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2 September 2013

Asian Research Consortium

Asian Journal of Research in Business Economics and Management Vol. 3, No. 9, 2013, pp. 1-13.

ISSN 2249-7307

Asian Journal of Research in Business Economics and Management

www.aijsh.org

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Abstract

The present study estimates the long run private investment function for the period from 1972 to 2011 by using Johansen cointegration approach. The results suggest debt servicing, inflation and private investment to be negatively associated. The study concludes positive impact of GDP growth rate, foreign direct investment, and exchange rate on private investment in Pakistan. The Wald (χ^2) Statistics show that GDP, FDI and exchange rate Granger cause private investment. The significance of coefficient of the error correction term confirms the long run causality between explanatory variables and private investment. The pair-wise Granger causality concludes unidirectional causality from private investment to GDP growth, from private investment to foreign direct investment, inflation rate to private investment and from private investment to exchange rate but causality test confirms bidirectional causality between debt servicing and private investment. The paper also suggests policy recommendations.

Keywords: Asia, Pakistan, Investment, Debt Servicing, Exchange Rate, Foreign Direct Investment, Inflation, Stationarity, Cointegration, Causality.

1. Introduction

Economic growth is the ultimate objective of the macroeconomic policy. In the process of economic growth in which productive and prolific capacity of the economy is developed to enhance the national output levels, Todaro and Smith (2005). Economic growth is associated to the increased prospective output of the economy. The foundations of the economic growth are laid down increasing the literacy levels, advancing the technology and accumulating the capital stock of the economy, Sial *et al.* (2010). Investment is an imperative determinant to establish the basis for the trajectory of growth of the economy. The economies with higher rates of investment grow on the double. Whereas the economies with low investment rate are observed to grow at slow pace.

Investment expenditure play very dual role in the economy. First, it increases the productive capacity of the economy by increasing the productive capacity of the economy through capital accumulation process. Second, it increases the aggregate demand and result in increase in desired levels of output to be produced through multiplier process. The role of private investment has been considered to be very important in determining the trajectory of growth of an economy. Investment increases the output and employment of the economy. Increase in income help to increase the living standards of the masses by increasing the individual income. This helps to alleviate poverty. Increase in domestic private investment also increases the confidence of foreign investors in the economy and create a center of attention for foreign investors. The private investment stimulates economic development process of the economy, Haroon and Nasr (2011).

It has been asserted in the economic theory that, the developing economies, domestic production , real interest rate, public sector investment , credit available to the investors, exchange rate, volume of external debt and macroeconomic performance of an economy affect the private investment. The vocals of the neoclassical theory assert that desired level of capital stock is positively associated with the output level, Khan and Khan (2007). The advocates of the accelerator principal theory argue that increase in desired level of output determines the level of investment by the firms. Monetarist school argues that budget deficit financed by taxes or borrowing increases the demand for loanable funds and results in rise in interest rate in the economy. This increased interest rate increases the cost of private investment, Taban and Kara (2006).

Mallick (2002) suggested, in a Keynesian structure, public investments, volume of domestic credit to private sector, real interest rate, and human capital to be the long run determinants of private sector investment in Indian economy. Ouattara (2004) estimated long run private investment function in Senegal over the period of 1970-2000. The used cointegration approach to find out a long run equilibrium relationship among private investment, public investment, real GDP, credit to private sector, aid, and terms of trade. Public investment, real GDP and external aid affected positively private investment but credit provided to the private sector and terms are trade are conclude to affect it negatively.

Afzal (2004) estimates the saving and demand function of Pakistan economy from 1960 to 2003 by using the Two-stage Least Squares (2SLS) technique. The results of the study suggested macroeconomic stability, inflation, domestic credit, exchanger rate and external and national savings to be the important

factors to determine the investment in Pakistan economy. Afzal (2004) emphasized that establishment of infrastructure, political satiability and good industrial relations can play vital role to create a supportive economic environment for the investors.

Heim (2008) attempted to identify the factors of investment demand in the U.S. The author used stepwise linear regression for the analysis. The determinants of the investment demand have been identified in the study. The study found crowd out problems caused by budget deficits, depreciation allowances, growth rate of the economy, variations in rate of interest, growth in stock values, exchange rate volatility, and profitability of the firm to be the significant determinants of investment demand of the U.S. during 1960-2000 period.

Ahmad and Qayyum (2008) using time series econometric techniques to conclude that private investment in services is negatively affected by the government's non-development expenditure. Macroeconomic instability is found to hinder private investment in Pakistan. The non-development public expenditure in Pakistan may cause an increase in budget deficit and taxes in future. This would cause a deprecation of the local currency resulting in the affecting the confidence of the foreign investors. The authors suggested the public expenditure should be used to reduce the cost of production for private sector. This would be helpful to raise the confidence and thus the profitability of the private investor.

Zakaria (2008) critically evaluating the investment environment in Pakistan identify the factors that put a damper on investment. High cost of doing business, political instability, corruption, bureaucracy, inconsistency in government policies and poor law and order situation of the economy are identified as the impediments of investment. The author also suggested some international best practice solutions to increase investment in Pakistan.

Rehman *et al.* (2009) attempted, by using ARDL cointegration approach, to estimate the investment demand of Pakistan for the 1973-2007 period. The authors found fractional support for accelerator principal and crowding out hypothesis. The study failed to verify McKinnon-Shaw hypothesis for Pakistan economy. External debt showed negative impact on investment both in short-run and long-run. The interest rate showed a negligible impact on investment. The traditional factors of investment in Pakistan are found to have very weak or no impact on investment but non-traditional factors showed robust effects on investment in Pakistan. The non-traditional factors are poor quality institutions, inefficient use of resources, and corruption in government institutions. The authors argued that impact of these factors on investment required further investigation.

Karagoz (2010) aimed to determine the factors of private investment in Turkish economy. The author estimated the long run private investment function by using ARDL approach to cointegration. The significance f the coefficients of real GDP, real exchange rate, ratio of private sector credit to GDP, private external debt, inflation and trade openness confirmed these factors to be the long run determinants of private investment in Turkey.

Haroon and Nasr (2011) discussed the factors of private investment in Pakistan from 1986-87 to 2007-08. The study focused on the examination of the impact of interest rate, GDP, inflation, public investment in infrastructure, domestic savings, subsidies, taxes and ratio of annual payback debt to GDP on private

investment. Indirect taxes were concluded to have negative impact on private investment whereas subsidies are concluded to be positively associated with the private investment. Domestic savings and public expenditure have positive and statistically significant impact on investment. The study also found debt servicing and private investment negatively and significantly associated.

2. The Data and Model Specification

2.1. The Data Sources

The study applies cointegration technique and derives vector error correction model to investigate the behavior of private investment in Pakistan. The variables included for the analysis are private investment as percentage of GDP (I), GDP growth rate (GDP), external debt servicing as percentage of GDP (DS), foreign direct investment as percentage of GDP (FDI), inflation rate measured by GDP deflator (INF), and exchange rate (ER). The data source for all of the variables is World Development Indicators (WDI) (2012) issued by the World Bank.

2.2. The Model

The private investment function to be estimated by using the cointegration technique is:

$$LI_t = \alpha_1 LGDP_t + \alpha_2 LDS_t + \alpha_3 LFDI_t + \alpha_4 LINF_t + \alpha_5 LER_t + e_t \qquad (1)$$

Here LI is the log of private investment as percentage of GDP, LGDP is the log of GDP growth rate, LDS is the log of external debt servicing as percentage of GDP, LFDI is the log of foreign direct investment as percentage of GDP, LINF is log of GDP deflator, LER is log of exchange rate and e_t is the white noise error term.

3. Methodology

Since the Vector Autoregressive Regression (VAR) takes into account the both long run and short run in a unified framework of cointegration and error correction modeling, Johansen (1988), so in the present study utilizes the Johansen (1988) and Johansen and Juselius (1990) approach to examine long run and short run dynamics of private investment.

3.1. The Test for Stationariy

Prior to the application of cointegration test the time series variables are concluded to be stationary at the same level by using the Augmented Dickey-Fuller (ADF) unit root test and Phillips-Perron test. A unit root test is a pretest to avoid spurious regression, Granger (1986). The Dickey and Fuller (1979) suggested a unit root test to check the presence of a unit root. But ADF unit root test is a better test since it can be applied when error terms are serially correlated. The Phillips-Perron (1988) test is another test to conclude an order of integration of time series. Phillips and Perron unit root test takes care of correlation between the error terms uses non-parametric statistical techniques.

3.2. Johansen (1988) and Johansen and Juselius (1990) Cointegration Test

The time series stationary at same level are cointegrated, Engle and Granger (1979). The present study utilized the Johansen (1988) and Johansen and Juselius (1990) cointegration test to examine the long run equilibrium relationship between the variables. Johansen (1988) and Johansen and Juselius (1990) method of cointegration estimated statistics; the trace statistic and max-eigenvalue statistic to conclude the number of cointegrating vectors. The conclusion of any cointegration vector implies that there exists a long run association among the variables.

3.3. Vector Error Correction Mechanism (VECM)

The variables having long run equilibrium relationship between them can be expressed as Error Correction Mechanism (ECM), Granger (1988). The negative sign and statistically significant value of the coefficient of the error correcting term would imply stability of the long run relation of the variables. The study uses diagnostic tests to test the stability and validity of the model.

4. The Results and Interpretations

4.1. The Results of the Unit Root Tests

The results of the ADF and Phillips-Perron unit root tests presented in the Table 1 and Table 2 respectively. The results of the unit root test show that LI, LDS, LFDI, and LER are nonstationary at their levels without drift, with drift, with drift and trend but LGDP and LINF are I(0) in levels with drift, and with drift and trend. However all of the variables are stationary at their first difference without no drift and no trend, with intercept and no trend and with intercept and trend. All of the time series are I(0) at their first difference.

4.2. Long Run Dynamics of Private Investment in Pakistan

The time series variables integrated of the same order are considered to be cointegrated. The cointegrated variables are hereby concluded to have common trend, that is, there exists a long run equilibrium relationship between them. Since all of the time series variables are integrated of the same order we proceeded to check number of cointegration vectors by using Johansen (1988) cointegration procedure. First, we applied VAR test to decide the optimum lag length. We applied the Schwartz Information Criterion (SIC) statistic to conclude optimum lag length of 1 for the Johansen-Juselius cointegration test. The results of the Johansen cointegration test are reported in the Table 3.

The two test statistics estimated by the Johansen–Juselius cointegration test are the Trace Statistic and Maximum Eigenvalue statistic. The null hypotheses of “one” and “at most one” cointegrating vectors are rejected at 5 percent significance level against the alternative hypotheses of “at least one” and “at least 2” cointegrating vectors respectively. Both of the Trace and Max-eigenvalue statistic indicate 2 cointegrating vectors at 0.05 level. The presence of two cointegrating vectors implies that there exists long run equilibrium relationship between private investment and the explanatory variables included in the analysis. The normalized cointegrating vector is given the Table 4.

The cointegration equation can be written as:

$$LI_t = 1.2666LGDP_t - 0.2264LDS_t + 0.7801LFDI_t - 0.1386LINF_t + 4.3676LER_t - 0.3308TIME_t \quad (2)$$

t-value = (9.3949) (-1.8966) (7.22610) (-1.4499) (7.40420) (-6.5601)

The confirmation of cointegrating vectors shows that private domestic investment, GDP growth rate, external debt servicing, foreign direct investment, inflation rate, and exchange rate move together in the long run. It means all of the explanatory variables affect private domestic investment in Pakistan. The coefficient of GDP growth rate has positive sign shows that national income has positive effects on private investment in Pakistan economy. The GDP elasticity of private investment is 1.2666 which implies that one percent increase in GDP growth rate increases the private investment by 126.66 percent. The high income elasticity of investment is statistically significant at 99 percent confidence level. The results of the long run analysis are strongly in consistency of the macroeconomic theory and maintain the accelerator principal theory. Finding of the positive and statistically significant income elasticity of investment is also supported by the conclusion in Ahmad and Qayyum (2008).

The external debt service is concluded to show negative impact on private investment in Pakistan. The external debt elasticity is negative (i.e. -0.2266) and significant at 10 percent level of confidence. One percent increase in external debt service as percentage of GDP causes 22.66 percent decline in private investment in Pakistan in long run. The results of the study are in strong agreement to that of Rehman *et al*. (2009) and Hameed *et al.* (2008). The results of the present study support the debt overhang hypothesis. In the situation of debt overhang external debt becomes so unwarranted that is affects the performance of the economy. The likely increase in the debt service payment disheartens the productive investment expenditure and results in slow down in the capital formation process.

Foreign direct investment has positive and significant impact on private investment in Pakistan. Private investment increases by 78.01 percent with one percent increase in foreign direct investment. The results of the study are in strong agreement with the conclusions of Shah *et al.* (2012). The inflows of foreign direct investment add to the trustworthiness of the recipient country. The spillover effects of FDI are helpful for the domestic private investment. FDI not only make possible the inflows of financial resources yet it also help the economy by introducing modern and innovative ideas, transfer of new technology and production techniques, and approach to the global market for the local investors. Furthermore foreign direct investment stimulates domestic economic activity in the economy by expanding the turnover and competition amongst the domestic firms. The empirical results of the present study are evident that FDI has positive impact on private investment and the relationship is robust. This robust impact of FDI on private investment suggests Pakistan economy would benefit from the policy measures aspired not only to encourage FDI into the economy but also the domestic investment.

The results of the long run investigation suggest that inflation rate exert negative effects on private investment in Pakistan. The coefficient of inflation is not significant. The negative impact of inflation may be due to the fact that increase in the general price level reduces the purchasing power of money. The household demand more money to keep their money balances unchanged. This results in increase in

demand for money balances cause interest rate to rise. Increase in the price level causes the private investment to fall. Inflation negatively affects the level of investment and reduces the efficiency in use of productive factors, Andres and Hernando (1997).

The coefficient of exchange rate has the positive sign. The exchange rate elasticity of private investment is 4.3676 which show that devaluation of the Pakistani currency would be helpful for the private investment in the economy. The changes in the interest rate affect the anticipated profitability of the investors or industry by changing the pattern and investment scales. Devaluation of the local currency has strong impact on relative prices in international market. The exports of the economy, with the appreciation of the exchange rate, become cheaper in terms of foreign currency therefore result in increase in demand for exportables. This increase in exports increases the confidence and profitability of the firms to increase their scale of production and exploit economies of scale.

4.3. Short Run Dynamics of Private Investment in Pakistan

When the time series stationary variables of the same order are cointegrated there must exist at least a unidirectional causality between the cointegrated variables, Granger (1988). The study applied VECM model to investigate the short run dynamics of the variables. The results of the VECM are reported in the Table 4. The error correction terms has the right sign. The coefficient of the error correction terms (given in first column of the Table 4) is -0.1657 which exhibits that 16.57 percent of the disturbances in the system, occurred in the last time period, are corrected in current time period. Though the speed of adjustment is not so high yet it is statistically significant. This statistical significance of error correction term shows the existence of long term equilibrium relationship amongst the time series variables.

The study also applies the pair-wise Granger causality test to examine the short dynamics of private investment and other variables. The results of pair-wise Granger causality test are given in the Table 5. The results show that the null hypothesis that LGDP does not Granger cause LI could not be rejected. But the Granger causality test F-value rejects the null hypothesis that LI does not Granger cause LGDP is rejected but at 10 percent level of significance. So we conclude unidirectional causality moving from private investment to GDP growth rate in the Pakistan economy. The pair-wise Granger causality test confirms bidirectional causality between debt servicing and private investment. Unidirectional causality is also confirmed from private investment to foreign direct investment as the F-value is significant at 0.01 level. The causality test also confirms the unidirectional causality from inflation rate to private investment and from private investment to exchange rate at 10 percent significance level.

We have estimated the Wald (χ^2) Statistic (reported in the Table 4) at 1*df* for the significance of the lagged endogenous variables in order to analyze the short run causal relationship among the variables for each of the equations of the VECM. The results show that GDP, FDI and exchange rate Granger cause domestic private investment. The statistical significance of $\sum\chi^2$ indicates the short run causality among the variables. The results of the diagnostic tests displayed in the Table 6 are evident that the error terms of the model for ΔLI are multivariate normal, serially uncorrelated and homoscedastic. The robustness of the VEC is concluded by analyzing the inverse characteristic roots of the variables. The characteristic roots of

the variables recline within the circle (see Figure 1), so it can be considered that estimated parameters are stable.

5. Conclusion

Economic growth is associated to the increased prospective output of the economy. Investment is an imperative determinant to establish the basis for the trajectory of growth of the economy. The present study estimates the long run private investment function for the period from 1972 to 2011 by using Johansen method of cointegration. The results of cointegration and vector error correction model suggest debt servicing, inflation and private investment to be negatively associated. The study concludes positive impact of GDP growth rate, foreign direct investment, and exchange rate on private investment in Pakistan. The coefficient of the error correction term has negative sign and it is statistically significant that confirms long run causality between explanatory variables and private investment. The diagnostic tests confirm the stability of the model.

The results of the present analysis warrant inclusively targeted actions for economic revival of the economy. There is a dire need of simultaneous pursuance of short term and long term reforms in the economy. Immediate steps would help to get macroeconomic stability and overcome the fiscal and financial imbalances. Domestic resource mobilization would help to stimulate development process in the economy. Taxing the rich and influential, and bringing up the exempted sectors of the economy into the tax net would not only help in broadening the tax base of the economy but would also help in setting up an evenhanded and productive tax system. The increased tax income would make the government to remove the infrastructure deficiency especially in the power sector. A fair regulatory framework of the economic actions would help to bring to a close of the hemorrhage of the state-owned enterprises especially Pakistan Steels, Pakistan International Airlines and Pakistan Railways. The inefficiencies of these enterprises have resulted an in increase in budget deficits and furthermore crowding out of private investment in Pakistan.

Agriculture sector is the one of the leading sectors that contributes more that 20 percent to the GDP of the economy. Investment in agriculture infrastructure, suitable agriculture pricing policies, focus of research and development in agriculture sector, use of modern technology would help to increase the access to international market and the economy could get benefits of international market opportunities. There is a need of time to focus on the promotion of industrial growth in the economy. The focus should be the expansion of the small scale and medium enterprises. The improvement of the small scale enterprise would help in identification and support of manufacturing sector with the development of manufacturing sector would help the economy to be integrated into the world production chains. The policy should focus on skill development and manpower training. This all cannot be done without the achievement of the objective of good governance. The enhancement of the competence and efficiency of the public institutions and institution of checks and balances would add to the investment climate of the Pakistan economy. All of the measures suggested would result in improving the confidence, profitability and competitiveness in the economy that would help not only to help increase the domestic but also to attract the foreign investment.

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Appendix

Table 1. The Results of ADF Unit Root Test

Variable	ADF-Statistic					
	Level			1st Difference		
	None	Constant	Constant & Trend	None	Constant	Constant & Trend
LI	0.6502	-2.6509	-2.1807	-6.8544	-6.8915	-7.2771
LGDP	-0.5250	-5.9803	-6.5542	-6.1794	-6.0899	-6.1467
LDS	-0.4527	-1.5931	-2.1811	-6.4692	-7.7272	-7.7960
LFDI	-0.7846	-1.2588	-3.4218	-7.0785	-7.3930	-7.3887
LINF	-0.9615	-3.9916	-3.9318	-7.6815	-7.5642	-7.8033
LER	6.0361	0.3256	-1.8658	-3.0906	-4.4843	-4.5423
1% Critical Value	-2.6256	-3.6105	-4.2119	-2.6272	-3.6156	-4.2191

Table 2. The Phillips-Perron Unit Root Test

Variable	Phillips-Perron Test Statistic					
	level			1st Difference		
	None	Constant	Constant & Trend	None	Constant	Constant & Trend
LI	0.6925	-2.6992	-2.2469	-6.8292	-6.8893	-7.2682
LGDP	-1.0489	-5.9704	-6.5171	-24.6246	-25.8851	-27.4832
LDS	-0.5670	-1.6696	-2.0679	-6.4667	-7.7171	-7.8017

LFDI	-0.6458	-1.2111	-3.6025	-7.1226	-7.5842	-7.7276
LINF	-0.0675	-3.9026	-3.8503	-9.1530	-8.9833	-10.0063
LER	4.8753	0.1877	-2.0402	-3.1014	-4.5455	-4.6006
1% Critical Value	-2.6256	-3.6105	-4.2118	-2.6272	-3.6156	-4.2191

Table 3. Johansen Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)				
Null Hypothesis	**Eigenvalue**	**Max-Eigen Statistic**	**5% Critical Value**	**Prob.****
None *	0.8150	173.4272	117.7082	0.0000
At most 1 *	0.7293	110.9975	88.8038	0.0005
At most 2	0.4895	62.6521	63.8761	0.0631
At most 3	0.4045	37.7714	42.9153	0.1488
At most 4	0.2578	18.5902	25.8721	0.3056
At most 5	0.1848	7.5608	12.5180	0.2897
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Null Hypothesis	**Eigenvalue**	**Max-Eigen Statistic**	**5% Critical Value**	**Prob.****
None *	0.8150	62.4298	44.4972	0.0002
At most 1 *	0.7293	48.3454	38.3310	0.0026
At most 2	0.4895	24.8808	32.1183	0.2934
At most 3	0.4045	19.1812	25.8232	0.2933
At most 4	0.2578	11.0294	19.3870	0.5103
At most 5	0.1848	7.5608	12.5180	0.2897

*denotes the rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Note: Trace test and Max-eigenvalue statistics indicate 2 cointegrating equations at 0.05 level

Table 4. Normalized Cointegrating Coefficients

LI	LGDP	LDS	LFDI	LINF	LER	TIME
1.0000	-1.2666	0.2265	-0.7801	0.1386	-4.3676	0.3308

Table 4: VEC Granger Causality/ Block Exogeneity Wald Tests

Variable	ΔLI	ΔLGDP	ΔLDS	ΔLFDI	ΔLINF	ΔLER
ΔLI	-	1.2657 [0.2606]	0.6202 [0.4310]	0.0075 [0.9309]	0.0014 [0.9705]	0.2816 [0.5956]
ΔLGDP	6.4950 [0.0108]*	-	0.0239 [0.8771]	0.2698 [0.6035]	0.4345 [0.5098]	1.5470 [0.2136]
ΔLDS	0.8459 [0.3577]	0.5671 [0.4514]	-	0.8523 [0.3559]	0.8251 [0.3637]	1.1556 [0.2824]
ΔLFDI	8.7924 [0.0030]**	5.0565 [0.0245]*	0.1277 [0.7208]	-	2.6482 [0.1037]	0.0000 [0.9965]
ΔLINF	0.7835 [0.3761]	0.0278 [0.8675]	0.1379 [0.7104]	0.1297 [0.7187]	-	3.2935 [0.0696]***
ΔLER	5.2672 [0.0217]*	0.1081 [0.7423]	0.3052 [0.5806]	6.1585 [0.0131]*	2.8530 [0.0912]***	-
$\sum\chi^2$ (df = 5)	12.5376 [0.0281]*	7.8728 [0.1634]	1.8350 [0.8715]	9.6989 [0.0842]***	4.4753 [0.4832]	5.9958 [0.3066]
ECT_{t-1} (t-value)	-0.1657 (-3.0958)*	1.0118 (4.5763)*	0.0235 (0.2235)	0.3190 (1.2328)	-0.3145 (-0.3145)	-0.0143 (-0.5211)

*significant at 0.05 level **significant at 0.01 and 0.05 level ***significant at 0.10 level

Table 5. Pair-wise Granger Causality Test

Null Hypothesis	Obs.	F-Statistic	p-value
LGDP does not Granger cause LI	39	0.5003	0.4839
LI does not Granger cause LGDP		3.1517**	0.0843
LDS does not Granger cause LI	39	3.8425**	0.0580
LI does not Granger cause LDS		3.1964**	0.0825
LFDI does not Granger cause LI	39	1.1828	0.2840
LI does not Granger cause LFDI		17.7723*	0.0002
LINF does not Granger cause LI	39	3.6024**	0.0657
LI does not Granger cause LINF		0.4070	0.5275
LER does not Granger cause LI	39	0.8679	0.3577
LI does not Granger cause LER		3.2237**	0.0810

*significant at 0.01 level ** Significant at 0.10 level

Table 6. Diagnostic Tests

Test	Test Statistic (χ^2-value)	p-value	Conclusion
Normality Test (Jarque-Bera)	0.2165	0.8774	Error terms are multivariate Normal
Serial Correlation LM Test	0.9761	0.3232	No serial correlation
ARCH Test	0.7750	0.3787	No Heteroscedasticiy in residuals

Figure 1. VECM Characteristic Roots