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The Effectiveness of Monetary Policy in Africa: Modeling the Impact of Financial Inclusion

Olaniyi Evans*[1]

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Abstract

This study uses annual data over the period 2005-2014 and the Panel VECM approach to examine financial inclusion and monetary policy effectiveness in Africa. The study shows that financial inclusion and monetary policy effectiveness are linked by a set of long-run relationships. Policy reaction to the positive financial inclusion shock is not significant. Policy reaction to the positive money supply shock is statistically significant and positive in the short-run while reactions are not significantly different from zero in the long-run. On the other hand, the positive interest rate has a positive and statistically significant permanent effect on the level of monetary policy effectiveness. To various degrees, financial inclusion, money supply and interest rate shocks have some role in explaining variations in monetary policy effectiveness, but in the long-run, more than 45 percent of variations in policy effectiveness are explained by interest rate shocks. Moreover, there exists a one-way causality from monetary policy effectiveness to financial inclusion. This study establishes that financial inclusion is not a significant driver of monetary policy effectiveness in Africa. On the contrary, monetary policy effectiveness is the driver of financial inclusion. For increased financial inclusion in Africa, therefore, heightened effectiveness of monetary policy will be required.

Keywords: Financial Inclusion, Monetary Policy, Panel VECM, Causality.
JEL Classification: E52, E44, G18, C32.

1. Introduction

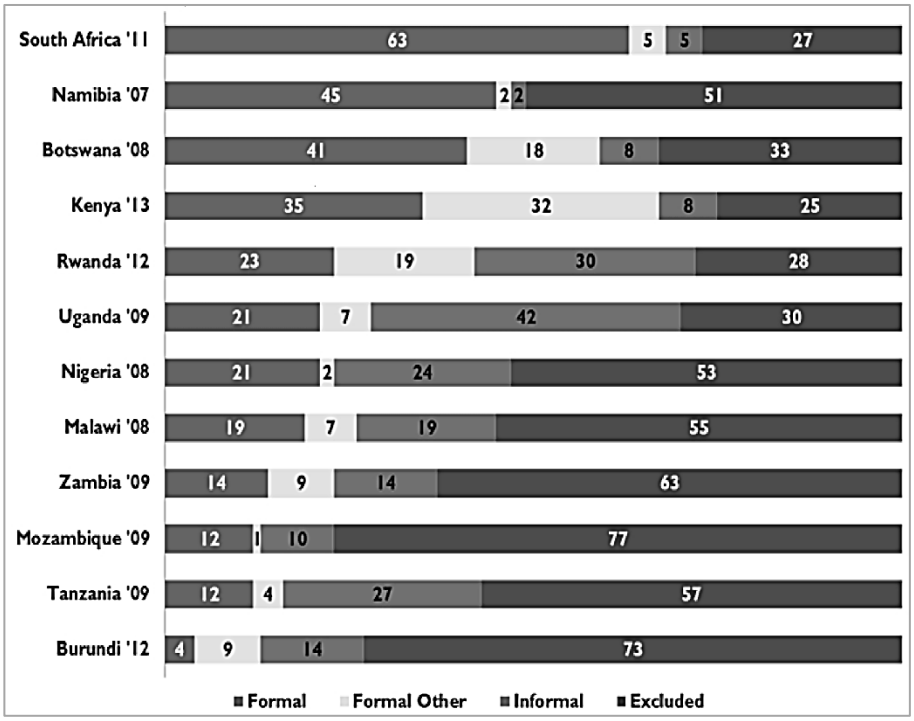
Low access to formal financial systems is a general facet of the economic environment of many African economies (Figure 1). According to CGAP (2014), 75% of adults in Sub-Saharan Africa do not have a bank account. Besides, African economies have large informal sectors[2]. The most vulnerable populations (i.e. the poorest,

1. University of Lagos, Akoka, Lagos, Nigeria.

2. The informal sector contributes about 55 per cent of Sub-Saharan Africa's GDP and 80

women and youth) have informal jobs. Most informal workers are without a bank account. Kahn (2010) opined that a large informal sector has a negative impact on monetary policy transmission, as a result of the financial decisions of the huge volume of the financially excluded who are unaffected by the monetary policies of the central bank. Expanding financial inclusion in Africa is therefore not just good for only these poor people, but it's also good for Africa's monetary policy effectiveness and, thus, financial stability (ADB, 2013).

Figure 1: Level of Financial Access in African Countries



Source: Demirgüç-Kunt & Klapper (2012)

Financial inclusion has been defined as the provision of access to formal financial services at an affordable cost (De Koker & Jentzsch, 2012) to the large segment of the vulnerable and low-income groups (Mahendra, 2006). In other words, financial inclusion means access to formal financial services such as savings, credit and insurance opportunities (Hariharan & Marktanner, 2012). Financial inclusion

percent of the labor force (ADB, 2013).

can thus have multiplier effects on the economy in the form of higher disposable income for rural households, more savings and a more robust deposit base for financial service providers. Financial inclusion can ensure different segments of the society are involved in the formal financial sector, thereby, increasing the reach of monetary policy and thus monetary policy effectiveness.

How does financial inclusion affect monetary policy? In general, financial inclusion increases access to financial services; access to financial services boosts aggregate demand and investment; aggregate demand and investment become more sensitive to monetary policy via the increased elasticity of the lending rate. Additionally, increase in financial inclusion offers a more robust pool of deposits, affording bigger resilience to banks as regards financial shocks. Succinctly, financial inclusion works with commercial banks' lending rates to stimulate monetary policy (Mbutor & Uba, 2013).

Concerning the literature, the existing studies on financial inclusion have mostly focused on the measurement and promotion of financial inclusion, i.e. Marshall (2004), Treasury (2004), Dev (2006), Sarma (2008), Hannig & Jansen (2010), Ardic, Heimann & Mylenko (2011), Demirgüç-Kunt & Klapper (2012), and Allen, Demirguc-Kunt, Klapper, & Peria (2016) as well as the impact on poverty reduction, income inequality, and growth, i.e. Thorat (2006), Sarma & Pais (2008), Chibba (2009), Kpodar & Andrianaivo (2011), Dabla-Norris, Ji, Townsend & Unsal (2015), Johal (2016), and Sharma (2016). The available cross-country evidence mostly emphasizes the benefits of financial depth rather than financial inclusion, i.e. King & Levine (1993), Khan & Semlali (2000), Asongu & De Moor (2015), Valickova, Havranek & Horvath (2015), and Goodhart (2016). The problem with this approach is that "deep financial systems are not necessarily inclusive ones, especially when financial access is heavily skewed toward the wealthy" (CGAP, 2012, as cited in Mbutor & Uba, 2013: 319).

Interestingly, only few studies have considered financial inclusion and its relationship with monetary policy effectiveness. For example, Mbutor & Uba (2013), using Nigerian data over the period 1980 and 2012, showed that growing financial inclusion improved the effectiveness of monetary policy. Mehrotra & Yetman (2014), using a

theoretical framework based on Galí, López-Salido, & Vallés (2004), examined how financial inclusion influences welfare-maximizing monetary policy. They showed that "optimal monetary policy implies a positive relationship between the share of financially included households and the ratio of output volatility to inflation volatility. The empirical results are driven primarily by central banks with a high degree of autonomy in their monetary policy decisions, who might be most likely to set monetary policy optimally" (Mehrotra & Yetman, 2014: 1). Lenka & Bairwa (2016), in a study of SAARC countries, found a significant impact of financial inclusion on monetary policy, meaning that increased financial inclusion can lead to reduced inflation in an economy, thus leading to increased monetary policy effectiveness.

There are several motivations for this study. One, although a few studies have evaluated financial inclusion and monetary policy effectiveness, to the best knowledge of the researcher, there is no empirical evidence available on Africa in this regard. Thus, this study fills that gap by determining the impact of financial inclusion on monetary policy effectiveness in Africa. Two, with the growing number of initiatives to boost financial inclusion in Africa, it would be worthwhile to evaluate the impacts of financial inclusion in the African economy. By determining the impact of financial inclusion on the effectiveness of monetary policy, this study provides important inferences in establishing sound monetary policies in Africa.

While it is possible to have a long list of the benefits of financial inclusion to the economy, this study aims at determining the impact of financial inclusion on the effectiveness of monetary policy by means of panel VECM and panel causality analysis. In the empirical analysis, we concentrate on African countries. The empirical model is augmented with the control variables – money supply and interest rate – in order to avoid omitted variable bias due to the point of view that financial inclusion might not alone stimulate monetary policy effectiveness.

The rest of the paper is organized as follows. The next section describes the data and the econometric methods. Section 3 interprets the empirical results. Finally, Section 4 provides a brief summary and policy implications.

2. Data, Model and Econometric Methods

With regards to the data employed in this study, the annual data was collected for the period 2005–2014 for 15 African countries: Algeria, Angola, Botswana, Cameroon, Ghana, Kenya, Libya, Malawi, Mali, Morocco, Namibia, Niger, Nigeria, Senegal and South Africa[1]. Financial inclusion is measured by the number of depositors with commercial banks (per 1,000 adults). In particular, the overriding target of monetary policy that financial inclusion influences is monetary and price stability. Thus, inflation (annual percentage change in consumer prices) is used as the proxy for monetary policy effectiveness in this study. We use money supply and interest rate as the control variables so as to preclude omitted variable bias. All the variables are collected from World Bank World Development Indicators and expressed in natural logarithm.

A three-stage procedure was followed in testing for the direction of causality. The first stage involves testing for the order of integration using the Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square. The advantage of these three panel unit root tests is that the alternative hypothesis assumes that at least one individual cross section is stationary.

The second stage involves using the Engle-Granger based Pedroni cointegration test to check for the presence of cointegrating relationship among the variables. The Pedroni (1995, 1999) Residual Cointegration Test is appropriate for this study because it is heterogeneous (Camarero & Tamarit, 2002).

The third stage involves estimating the Panel VECM which adjusts to both short-run changes in the variables and the deviations from long run equilibrium. The Panel VECM can be specified as follows:

$$\begin{bmatrix} POLICY_t \\ FINC_t \\ MONEY_t \\ INTEREST_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \end{bmatrix} + \begin{bmatrix} \beta_{11k} & \beta_{12k} & \beta_{13k} & \beta_{14k} \\ \beta_{21k} & \beta_{22k} & \beta_{23k} & \beta_{24k} \\ \beta_{31k} & \beta_{32k} & \beta_{33k} & \beta_{34k} \\ \beta_{41k} & \beta_{42k} & \beta_{43k} & \beta_{44k} \end{bmatrix} x \begin{bmatrix} POLICY_{t-k} \\ FINC_{t-k} \\ MONEY_{t-k} \\ INTEREST_{t-k} \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \end{bmatrix} x \left[ECT_{t-1} \right] + \begin{bmatrix} \xi_{1t} \\ \xi_{21t} \\ \xi_{31t} \\ \xi_{4t} \end{bmatrix}$$

where POLICY is the monetary policy effectiveness; FINC financial

1. The period and countries are selected due to data availability.

inclusion, MONEY supply; INTEREST lending interest rate, *ECT* the error-correction term; β the adjustment coefficients; ξ_t the disturbance term and ECT_{t-1} is the lagged error-correction term.

The fourth stage involves constructing Granger causality tests to determine the link between financial inclusion and monetary policy effectiveness in Nigeria. The Granger causality test is set in the following equation:

$$(1-L)\begin{bmatrix} POLICY_t \\ FINC_t \\ MONEY_t \\ INTEREST_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \end{bmatrix} + \sum_{k=1}^{p}(1-L)\begin{bmatrix} \beta_{11k} & \beta_{12k} & \beta_{13k} & \beta_{14k} \\ \beta_{21k} & \beta_{22k} & \beta_{23k} & \beta_{24k} \\ \beta_{31k} & \beta_{32k} & \beta_{33k} & \beta_{34k} \\ \beta_{41k} & \beta_{42k} & \beta_{43k} & \beta_{44k} \end{bmatrix} x \begin{bmatrix} POLICY_{t-k} \\ FINC_{t-k} \\ MONEY_{t-k} \\ INTEREST_{t-k} \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \end{bmatrix} x\left[ECT_{t-1}\right] + \begin{bmatrix} \xi_{1t} \\ \xi_{21t} \\ \xi_{31t} \\ \xi_{4t} \end{bmatrix}$$

where (1 - L) is the difference operator.

3. Empirical Results

In the first step, Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP-Fisher Chi-square are used to examine the trend properties of the data (Table 1). The deterministic components are intercept and trend. The results show that all variables are I(1) (trend stationary), thus demonstrating that it is proper to examine the existence of cointegrating relationships.

Table1: Panel Unit Root Tests

	IPS		ADF		PP	
POLICY	-1.620	-1.985**	38.192	59.398*	39.514	105.094*
FINC	-1.734	-2.059*	35.450	52.593*	38.736	90.273*
MONEY	-1.608	-1.920**	37.079	58.621*	25.008	44.43**
INTEREST	-1.691	-1.994**	36.145	53.117*	23.089	51.148*

Notes: Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. IPS assumes asymptotic normality.

The next step is the Pedroni Residual Cointegration Test, where the trend assumption is deterministic intercept and trend (Table 2). The results suggest the existence of one (or more) long-run relationships among the set of variables.

Table2: Pedroni Residual Cointegration Test

Alternative hypothesis: common AR coefs. (within-dimension)				
			Weighted	
	Statistic	**Prob.**	**Statistic**	**Prob.**
Panel v-Statistic	-1.205021	0.8859	-1.660301	0.9516
Panel rho-Statistic	2.208227	0.9864	2.001919	0.9774
Panel PP-Statistic	-9.426276	0.0000	-9.624123	0.0000
Panel ADF-Statistic	-6.902081	0.0000	-7.950612	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)		
	Statistic	**Prob.**
Group rho-Statistic	3.334882	0.9996
Group PP-Statistic	-15.06312	0.0000
Group ADF-Statistic	-9.452559	0.0000

Note: Automatic lag length selection based on SIC., Newey-West automatic bandwidth selection and Bartlett kernel.

The third step is the estimation of the vector correction model (VECM)[1]. Table 3 reports the results for the VECM model with a 3-lag structure. The most important is the first column under the heading "D(POLICY)". This is the set of estimated parameters that pinpoint a long-term relationship among our variables of interest.

Table3: Vector Error Correction Estimates

Error Correction:	**D(POLICY)**	**D(FINC)**	**D(MONEY)**	**D(INTEREST)**
ECT(-1)	-0.51	0.03	-0.01	0.04
	[-3.66]	[3.33]	[-0.55]	[0.39]
D(POLICY(-1))	-0.32	-0.02	0.00	-0.21
	[-2.31]	[-1.99]	[0.02]	[-2.03]
D(POLICY(-2))	-0.41	-0.01	-0.01	-0.16
	[-3.39]	[-1.75]	[-0.87]	[-1.79]
D(POLICY(-3))	0.02	0.00	-0.03	-0.03
	[0.16]	[0.21]	[-2.29]	[-0.46]
D(FINC(-1))	0.56	0.09	0.31	-1.32
	[0.35]	[0.82]	[1.42]	[-1.12]
D(FINC(-2))	0.23	-0.19	0.04	-0.13
	[0.14]	[-1.74]	[0.18]	[-0.11]
D(FINC(-3))	-2.38	0.15	-0.44	-0.28
	[-1.15]	[1.06]	[-1.53]	[-0.18]
D(MONEY(-1))	1.81	-0.04	-0.45	0.73
	[2.02]	[-0.71]	[-3.55]	[1.09]
D(MONEY(-2))	1.97	-0.02	-0.49	-0.18
	[1.60]	[-0.26]	[-2.85]	[-0.19]

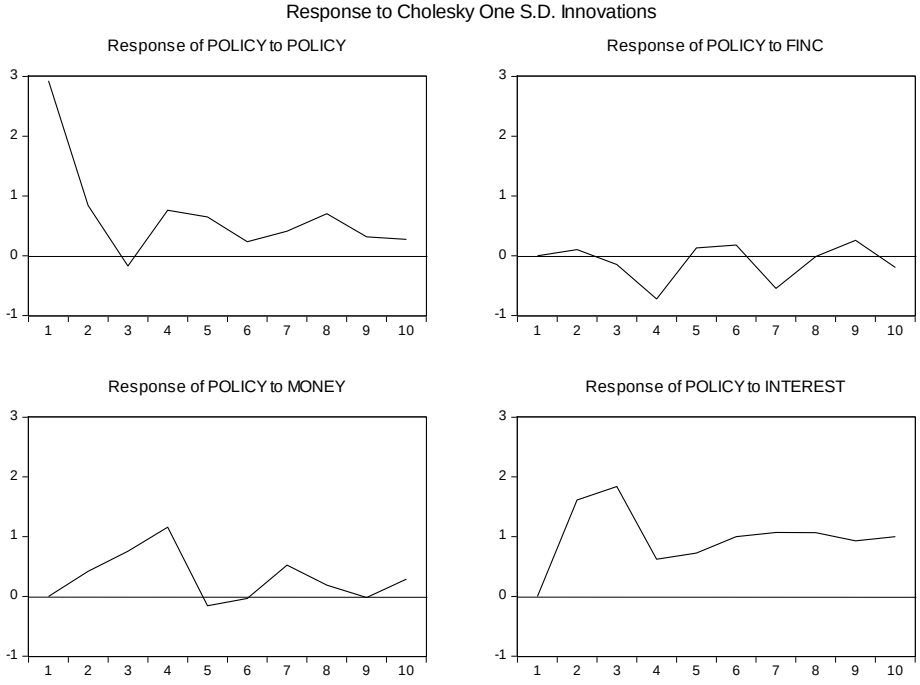
1. The lag selection criteria and the AR structure of the VECM are as shown in the appendix.

D(MONEY(-3))	3.91	0.04	-0.09	2.24
	[2.23]	[0.36]	[-0.36]	[1.70]
D(INTEREST(-1))	0.41	-0.01	-0.01	0.08
	[2.41]	[-1.04]	[-0.29]	[0.62]
D(INTEREST(-2))	0.42	0.03	-0.02	-0.25
	[2.29486]	[2.18]	[-0.59]	[-1.82]
D(INTEREST(-3))	0.13	-0.01	0.00	0.06
	[0.68]	[-0.55]	[0.14]	[0.39]

Note: t-statistics in [ ]

In order to understand the results of the VECM, we use impulse response functions (IRF) and variance decompositions. The IRF) are as shown in Figure 2 (IRF is shown for only POLICY so as to save pace). The reaction of policy effectiveness to the positive financial inclusion shock is not significant. Policy reaction to the positive money supply shock is statistically significant and positive in the short-run while reactions are not significant different from zero in the long-run. On the other hand, the positive interest rate has a positive and statistically significant permanent effect on the level of monetary policy effectiveness.

Figure 2: Impulse Response Functions



The variance decomposition is shown in Table 4 (for only POLICY so as to save pace). In the short-run, financial inclusion, money supply and interest rate shocks have some role in explaining variations in the monetary policy effectiveness, but in the long-run, more than 45 percent of variations are explained by interest rate shocks.

Table 4: Variance Decomposition

Period	S.E.	Policy	FINC	Money	Interest
1	2.925527	100.0000	0.000000	0.000000	0.000000
2	3.471385	76.88970	0.087939	1.456477	21.56588
3	4.007646	57.87559	0.204661	4.654274	37.26548
4	4.346027	52.27435	2.938762	11.05738	33.72951
5	4.457953	51.78998	2.879196	10.63132	34.69951
6	4.577937	49.36964	2.879606	10.08676	37.66399
7	4.779570	46.02423	3.950514	10.45519	39.57007
8	4.950657	44.90541	3.682927	9.890740	41.52093
9	5.053763	43.47968	3.791671	9.492588	43.23606
10	5.170844	41.81430	3.765794	9.382431	45.03748

Cholesky Ordering: Policy FINC Money Interest

The results of the panel Granger causality are as shown in Table 5. There exists a one-way causality from monetary policy effectiveness to financial inclusion. There seems to be no causality from financial inclusion to policy effectiveness. This holds for all specifications tried. There is bidirectional causality between money supply and monetary policy effectiveness. As well, there is bidirectional causality between interest rate and monetary policy effectiveness.

Table5: Granger Causality Tests

Null Hypothesis	Chi-Sq	df	Prob.
ΔFINC → ΔPOLICY	1.54	3	0.67
ΔPOLICY → ΔFINC	7.36**	3	0.04
ΔMONEY → ΔPOLICY	8.89**	3	0.03
ΔPOLICY → ΔMONEY	7.73**	3	0.04
ΔINTEREST → ΔPOLICY	10.48**	3	0.01
ΔPOLICY → ΔINTEREST	I.21	3	0.16

Note: * and ** denote the significance level at the 1% and 5%.The lag length is determined by Akaike's Information Criterion (AIC).

In a nutshell, the grand summary of our empirical results indicates

that, over time, financial inclusion and monetary policy effectiveness are linked by a set of long-run relationships. However financial inclusion has no significant impact on monetary policy effectiveness, while monetary policy effectiveness causes financial inclusion. The findings of this study is, therefore, in contrast to earlier studies such as Lenka & Bairwa (2016) which found a significant impact of financial inclusion on monetary policy effectiveness in a study of SAARC countries; and Mbutor & Uba (2013) which showed that growing financial inclusion improved the effectiveness of monetary policy in Nigeria.

Conclusions and Policy Implications

This study used annual data over the period 2005-2014, the Panel VECM approach and panel Granger causality to examine the impact of financial inclusion on monetary policy effectiveness in Africa. The study has shown that financial inclusion and monetary policy effectiveness are linked by a set of long-run relationships. The reaction of policy effectiveness to the positive financial inclusion shock is not significant. Policy reaction to the positive money supply shock is statistically significant and positive in the short-run while reactions are not significantly different from zero in the long-run. On the other hand, the positive interest rate has a positive and statistically significant permanent effect on the level of monetary policy effectiveness. The study found that financial inclusion, money supply and interest rate shocks have some role in explaining variations in monetary policy effectiveness, but in the long-run, more than 45 percent of variations in monetary policy effectiveness are explained by interest rate shocks.

Moreover, while there is a one-way causality from monetary policy effectiveness to financial inclusion, there seems to be no causality from financial inclusion to monetary policy effectiveness. This holds for all specifications tried. There is bidirectional causality between money supply and monetary policy effectiveness. As well, there is bidirectional causality between interest rate and monetary policy effectiveness.

Therefore, this study has established that financial inclusion is not a significant driver of monetary policy effectiveness in Africa. On the

contrary, monetary policy effectiveness is the driver of financial inclusion. For increased financial inclusion in Africa, therefore, heightened effectiveness of monetary policy will be required. Most national governments and international institutions in Africa have been leading major policy initiatives to encourage financial inclusion. The Financial Sector Charter and the Black Economic Empowerment Act in South Africa are examples of initiatives towards universal financial inclusion in Africa. Yet, there is still a yawning gap across the continent. Financial inclusion policies for harder-to-reach rural and remote populations should be the focus of monetary policy in Africa. Other areas are policies for improving digital access to finance, sustaining financial service delivery to remote areas and culturally fitting models for increasing the financial capabilities of populations with cultural/language barriers and poor literacy/numeracy.

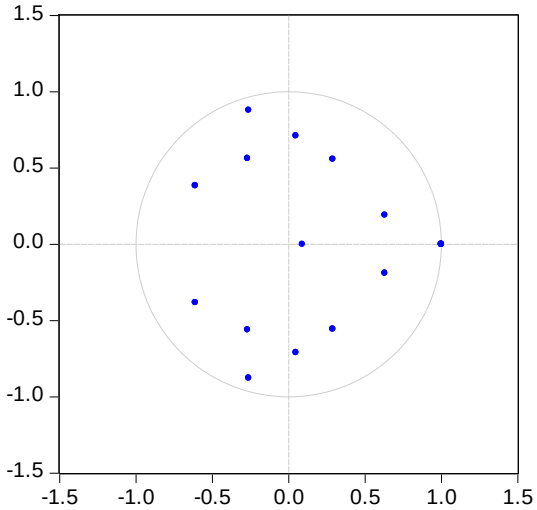
Appendices

Table1: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-447.7113	NA	40.67236	15.05704	15.19667	15.11166
1	-297.8149	274.8101	0.469480	10.59383	11.29194*	10.86690*
2	-282.6530	25.77523	0.486451	10.62177	11.87837	11.11329
3	-261.5444	33.07014*	0.418067*	10.45148*	12.26658	11.16146
4	-245.8136	22.54753	0.437227	10.46045	12.83404	11.38889
5	-234.0944	15.23497	0.535361	10.60315	13.53523	11.75004

* 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

Figure 1: Inverse Roots of AR Characteristic Polynomial



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