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Abstract

This study investigates the stability of demand for money in the proposed Southern African Monetary Union (SAMU). The study uses annual data for the period 1981 to 2015 from ten countries making-up the Southern African Development Community (SADC). A standard function of demand for money is designed and estimated using a bounds testing approach to co-integration and error-correction modeling. The findings show divergence across countries in the stability of money. This divergence is articulated in terms of differences in cointegration, CUSUM (cumulative sum) and CUSUMSQ (CUSUM squared) tests, short run and long-term determinants and error correction in event of a shock. Policy implications are discussed in the light of the convergence needed for the feasibility of the proposed SAMU. This study extends the debate in scholarly and policy circles on the feasibility of proposed African monetary unions.

Keywords: Stable; demand for money; bounds test
JEL classification: E41; C22

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1. Introduction

Three fundamental factors motivate the positioning of a study on the assessment of the stability of demand for money in the proposed Southern African Monetary Union (SAMU), notably: (i) the policy relevance of such a study in the light of the recent European Monetary Union (EMU) crisis; (ii) the evolving debate on the stability of demand for money and (iii) the need to bridge existing gaps in the literature. These three factors are expatiated in chronological order.

First, in relation to the policy front, the post-2008 monetary crises in the EMU have shown that a currency union that is not designed to be robust to a variety of macroeconomic shocks is not sustainable[2]. This is essentially because; in the event of serious disequilibria, adjustments to the long-run equilibrium are important in order to ensure consistency with the adopted convergence criteria (Asongu, 2013). Within the framework of demand for money, the effectiveness of the EMU central bank's monetary policy is substantially contingent on a stable function of the demand for money in order to ensure that changes in monetary policy rate have expected outcomes on macroeconomic indicators such as national income and inflation (Fisher *et al*., 2007). This is because the criteria for the formation of currency areas suggests that the countries coming together to form a currency area should exhibit commonalities[3]. In this study, we looked at the effectiveness of monetary policy from the lens of price stability and by extension, shocks. Price stability can only be achieved when monetary policy is effective. In other words, the ineffectiveness of monetary policy will adversely affect the attainment of price stability.

The underlying stability of demand for money function which is crucial for monetary policy effectiveness in the currency areas (Foresti & Napolitano, 2014) has been documented

2 The statement should not be construed as an indication of the EMU collapsing. This research is building on the experience of an existing monetary union (i.e. the EMU) to assess the feasibility of a Southern African Monetary Union within the framework of stability in money demand.

3 The extent of trade, similarities of shocks and cycles, the degree of factor mobility and the system of fiscal transfer are the main criteria stipulated in Frankel and Rose (1998) as conditions for the establishment of a currency area. According to Frankel and Rose (1998), the suitability of a common currency area is strengthened when the linkage between the countries based on these criteria is high. Put in other words, the attendant literature on optimal currency areas shows that four main conditions are relevant for a successful common currency union. First, significant labor mobility should be apparent across borders of countries forming the currency union. Second, capital mobility should also be apparent as well as wage and price flexibility. Third, given that individual country monetary policy is subservient to the central bank of the monetary union, fiscal transfers are needed to automatically take place in order to assist nations that are adversely affected by the underlying factors of capital and labor mobility. Fourth, countries forming the common currency area must also share similar business cycles. The feasibility of potential common monetary policy is relevant for the effectiveness of some of the four components required for a successful common currency. Accordingly, as argued in this research, the stability of money demand in potential member states is imperative for the feasible common monetary policy.

to be fundamental in the recovery of the eurozone from negative externalities of the 2008 global financial crisis (Barnett & Gaekwad, 2018). Effectiveness of monetary policy implies that it is possible to forecast the effect of monetary policy. When the demand for money is stable, the money multiplier is also stable, which in turn, implies that the effect of monetary policy could be forecasted[4]. The relevance of the EMU crisis to the potential effectiveness of a future African monetary union rests on the importance of an effective monetary policy that is contingent on a stable demand for money function.

Second, the relevance of monetary policy instruments in the demand for money function is still open to debate in the literature. One strand in the literature maintains that monetary policy effectiveness by means of mainstream instruments (such as the interest rate) is contingent on a stable demand for money (Poole, 1970). In accordance with a strand of recent literature (Foresti & Napolitano, 2014), the stability of the demand for money function is perceived as a basis for the utilization of aggregates of money in the exercise of monetary policy (Goldfeld & Sichel, 1990). Lucas (1976) maintains that when the demand for money function is unstable, it is impossible to tailor a constant conditional model for the demand for money. According to Pradhan and Subramanian (2003), stability in the demand for money is an indication of the possibility of forecasting the impacts of monetary policy owing to evidence of a stable money multiplier. Hamori and Tokihisa (2001) posit that a stable function of the demand for money is fundamental in monetary policy that is not neutral.

The second stance in the debate is based on the premise that less developed countries cannot be characterized by technically-feasible monetary policies because their comparatively less developed financial systems are not associated with conducive environments for monetary policy effectiveness. Weeks (2010) in this strand, cites sub-Saharan Africa as an example by arguing that governments within the sub-region are fundamentally deficient in the relevant instruments needed to implement effective monetary policy. According to the author, such deficiencies are apparent in, *inter alia*: (i) the relevance of private credit through mechanisms such as open market operations and (ii) efforts devoted to affect private sector credit through variations in interest rates at which central banks lend to their commercial counterparts.

4 It is also relevant to note that the suggestion that a stable money demand automatically leads to a stable money multiplier may not be always the case. For instance, the money multiplier in the United States has gone through significant adjustments since the Federal Reserve began paying interest on excess reserves. The argument now is that the interest rate on excess reserves is the driving force of monetary policy and not the money stock.

Third, in accordance with Folarin and Asongu (2019), contemporary studies related to the stability of the demand for money in developing countries have for the most part, been motivated by the importance of financial innovation in the instability of demand for money function. The extant studies that are supportive of this position include: Nachega et al. (2001) for Kenya, Kumar (2011) for twenty developing nations and Ndirangu and Nyamongo for Uganda. Considering the specific framework of this study on the SAMU, the extant knowledge on the proposed common currency area can be summarized in relation to positions for, positions against and positions for that are contingent on the convergence of certain criteria. The three contending positions are summarized in Section 2, notably: (i) positions for the embryonic monetary union (Debrun & Masson, 2013; Grandes, 2003); (ii) studies that have argued against the potential common currency area (Agdeyegbe, 2009) and (iii) research which has advanced positions on the feasibility of the monetary union contingent on some common efforts from candidate states (Zehirun et al., 2015; Masson, 2008; Bangaké, 2008; Wang et al., 2007; Jefferis, 2007; Khamfula & Huizinga, 2004)[5]. It is apparent after comparing and contrasting contending positions that the dominant position in the literature is that the proposed currency area is feasible in the long-term if synchronization of and convergence in, some macroeconomic criteria is enhanced.

In spite of the substantially documented literature on the proposed SAMU on the one hand and the stability of demand for money on the other hand, the extant literature has failed to investigate the stability of the demand for money within the framework of the SAMU. This study is therefore positioned as an extension of the underlying literature (engaged in the third strand) in view of contributing to the existing literature on the effectiveness of monetary policy (discussed in the second strand), in order to ultimately improve policy insights into the feasibility of the proposed SAMU (covered in the first strand). To this end, an autoregressive distributed lag (ARDL) bounds testing empirical approach to cointegration and an error correction modelling framework are employed to examine both short run and long-term nexuses between the demand for money and its determinants within a stability framework. The findings show divergence across countries in the stability of money. This divergence is articulated in terms of differences in, cointegration, CUSUM (cumulative sum) and

5 The positioning of this research is also partially motivated by a growing strand of literature on the relevance of sovereign debt, financial access and alternative mechanisms of financing in Africa's development (Gevorkyan & Kvangraven, 2016; Danquah *et al*., 2017; Amponsah, 2017; Boamah, 2017; Kusi *et al*., 2017; Bayraktar & Fofack, 2018; Tchamyou, 2019a, 2019b; Boateng *et al*., 2018; Kusi & Opoku-Mensah, 2018; Senga *et al*., 2018; Senga & Cassimon, 2018 ; Asongu *et al*., 2018, 2019; Dafe et al., 2018; Gyeke-Dako *et al*., 2018; Tchamyou et al., 2019; Bokpin et al., 2018; Asongu & Odhiambo, 2019).

CUSUMSQ (CUSUM squared) tests, short run and long-term determinants and error correction in event of a shock.

The positioning of the research departs from contemporary emerging market studies in Africa which have largely focused on *inter alia*: exchange rate volatility in West African countries (Emenike, 2018); studies on whether sovereign credit ratings announcements influence excess equity and bond returns in Africa (Mutize & Gossel, 2018); linkages between industry structure, macroeconomic fundamentals and equity return in emerging market economies (Ndlovu & Alagidede, 2018); macroeconomic drivers of stock market development in South Africa (Ho, 2019) and factors that are hampering economic development in the Middle East and North Africa (Awdeh & Hamadi, 2019). The rest of the study is presented as follows. A brief historical perspective and summary of the existing literature are covered in Section 2 while the data and methodology are discussed in Section 3. The empirical results are presented and discussed in Section 4 whereas Section 5 engages concluding implications and future research directions.

2. Brief history and literature

Before summarizing the extant literature motivating the positioning of this study, it is relevant to briefly discuss the historical context of the SAMU, which substantially builds from a broader scope of objectives of the African Union (AU). The proposed SAMU is within a broader goal of an African Monetary Union (AMU) promoted by the AU. It is important to note that a core monetary objective of the AU is articulated in the African Economic Community (AEC) or Abuja treaty (Asongu et al., 2017). The treaty was signed on the 3rd of June 1991 and emphasized the need for an African Central Bank to be established by 2028, prior to the creation of an African Economic Community. Hence, the potential African Central Bank is projected to manage the proposed African currency within the framework of the AMU. The adoption of such a common currency in Africa is not a blanket process, but requires, *inter alia*, the integration of present and embryonic regional monetary unions, namely: the East African Monetary Union, the West African Monetary Union and the SAMU.

The foundations of the SAMU were set with a Trilateral Monetary Agreement of April 1st 1986 within the framework of a Common Monetary Area (CMA) (Wang et al., 2007)[6]. The agreement and corresponding bilateral agreement binding South Africa with small

6 For more information on the integration process in Southern Africa region see Khamfula and Huizinga (2004), Jefferis (2007) and Tavlas (2009).

member states set the ground work for the harmonization of exchange and monetary policies. The purpose of the CMA was to boost economic development between countries, by *inter alia*: encouraging less developed countries within the monetary area on the one hand and on the other, enabling all parties to reap equitable benefits from the maintenance and development of the CMA.

Table 1: Summary of empirical studies on the proposed Southern African Monetary Union

Author(s)	Periods	Countries	Methodologies	Feasibility	Justification/ recommendation
Grandes (2003)	1990-2001	Botswana, Lesotho, Namibia, Swaziland , South Africa	Cointegration and cost/benefit analysis.	Yes	Common long-run trends.
Khamfula & Huizinga (2004)	1980-1996	SADC	GARCH Model to assess disturbances in RER.	Yes/No	Yes for South Africa, Botswana, Lesotho, Malawi, Mauritius, Namibia, Swaziland and Zimbabwe.
Khamfula & Mensteab (2004).	1995-1999	SAMU (Southern African Monetary Union)	Cost and Benefit analysis.	Not definite	Structural adjustment policies are needed to enhance integration needed for the SAMU.
Jefferis (2007)	1990-2002	SADC	Macroeconomic and monetary convergence.	Yes/No	Selective expansion.
Wang et al. (2007)	1980-2005	CMA	Integration, convergence, shock and adjustment analyses.	Yes/No	Evidence of integration but more symmetric responses to shocks are needed.
Bangaké (2008)	1990-2003	21 African countries	System of simultaneous equations and GMM.	Yes/No	Yes for Malawi, Zambia and Zimbabwe.
Masson (2008)	1995-2000	SADC	Calibration approach**.**	Yes/No	Selective expansion.
Agdeyegbe (2009)	1992-2000	SADC	Estimating time-varying convergence parameters.	No	Non convergence in exchange rate and inflation.
Debrun & Masson (2013)	1994-2010	SADC	Calibration approach.	Yes	Most members would benefit.
Zehirun et al. (2015)	1995-2012	11 SADC member countries	Cointegration and VECM.	Yes, without Angola and Mauritius.	Generalised Purchasing Power Parity (GPPP) hypothesis holds.

Notes. SADC: Southern African Development Community. CMA: Common Monetary Area. GARCH: Generalised Autoregressive Conditional Heteroscedasticity. RER: Real Exchange Rate. VECM: Vector Error Correction Model. GMM: Generalised Method of Moments.
Source: Asongu et al. (2017)

Over the past decades, there have been significant changes within the CMA, notably: the integration of Namibia and the end of apartheid in South Africa. The corresponding targets, results and challenges are worth discussing. First, in relation to the targets, the adoption of a single currency by member states of the Southern African Development Community (SADC) is the last phase in the boosting of regional economic integration. The timeline for this target was 2018[7], a date that was set by the Regional Indicative Strategic

7 It should be noted that the region was unable to form the SAMU by the expiration of the targeted year of 2018. However, countries such as Namibia, Swaziland and Lesotho have been using the Rand (i.e. the South African currency) as their second national currency following the Rand Monetary treaty in December 1974 (Wang et al., 2007).

Development Plan Implementation Framework. Second, some issues have also been raised and the SADC Payment Systems Steering Committee proposed a framework that could facilitate cross-border settlements and alleviate payment constraints. Third, the fundamental challenge to establishing the monetary union is the lack of clarity on the position of countries which are associated with two or more custom unions.

The extant literature on the feasibility of the proposed SAMU has been summarised by Asongu et al. (2017) in terms positions for, positions against and positions that are contingent on the fulfilment of certain criteria, notably: a thesis for the currency area (or arguments in support for the establishment of the currency union), an anti-thesis (or corresponding arguments against) and a synthesis (or arguments for the currency union that are contingent on the realisation of some common macroeconomic criteria). The extant literature is summarised in Table 1.

Studies with the position for the currency area are Grandes (2003) and Debrun and Masson (2013) while studies with a stance on synthesis are Khamfula & Huizinga, 2004; Jefferis, 2007; Wang et al., 2007; Bangaké, 2008; Masson, 2008; Zehirun et al., 2015. Studies under the synthesis stance argued for relevance of the currency areas, contingent on efforts from member states in view of enhancing the harmonization of convergence criteria. An opposite position is adopted by Agdeyegbe (2009) who recommends against the currency union.

In the light of the above, the predominant position from the extant literature is that a monetary union in Southern Africa is very likely if concerns about heterogeneities in fundamental variables are addressed, namely, in terms of fiscal, monetary and real policy convergence (Zehirun et al., 2015; Masson, 2008; Bangaké, 2008; Masson, 2008; Wang et al., 2007; Jefferis, 2007; Khamfula & Huizinga, 2004). This implies that a selective process of monetary integration is the optimal route. This selective process includes, direct disqualification of member states and/or identification of clusters. For instance, Debrun and Masson (2013) maintain that with the exceptions of Mauritius, Tanzania and Angola, integrating the CMA by SADC countries will prove beneficial for all. Moreover, a SADC-extended symmetry monetary union is beneficial to all member states without Mauritius. Furthermore, Jefferis (2007) posits that Swaziland, South Africa, Namibia, Lesotho, Tanzania, Mauritius and Mozambique constitute the core convergence panel with the CMA whereas Zambia, Malawi, the Democratic Republic of Congo and Angola constitute the non-

converging panel. For brevity and lack of space, substantiated narratives of the literature as summarised in Table 1 are documented in Asongu et al. (2017)[8].

3. Data and Methodology

3.1 Data

The study uses annual data for the period 1981 to 2015 from World Development Indicators (WDI) and the International Financial Statistics (IFS). The adopted frequency and periodicity of the data are contingent on data availability constraints at the time of the study. Moreover, such frequency has been used in recent literature on the stability of money demand in the proposed West African Monetary Union (Asongu *et al*., 2019). Thus, for each country, a total of 35 observations are used for the analysis[9]. Ten countries in SADC are involved in the analysis, namely: Botswana, the Democratic Republic of Congo (DRC), Lesotho, Madagascar, Malawi, Mauritius, Seychelles, South Africa, Swaziland and Zambia. The adopted variables include: real broad money, real gross domestic product (GDP), exchange rate, inflation and foreign interest rate. The adopted variables are in line with Folarin and Asongu (2019) and the literature on the stability of the demand for money discussed in the introduction. The definitions and sources of the variables are clarified in Table 2.

(i) Foreign interest rate represents the United Kingdom (UK) three month treasury bills. (ii) The exchange rate denotes the official exchange rate in terms of local currency units, relative to the United States (US) Dollar. (iii) The inflation rate is measured as a percentage change in the Gross Domestic Product (GDP) deflator. (iv) Real broad money is measured in terms of nominal broad money divided by the GDP deflator. Here, the demand for money comprises of saving and time deposits (at constant prices) at the commercial banks. (v) Real GDP is obtained when GDP is divided by the GDP deflator. Accordingly, this is the monetary value (at constant price) pertaining to commodities that are produced over a specific time period within an economy.

While the first (i.e. foreign interest rate) variable is from the IFS, the second to the fifth variables are from WDI of the World Bank. Table 3 provides the summary statistics of the variables. From the table it is apparent that there is substantial variation in the variables

8 In addition, the bulk of contemporary financial development literature on the continent has not focused on whether the proposed African monetary unions are feasible (Wale & Makina, 2017; Daniel, 2017; Chikalipah, 2017; Bocher *et al*., 2017; Osah & Kyobe, 2017; Boadi *et al*., 2017; Oben & Sakyi, 2017; Ofori-Sasu *et al*., 2017; Iyke & Odhiambo, 2017; Chapoto & Aboagye, 2017).

9 In all the sampled countries, there were more of periods with positive growth in money demand than periods with negative growth. This suggests that in the selected countries, the monetary aggregate is associated with inflationary pressure.

such that we can be confident that reasonable estimated nexuses will be derived from the regressions.

Table 2: Definitions and sources of variables

Variables	Full names	Definitions	Units	Sources
UKINTEREST[10]	Foreign interest rate	UK three month treasury bill rate	Percentage	International Financial statistics (IFS)
RM2	Real broad money	Nominal board money divided by GDP deflator	Billion local currency	World Development Indicators (WDI)
RGDP	Real GDP	Gross domestic product divided by GDP deflator	Billion local currency	World Development Indicators (WDI)
INFL	Inflation rate	GDP deflator (Annual %)	Percentage	World Development Indicators (WDI)
EXCH	Exchange rate	Official exchange rate - local currency units relative to the U.S. dollar	Local currency	World Development Indicators (WDI)

Note: The data used for the study spans over the period 1981 to 2015. RM2: Real broad money. Real GDP: Real Gross Domestic Product. INFL: Inflation rate. EXCH: Exchange rate. UKINTEREST; Foreign interest rate.

10 UKINTEREST is used to proxy foreign interest rate. Foreign interest rate is the same as UK interest rate. Thus, it is used interchangeably in the paper. Foreign interest rate (i.e. the UK interest rate), is relevant in the study because an increase in foreign interest rate has the potential of inducing domestic residents to increase their holding of foreign assets, thus reducing corresponding holdings of domestic currency (Sriram, 2000). Our choice of the UK interest rate as a measure of foreign interest rate is because large shares of African countries' foreign assets holdings are in the UK (Page & te Velde, 2004).

Table 3: Descriptive Statistics of the Southern African Development Community

		RM2	RGD	INFL	EXCH	UKINTEREST
	Mean	0.17	0.44	9.21	4.26	6.36
Botswana	Maximum	0.40	0.88	22.89	10.13	14.64
	Minimum	0.03	0.11	-0.11	0.84	0.30
	Standard dev.	0.12	0.22	5.97	2.53	4.26
Democratic	Mean	8.04	70.8	1144.67	278.045	6.36
Republic of	Maximum	57.3	108	26762.02	925.99	14.64
Congo	Minimum	0.76	46.1	-0.39	0.00	0.30
	Standard dev.	9.53	16.9	4545.315	365.10	4.26
	Mean	0.05	0.13	9.34	5.38	6.36
Lesotho	Maximum	0.08	0.24	20.08	12.76	14.64
	Minimum	0.02	0.06	-4.85	0.88	0.30
	Standard dev.	0.02	0.05	5.49	3.17	4.26
	Mean	0.99	4.61	14.12	11119.05	6.36
Madagascar	Maximum	1.75	6.83	45.12	2933.51	14.64
	Minimum	0.46	3.30	2.76	54.35	0.30
	Standard dev.	0.37	1.13	9.51	848.01	4.26
	Mean	1.33	6.74	22.94	88.36	6.36
Malawi	Maximum	3.13	12.8	112.69	496.37	14.64
	Minimum	0.67	3.58	4.10	0.90	0.30
	Standard dev.	0.75	2.72	20.90	124.52	4.26
	Mean	1.44	1.68	6.38	22.36	6.36
Mauritius	Maximum	3.42	3.20	12.92	35.06	14.64
	Minimum	0.25	0.62	-0.65	8.94	0.30
	Standard dev.	0.94	0.79	3.31	7.83	4.26
	Mean	0.03	0.05	5.65	7.23	6.36
Seychelles	Maximum	0.05	0.08	34.97	13.70	14.64
	Minimum	0.01	0.02	-4.21	4.76	0.30
	Standard dev.	0.02	0.02	8.20	2.99	4.26
	Mean	12.7	20.5	10.14	5.38	6.36
South Africa	Maximum	22.5	30.6	17.22	12.76	14.64
	Minimum	7.28	14.5	4.99	0.88	0.30
	Standard dev.	5.65	5.41	4.06	3.17	4.26
	Mean	0.05	0.23	9.49	5.38	6.36
Swaziland	Maximum	0.10	0.41	30.38	12.76	14.64
	Minimum	0.02	0.09	1.11	0.88	0.30
	Standard dev.	0.02	0.10	6.63	3.17	4.26
Zambia	Mean	5.40	0.59	36.68	2.44	6.36
	Maximum	95.7	1.25	165.53	8.63	14.64
	Minimum	0.05	0.37	5.44	0.00	0.30
	Standard dev.	21.8	0.28	40.23	2.39	4.26

Notes: RM2 is real board money; RGDP is real gross domestic product; INFL is inflation rate based on GDP deflator; EXCH is exchange rate; UKINTEREST is the foreign interest rate. Standard dev: Standard deviation.

3.2 Methodology

Consistent with recent literature on the relevance of assessing the stability of the demand function with cointegration techniques (Bahmani-Oskooee & Rehman, 2005; Bahmani-Oskooee & Gelan, 2009; Asongu *et al*., 2019), an ARDL approach is adopted in this study because it is consistent with unit root properties of the data. One of the main advantages of the ARDL model is that it addresses concerns pertaining to collinearity between the lags of the outcome indicators, variables in the conditioning information set and their corresponding lags. Also, the ARDL is appropriate when the variables used are comprised of series' that are integrated of order zero, I(0) and of order one, I(1) (Asongu et al., 2019; Folarin, 2019).

As documented in Folarin and Asongu (2019), the theoretical settings for an investigation on the stability of the demand for money is in accordance with Hossain (1993, p. 91). Within the context of this paper, while real income is used as a scale variable, opportunity variables include: the inflation and interest rates. Consistent with Bahmani-Oskooee and Gelan (2009), using interest rate to proxy for an opportunity variable within the framework of a developing nation is not appropriate because of the comparative underdevelopment of financial sectors in less developed countries. This is partly because a great chunk of the monetary base in developing countries circulates outside the formal financial sector (Tchamyou, 2019a, 2019b). It has further been argued by Bahmani-Oskooee and Gelan (2009) that owing to the relatively less formal nature of financial systems in countries with less developed financial systems (e.g. most African countries), the complex market situation cannot be captured by the interest rate. This shortcoming can be tackled by employing the inflation rate as an alternative opportunity variable. Studies in the attendant literature have either employed both (i.e. interest rate and inflation rate) variables (e.g. Kumar et al., 2013) or exclusively interest rate (Anoruo, 2002; Akinlo, 2006) or exclusively inflation rate (Bahmani-Oskooee and Gelan, 2009; Asongu et al. 2019)

The extant literature has also articulated the relevance of acknowledging currency substitution and foreign exchange rates in the assessment of the money demand function (Folarin & Asongu, 2019). For instance, Chaisrisawatsuk et al. (2004) have emphasized that the use of foreign bonds as an alternative channel of investment by the citizens of a country has an incidence on the potential return on investment connected to the domestic demand for money. Also, Sriram (2000) has pointed out that foreign assets are also substitutes for holding money; hence, an increase in the return on foreign assets reduces the incentive for the residents of a country to hold money. Note should be taken of the fact that currency

substitution is associated with the incidence of exchange rate on money demand while the essence of foreign interest rates on money demand is articulated by the impact of capital mobility.

In the light of the discussed empirical framework, the examination of the demand for money can be expressed as follows:

$$m = f(y, op, R^f, E), \quad (1)$$

where m is real monetary aggregate, y is income variable, op are opportunity variables, R^f is foreign interest rate and E is real effective exchange rate.

Equation (1) can be re-expressed in a double log form as follows:

$$\ln(m)_t = \beta_0 + \beta_1 lny_t + \beta_2 R^d{}_t + \beta_3 INF_t + \beta_4 R^f{}_t + \beta_5 \ln E_t + \varepsilon_t \quad (2)$$

where, ln is natural logarithm, m is real demand for money, y is real income, R^d is domestic interest rate, INF is inflation rate, R^f is foreign interest rate[11], E is exchange rate, β's are the coefficients for the variables considered in the study, ε is the residual term and t is time.

Considering that the variables defined in Equations (2) are characterized by time series, it is important to test their corresponding stationary properties in order to avoid concerns about spurious regressions. Such stationary properties are tested with the Phillips-Perron (PP) test which has been established to be comparatively more reliable and efficient (relative to the Augmented Dickey Fuller test) when the time series is of longer periodicity (Gries et al., 2009). The notion of longer periodicity should be understood within the framework of annual versus monthly and/or quarterly data.

Table 4: Philips-Perron Unit root test results

	Botswana	The DRC	Lesotho	Madagascar	Malawi
LRM2	-1.070	-1.801	-1.838	-5.492***	-1.31
ΔLRM2	**-7.278*** **	**-7.998*** **	**-5.556*** **	-6.836***	-5.478***
LRGDP	-2.650	0.068	-1.675	-2.608	-1.850
ΔLRGDP	**-4.035*** **	**-1.627***	**-5.333*** **	**-7.089*** **	**-7.604*** **
INFL	**-8.620*** **	**-5.422*** **	**-5.364*** **	-3.004	-4.704***
ΔINFL	-10.732***	-19.290***	-14.510***	-10.161***	-16.589***
LEXCH	-2.795	-0.619	-2.427	-1.760	-1.671
ΔLEXH	**-5.129*** **	**-2.213** **	**-4.208*** **	**-5.243*** **	**-3.868*** **
UKINTEREST	-2.495	-2.495	-2.495	-2.495	-2.495
ΔUKINTEREST	**-6.320*** **	**-6.320*** **	**-6.320*** **	**-6.320*** **	**-6.320*** **

[11] Foreign interest rate is in nominal form.

	Mauritius	Seychelles	South Africa	Swaziland	Zambia
LRM2	-1.322	-0.992	-1.892	-1.959	-3.091
ΔLRM2	**-4.406*** **	**-4.344*** **	**-3.638** **	**-6.447*** **	**-11.735*** **
LRGDP	-0.794	-2.003	-2.136	-1.334	-1.305
ΔLRGDP	**-5.092*** **	**-4.644*** **	**-3.932*** **	**-3.70*** **	**-3.985*** **
INFL	**-3.997** **	**-4.272*** **	**-4.296*** **	**-8.323*** **	-2.361
ΔINFL	-17.868***	-11.098***	-8.801***	-33.307***	**-4.936*** **
LEXCH	-2.690	-1.014	-2.427	-2.428	-0.586
ΔLEXH	**-6.376*** **	**-3.860*** **	**-4.208*** **	**-4.207*** **	**-2.755***
UKINTEREST	-2.495	-2.495	-2.495	-2.495	-2.495
ΔUKINTEREST	**-6.320*** **	**-6.320*** **	**-6.320*** **	**-6.320*** **	**-6.320*** **

Notes: *, **, *** are significance levels of 10%, 5% and 1%, respectively. RM2 is real board money; RGDP is real gross domestic product; INFL is inflation rate based on GDP deflator; EXCH is exchange rate; UKINTEREST is foreign interest rate. The reported values are the corresponding t-statistics. The DRC: The Democratic Republic of Congo.

As apparent in Table 4, the variables are stationary both in levels and first difference. Given the nature of the stationary property of the variables used in this study, it follows that an ARDL approach is appropriate for the estimation. In this situation, a bounds testing framework developed by Pesaran *et al.* (2001) is employed to assess if variables have a long-term nexus or are cointegrated. Contrary to existing empirical strategies (such as Johansen and Engle & Granger tests), a favorable characteristic of the adopted strategy is that it is suitable when the variables used are of various orders of integration, that is, it allows variables of order zero and one to be combined when testing for the presence of long-run relationships. The corresponding ARDL model is specified in Equation (3) as follows:

$$\Delta \ln(m)_t = \delta_0 + \delta_1 \ln(m)_{t-1} + \delta_2 lny_{t-1} + \delta_3 R^d{}_{t-1} + \delta_4 INF_{t-1} + \delta_5 R^f{}_{t-1} + \delta_6 lnE_{t-1} + \sum_{j=1}^{l} \tau_{1j} \Delta \ln(m)_{t-j} + \sum_{j=0}^{m} \tau_{2j} \Delta lny_{t-j} + \sum_{j=0}^{n} \tau_{3j} \Delta R^d{}_{t-j} + \sum_{j=0}^{n} \tau_{4j} \Delta INF_{t-j} + \sum_{j=0}^{o} \tau_{5j} \Delta R^f{}_{t-j} + \sum_{j=0}^{p} \tau_{6j} \Delta lnE_{t-j} \varepsilon_t \quad (3)$$

The extended ARDL framework expressed in Equation (3) is then estimated by means of bounds testing[12]. The results of the cointegration test are presented in Table 5. From the

12 Optimal lag selection for each variable is based on the Schwarz Information Criterion (SIC). Through the Wald restriction, the F-statistics is then estimated, notably: by assigning restrictions to the lagged value of all level series' corresponding to the two equations (see Pesaran *et al*., 2001). The related F-statistics is then employed to examine the long run effect among adopted variables. It is relevant to note that the null hypothesis corresponding to the Wald restriction which is imposed on Equation (3) is the following: $\delta_2 = \delta_3 = \delta_4 = \delta_4 = \delta_5 = \delta_6 = 0$. The value of the F-statistics is obtained by comparing the critical values of the lower limit vis-à-vis those of the upper limit. The critical values are from Pesaran *et al*. (2001). To the best of our knowledge, within the framework of cointegration, in a situation where the estimated F-statistics exceeds the critical value corresponding to the upper limit, then the null hypothesis for the position of "no cointegration" is rejected and evidence of a long run relationship or cointegration is established. Conversely, in a scenario

results, it is evident that cointegration holds in six out of the ten selected SADC countries[13], namely: Botswana, the DRC, Madagascar, Malawi, Seychelles and Zambia. Hence, for the remaining countries that do not reflect cointegration because the F-statistics is below the lower bound critical value, only short run analysis will be performed. These include: Lesotho, Mauritius, South Africa and Swaziland.

Table 5: Results of the ARDL co-integration test

Countries	ARDL structure	F-statistics	Remarks
Botswana	2,1,0,2,0	**4.349****	Co-integrated
The DRC	1,1,0,0,3	**12.908*****	Co-integrated
Lesotho	1,0,0,1,0	2.416	Not co-integrated
Madagascar	1,0,0,2,3	**6.370*****	Co-integrated
Malawi	1,0,0,1,0	**6.029*****	Co-integrated
Mauritius	1,0,0,1,0	2.943	Not co-integrated
Seychelles	1,0,3,0,0	**13.976*****	Co-integrated
South Africa	1,2,0,0,1	1.711	Not co-integrated
Swaziland	2,3,0,1,0	1.424	Not co-integrated
Zambia	2,0,0,0,0	**3.508****	Co-integrated

Notes: *, **, *** are significance levels of 10%, 5% and 1%, respectively. ARDL: Autoregressive Distributed Lag. Critical values are the following: (i) 2.45 for the I(0) Bound and 3.52 for the I(1) Bound at the 10% significance level; (ii) 2.86 for the I(0) Bound and 4.01 for the I(1) Bound for the 5% significance level; (iii) 3.25 for the I(0) Bound and 4.49 for the I(1) Bound for the 2.5% significance level and (iv) 3.76 for the I(0) Bound and 5.06 for the I(1) Bound for the 1% significance level. The DRC: The Democratic Republic of Congo.

With evidence of co-integration, we proceed to assess the long run and short run impacts using an Error Correction Model (ECM) framework. Within this empirical framework, in a scenario of short-term shock, there is a speed of adjustment back to the cointegration or long term nexus. Moreover, the ECM also enables the study to investigate the effects of adopted control variables on the short run and long run demand for money.

The ECM entails two steps. The first step focuses on the derivation of the Error Correction Term (ECT). For this purpose, the outcome variable is regressed on the

where the F-statistics is situated below the lower critical value, the corresponding hypothesis of cointegration is rejected. Unfortunately, evidence of the absence or presence cointegration cannot be established with certainty if the F-statistics falls between the critical values in the lower limit and upper limit.

13 For these countries, the F-statistics exceeded the upper critical value for five countries and higher than the lower critical value for the sixth country, which is Zambia. For the case of Zambia, because the F-statistics falls between the lower and the upper critical bound, it falls under the unsure zone, which could either imply that a long run relationship holds or that it does not hold. A long run relationship holds in this situation if the coefficient of the ECT is negative and significant. This is exactly what we obtained in this study. Hence, it is appropriate to say that long run relationships hold in the six highlighted countries.

corresponding independent variables. Then the actual value of the outcome variable is deducted from the estimated value. This is illustrated as follows.

$$ECT = \ln(m)_t - (\vartheta_0 + \vartheta_1 lny_t + \vartheta_2 R^d{}_t + \vartheta_3 INF_t + \vartheta_4 R^f{}_t + \vartheta_5 lnE_t) \quad (4)$$

In order to obtain the main model, the derived ECT from Equation (4) is then fitted in Equation (2) in order to obtain Equation (5) that is estimated within an ECM framework. The ECT is anticipated to reflect a negative sign. Such a negative sign implies that in case of an exogenous shock, the equilibrium nexus can be potentially restored. It is relevant to also emphasis that, one period after an exogenous shock the negative speed of adjustment should fall within the range of 0 and 1, with 1 implying a full adjustment and 0 denoting the absence of an adjustment. Conversely, a positive value of the adjustment coefficient implies the lack of evidence of convergence towards the long term cointegration after the underlying exogenous shock. In a nutshell, this reflects a permanent deviation from the long term equilibrium.

$$\Delta\ln(m)_t = \gamma_0 + \gamma_1 \Delta lny_t + \gamma_2 \Delta R^d{}_t + \gamma_3 INF_t + \gamma_4 \Delta R^f{}_t + \gamma_5 \Delta lnE_t + \tau ECT_{t-1} + \varepsilon_t \quad (5)$$

Consistent with attendant studies in the empirical literature, the cumulative sum (CUSUM) and CUSUM squared (CUSUMSQ) tests of Brown *et al.* (1975) are employed to investigate the consistency of parameters (Kumar, 2011; Akinlo, 2006; Kumar *et al.*, 2013; Khan & Hye, 2013). Whereas the CUSUM test is related to the cumulative recursive sum of recursive residuals, CUSUMSQ test reflects the cumulative sum of squares of recursive residuals. The stance on instability of the money function is rejected when the plots corresponding to the CUSUMSQ and CUSUM are significant at the 5% level. Hence, when the plots fall outside the critical lines (denoting the 5% significance levels), there is evidence of an unstable money demand function. Moreover, some diagnostic tests are conducted on the findings obtained from the ECM. These tests which are further employed to assess the goodness of fit of estimated models include: the Jarque-Bera test for normality test, the Breusch-Godfrey (BG) test for serial correlation test and Autoregressive Conditional Heteroscedasticity (ARCH) test for heteroscedasticity.

4. Empirical results

Tables 6-7 show short-term and long run relationships between the broad money aggregate and its determinants for the ten sampled countries. While Table 6 focuses on Botswana, the

DRC, Lesotho, Madagascar and Malawi, Table 7 is concerned with Mauritius, Seychelles, South Africa, Swaziland and Zambia. The last column of Table 7 provides panel-based evidence for the ten countries.

The following are apparent from the results. In the short run, an increase in income has a significant contemporary positive effect on the demand for money in Madagascar, Malawi, Mauritius, Seychelles and South Africa. Furthermore, the results show that in the short run, a change in inflation rate has a significant negative effect on money demand in Botswana, Lesotho, Malawi, Seychelles and Swaziland. In addition, the results suggest that in Botswana, the DRC and Malawi, a change in exchange rate has a significant and positive effect on money demand. Foreign interest rate (UKINTEREST) is found to exert a positive and significant effect on money demand in the short run in Botswana while a negative and significant effect is observed for Seychelles. In the remaining eight SADC member states, the effect is insignificant.

In all the six countries in the SADC where we were able to establish the existence of a long run relationship between money demand and its determinants, we discover that the values of the associated ECTs vary significantly. Moreover, for the cases considered, the coefficients of the ECT are negative and within the expected range of 0 and -1. Going by the value of the coefficient of the ECT, it can be deduced that if shocks occur to countries within the SADC, the DRC will restore its long run equilibrium fastest, followed by Zambia while Seychelles will be the last country to restore its long-run equilibrium. In decreasing order to quick speed in restoring the long run equilibrium, we have the DRC, Zambia, Malawi, Botswana and Seychelles.

By examining the long-run results, it is observed that in the DRC, Madagascar, Malawi and Seychelles, income has a significant and positive effect on money demand while an insignificant effect is apparent in Botswana and Zambia. More specifically, the results suggest that an increase in income leads to a more than proportional increase in the demand for money in the long run. In addition, in Botswana, Malawi and Seychelles, an increase in the inflation rate has a significant and negative effect on money demand while the effect is found to be insignificant in the DRC, Madagascar and Zambia. This suggests that as the opportunity cost of holding money increases (price level), less money is demanded in Botswana, Malawi and Seychelles. By implication, domestic residents of Botswana, Malawi and Seychelles will hold less of money and hold more of financial assets during inflationary

pressure. Since inflationary pressure makes the purchasing power of money to fall, this further implies that during inflationary pressure, money loses its role as a store of value.

On the effect of exchange rate, an increase in exchange rate has a significant and positive effect on money demand in Botswana, the DRC and Madagascar while a significant and negative effect is found in Malawi and Seychelles. The findings suggest that currency substitution is associated with exchange rate depreciation in Malawi and Seychelles. In addition, we discovered that foreign interest rate has a significant and negative effect on money demand in Seychelles while a positive and significant effect is apparent in the DRC. In the remaining four countries were cointegration holds, foreign interest rate has an insignificant effect on money demand.

We now turn to the last column of Table 7, which is the panel evidence. In this column, we find that in the long run, income has a positive and significant effect on money demand while inflation has a negative and significant effect. The effects of exchange rate and foreign interest rate are insignificant. The implication of these findings is that within the SADC, demand for money is associated with an increase in income and inversely related to the inflation rate. Only inflation has a significant effect among the opportunity variables considered in the study.

Table 6: ARDL Estimation

	Botswana	DRC	Lesotho	Madagascar	Malawi
Long run estimation					
constant	**62.814***	**-91.811*****		-2.756	**-35.775*****
	(33.304)	**(14.699)**		(4.155)	**(10.186)**
LRGDP	-2.438	**4.533*****		**1.016*****	**2.573*****
	(1.776)	**(0.575)**		**(0.188)**	**(0.455)**
INFL	**-0.066***	0.000		0.000	**-0.011****
	(0.038)	(0.000)		(0.003)	**(0.005)**
LEXCH	**3.492****	**0.081****		**0.126****	**-0.337*****
	(1.620)	**(0.031)**		**(0.045)**	**(0.080)**
UKINTEREST	0.089	**0.196****		0.007	-0.031
	(0.066)	**(0.089)**		(0.014)	(0.029)
Short run estimation					
ΔLRM2(-1)	**-0.326****				
	(0.138)				
ΔLRGDP	0.473	1.088	0.532	**0.687*****	**0.959*****
	(0.509)	(1.526)	(0.729)	**(0.199)**	**(0.322)**
ΔLRGDP(-1)					
ΔLRGDP(-2)					
ΔINFL	**-0.015*****	0.000	**-0.004***	0.000	**-0.004*****
	(0.004)	(0.000)	**(0.002)**	(0.002)	**(0.001)**
ΔLEXCH	**0.680*****	**0.069****	0.151	-0.011	**0.221****
	(0.229)	**(0.025)**	(0.108)	(0.117)	**(0.104)**
ΔLEXCH(-1)	**-0.594****				
	(0.222)				
ΔUKINTEREST	**0.021***	-0.066	-0.005	0.000	-0.011
	(0.011)	(0.046)	(0.009)	(0.008)	(0.011)
ΔUKINTEREST(-1)		0.086		-0.002	
		(0.057)		(0.012)	
ΔUKINTEREST(-2)		**-0.156*****		**-0.018***	
		(0.049)		**(0.009)**	
ECT(-1)	**-0.233****	**-0.862*****		**-0.676*****	**-0.373*****
	(0.107)	**(0.132)**		**(0.159)**	**(0.107)**
R-squared	0.981	0.864	0.069	0.978	0.955
Normality test	0.622	0.432	0.649	0.848	0.597
ARCH test	(1)0.903	(1)0.580	(1)0.838	(1)0.470	(1)0.558
	(3)0.931	(3)0.784	(3)0.641	(3)0.790	(3)0.895
BG LM test	(1) 0.0	(1)0.077	(1)0.153	(1)0.702	(1)0.476
	20	(3)0.214	(3)0.250	(3)0.399	(3)0.607
	(3)0.034				
CUSUM	Stable	Stable	Stable	Not stable	Stable
CUSUMSQ	Stable	Stable	Stable	Stable	Stable

Notes: *,**, *** denote significant at 10%, 5% and 1%, respectively. The reported values in parenthesis are the standard errors. The reported value for Normality test, ARCH test and BG LM test are the probability value of the F-statistics. BG is Breusch-Godfrey Serial correlation LM test. DRC: Democratic Republic of Congo.

Table 7: ARDL Estimation (Continuation)

	Mauritius	Seychelles	South Africa	Swaziland	Zambia	All
Long run estimation						
constant		-6.484			23.820	**1.706*** **
		(6.018)			(31.652)	**(0.594)**
LRGDP		**1.467*** **			-0.227	**0.473** **
		(0.337)			(1.532)	**(0.216)**
INFL		**-0.065** **			-0.007	**-0.038*** **
		(0.031)			(0.010)	**(0.010)**
LEXCH		**-0.656** **			0.132	0.088
		(0.262)			(0.223)	(0.064)
UKINTEREST		**-0.059** **			0.014	-0.007
		(0.028)			(0.210)	(0.022)
Short run estimation						
ΔLRM2(-1)					**0.393** **	0.004
					(0.178)	(0.102)
ΔLRM2(-2)						
ΔLRGDP	**1.007** **	**0.274** **	**2.074*** **	-0.038	-0.176	0.283
	(0.412)	**(0.122)**	**(0.373)**	(0.425)	(1.185)	(0.416)
ΔLRGDP(-1)						0.136
						(0.0347)
ΔINFL	-0.005	**-0.005*** **	-0.000	**-0.006*** **	-0.006	-0.000
	(0.003)	**(0.001)**	(0.003)	**(0.001)**	(0.008)	(0.001)
ΔINFL(-1)		-0.002				0.001
		(0.001)				(0.001)
ΔINFL(-2)		**0.006*** **				
		(0.001)				
ΔLEXCH	-0.093	-0.122	0.019	0.059	0.102	0.090
	(0.103)	(0.077)	(0.058)	(0.116)	(0.173)	(0.091)
ΔLEXCH(-1)						0.083
						(0.161)
ΔUKINTEREST	0.000	**-0.011** *	0.003	-0.001	0.011	-0.015
	(0.005)	**(0.006)**	(0.005)	(0.010)	(0.163)	(0.019)
ΔUKINTEREST(-1)						0.004
						(0.006)
ΔUKINTEREST(-2)						
ECT(-1)		**-0.187*** **			**-0.773*** **	**-0.166*** **
		(0.057)			**(0.187)**	**(0.058)**
R-squared	0.142	0.994	0.548	0.321	0.233	
Normality test	0.721	0.380	0.623	0.521	0.000	
ARCH test	(1)0.294	(1)0.763	(1)0.549	(1)0.776	(1)0.668	
	(3)0.164	(3)0.939	(3)0.821	(3)0.810	(3)0.908	
BG LM test	(1)0.595	(1)0.281	(1)0.735	(1)0.061	(1)0.500	
	(3)0.466	(3)0.487	(3)0.943	(3)0.170	(3)0.364	
CUSUM	Not stable	Stable	Stable	Stable	Stable	
CUSUMSQ	Stable	Not stable	Stable	Stable	Not Stable	

Notes: *,**, *** denote significant at 10%, 5% and 1%, respectively. The reported values in parenthesis are the standard errors. The reported value for Normality test, ARCH test and BG LM test are the probability value of the F-statistics. BG is Breusch-Godfrey Serial correlation LM test.

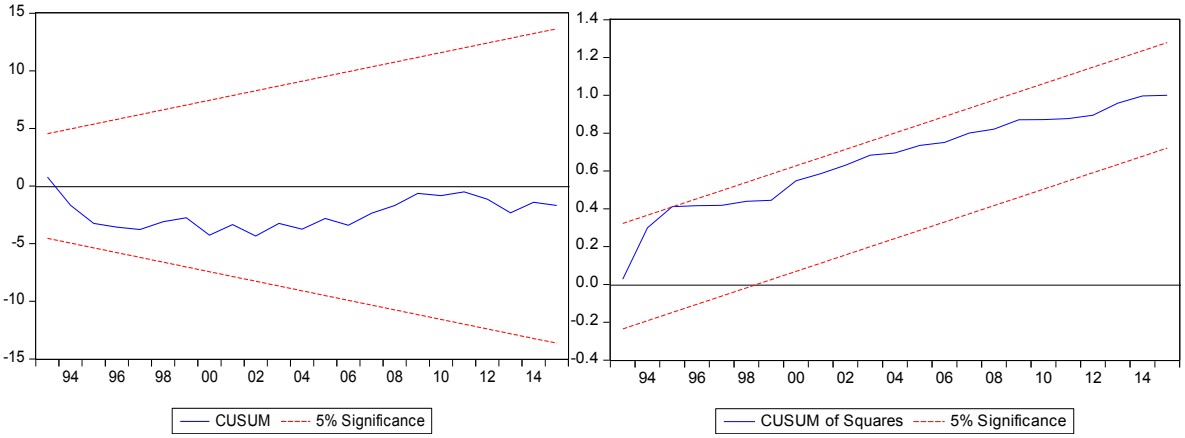
We now turn to the assessment of the stability of the relationship between money demand and its determinants. As discussed in the methodological section, we employ the CUSUM and CUSUM-squared tests. The CUSUM test is based on the cumulative sum of the recursive residuals whereas the CUSUM-squared test is based on the cumulative sum of the squared recursive residuals. The results of the stability of money demand function reveal divergence for the countries in the SADC[14]. Specifically, the results show that the demand for money is stable in six out of the ten selected SADC countries based on both CUSUM and CUSUMSQ tests, namely: Botswana, the DRC, Lesotho, Malawi, South Africa and Swaziland. The remaining four countries exhibit partial stability. This is because one of the two stability tests reveals that the demand for money is stable. More specifically, the results point out that the demand for money is stable based on CUSUM test in Seychelles and Zambia but turn to be unstable judging by CUSUMSQ test while in the case of Madagascar and Mauritius, the results reveal that the demand for money is unstable judging by CUSUM test but stable in the light of the CUSUMSQ test. Our results point out that despite the introduction of financial innovations over the last decades and the liberalization of the financial sector in SADC countries, the demand for money is still stable in six out of the ten countries examined. The partial stability observed in the remaining 4 countries suggests that when designing common monetary policy, the attending implication of financial innovation should be considered.

Overall, in Tables 6-7, the diagnostic tests of residuals overwhelmingly confirm the presence of normally distributed errors (i.e. failure to reject the null hypothesis of Jarque-Bera test) and absence of serial correlation (i.e. failure to reject the null hypothesis of the Breusch-Godfrey).

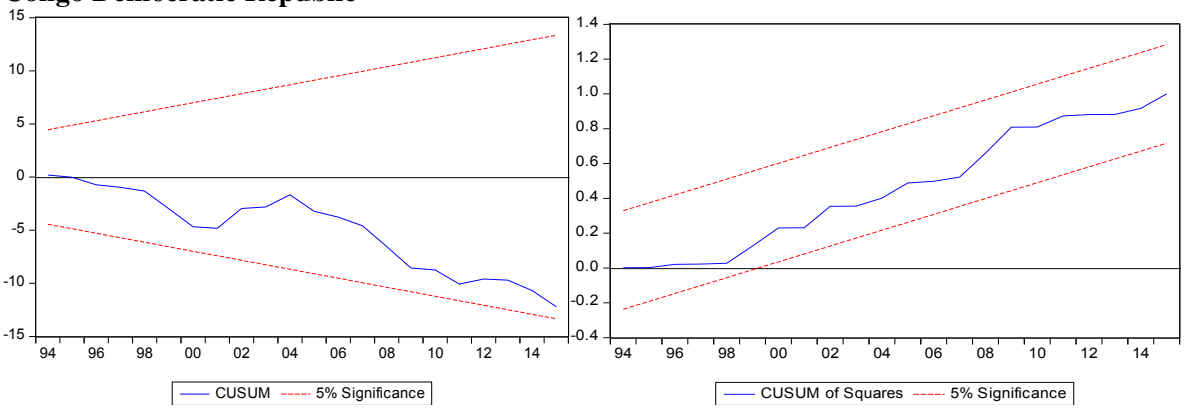
14 A country is said to experience stability of money demand in this paper if the conclusion emanating from both CUSUM and CUSUM-squared tests implies stability. Partial stability is when it is only stable based on either the CUSUM test or the CUSUM-squared test.

Stability test charts

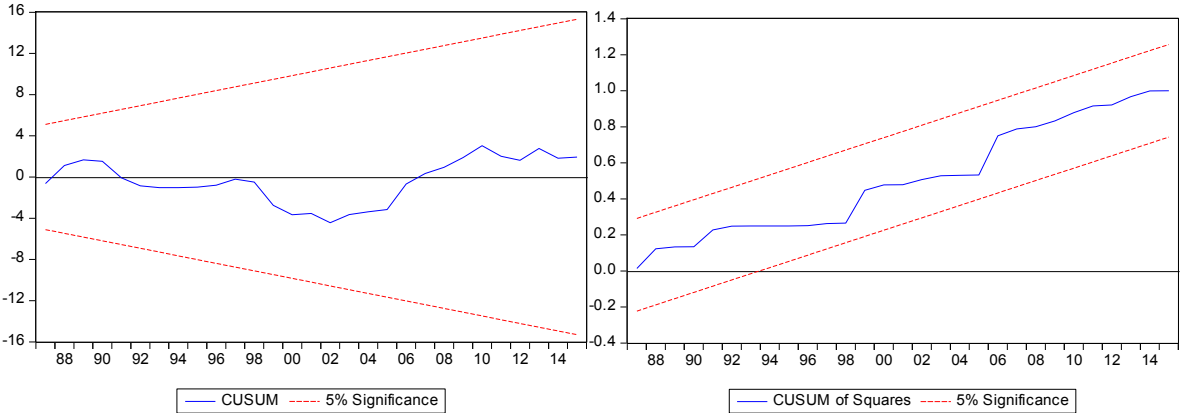
Botswana



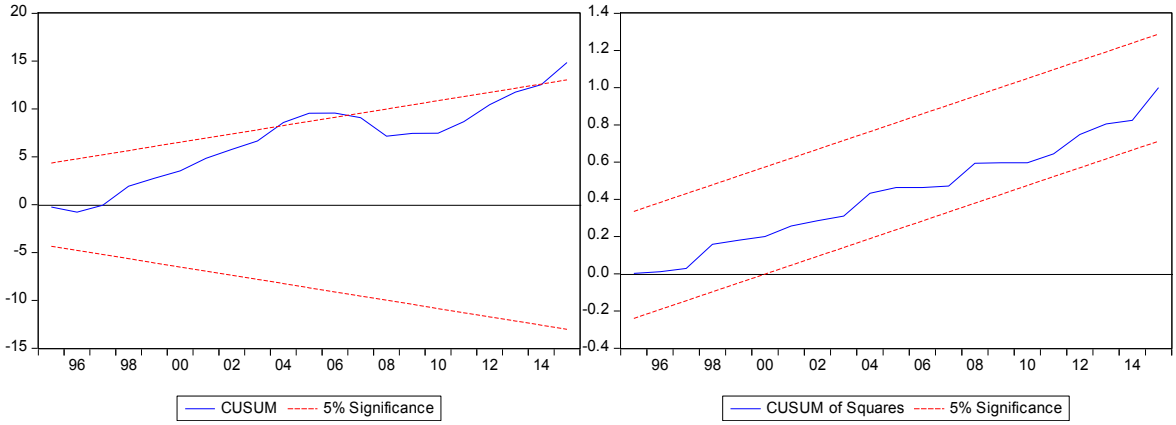
Congo Democratic Republic



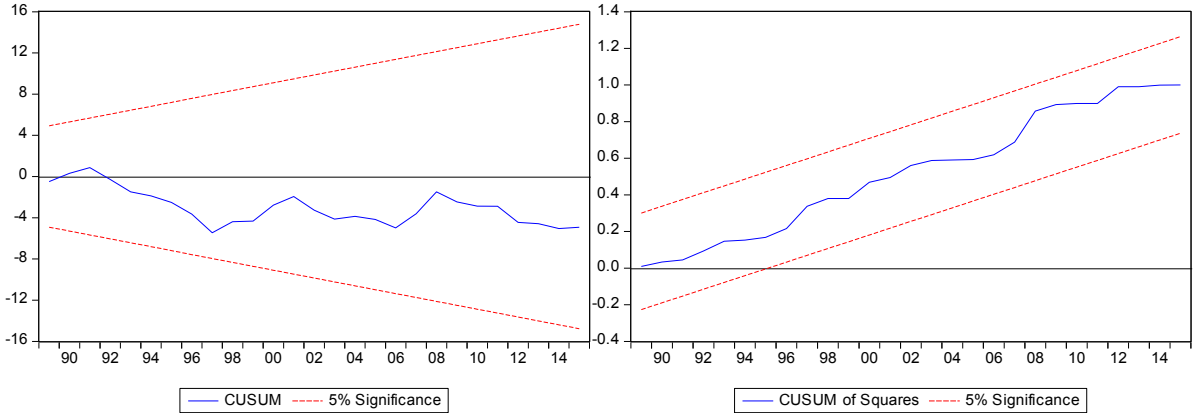
Lesotho



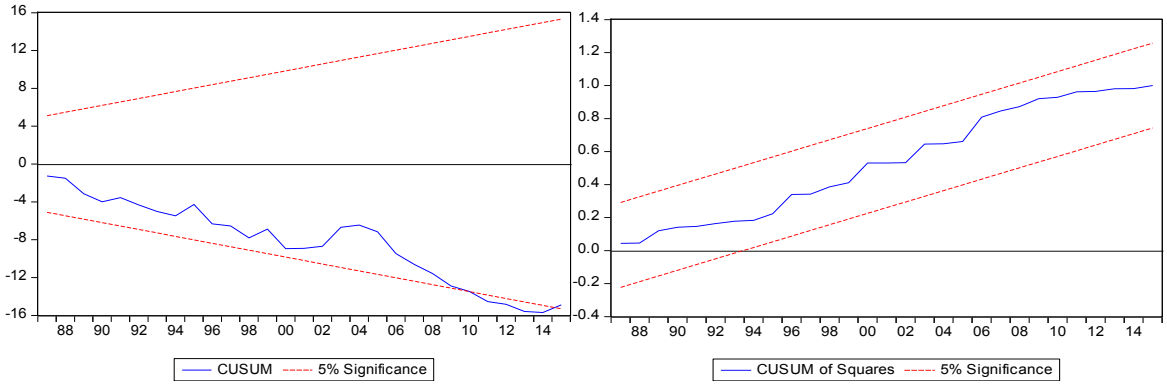
Madagascar



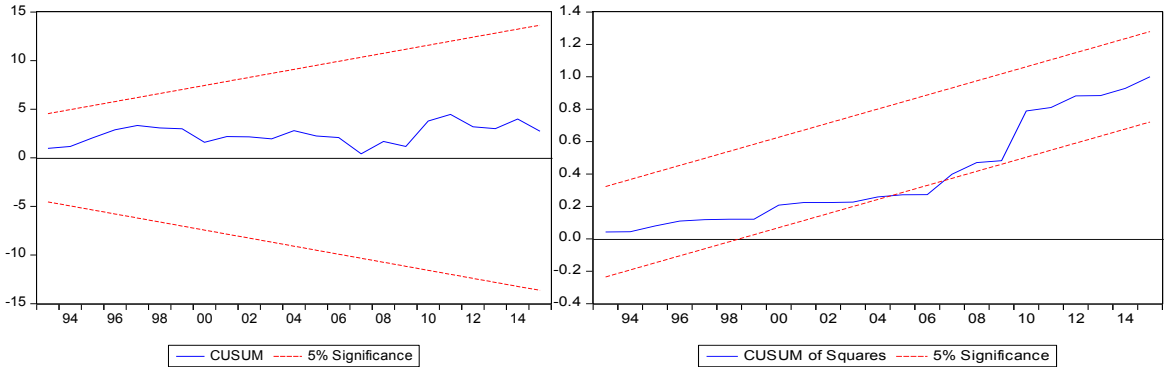
Malawi



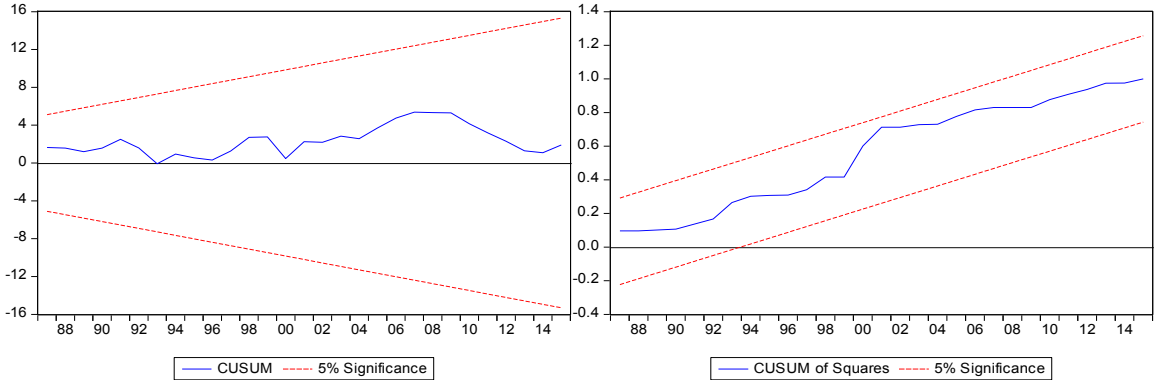
Mauritius



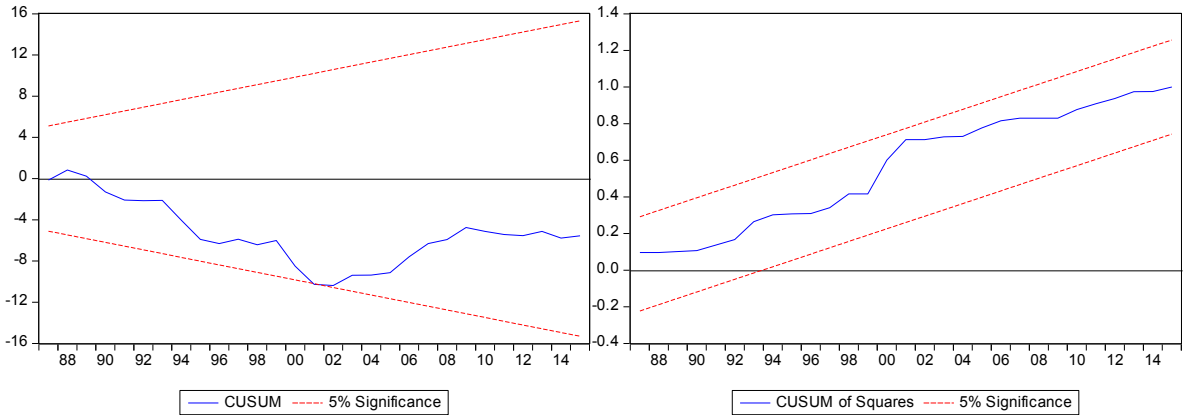
Seychelles



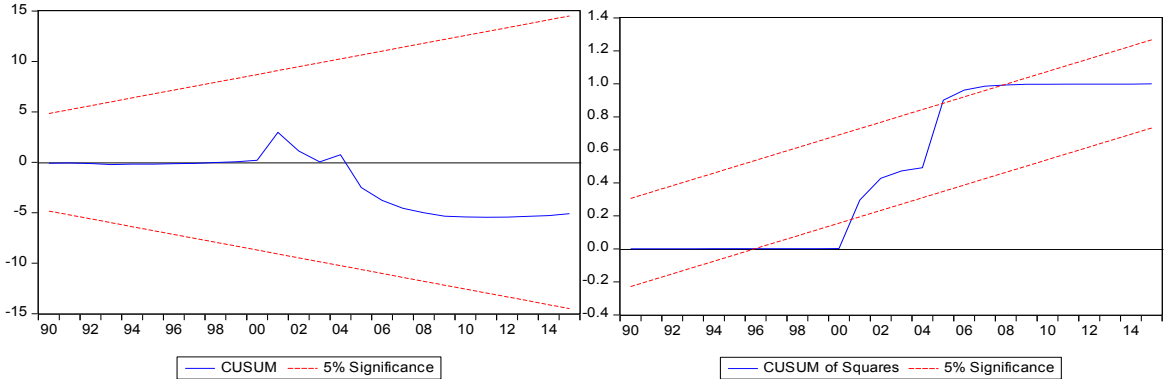
South Africa



Swaziland



Zambia



5. Concluding implications and future research directions

An important outcome of the quantity theory of money is that variations in economic activity (i.e. changes in prices and output) which influence variations in the quantity of money are feasible when the velocity of money is stable. A relevant lesson from the recent European Monetary Union (EMU) crisis to the proposed African monetary unions is the importance of stable macroeconomic policies. The formation of the Southern African

Monetary Union (SAMU) implies that each country will abandon its idiosyncratic monetary policy objectives in favour of the union's objectives and by extension, common monetary policy measures. Application of the same monetary policy implies that all the countries exhibit a similar monetary pattern and one of such crucial patterns is the stable nature of money demand. The use of monetary aggregates as monetary policy instruments can only be effective when money demand is stable. Hence, instability of money demand in some countries can undermine the effectiveness of monetary policy in the proposed union.

This study investigates the stability of money in the proposed SAMU. It uses annual data for the period 1981 to 2015 from ten countries making-up the Southern African Development Community (SADC). A standard money demand function is designed and estimated using a bounds testing approach to co-integration and error-correction modeling. The findings show divergence across countries in the stability of money. This divergence is articulated in terms of differences in cointegration, CUSUM (cumulative sum) and CUSUMSQ (CUSUM squared) tests, short run and long term determinants and error correction in event of a shock. Cointegration is apparent in six of the ten SADC countries, namely: Botswana, the Democratic Republic of Congo (DRC), Madagascar, Malawi, Seychelles and Zambia. In event of a shock, the DRC will restore its long-run equilibrium first followed by Zambia, Malawi, Botswana and Seychelles. The demand for money is stable in six of the ten SADC countries based on both CUSUM and CUSUM SQ tests, namely: Botswana, the DRC, Lesotho, Malawi, South Africa and Swaziland. The remaining four countries exhibit partial stability, namely: Seychelles and Zambia (from the CUSUM test) and Madagascar and Mauritius (from the CUSUMSQ test). In what follows, we discuss policy implications in the light of convergence needed for the feasibility of the proposed SAMU.

Given the variations in the fundamentals of demand for money, the established divergence could be the outcome of asymmetry in the targeted objectives and benchmarks related to convergence in monetary policy in the member states. Based on this observed divergence, to achieve convergence, country-specific and idiosyncratic policies are important. For instance, South Africa, which is a major driver in Southern Africa, does not have a cointegrated money demand. This implies that South Africa could substantially undermine the effectiveness of monetary policy in the union. This is essentially because the established determinants of the demand for money vary from one country to another. Moreover, even when some cross-country determinants appear to affect the demand for money in the same

order of significance and sign, the contemporaneous nature of the effect differs. Hence, harmonizing the timing of how determinants of demand for money affect the demand for money is also essential for the convergence process. The potential harmonization is important because the countries are aiming to create a common currency area. Hence, this recommendation of harmonizing policies is based on the prospect of a common currency area.

The engineering of effective monetary policy within a monetary union is contingent on the stability of the money demand function. Accordingly, a stable money demand function is an indication that a more stable money multiplier is feasible and by extension, better forecasts of the impacts of monetary policy for the proposed SAMU as well for financial markets in the sub-region. It also worthwhile to note that countries that have a history of economic turbulence are more likely to reflect a less stable money demand function and a higher inflation influence, compared to their counterparts with stable economies.

The heterogeneity of the results in the paper suggests that the various countries forming the potential SAMU have slightly different demand for money features. In the event that the union is established, the ineffectiveness of monetary policy will be traceable to cross-country differences in monetary policy fundamentals. Hence, monetary policy under the proposed union should be designed in such a way that it is flexible to incorporate the characteristics of different countries. For instance, from our results, we have not established a long run relationship in South Africa which is a key player in the proposed monetary union. The importance of South Africa in the proposed union is informed by the relative size of the country's economy. This further reinforces our view on the need to incorporate country differences when designing monetary policy for the proposed union in order to avert the issue of monetary policy ineffectiveness. South Africa currently practices inflation targeting. This policy initiative is informed by the unstable nature of the country's demand for money function. Further research can focus on clarifying factors contributing to the established divergences by assessing inherent macroeconomic differences between sampled countries.

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Ethical approval: This article does not contain any studies with human participants or animals performed by the authors.

References

Agdeyegbe, T. D., (2009). "On the feasibility of a monetary union in the Southern Africa development community". *International Journal of Finance and Economics*, 13(2), pp. 150–157.

Akinlo, A. E., (2006) "The stability of money demand in Nigeria: An autoregressive distributed lag approach". *Journal of Policy Modelling*, 28(4), pp. 445-452.

Amponsah, S., (2017). "The Impacts of Improvements in the Delivery of Credit from Formal and Semi-Formal Financial Institutions: Evidence from Ghana," *Journal of African Development*, 19(2), pp. 33-66.

Anoruo, E., (2002) "Stability of the Nigerian M2 money demand function in the SAP period", *Economics Bulletin*, 14 (3), pp. 1-9.

Asongu, S. A., (2013). "Real and Monetary Policy Convergence: EMU Crisis to the CFA Zone". *Journal of Financial Economic Policy*, 5(1), pp. 20-38.

Asongu, S. A., Folarin, O., & Biekpe, N., (2019). "The Long Run Stability of Money Demand in the Proposed West African Monetary Union", *Research in International Business and Finance*, 48(April), pp. 483-495.

Asongu, S. A., Batuo, E., Nwachukwu, J. C., & Tchamyou, V. S., (2018a). "Is information diffusion a threat to market power for financial access? Insights from the African banking industry", *Journal of Multinational Financial Management*, 45(June), pp. 88-104.

Asongu, S. A., Nwachukwu, J. C., & Tchamyou, V. S., (2017). "A literature survey on the proposed African Monetary Unions", *Journal of Economic Surveys*, 31(3), pp. 878–902.

Asongu, S. A., & Odhiambo, N. M., (2019). "Challenges of Doing Business in Africa: A Systematic Review", *Journal of African Business*. DOI: 10.1080/15228916.2019.1582294

Asongu, S., Raheem, I., & Tchamyou, V., (2018). "Information asymmetry and financial dollarization in sub-Saharan Africa", *African Journal of Economic and Management Studies*, 9(2), pp.231-249.

Awdeh, A., & Hamadi, H., (2019). "Factors hindering economic development: evidence from the MENA countries", *International Journal of Emerging Markets*, 14(2), pp. 281-299,

Bahmani-Oskooee, M., & Gelan, A., (2009) "How stable is the demand for money in African countries?", *Journal of Economic Studies*, 36(3), pp. 216-235.

Bahmani-Oskooee, M., & Rehman, H., (2005) "Stability of the money demand function in Asian developing countries", *Applied Economics*, 37(7), pp. 773-792.

Bangaké, C., (2008). “Exchange Rate Volatility and Optimum Currency Area: Evidence from Africa”, *Economics Bulletin*, 6(12), pp. 1-10.

Barnett, W. A. & Gaekwad, N. B., (2018). “The Demand for Money for EMU: a Flexible Functional Form Approach”, *Open Economies Review*, 29(2), pp. 353-371.

Barros, C.P., Faria, Joao R. & Gil-Alana, Luis A. (2016). “The demand for money in Angola”, *Journal of Economics and Finance*, 41(2), pp. 408-420.

Bayraktar, N, & Fofack, H., (2018). “A Model for Gender Analysis with Informal Production and Financial Sectors," *Journal of African Development*, 20(2), pp. 1-20.

Boadi, I., Dana, L. P., Mertens, G., & Mensah, L., (2017). “SMEs’ Financing and Banks’ Profitability: A “Good Date” for Banks in Ghana?”, *Journal of African Business*, 17(2), pp. 257-277.

Boamah, C., (2017). “In Search of New Development Financing Models: Keynote address at the African Development Bank/African Finance and Economic,” *Journal of African Development*, 19(2), pp. 111-114.

Boateng, A., Asongu, S. A., Akamavi, R., & Tchamyou, V. S., (2018). “Information Asymmetry and Market Power in the African Banking Industry”, *Journal of Multinational Financial Management,* 44(March), pp. 69-83.

Bocher, F. T., Alemu, B. A., & Kelbore, Z. G., (2017). “Does access to credit improve household welfare? Evidence from Ethiopia using endogenous regime switching regression”, *African Journal of Economic and Management Studies*, 8(1), pp. 51-65.

Bokpin, G. A., Ackah, C., & Kunawotor, M. E., (2018). “Financial Access and Firm Productivity in Sub-Saharan Africa," *Journal of African Business*, 19(2), pp. 210-226.

Brown, R.L., Durbin, J., & Evans, J.M., (1975) “Techniques for testing the constancy of regression relations over time”, *Journal of the Royal Statistical Society,* 37(2), pp. 149–192.

Cavoli, T. & Rajan, R.S., (2008). “Open economy inflation targeting arrangements and monetary policy rules. Application to India”, *Indian Growth and Development Review*, 1(2), pp. 237-251.

Carstensen, K., Hagen, J., Hossfeld, O. & Neaves, A.S. (2009). “Money demand stability and inflation prediction in the four largest EMU countries. *Scottish Journal of Political Economy,* 56(1), pp. 73-93.

Chaisrisawatsuk, S., Sharma, S. C., & Chowdhury, A. R., (2004) “Money demand stability under currency substitution: some recent evidence”, *Applied Financial Economics*, 14(1), pp. 19-27.

Chikalipah, S., (2017). “What determines financial inclusion in Sub-Saharan Africa?” *African Journal of Economic and Management Studies*, 8(1), pp. 8-18.

Chapoto, T., & Aboagye, A. Q. Q., (2017). “African innovations in harnessing farmer assets as collateral”, *African Journal of Economic and Management Studies*, 8(1), pp. 66-75.

Cristadoro, R. & Veronese, G., (2011). “Monetary policy in India: is something amiss?”, *Indian Growth and Development Review*, 4(2), pp. 166-192.

Dafe, F., Essers, D., & Volz, U., (2018). “Localising sovereign debt: The rise of local currency bond markets in sub-Saharan Africa”. *The World Economy*, DOI: 10.1111/twec.12624.

Daniel, A., (2017). “Introduction to the financial services in Africa special issue”, *African Journal of Economic and Management Studies*, 8(1), pp. 2-7.

Danquah, M., Quartey, P., & Iddrisu, A. M., (2017). "Access to Financial Services Via Rural and Community Banks and Poverty Reduction in Rural Households in Ghana," *Journal of African Development*, 19(2), pp. 67-76.

Debrun, X., & Masson, P. R., (2013). “Modelling monetary union in Southern Africa: Welfare evaluation for the CMA and SADC”, *South African Journal of Economics*, 81(2), pp. 275-291.

Emenike, K. O., (2018). “Exchange rate volatility in West African countries: is there a shred of Spillover?”, *International Journal of Emerging Markets*, 13(6), pp. 1457-1474.

Fischer, B., Lenza, M., Pill, H., & Reichlin, L. (2007). “Monetary Analysis and Monetary Policy in the Euro Area 1999- 2006”. *Journal of International Money and Finance*, 25(4), 1138–1164.

Folarin, O. E., & Asongu, S. A., (2019). “Financial liberalization and long-run stability of money demand in Nigeria”, *Journal of Policy Modeling*: Forthcoming.

Folarin O.E. (2019). “Financial reforms and industrialisation: Evidence from Nigeria. *Journal of Social and Economic Development*, Doi: 10.1007/s40847-019-00075-z

Foresti, P., & Napolitano, O., (2014). “Money Demand in the Eurozone: Do Monetary Aggregates Matter?”, *Inzinerine Ekonomika-Engineering Economics*, 25(5), pp. 497-503.

Frankel, J. and Rose, A. (1998). “The Endogenity of the Optimum Currency Area Criteria. *The Economic Journal*, 108(449), 1009-1025.

Gerlach, S., & Svensson, L. E. O. (2003). “Money and Inflation in the Euro Area: A Case for Monetary Indicators?” *Journal of Monetary Economics*, 50(8), 1649-1672.

Gevorkyan, A. V., & Kvangraven, I. H., (2016). "Assessing Recent Determinants of Borrowing Costs in Sub-Saharan Africa". *Review of Development Economics*, 20(4), pp. 721-738.

Ghironi, F., & Rebucci, A., (2000). "Monetary rules for emerging market economies", *Working Paper* No. 476, Boston College Economics Department, Boston, MA.

Goldfeld, S. M., & Sichel, D. E. (1990). The Demand for Money. In Friedman, B.M. & Hahn, F.H. (Eds.), Handbook of Monetary Economics 1, North-Holland.

Grandes, M. (2003). "Macroeconomic convergence in Southern Africa: the rand zone experience". *OECD Development Centre Working Papers* No. 231, Paris.

Gries, T., Kraft, M., & Meierrieks, D., (2009). "Linkages between financial deepening, trade openness, and economic development: causality evidence from Sub-Saharan Africa", *World Development*, 37(12), pp. 1849-1860.

Gyeke-Dako, A., & Agbloyor, E. K., Turkson, F. E. & Baffour, P. T., (2018). "Financial Development and the Social Cost of Financial Intermediation in Africa," *Journal of African Business*, 19(4), pp. 455-474.

Hamori, S., & Hamori, N. (2008). "Demand for Money in the Euro Area". *Economic Systems*, 32(3), pp. 274–284,

Hamori, S., & Tokihisa, A. (2001). "Seasonal Cointegration and the Money Demand Function: Some Evidence from Japan". *Applied Economics Letters*, 8(5), pp. 305-310.

Harvey, S. K., & Cushing, M. J., (2015). "Is West African Monetary Zone (WAMZ) a common currency area?", *Review of Development Finance*, 5(1), pp. 53-63.

Ho, S-Y., (2019). "Macroeconomic determinants of stock market development in South Africa", *International Journal of Emerging Markets*, 14(2), pp.322-342.

Hossain, A., (1993). "Financial reforms, stability of the money demand and monetary policy in Bangladesh: An econometric investigation". *Indian Economic Review*, 28(1), pp. 85-100.

Iyke, B., N., & Odiambo, N. M., (2017). "Foreign exchange markets and the purchasing power parity theory: Evidence from two Southern African countries", *African Journal of Economic and Management Studies*, 8(1), pp. 89-102.

James, G. A., (2005) "Money demand and financial liberalization in Indonesia", *Journal of Asian Economics*, 16(5), pp. 817-829.

Jefferis, K. R., (2007). "The process of monetary integration in the SADC region". *Journal of Southern African Studies,* 33(1), pp. 83-106.

Khamfula, Y., & Huizinga, H., (2004). "The Southern African Development Community: Suitable for a monetary union?" *Journal of Development Economics*, 73(2), pp. 699-714.

Khamfula, Y., & Mensteab T., (2004). "South Africa and Southern African Monetary Union: A Critical Review of Sources of Costs and Benefits," *South African Journal of Economics*, 72(1), pp. 37-49.

Khan, R. E. A., & Hye, Q. M. A. (2013). "Financial liberalization and demand for money: A case of Pakistan", *The Journal of Developing Areas*, 47 (2), pp. 175-198.

Kumar, S., (2011). "Financial reforms and Money demand: Evidence from 20 developing countries", *Economic System*, 35(3), pp. 323-334.

Kumar, S., Webber, D. J., & Fargher, S., (2013). "Money demand stability: A case study of Nigeria", *Journal of Policy Modelling*, 35(6), pp. 978-991.

Kusi, B. A., Agbloyor, E. K., Ansah-Adu, K., &Gyeke-Dako, A. (2017). "Bank credit risk and credit information sharing in Africa: Does credit information sharing institutions and context matter?" *Research in International Business and Finance*, 42(December), pp.1123- 1136.

Kusi, B. A., & Opoku- Mensah, M. (2018)."Does credit information sharing affect funding cost of banks? Evidence from African banks".*International Journal of Finance & Economics*, 23(1), pp. 19- 28.

Levine, P. (2012). "Monetary policy in an uncertain world: probability models and the design of robust monetary rules", *Indian Growth and Development Review*, 5(1), pp. 70-88.

Lucas, R. E. (1976). Economic Policy Evaluation: A Critique. In Carnagie-Rochester Conference Series on Public Theory: the Phillips Curve and Labour Markets, 12. K. Brunner & Meltzer, A. (Eds). North-Holland, Amsterdam, 19–46.

Masson, P. (2008) "Currency Unions in Africa: Is the Trade Effect Substantial Enough to Justify their Formation?", *The World Economy*, 31(4), pp. 533-547.

Mishkin, F.S. (2002). "The role of output stabilization in the conduct of monetary policy", *International Finance*, 5(2), pp. 213-227.

Mutize, M., & Gossel, S. J., (2018). "Do sovereign credit rating announcements influence excess bond and equity returns in Africa?", *International Journal of Emerging Markets*, 13 (6), pp.1522-1537.

Nachega, J-C., (2001) "Financial liberalization, money demand and inflation in Uganda" IMF Working paper No. 01/118, Washington.

Ndirangu, L., & Nyamongo, E. M., (2015) "Financial innovations and their implications for monetary policy in Kenya", *Journal of African Economics*, 24(Supplement), pp. i48-i71.

Ndlovu, C., & Alagidede, P., (2018). "Industry structure, macroeconomic fundamentals and return on equity: Evidence from emerging market economies", *International Journal of Emerging Markets*, 13(6), pp. 2047-2066.

Obeng, S. K., & Sakyi, D., (2017). "Macroeconomic determinants of interest rate spreads in Ghana", *African Journal of Economic and Management Studies*, 8(1), pp. 76-88.

Ofori-Sasu, D., Abor, J. Y., & Osei, A. K., (2017). "Dividend Policy and Shareholders' Value: Evidence from Listed Companies in Ghana", *African Development Review*, 29(2), pp. 293-304.

Osah, O., & Kyobe, M., (2017). "Predicting user continuance intention towards M-pesa in Kenya", *African Journal of Economic and Management Studies*, 8(1), pp. 36-50.

Page, S. & te Velde D.W. (2004). "Foreign Direct Investment by African Countries" Papers prepared for InWent/UNCTAD meeting on FDI in Africa 22-24 Novemebr 2004, UNECA, Addis Ababa.

Pesaran, H. M., Shin, Y., & Smith, R., J. (2001). "Bounds testing approaches to the analysis of level relationships", *Journal of Applied Econometrics*, 16 (1), pp. 289–326.

Poole, W., (1970). "Optimal choice of monetary policy instruments in a simple stochastic macro model", The *Quarterly Journal of Economics*, 84 (2), pp. 192-216.

Pradhan, B. K., & Subramanian, A. (2003). "On the Stability of Demand for Money in a Developing Economy: Some Empirical Issues". *Journal of Development Economics*, 72(1), 335–351.

Rao, B. B., & Kumar, S., (2009). "A panel data approach to the demand for money and the effects of financial reforms in the Asian countries", *Economic Modelling*, 26(5), pp. 1012-1017.

Senga, C., & Cassimon, D., (2018). "Spillovers in Sub-Saharan Africa's sovereign Eurobond yields", *Belgian Policy Research Group on Financing for Development, Working Paper* No. 24, Antwerp.

Senga, C., Cassimon, D., & Essers, D., (2018). "Sub-Saharan African Eurobond yields: What really matters beyond global factors?", *Review of Development Finance*, 8(1), pp. 49-62.

Singh, R., & Kumar, S., (2012). "Application of the alternative techniques to estimate demand for money in developing countries, *Journal of Developing Areas*, 46(2), pp. 43-63.

Sriram, S. S., (2000). "A survey of recent empirical money demand studies. *IMF Staff Papers*, 47(3), pp. 334-365.

Tavlas, G.S. (2009). "The benefits and cost of monetary union in Southern Africa: A critical survey of the literature. Journal of Economics Surveys, 23(1), 1-43

Tchamyou, V. S., (2019a). "Education, Lifelong learning, Inequality and Financial access: Evidence from African countries". *Contemporary Social Science*. DOI:10.1080/21582041.2018.1433314.

Tchamyou, V. S., (2019b)."The Role of Information Sharing in Modulating the Effect of Financial Access on Inequality". *Journal of African Business*. DOI: 10.1080/15228916.2019.1584262.

Tchamyou, V. S., & Asongu, S. A., (2017). "Information Sharing and Financial Sector Development in Africa", *Journal of African Business*, 18(1) pp. 24-49.

Tchamyou, V. S., Erreygers, G., & Cassimon, D., (2019). "Inequality, ICT and Financial Access in Africa", *Technological Forecasting and Social Change*, 139(February), pp. 169-184.

UNCTAD (2014). "Monetary unions and regional trade in Africa", United Nations Conference on Trade and Development, Trade and Development Board Fifty-ninth executive session Geneva, 23–25 June 2014. http://unctad.org/meetings/en/SessionalDocuments/tdbex59d3_en.pdf (Accessed: 25/06/2016).

Wale, L. E., & Makina, D., (2017). "Account ownership and use of financial services among individuals: Evidence from selected Sub-Saharan African economies", *African Journal of Economic and Management Studies*, 8(1), pp. 19-35.

Wang, J.-Y., Masha, I., Shirono, K., & Harris, L. (2007). "The common monetary area in Southern Africa: shocks, adjustment, and policy challenges". *IMF Working Paper* No. 07/158, Washington.

Weeks, J. (2010). "Why monetary policy is irrelevant in Africa South of the Sahara", Development Viewpoint No. 53, School of Oriental and African Studies, Center for Development and Policy Research, available at: www.soas.ac.uk/cdpr/publications/dv/file59766.pdf (Accessed: 29/10/2012).

Zehirun, M. F., Breitenbach, M. C., & Kemegue, F., (2015). "Assessment of Monetary Union in SADC: Evidence from Cointegration and Panel Unit Root Tests", *Economic Research Southern Africa (ERSA) Paper* No. 945, Cape Town.