz criterion		-4.448727
		Hannan-Quinn criter.		-4.577997
Dependent Variable: LEXCR				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.922667	3.730981	-0.247299	0.8060
LGDP	-0.005888	0.378986	-0.015537	0.9877
LINF	-0.021123	0.326500	-0.064696	0.9488
LM1	0.077774	0.143706	0.541202	0.5915
LEXCR1	0.958695	0.125439	7.642687	0.0000
R-squared	0.922401	Akaike info criterion		-2.317452
Adjusted R-squared	0.914233	Schwarz criterion		-2.112661
		Hannan-Quinn criter.		-2.241931
Dependent Variable: LINF				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.932677	0.745354	-2.592965	0.0134
LM1	0.081303	0.021176	3.839284	0.0004
LGDP	0.106060	0.036864	2.877067	0.0065
LINF1	0.816389	0.049491	16.49574	0.0000
LEXCR	-0.023453	0.022147	-1.058973	0.2961
R-squared	0.997182	Akaike info criterion		-5.528297
Adjusted R-squared	0.996965	Schwarz criterion		-5.364464
		Hannan-Quinn criter.		-5.467880