

DOES FINANCIAL DEVELOPMENT EXPLAIN THE CYCLICALITY OF MONETARY POLICY IN SUB-SAHARAN AFRICA?

ITCHOKO MOTANDE MONDJELI MWA NDJOKOU AND CHRISTOPHE MARTIAL MBASSI

University of Yaoundé II, Cameroon

This paper evaluates the influence of financial development on the cyclicity of monetary policy in a sample of 22 Sub Saharan African countries. We use a GMM model to estimate an equation of monetary policy stance based on Taylor's rule over the period 1984-2012. We obtain the following results. Monetary policy is pro-cyclical in Sub Saharan African countries. Central Banks implement counter-cyclical monetary policy when the country exhibits high level of financial development and pro-cyclical monetary policy in the presence of low level of financial development. The threshold level at which monetary policy is a-cyclical lies between 15% and 18%.

Keywords: Monetary Policy, Business-cycle, Financial Development, GMM

JEL Classification: E32, E52, C33

1. INTRODUCTION

The aim of macroeconomic stabilization policies is to overcome business-cycle fluctuations. Since the last financial crisis, there is a huge interest for macroeconomic stabilization policies. From literature, it has been noticed that stabilization policies tend to be historically counter-cyclical in developed countries (Gali and Perotti, 2002; Lubik and Schorfheide, 2007) and pro-cyclical in less developed countries (LDCs henceforth) (Talvi and Vegh, 2005; Ilzetzki and Vegh, 2008). But since the 2000s, macroeconomic policies in LDCs seem to be more counter-cyclical. Although there are numerous papers related to the cyclical nature of fiscal policy (Mondjeli, 2017; Bobbo, 2016; Carmignani, 2010), there are few on the cyclicity of monetary policy. Studies on this topic confirm that monetary policy is counter-cyclical in developed countries, pro-cyclical and, at best, a-cyclic in LDCs. In Sub Saharan African (SSA henceforth) countries, empirical studies on cyclicity of monetary policy are also very sparse. We can mention the studies done by Du Plessis et al. (2007) mainly focuses on South Africa and Kaskende et al. (2010) which limit their analysis to some indicators. As it is well known, pro-cyclicity of monetary policy leads to macroeconomic instability especially in LDCs. For Aguiar and Gopinath (2007), this feature might partly explain the higher volatility of output in

LDCs compared to advanced economies. According to Woodford (2001), it's therefore useful for monetary policy to be counter-cyclical or optimal.

Conceptually, cyclicalness of monetary policy refers to the behavior of the Central Bank during business- cycle. Thus, monetary policy is said to be pro-cyclical (counter-cyclical) if during periods of expansion, the Central Bank decreases (increases) the interest rate and vice versa. In other words, pro-cyclical monetary policy refers to when Central Banks that relax monetary policy during booms while adopting contractionary policies during busts. Many reasons have been established in literature to justify this destabilizing behavior, among them the quality of institutions. Countries with strong institutions tend to show positive output-interest rate correlations while countries with weak institutions have negative correlations, meaning that they pursue pro-cyclical monetary policy. For instance, Duncan (2014) shows that the strengthening of institutional framework explains the convergence towards counter-cyclical policies. Regarding the institutions, there is no definition unanimously accepted. Besides the definition of North (1990) where institutions are considered as set of formal and informal rules that govern the interaction between individuals, there is a wide range of definitions. Furthermore, in their large variety, institutions may be political, economic or social.

In this article, we focus on economic institutions especially financial development for at least two reasons. Firstly, the effects of monetary policy on real economy mainly channeled through the financial system. Theoretically, financial development enables a more efficient transmission of monetary policy and, hence, increases the incentives to conduct counter-cyclical policy (Coulbaly, 2012). Secondly, statistics show that SSA' countries record lower level of financial development. Table A1, in Appendix, gives an illustration. The average level of financial development in SSA' countries are less than 19% with strong disparities between countries. For instance, the level of financial development in South Africa is 116% when it's about 7.6% in Uganda. Moreover, it seems that there is a link between financial development and cyclicalness of monetary policy. Thus, the five countries with the lowest levels of financial development namely Uganda, Angola, Zambia, Guinea-Bissau and Ghana experience pro-cyclical monetary policy. Within the countries with higher level of financial development such as South Africa, Namibia, Ivory Coast, Senegal and Togo, only Ivory Coast pursues a pro-cyclical monetary policy. Figure A1 in Appendix highlights the existence of a positive relation between financial development and cyclicalness of monetary policy. The issue of the role of financial development in explaining the cyclical behavior of monetary policy is therefore raised.

The purpose of the paper is to evaluate the influence of financial development on the cyclicalness of monetary policy. Before that, we determine the cyclical nature of monetary policy. The first conjecture shows that, in SSA' countries, monetary policy is pro-cyclical. The second conjecture highlights that countries with strong financial development will be able to pursue counter-cyclical monetary policy. The rest of the article is structured as follows. Section 2 reviews the empirical literature. Section 3

presents the methodology of the study. The results are reported and discussed in Section 4 while Section 5 gives concluding remarks.

2. REVIEW OF LITERATURE

In accordance with the objectives of the study, the literature is discussed in two ways. Firstly, we focus on studies which evaluate the cyclical nature of monetary policy. Numerous papers seem to agree with the idea that the cyclical nature of monetary policy is linked to the level of development of a country. In a sample of 104 countries over the period 1960 to 2003, Kaminsky et al. (2005) show that most of the OECD countries are characterized by a counter-cyclical monetary policy while LDCs conduct pro-cyclical monetary policy. Similar findings were found by Calderón et al. (2003, 2004). However, it's noticed in recent papers that monetary policy in some LDCs tend to be counter-cyclical. An example is given by Vegh and Vuletin (2012), who demonstrate in a sample of 68 countries that about 35% of LDCs have shifted to counter-cyclical monetary policies. This tendency known as the "graduation phenomenon" is confirmed by Coulibaly (2012) and McGettigan et al. (2013). In the particular case of SSA, Kaskende et al. (2010) highlight that monetary policy was counter-cyclical during the last economic and financial crisis. The same result was already found in a more robust study of Du Plessis et al. (2007) in the case of South Africa.

Secondly, we review the studies which evaluate the relation between the quality of institutions, specifically economic institutions, and cyclical nature of monetary policy. In this sense, Coulibaly (2012) and McGettigan et al. (2013) emphasize the role of financial reforms in the counter-cyclical trend of monetary policy. For Lane (2003), there is an indirect effect through the credibility of monetary policy. In this vein, the ability of a Central Bank to conduct a counter-cyclical monetary policy depends on the credibility of its policy. According to Calderón et al. (2003), a credible policy reduces the country's risk and therefore facilitates the implementation of counter-cyclical policy. This credibility itself depends on the monetary policy framework. Therefore, inflation targeting countries tend to carry out counter-cyclical policy. Finally, the exchange rate regime is also another factor. For instance, Vegh and Vuletin (2012) show that monetary policy is pro-cyclical in countries with fixed exchange rate and counter-cyclical in countries under flexible exchange rate regime.

From the empirical literature, we observe that papers on monetary policy cyclical nature are very sparse especially in LDCs and notably in SSA' countries. In fact, there is no specific empirical research on the cyclical nature of monetary policy in the case of SSA' countries. Moreover, many papers focus on political institutions to explain the cyclical nature of monetary policy. Although these political factors are very important, none of the papers, to the best of our knowledge, are devoted to economic institutions. And in a context of Central Banks' independence, monetary policy seems to be mainly influenced by economic institutions rather than political ones. Our paper complements

and improves upon the existing literature on these issues.

3. METHODOLOGY AND DATA

This section introduces the methodology and data used to test the influence of financial development on the cyclicity of the monetary policy in a panel dataset of 22 SSA' countries over the period 1984-2012 on an annual frequency. Following Calderón et al. (2016), monetary policy is specified as an extension of the standard Taylor rule (1993). By focusing on the Taylor rule, we assume an imperfect substitution between domestic and foreign assets; therefore, short-term interest rates can represent common monetary policy instruments under both flexible and fixed exchange rate regimes. The specification also takes into account the changes in exchange rate since there is evidence that Central Banks in LDCs usually react to exchange rate deviations. Regarding our main hypothesis, the specification includes a variable that captures the interaction between financial development and business-cycle variable. The formulation of the structural equation in panel data is described as follows:

$$r_{i,t} = \alpha_0 + \beta_1 r_{i,t-1} + \beta_2 \pi_{i,t} + \beta_3 e_{i,t} + \beta_4 y_{i,t} + \beta_5 y_{i,t} Q_{i,t} + u_{i,t}, \quad (1)$$

where r is the deviation from trend of the nominal interest rate, π is the deviation of domestic inflation from its trend path, e is the deviation of currency depreciation from its trend path, y is the real output gap or business cycle measure, and Q a measure of financial development. u is a stochastic disturbance. The subscripts i and t indicate the country and the time period, respectively.

The nominal interest rate (r) is defined as the cyclical component of the logarithm of gross nominal central bank's discount rate. It is expressed in percent deviations from trend. Otherwise, money market or interbank rates are used when the discount rate is not available. The inflation rate (π) is defined as the cyclical component of the logarithm of the gross consumer price index. It is expressed in percent deviations from trend. The output gap (y) is the cyclical component of the logarithm of real GDP. The exchange rate (e) is measured by the cyclical component of the logarithm of the nominal exchange rate as a percentage of its trend. For each country, nominal exchange rate is expressed as the value of the domestic currency per US dollar. Finally, financial development is defined as the ratio between the domestic volume of credit to private sector and GDP. The cyclical components are obtained from de-trending the variables by applying the Hodrick-Prescott (HP) filter. Series on GDP and inflation are obtained from the World Economic Outlook database (WEO). Data on interest rate and exchange rate are extracted from the International Financial Statistics (IFS) of International Monetary Fund (IMF). Data on financial development come from the World Development Indicator (WDI).

As far as explanatory variables are concerned, the expected coefficients are

described as follows. The cyclical nature of monetary policy is determined by the sign of the coefficient β_4 . When this coefficient is negative, monetary policy is pro-cyclical and otherwise it's counter-cyclical. The influence of financial development on the cyclical nature of monetary policy is captured by the parameter β_5 . If β_5 is positive, then financial development improves the cyclical nature of monetary policy. In other words, it means that the monetary policy tends to be less pro-cyclical or more counter-cyclical. We expect β_1 to lie between 0 and 1, β_2 and β_3 to be positive. With respect to exchange rate variable, it's well known that in fixed regimes with open capital accounts, capital flows can complicate the conduct of monetary policy; it can be loosened in periods of strong capital inflows and growth, and be tightened in the event of outflows. Relatively to inflation, it's theoretically admitted that Central Bank answers to a high inflation by a tight monetary policy.

Equation (1) also provides the ability to distinguish among the countries pursuing a pro-cyclical monetary policy and those with a counter-cyclical monetary policy. For this purpose, we first of all determine the threshold level Q^* that ensures the monetary policy to be a-cyclic. As in Calderón et al. (2016), we calculate the partial derivative of equation (1) expressed as follows:

$$\frac{\delta r_{i,t}}{\delta y_{i,t}} = \beta_4 + \beta_5 Q_{i,t}^* \quad (2)$$

Secondly, we compare the average level of financial development Q_i of the country i with the threshold Q^* . When the country exceeds our estimated threshold value of financial development Q^* , it would be able to adopt counter-cyclical policies. Otherwise, it would engage in pro-cyclical policies if it has a financial development level below Q^* . In the case that the financial development of the country equals the threshold value of financial development Q^* , monetary policy is qualified as a-cyclic.

To estimate equation (1), we use the generalized method of moments (GMM) in system. This is justified by the specificities and difficulties related to dynamic models which are dealt in GMM models. Firstly, we have the problem of endogeneity. Secondly, the presence of one or more lagged variable raises the problem of autocorrelation of errors terms. Finally, the specific characteristics of countries such as demography and geography may be correlated with explanatory variables. Moreover, given the limits of GMM in difference, we use the GMM model in system. The instruments are the lags of the key macroeconomic variables (output gap, inflation rate, exchange rate) and the monetary policy instrument. To check the validity of the instruments, we perform the Sargan test of over-identifying restrictions. If we accept the null hypothesis of the moment's conditions specified by our GMM estimator, we validate our specified regression model. The robustness of the results is controlled by using different de-trending methods to calculate the cyclical components of the variables.

4. RESULTS

This section reports estimation results on the cyclicity of monetary policy and how financial development influences this cyclicity. Before that, we underline how the unit root test was conducted. Two types of unit root tests, first and the second generation tests, are usually used on panel data. The first generation tests are based on the assumption of the independence of individuals within the panel dataset. In our sample, many SSA' countries are relatively integrated since they are members of at least one regional integration agreements. Also, some countries belong to the same monetary union facing a common monetary policy. It is therefore useful to assume a possible dependence of individuals in the panel, which it is taken into account by the second generation tests. But, the choice of unit root test depends on the result of the Pesaran (2004) test. The Pesaran (2004) test is adapted for small size samples, compatible with unbalanced panels and allow for the existence of one or more structural breaks. For a given variable, Pesaran (2004) tests for the existence of correlation between residuals of the ADF regression of individual i with those of each of the other $n - 1$ individuals in the sample. The test leads to the rejection of the null hypothesis at 1% level of significance (see table 1 below).

Table 1. Dependency Tests Individuals [CD-test $\sim N(0, 1)$]

Variables	CD-test	p-value	corr.	abs (corr.)
Deviation from trend of the nominal interest rate	11.02	0.000	0.154	0.317
Inflation Deviations from its Trend	14.31	0.000	0.205	0.376
Exchange Rate Deviations from its Trend	17.86	0.000	0.258	0.448
Output Gap	4.11	0.000	0.059	0.267
Output Gap x Financial Development	2.72	0.007	0.040	0.246

Table 2. Unit Root Tests

Variables	Lags	Without Trend		With Trend	
		Zt-bar	p-value	Zt-bar	p-value
Deviation from trend of the nominal interest rate	0	-9.530	0.000	-7.085	0.000
Deviation from trend of the nominal interest rate	1	-9.838	0.000	-8.430	0.000
Inflation Deviations from its Trend	0	-6.782	0.000	-3.647	0.000
Inflation Deviations from its Trend	1	-5.941	0.000	-3.096	0.001
Exchange Rate Deviations from its Trend	0	-7.575	0.000	-5.187	0.000
Exchange Rate Deviations from its Trend	1	-6.173	0.000	-3.769	0.000
Output Gap	0	-5.240	0.000	-3.200	0.001
Output Gap	1	-4.779	0.000	-1.970	0.024
Output Gap x Financial Development	0	-6.432	0.000	-4.682	0.000
Output Gap x Financial Development	1	-5.916	0.000	-4.231	0.000

Hence, to control for integration properties of series, we perform a Pesaran (2007) test. From Table 2, we observe that for all variables, the hypothesis of the presence of a unit root cannot be accepted; the variables in our specification are therefore stationary at level.

Table 3 reports the results of the estimation of equation (1) by the GMM in system. The sensitivity of the estimated parameters is tested using different de-trending methods. These different methods are the HP filter with $\lambda = 100$, HP filter with $\lambda = 6.5$ as formulated by Ravn and Uhlig (2002) and the Bandwidth filter proposed by Baxter and King (1999).

The Sargan test validates the selected instruments; it confirms that the specification adopted cannot be rejected at the conventional level of significance. The coefficient estimates of equation (1) display the expected signs and are statistically significant at the standard levels. Firstly, the coefficient associated with output gap is significantly negative at the conventional levels. This result, as in previous studies, confirms the fact that monetary policy is pro-cyclical in SSA' countries. Many explanations can justify this result. For instance, Calvo and Reinhart (2002) highlight that developing countries do not adopt counter-cyclical stabilization policies because Central Banks usually raise interest rates in presence of capital outflows when the domestic economy contracts. This destabilizing behavior of Central Banks is preferred instead of leaving the currency value to float freely. Notably, for the countries under fixed exchange regime (For example Cameroon and Benin among others), this behavior seems to be the only alternative.

Secondly, our estimation results yield a positive and significant estimate for the interaction between output gap and financial development. This implies that Central Banks in SSA's countries are able to implement counter-cyclical monetary policies when the country exhibits a high level of financial development and pro-cyclical monetary policy in the presence of a low level of financial development. This conclusion could be assimilated to the findings of Yakhin (2008), which focus on the role of financial integration to the cyclicality of monetary policy. Thirdly, the possibility that the stance of monetary policy can shift with the level of financial development enables us to calculate the threshold level at which monetary policy is a-cyclical. This threshold lies between 15% and 18% depending on the de-trending method used. For the HP filter (with $\lambda = 100$), the threshold of financial development is 15.41%. Thus, countries with financial development less than 15.41% conduct pro-cyclical monetary policy. On the contrary, when the financial development exceeds 15.41%, the monetary policy stance is counter-cyclical. In our sample, 15 countries (more than 68% of the sample) have a level of financial development less than 15.41%. Countries nearer to the threshold are Mozambique (15.09%), Botswana (14.57%) and Cameroon (14.11%). Uganda, Angola and Zambia are the countries where the ability to pursue counter-cyclical monetary policy is really reduced with a level of financial development around 7.64%, 8.25% and 8.93% respectively. Only 7 countries have a level of financial development above the threshold namely South Africa (116.94%), Namibia (41.72%), Ivory Coast (22.76%),

Senegal (22.76%), Togo (19.79%), Nigeria (15.57%) and Mali (15.55%). The HP filter (with $\lambda = 6.5$) and the Bandwidth filter give different thresholds around 18.43% and 16.01%, respectively, levels that do not really change the conclusions about the cyclicity of monetary in SSA' countries.

Table 3. GMM Estimation Results

Dependent variable: Deviation from trend of the nominal interest rate			
Estimation methods: Generalized Method of Moments (GMM) in system			
Sample: 22 Sub-Saharan Africa countries, annual data, 1984-2012			
Regressors	GMM-HP ($\lambda = 100$)	GMM-HP ($\lambda = 6.5$)	GMM-BK
Constant	0.0010 (0.523)	-0.0026*** (0.000)	-0.0024** (0.047)
Lagged dependant Variable	0.4170*** (0.000)	0.2524** (0.045)	0.1800 (0.170)
Inflation Deviations from its Trend	-0.0470* (0.092)	0.0206 (0.747)	0.5051* (0.094)
Exchange Rate Deviations from its Trend	0.2087** (0.033)	-0.0088 (0.378)	0.0291 (0.884)
Output Gap	-0.3685** (0.026)	-0.6777** (0.013)	-0.4821* (0.087)
Output Gap x Financial Development	0.0239*** (0.000)	0.0367*** (0.001)	0.0300*** (0.010)
Statistics			
Wald Chi2(5) (P-Value)	0.000	0.000	0.000
Sargan Statistics (P-value)	0.916	0.409	0.198
N of Observations	478	433	360
Neutral-Policy Index (Q*)	15.4157	18.4370	16.0196

Note: (a) For BK filter, as widely admitted for annual data, we use $pl(2)$ $\phi(8)$ and $k(3)$. Where $pl()$ and $\phi()$ specify the minimum period of oscillation and maximum period of oscillation of the desired component of the time series respectively, while $k()$ specifies the lead-lag length of the filter. (b) Significance level: (***) 1%; (**) 5%; (*) 10%. (c) The values in parentheses are probabilities.

Economically, the preceding result suggests that most SSA' countries are not sufficiently financially developed in order to adopt countercyclical monetary policies. In fact, the level of financial development of the majority of SSA' countries is less than the estimated optimal levels lying between 15% and 18%. Following Calderon et al. (2016), our result means that monetary policy is pro-cyclical in SSA' countries because of the lack of access to funding since we measure financial development by the domestic credit to GDP ratio, a proxy of credit supply. As it's theoretically known, monetary policy can stabilize output fluctuations through credit channel for instance. Moreover, SSA' countries are mostly debt-based economies with the predominance of funding through banks. But these economies are characterized by over liquidity paradox. While banks are over liquid, they do not grant sufficiently credit to agents. Then, such a feature reinforces the argument of lack of funding on one hand, and on the other hand, there is an issue

with the transmission of monetary policy. Indeed, in a theoretical model, Agénor and El Aynaoui (2010) find that over liquidity leads to an increase in interest rate stickiness, which alter the ability of monetary policy to produce countercyclical effects. In this vein and more related to the SSA's region, Saxegaard (2006) shows that excess liquidity weakens the effectiveness of monetary policy and the ability of central bankers to influence economic conditions in the intentional way.

The main policy implication is that it's necessary to improve financial development around 15% to expect counter-cyclical monetary policies in SSA' countries. More operationally, the improvement of financial development can be made by promoting the development of financial markets and innovations in the banking sector. In addition with the improvement of the overall quality of institutions, the latter measures could solve the issue of over liquidity. Moreover, to reach the estimated optimal thresholds of financial development, it's also desirable to promote financial inclusion. Such a policy is a way to improve access to funding, one of the conditions to have counter-cyclical monetary policy.

5. CONCLUSION

Theoretically, macroeconomic stabilization policies aim at dampens economic cycles. But empirical papers emphasize that stabilization policies seem to be pro-cyclical in LDCs. Although the cyclical nature of fiscal policy is widely documented, papers on monetary policy are very sparse especially in LDCs. In the case of SSA' countries, there is no specific empirical research on the cyclical nature of monetary policy. Furthermore, empirical studies focus on political institutions when they identify the factors explaining the cyclical nature, leaving aside economic institutions, notably financial development. This paper fills the gaps in the existing literature. The purpose of the paper was to evaluate the influence of financial development on the cyclical nature of monetary policy. Prior to that, we have determined the cyclical nature of monetary policy. To accomplish this task, we rely on a large sample of 22 SSA's countries over the period 1984-2012. Our specification of the monetary policy stance is based on Taylor's rule. The explanatory variables of interest include the output gap (a measure of business-cycle conditions) and the interaction between the output gap and financial development variable. The cyclical component of the variables is obtained by using various methods of de-trending. For the estimation, we use the GMM method in system.

The key findings of our empirical research are as follows. Firstly, monetary policy is pro-cyclical in SSA' countries since the coefficient associated with output gap is significantly negative. This results mean that Central Bankers in SSA tend to increase (decrease) their policy rates when economic activity contracts (expands). Secondly, the empirical analysis strongly confirms the existence of a positive interaction between output gap and financial development. This implies that Central Banks in SSA' countries implement counter-cyclical monetary policy when the country exhibits a high

level of financial development and pro-cyclical monetary policy in the presence of a low level of financial development. In others words, financial development enables the graduation from pro-cyclical monetary policies to counter-cyclical ones, confirming the existence of “graduation phenomenon” in LDCs. Thirdly, the threshold level at which monetary policy is a-cyclical lies between 15% and 18% depending on the filter method used. Considering for instance the HP filter with $\lambda = 100$, the threshold of financial development is 15.41%. At this level, only 7 countries, i.e. 31.81% of the sample, have the ability to pursue counter-cyclical monetary policies. This result means that most countries of the sample have not yet reached a sufficiently high level of financial development to expect counter-cyclical monetary policy. The main policy recommendation is for SSA’ governments to put in place some structural measures in order to improve financial development. Such measures could lead to better funding of economic activities since it’s theoretically admitted that lack of funding is a source of a pro-cyclicality of monetary policy.

APPENDICES

Table A1. Average Values of the Level of Financial Development and the Correlation between Economic Cycle and Nominal Interest Rate of the Central Bank

Countries	Financial Development	Correlation between interest rate and business-cycle
South Africa	1.1694	0.4393
Angola	0.0825	-0.7302
Botswana	0.1457	0.0455
Burkina Faso	0.1344	0.3259
Cameroon	0.1412	0.0929
Ivory Coast	0.2277	-0.3361
Gabon	0.1264	-0.2073
Gambia	0.1072	-0.0837
Ghana	0.0903	-0.0586
Bissau-Guinea	0.0896	-0.1991
Malawi	0.0980	-0.2664
Mali	0.1555	0.1504
Mozambique	0.1509	-0.5618
Namibia	0.4173	0.0498
Niger	0.0963	0.3297
Nigeria	0.1557	-0.2493
Uganda	0.0765	-0.2277
Congo Republic	0.1020	0.2669
Senegal	0.2276	0.3825
Tanzania	0.0967	0.5644
Togo	0.1979	0.1118
Zambia	0.0893	-0.1453
Average Mean	0.1899	-0.0139

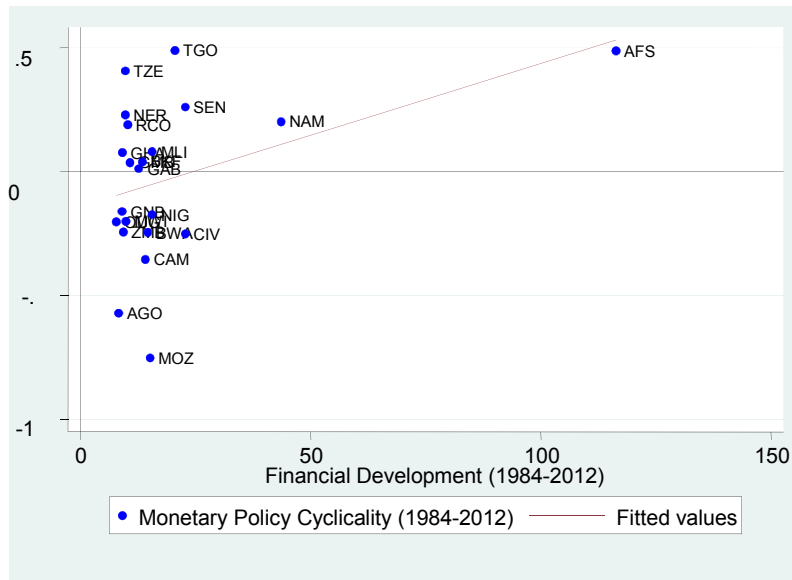


Figure A1. Monetary Policy Cyclicity and Financial Development

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Mailing Address: Faculty of Economics and Management, University of Yaounde II- Soa P.O. BOX 1365 Yaounde Cameroon Email: motande@yahoo.fr.

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