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An investigation of the determinants of foreign exchange reserves in Southern African countries

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Abstract. The controversy whether the "fear of floating" or the "fear of capital mobility" determines a country's foreign reserve holdings is an ongoing research debate. This issue remains unresolved in global economic and finance studies. This study has the aim to contribute to the ongoing debate by probing the determinants of foreign exchange reserves in Southern African countries. This study makes use of the annual data sets over the period of 26 years from 1990 to 2015, with the application of the ARDL approach within a panel econometric framework. Variables included in the model are foreign reserves, capital inflows, exports, inflation, exchange rate and imports. The empirical findings show the existence of cointegration amongst the studied variables. The findings show that exports, inflation rate, exchange rate and imports are significant determinants of foreign reserve holdings in the long run and with all the variables having positive impacts, except for import demand. Meanwhile, capital inflow was found to be a non-significant determinant of reserve holdings in the long run. Evidence from the short-run analysis shows that all the independent variables, with the exception of exchange rate, do not significantly determine reserve holdings. The study concludes that "fear of floating" rather than "fear of capital" is a significant driver or determinant of foreign reserves in

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1. INTRODUCTION

The role and the importance of international reserve holdings, also known as foreign exchange reserves, has been documented in both theoretical and empirical literature. Foreign reserves are believed to play significant roles in the stability of exchange rate, and in ameliorating or reducing the impact of unanticipated emergencies and economic shocks (Mishkin, 1999; Aizenman & Marion, 2002; Frenkel, 2005). Foreign reserves holdings can be defined as stocks of all international financial assets and instruments kept and maintained by a country to finance and carry out all international obligations and transactions (Dominguez, Hashimoto & Ito, 2012). Meanwhile, reserve holdings have also been seen as a means by which the apex bank secure and maintain the external competitiveness of an economy (Dooley, Folkerts-Landau & Garber, 2004). Other significant merits from holding reserves include among other things: intertemporal smoothening of the tax burden which is most important during adverse productivity shocks; an important investment scheme if foreign currency assets are negatively correlated with that of domestic investments; and improved or favourable political perceptions (Aizenman & Marion, 2002; Aizenman & Marion, 2004; Choi, Sharma & Stromqvist, 2009).

Both theoretical and empirical evidence indicate that countries with fixed or managed floating exchange rate systems ought to have accumulated adequate and more reserves when compared with the economies adopting floating exchange rate systems (Park, Chung & Wang, 2001; Williamson, 2002; Buiter & Grafe, 2002; Czech & Waszkowski, 2012). This, of course, is a dilemma, otherwise referred to as the 'impossible trinity' in international macroeconomics and finance. The trilemma confronts the emerging economies of Asia, Latin America while those of Southern African countries are also not left out. The major aftermath of the 2008 global financial crisis was the increase of capital inflow to both developing and emerging economies (Taguchi, 2011). The increased capital inflow consequently motivated currency appreciation due to increased demand for domestic currency relative to foreign currency. This consequently has negative effects on the international trade sector of an economy. This is because currency appreciation reduces the competitiveness of the export relative to import and consequently affect the balance of payment position. However, Taguchi (2011) argued that the apex bank often intervenes by means of increasing the supply of domestic currency to prevent currency appreciation. This explains why many of the fixed or managed exchange rate economies often keep high levels of reserves (Taguchi, 2011).

Meanwhile, the majority of Southern African countries adopt managed floating exchange rate systems and as such must maintain relatively high levels of reserve holdings (Fischer, 2001). While empirical investigations on the determinants of foreign reserves abound in literature, it is yet to receive significant attention in Southern African countries. Also, the majority of these studies are country-specific studies with limited empirical data on Southern African countries (Ramachandran, 2006; Mishra & Sharma, 2011; Aizenman, 2011). Available evidence from panel studies are largely from Asia, European and Latin American countries (Cheung & Sengupta, 2011; Aizenman, Jinjarak & Park, 2011; Gosselin and Parent, 2007; Pontines & Rajan, 2011). Steiner (2012), Steiner (2013) and Bussière, Cheng, Chinn, & Lisack (2015) in their panel studies on both developed and developing countries from Europe, Asia, Latin America and Africa included a few Southern African countries as well. However, inferences from these studies for countries in Southern Africa as a region, are unreliable as there is no uniformity in the

economic structures of these regions. This study, therefore, examines the factors that are capable of significantly influencing the reserve holdings of Southern African countries.

The rest of the study is structured as follows: section two synthesizes the existing literature. Section three introduces the empirical approach while sections four and five present the results and the robustness checks, respectively. The last section concludes the study.

2. LITERATURE REVIEW

The issue surrounding the determinants of foreign reserves has been extensively discussed in both theoretical and empirical literatures, whether on time-series, panel or cross-country comparative basis. Aizenman and Marion (2002) investigated the rationale behind the differences in the level of demand for foreign reserves held by developing countries, using a sample of 125 developing countries. Their empirical findings suggest that international reserve holdings are influenced by factors such as the size of international transactions, exchange rate volatility and political considerations. They argued that countries with high political instability or political corruption have tendencies to hold low levels of reserves, while those with high rate of volatility are perceived to hold high levels of reserves. Bussière, Cheng, Chinn, & Lisack (2015) concerned by the claim that protection during a crisis is a determinant for holding reserves, made use of sample data from 112 developing countries to examine the potency of accumulation of international reserves in protecting countries in times of financial crises. The empirical findings suggest that countries with high reserves suffered less from the crisis. They also pointed out that such crisis should not be associated with serious capital flight. This position on the effectiveness of the reserve holdings during the episodes of crisis conforms to the position of Dominguez (2012).

On the contrary, Steiner (2013) attributes accumulation of foreign reserves mainly to the "fear of capital mobility". His empirical findings from a large panel data argued that the accumulation of reserves is consequent upon the 'fear of capital mobility' experienced by central banks. He submits that foreign reserves are not only used by the apex bank to defend the exchange rate in time of crisis, but also to manage capital flows in periods of limited economic disturbances. By implication, Steiner (2013) means that accumulation of official reserves is used to compensate capital market's liberalization. This is contrary to findings by Calvo and Reinhart (2002) which argued that "fear of floating" rather than "fear of capital flight" is the main determinant of reserve holdings especially in emerging Asian economies. Meanwhile, Levy-Yeyati and Sturzenegger (2007) brought the issue of asymmetry into the discussion of the "fear of floating" as the sole determinant of reserves accumulation. They argued that accumulation of reserves as a means of interventions has been aimed at limiting appreciations rather than depreciations. Pontines and Rajan (2011) were motivated by this line of argument and consequently investigate asymmetry in central bank foreign exchange intervention responses to currency appreciations versus depreciations in emerging economies of Asia. Their empirical results confirm the existence of an asymmetry in central banks' interventions. Their findings suggest that central banks' holding of reserves tend to be a manifestation of fear of appreciation than a fear of depreciation.

Ramachandran (2004) claims that reserves demand is largely determined by the opportunity cost than the reserve volatility in India. This position, according to Ramachandran (2004), can be associated to relatively free inflow versus outflow of capital in India. Further evidence from India disagrees with Ramachandran (2004) in respect of the volatility of reserves. Chakravarty (2008) also analyzes the optimal reserve holding for India using an ARDL estimation. Empirical findings support the position that opportunity cost together with the volatility of reserves, have significant effect on the reserve demand. The position is further corroborated by Prabheesh (2013). They however argued that exchange rate flexibility does not have any significant impact on the reserve demand. Findings by Mishra and Sharma

(2011) differ significantly from Ramachandran (2004) and Chakravarty (2008), but agree with a number of other existing studies. They submit that the size of foreign trade, uncertainty and profitability considerations play an important role in determining India's long-term reserve demand policies. They conclude that national monetary disequilibrium does play a crucial role in short-run reserve movements.

Pina (2015) examined the growth in the trend of international reserves in developing economies from a monetary perspective. He concludes that the motive for holding reserves includes among other things, inflation, exchange rate management and financial sector support during crises. Also, Gosselin and Parent (2007) using data from 1980 to 2003 for emerging Asian economies, find that the level of reserve holdings is determined by GDP, the ratio of imports relative to GDP, share of broad money to GDP, the volatility of export receipts, as well as a break in the coefficient of imports to GDP, and a break in the coefficient of broad money to GDP in the post-crisis period. In another dimension, Cheung and Ito (2009) use data from more than 100 economies for the period of 1975 to 2004 in investigating the determinants of international reserve holdings. They argued that the relationship between international reserves and their determinants are different between developed and developing economies and is not stable over time. The empirical analysis indicates that a developed economy tends to hold a lower level of international reserves than a developing one. Hence, the need to investigate the determinants of foreign reserve holdings in Southern African countries, as findings from existing panel studies that pooled some Southern African countries with other developed countries cannot be solely relied upon since there is no consistent uniformity in the economic structures across regions.

3. METHODOLOGY

The focus of this study is the investigation of the determinants of foreign reserves holdings for Southern African countries. The literature is replete with a number of variables that significantly influence foreign reserve holdings such as capital inflow, export, import, exchange rate and other variables (Mishkin, 1999; Aizenman and Marion, 2002; Dooley et al., 2004; Taguchi, 2011; Steiner, 2013). The model was therefore specified with the following variables to examine the long-run relation between the variables of interest:

$$lnfre_{it} = \alpha_{0i} + \alpha_{1i} lnexp_{it} + \alpha_{2i} lnimp_{it} + \alpha_{3i} lninf_{it} + \alpha_{4i} lnexc_{it} + \alpha_{5i} lncap_{it} + \varepsilon_{it} \ldots\ldots (1)$$

where $lnfre_{it}$ is the natural log of foreign reserves, $lnexp_{it}$ is the natural log of exports of goods and services, $lnimp_{it}$ is the natural log of imports of goods and services, $lninf_{it}$ is the natural log of inflation rates, $lnexc_{it}$ is the natural log of exchange rates, $lncap_{it}$ is the natural log of capital inflows and ε_{it} is the residual term, which is assumed to be white noise. There are several cointegration techniques that are used to test the existence of long-run relationships among analysis variables. In this study, one of these cointegration techniques was employed namely panel autoregressive distributed lag (Panel-ARDL). Specifically, robust heterogenous panel techniques of pooled mean group (PMG), mean group (MG) and dynamic fixed effect (DFE) estimators for dynamic non-stationary heterogenous panels were employed, with the most appropriate of the three estimators determined by the Hausman test. Using heterogenous ARDL model for this study is quite justifiable because of its ability to handle possible heterogeneity among the sample countries. Furthermore, the dimension of the data set, namely large T and small N, also justifies the appropriateness of this technique. This method, developed by Pesaran, Shin and Smith (2001), is considered superior to other cointegration methods because of its several econometric advantages: it allows for simultaneous estimation of both long-run and short-run parameters; it can be applied whether the regressors are purely I(0), purely I(1) or a combination of both; it avoids endogeneity problems; and it

provides better results with small sample than other methods. The panel ARDL representation of equation (1) is formulated as follows:

$$\Delta lnfre_{it} = \beta_{0i} + \sum_{i=1}^{j} \beta_{1i} \Delta lnfre_{i,t-1} + \sum_{i=0}^{k} \beta_{2i} \Delta lnexp_{i,t-1} + \sum_{i=0}^{l} \beta_{3i} \Delta lnimp_{i,t-1} + \sum_{i=0}^{m} \beta_{4i} \Delta lninf_{i,t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta lnexc_{i,t-1} + \sum_{i=0}^{o} \beta_{6i} \Delta lncap_{i,t-1} + \emptyset_{1i} lnfre_{i,t-1} + \emptyset_{2i} lnexp_{i,t-1} + \emptyset_{3i} lnimp_{i,t-1} + \emptyset_{4i} lninf_{i,t-1} + \emptyset_{5i} lnexc_{i,t-1} + \emptyset_{6i} lncap_{i,t-1} + \varepsilon_{it} \quad (2)$$

where all variables are as earlier defined, $i = 1, 2, \dots, N;\ t = 1, 2, \dots, N$; j, k, l, m, n and o are lag orders; $\phi(\phi_{1i}, \phi_{2i}, \phi_{3i}, \phi_{4i}, \phi_{5i}, \phi_{6i})$ is a vector of long-run parameters to be estimated; $\beta(\beta_{1i}, \beta_{2i}, \beta_{3i}, \beta_{4i}, \beta_{5i}, \beta_{6i})$ is a vector of short-run parameters to be estimated, and ε_{it} is a normally distributed error term with zero mean and constant variance. The long-run slope (elasticity) for each country in the model is computed as $\frac{-\emptyset_{2i}}{\emptyset_{1i}}$, $\frac{-\emptyset_{3i}}{\emptyset_{1i}}$, $\frac{-\emptyset_{4i}}{\emptyset_{1i}}$, $\frac{-\emptyset_{5i}}{\emptyset_{1i}}$ and $\frac{-\emptyset_{6i}}{\emptyset_{1i}}$ for export, import, inflation, exchange rate and capital inflows, respectively, since it is assumed that $\Delta lnfre_{i,t-j} = \Delta lnexp_{i,t-j} = \Delta lnimp_{i,t-j} = \Delta lninf_{i,t-j} = \Delta lnexc_{i,t-j} = \Delta lncap_{i,t-j} = 0$ in the long run.

We can re-formulate equation (2) in error correction form as follows:

$$\Delta lnfre_{it} = \vartheta_i e_{t-1} + \sum_{i=1}^{j} \beta_{1i} \Delta lnfre_{i,t-1} + \sum_{i=0}^{k} \beta_{2i} \Delta lnexp_{i,t-1} + \sum_{i=0}^{l} \beta_{3i} \Delta lnimp_{i,t-1} + \sum_{i=0}^{m} \beta_{4i} \Delta lninf_{i,t-1} + \sum_{i=0}^{n} \beta_{5i} \Delta lnexc_{i,t-1} + \sum_{i=0}^{o} \Delta lncap_{i,t-1} + \varepsilon_{it} \quad (3)$$

where $e_{t-1} = lnfre_{i,t-1} - \rho_{0i} - \rho_{1i} lnexp_{i,t-1} - \rho_{2i} lnimp_{i,t-1} - \rho_{3i} lninf_{i,t-1} - \rho_{4i} lnexc_{i,t-1} - \rho_{5i} lncap_{i,t-1}$ and it represents the linear error correction term for each country. Furthermore, ϑ_i is the speed of adjustment term for each country and is also equivalent to $\emptyset_{1i}$ in equation (2). For long-run relationship to exist among the variables in the model, ϑ_i is expected to be negative, less than one and statistically significant. In the model, the long-run parameters are computed as $\frac{-\beta_{0i}}{\emptyset_{1i}}, \frac{-\emptyset_{2i}}{\emptyset_{1i}}, \frac{-\emptyset_{3i}}{\emptyset_{1i}}, \frac{-\emptyset_{4i}}{\emptyset_{1i}}, \frac{-\emptyset_{5i}}{\emptyset_{1i}}$ and $\frac{-\emptyset_{6i}}{\emptyset_{1i}}$ for constant, export, import, inflation, exchange rate and capital inflows, respectively.

Annual data sets for 10 Southern African countries are employed in this study. The countries comprise Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. The study covers a period of 26 years, from 1990 to 2015. Data on all the variables (foreign reserves, export of goods and services, import of goods and services, inflation rate, exchange rate

and capital inflow, proxied by foreign direct investment (FDI)) were sourced from the World Bank's World Development indicators (WDI).

4. EMPIRICAL RESULTS AND DISCUSSION

Table 1 presents the descriptive statistics of the variables of interest. It can be observed that the mean and median of virtually all the variables are close in values, which implies that their distributions are nearly symmetrical. This is an indication of low variability. The skewness statistics shows that three of the variables namely, log of foreign reserves, log of imports and log of inflation, are positively skewed, while the remaining three namely, log of exports, log of exchange rate and log of capital inflows, are negatively skewed. The Jarque-Bera probability values for all the variables are below the 0.05 critical level. This suggests a rejection of the null hypothesis of normal distribution for all the variables at 5 per cent level of significance. The absence of normality in their distribution may be as a result of the cross-sectional and heterogeneous nature of the data employed in the study. However, such heterogeneities are corrected for in panel data analysis.

Table 1

Descriptive statistics of variables

Variable	lfre	lexp	limp	Linf	lexc	lcap
Mean	20.5588	3.5713	3.8815	2.6341	1.4979	0.8656
Median	20.2005	3.5646	3.8163	2.2052	1.9127	0.9923
Maximum	24.6489	4.5613	5.0137	10.1027	6.1915	3.7331
Minimum	17.6316	2.1009	2.8506	0.3259	-16.7141	-5.9627
Std. Dev.	1.6000	0.4615	0.4738	1.3991	2.8706	1.3437
Skewness	0.7062	-0.4770	0.4654	1.9788	-3.0924	-1.1208
Kurtosis	2.8540	3.4919	2.6818	8.3004	17.0648	6.9436
Jarque-Bera	19.6595	11.2335	9.4372	426.6373	2301.715	200.6349
Probability	0.00005	0.0036	0.0089	0.0000	0.0000	0.0000
Sum	4810.771	835.6913	908.2809	616.3967	350.5198	202.5582
Sum Sq. Dev.	596.5348	49.6330	52.3104	456.1286	1920.123	420.7467

While the ARDL approach to cointegration is applicable whether the variables are all integrated of order zero or of order one, it is still necessary to carry out unit root tests on the variables in order to be sure that no I(2) variable is involved. The results of the Levin, Lin & Chu (LLC), Im, Pesaran and Shin (IPS), Augmented Dickey-Fuller (ADF), and Phillips Peron (PP) panel unit root tests carried out on the variables are presented in Table 2. Individual intercept was included in the test equation for each of the unit root tests, while the lag length for each variable was automatically selected by the Schwarz Information Criterion (SIC). As detailed in Table 2, foreign reserves is integrated of order one at five per cent significance level, with only LLC indicating that it is stationary at level. All the tests are unanimous that the remaining variables are integrated of order zero at five per cent significance level, with only LLC indicating that import is integrated of order one.

Table 2

Panel unit root tests

Variable	Level	LLC	P-v	IPS	P-v	ADF	P-v	PP	P-v
lfre	0	-2.45	0.01**	-0.38	0.35	24.07	0.24	20.29	0.44
	1	-11.14	0.00**	-11.52	0.00**	143.34	0.00**	143.48	0.00**
lexp	0	-1.84	0.03**	-2.04	0.02**	35.36	0.02**	34.43	0.02**
	1	-13.95	0.00**	-12.78	0.00**	159.13	0.00**	182.64	0.00**
limp	0	-1.23	0.11	-1.74	0.04**	33.05	0.03**	33.46	0.03**
	1	-13.56	0.00**	-15.23	0.00**	189.69	0.00**	201.31	0.00**
linf	0	-2.68	0.00**	-2.38	0.00**	37.48	0.01**	36.22	0.02**
	1	-13.28	0.00**	-12.29	0.00**	152.05	0.00**	196.35	0.00**
lexc	0	-9.13	0.00**	-4.31	0.00**	70.87	0.00**	65.97	0.00**
	1	-5.73	0.00**	-4.94	0.00**	59.75	0.00**	57.92	0.00**
lcap	0	-4.16	0.00**	-4.15	0.00**	52.87	0.00**	51.99	0.00**
	1	-15.98	0.00**	-16.75	0.00**	201.05	0.00**	465.39	0.00**

** represents significance at five per cent, while P-v indicates probability value.

Following the estimation of equation (2), the panel ARDL estimation results which consist of panel ARDL models, estimated with pooled mean group (PMG), mean group (MG) and dynamic fixed estimator (DFE) are presented in Table 3. In order to ascertain the most efficient model under the null among the three estimators, the Hausman test was employed which indicates that the null hypothesis that PMG is more efficient in comparison to MG cannot be rejected at 5% significance level. This implies that PMG is better than MG. Furthermore, in comparing PMG with DFE, the test also shows that the null hypothesis that PMG is preferable to DFE cannot be rejected at 5% significance level, which implies that PMG is better that DFE as well. Hence, PMG is held as the most efficient of the three estimators, and is therefore adopted for this study. As indicated in Table 3, the long-run coefficient of log of exports of goods and services is positive and significant at 1% significance level. The result suggests that a 1% increase in export of goods and services is related to an increase in foreign reserves by roughly 1.05% in the sampled countries over the long-run. In the case of log of imports of goods and services, the results indicate that it has a significant, but negative relationship with foreign reserves at the 5% level. Specifically, the result suggests that a 1% increase in import of goods and services would lead to a decline in foreign reserves by about 1.57% in the Southern African countries over the long run. These results corroborate the findings of Gosselin and Parent (2007) who find that the level of reserve holdings for emerging Asian economies is determined by imports and exports, among other variables. The long-run coefficient of log of inflation rate is positive and significant at 1% significance level. This indicates that in the long run, a 1% increase in the rate of inflation would lead to an increase in the level of reserves by about 0.62% in the sampled countries. The coefficient of log of exchange rate is also positive and significant at the 1% level. This means that an increase in exchange rate; otherwise known as depreciation of currency, would have positive and significant impact on international reserves holding. More specifically, a 1% depreciation in exchange rates of the Southern African countries is related to an improvement in the level of reserves by roughly 0.01% in the long run. This affirms theoretical position that depreciation of the currency would promote export and subsequently improve the reserves holding in the long run. These results are in

agreement with the claim of Pina (2015) that the motive for holding reserves include, among other things, inflation, exchange rate management and financial sector support.

Table 3

Panel ARDL results

	PMG	MG	DFE		PMG	MG	DFE
$lexp$	1.047***	2.412**	0.983	$\Delta lexp$	0.206	-0.342	0.334
	(0.207)	(1.121)	(0.674)		(0.362)	(0.476)	(0.229)
$limp$	-1.573**	-0.066	-0.266	$\Delta limp$	0.255	0.191	-0.168
	(0.646)	(1.199)	(1.067)		(0.354)	(0.457)	(0.232)
$linf$	0.623***	-0.367	-0.473**	$\Delta linf$	0.082	0.195*	-0.007
	(0.195)	(0.401)	(0.193)		(0.051)	(0.103)	(0.045)
$lexc$	0.309***	0.064	0.114	$\Delta lexc$	-0.459**	-0.394	0.046
	(0.092)	(0.327)	(0.081)		(0.182)	(0.267)	(0.079)
$lcap$	0.007	-0.264	0.098	$\Delta lcap$	-0.045	0.006	-0.025
	(0.073)	(0.271)	(0.198)		(0.041)	(0.071)	(0.031)
				ect_{t-1}	-0.193***	-0.444***	-0.182***
					(0.069)	(0.116)	(0.040)
Hausman test							
MG vs. PMG		53.23					
Prob.		0.15					
DFE vs. PMG		3.56					
Prob.		0.92					

Note: Standard errors in parenthesis. ***, ** and * represent significance at 1%, 5% and 10% levels, respectively. PMG, MG and DFE represent pooled mean group, mean group and dynamic fixed effect estimators, respectively.

Lastly, the long-run coefficient of log of capital inflows is positive, but statistically insignificant. This suggests that capital inflow does not significantly affect the level of foreign reserves in Southern African countries. This result supports the claim of Calvo and Reinhart (2002) that "fear of floating", rather than "fear of capital flight", is the main determinant of reserves holdings, especially in emerging Asian economies and elsewhere. However, it contradicts the finding by Steiner (2013) in a large panel data analysis that foreign reserves are not only used to defend the exchange rate in time of crisis, but also to manage capital flows in periods of no economic disturbances.

For the short-run, the results as also presented in Table 3 provide evidence of no short-run relationship between foreign reserves and the independent variables, with the exception of exchange rate. Specifically, in the short-run, the coefficients of logs of export, import and inflation rate are positive, and statistically insignificant, while that of capital inflows is negative and statistically insignificant. This indicates that none of these variables has effect on the level of foreign reserves for Southern African countries in the short-run. In contrast to this, however, the coefficient of log of exchange rate is negative, and significant in the short run at 5% level of significance. Specifically, a 1% appreciation in the exchange rate of Southern African countries' currencies would lead to an increase in the level of their foreign reserves holdings by roughly 0.5% in the short run. This shows that an increase in exchange rate,

otherwise known as depreciation of currency in the short run puts downward pressure on reserves, especially if the economy is highly import-dependent.

Another very important result in Table 3 is that of the error correction term (ECT), which estimates the speed at which the dependent variable converges to long-run equilibrium after changes in independent variables. For long-run relationship to be adjudged existent among the variables in the model, the coefficient of ECT is expected to be less than one, negative and statistically significant. As evident in the Table, the three estimators suggest that the logs of foreign reserves, export, import, inflation rate, exchange rate and capital inflows are cointegrated. Specifically, based on the PMG result, the lagged ECT is found to be less than one, negative and statistically significant at 1% significance level. Finally, the estimate of the lagged error correction term (ECT), is negative (-0.19) and it is statistically significant at 5%. The coefficient of the ECT suggests that the speed of adjustment from the short-run to the long-run equilibrium path is 19%, which is much lower than that suggested by the DFE at 44%.

5. ROBUSTNESS CHECK

In order to evaluate the robustness of the regression results as found in this research, equation (2) was also estimated without outliers with respect to the dependent variable. The outliers as identified were Angola, Botswana and South Africa, being countries with very high levels of foreign reserves, compared to the rest of the sample. After performing the robustness test which is presented in Table 4, the results that were found were not fundamentally inconsistent with our original findings in Section 4.

Table 4

Panel ARDL results (without Angola, Botswana and South Africa)

	PMG	MG	DFE		PMG	MG	DFE
$lexp$	1.144***	3.114**	1.117*	$\Delta lexp$	0.482	-0.493	0.00386
	(0.233)	(1.490)	(0.660)		(0.439)	(0.508)	(0.276)
$limp$	-1.806**	-1.073	0.285	$\Delta limp$	0.0122	0.251	-0.464
	(0.778)	(1.483)	(1.232)		(0.465)	(0.665)	(0.291)
$linf$	0.712***	-0.468	-0.390*	$\Delta linf$	0.109	0.188	-0.0175
	(0.233)	(0.505)	(0.199)		(0.0705)	(0.118)	(0.0501)
$lexc$	0.193	0.185	0.117	$\Delta lexc$	-0.625**	-0.398	0.0221
	(0.123)	(0.359)	(0.109)		(0.278)	(0.359)	(0.110)
$lcap$	0.00389	0.000291	-0.0751	$\Delta lcap$	-0.0231	-0.0652	0.0098
	(0.0845)	(0.172)	(0.244)		(0.0365)	(0.0592)	(0.0393)
				ect_{t-1}	-0.203**	-0.579***	-0.193***
					(0.0875)	(0.0941)	(0.0516)
Hausman test							
Chi-sq. (prob.)							
MG vs. PMG		7.05					
		0.11					
DFE vs. PMG		3.37					
		0.78					

Note: Standard errors in parenthesis. ***, ** and * represent significance at 1%, 5% and 10% levels, respectively. PMG, MG and DFE represent pooled mean group, mean group and dynamic fixed effect estimators, respectively.

The only deviation from the original result is that the long-run coefficient of exchange rate is statistically insignificant. All the other results corroborate the original result. The coefficients of the ECT are also negative, less than one and significant across the three estimators, with the speed of adjustment from the short-run to the long-run equilibrium path being only slightly higher at 20%, according to the PMG estimator. This, therefore, suggests that the regression results are robust to the consistency test.

6. CONCLUSION

The empirical evidence from the literature has adduced several reasons for the accumulation of foreign exchange. Fear of capital mobility and fear of floating are among the most controversial reasons among other factors argued to be justification for accumulation of reserves. This study investigated the determinants of foreign reserves in Southern African countries using the panel ARDL approach. Annual data sets of 10 Southern African countries were included in the study. The results confirm the existence of cointegration and hence there is a long-run relationship among the variables. The empirical results show that exports, inflation, exchange rate and imports are significant determinants of international reserves holding in the long run and the impacts are found to be positive with the exception of import that has negative impacts. Also, capital inflow, though has positive impact, is found to be an insignificant determinant of the international reserves holding in Southern African countries in the long run. Meanwhile, short run analysis shows that all the independent variables, with the exception of exchange rate do not significantly determine reserves holding in the short run. It must however be noted that the exchange rate is negative in the short run. The overall picture from this study is that exchange rate is a significant determinant of foreign reserves in Southern African countries; confirming the fear of floating rather fear of capital mobility as major determinant of international reserves holding in Southern African region. Hence, the study concludes that the desire to defend the external value of currencies in Southern African countries is one of the major rationale for the accumulation of reserves.

REFERENCES

Aizenman, J. & Marion, N. (2002). International reserve holdings with sovereign risk and costly tax collection. Retrieved September 24, 2017. https://ideas.repec.org/p/nbr/nberwo/9154.html.

Aizenman, J. & Marion, N. (2004). International reserve holdings with sovereign risk and costly tax collection. *The Economic Journal, 114*(497), 569-591.

Aizenman, J. (2011). Hoarding international reserves versus a Pigovian tax-cum-subsidy scheme: Reflections on the deleveraging crisis of 2008–2009, and a cost benefit analysis. *Journal of Economic Dynamics and Control, 35*(9), 1502-1513.

Aizenman, J., Jinjarak, Y. & Park, D. (2011). International reserves and swap lines: Substitutes or complements? *International Review of Economics & Finance, 20*(1), 5-18.

Buiter, W. & Grafe, C. (2002). Anchor, float or abandon ship: Exchange rate regimes for the accession countries. *EIB papers, 7*(2), 51-71.

Bussière, M., Cheng, G., Chinn, M.D. & Lisack, N. (2015). For a few dollars more: Reserves and growth in times of crises. *Journal of International Money and Finance, 52*, 27-145.

Calvo, G.A. & Reinhart, C.M. (2002). Fear of floating. *The Quarterly Journal of Economics, 117*(2), 379-408.

Chakravarty, S.L. (2008). The optimal level of international reserves: the case of India. Retrieved September 12, 2017. www.igidr.ac.in/conf/money/.

Cheung, Y.W. & Ito, H. (2009). A cross-country empirical analysis of international reserves. *International Economic Journal, 23*(4), 447-481.

Cheung, Y.W. & Sengupta, R. (2011). Accumulation of reserves and keeping up with the Joneses: The case of LATAM economies. *International Review of Economics & Finance, 20*(1), 19-31.

Choi, W.G., Sharma, S. & Strömqvist, M. (2009). Net capital flows, financial integration, and international reserve holdings: The recent experience of emerging markets and advanced economies. *IMF Staff Papers, 56*(3), 516-540.

Czech, K.A. & Waszkowski, A. (2012). Foreign exchange market efficiency. Empirical results for the USD/EUR market. *Financial Internet Quarterly „e-Finanse", 8*(3), 1-9.

Dominguez, K.M. (2012). Foreign reserve management during the global financial crisis. *Journal of International Money and Finance, 31*(8), 2017-2037.

Dominguez, K.M., Hashimoto, Y. & Ito, T. (2012). International reserves and the global financial crisis. *Journal of International Economics, 88*(2), 388-406.

Dooley, M.P., Folkerts-Landau, D. & Garber, P. (2004). The revived Bretton Woods system. International *Journal of Finance & Economics, 9*(4), 307-313.

Fischer, S. (2001). Exchange rate regimes: is the bipolar view correct? *Journal of Economic Perspectives, 15*(2), 3-24.

Frankel, J. (2005). On the renminbi: the choice between adjustment under a fixed exchange rate and adjustment under a flexible rate (№w11274). National Bureau of Economic Research. Retrieved September 16, 2017. http://www.nber.org/papers/w11274.

Gosselin, M.A. & Parent, N. (2005). An empirical analysis of foreign exchange reserves in emerging Asia. Montreal, Quebec: Bank of Canada. Retrieved August 12, 2017. https://www.bankofcanada.ca/wp-content/uploads/2010/02/wp05-38.pdf.

Levy-Yeyati, E., & Sturzenegger, F. (2007). Fear of floating in reverse: exchange rate policy in the 2000s. In LAMES-LACEA Annual Meetings. Retrieved August 14, 2017. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.77.3185&rep=rep1&type=pdf.

Mishkin, F.S. (1999). Lessons from the Asian crisis. *Journal of International Money and Finance, 18*(4), 709-723.

Mishra, R.K. & Sharma, C. (2011). India's demand for international reserve and monetary disequilibrium: Reserve adequacy under floating regime. *Journal of Policy Modeling, 33*(6), 901-919.

Park, Y.C., Chung, C.S. & Wang, Y. (2001). Fear of floating: Korea's exchange rate policy after the crisis. *Journal of the Japanese and International Economies, 15*(2), 225-251.

Pesaran, M.H., Shin, Y. & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326.

Pina, G. (2015). The recent growth of international reserves in developing economies: A monetary perspective. *Journal of International Money and Finance, 58*, 172-190.

Pontines, V. & Rajan, R.S. (2011). Foreign exchange market intervention and reserve accumulation in emerging Asia: Is there evidence of fear of appreciation? *Economics Letters, 111*(3), 252-255.

Prabheesh, K.P. (2013). Optimum international reserves and sovereign risk: Evidence from India. *Journal of Asian Economics, 28*, 76-86.

Ramachandran, M. (2004). The optimal level of international reserves: evidence for India. *Economics Letters, 83*, 365–370.

Ramachandran, M. (2006). On the upsurge of foreign exchange reserves in India. *Journal of Policy Modeling, 28*(7), 797-809.

Steiner, A. (2013). The accumulation of foreign exchange by central banks: Fear of capital mobility?. *Journal of Macroeconomics, 38*, 409-427.

Taguchi, H. (2011). Monetary autonomy in emerging market economies: The role of foreign reserves. Emerging Markets Review, 12(4), 371-388.

Williamson, J. (2002). Future Exchange Rate Regimes for Developing East Asia: Exploring the Policy Options1. Asian Economic Recovery: Policy Options for Growth and Stability, 83-109.