THE EFFECTIVENESS OF MONETARY POLICY IN THE COMESA-EAC-SADC REGION OF SUB-SAHARAN AFRICA

by

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Dedication

To Hastings, Orama, Alipo and my siblings.

Abstract

This research investigates the effectiveness of monetary policy in 11 countries from the COMESA-EAC-SADC free trade area of the sub-Saharan Africa region. The study provides a historical account on the environment upon which monetary policy operated in each country and examines the transmission channels of monetary policy using factor augmented vector auto-regression models. It also uses auto regressive distributed lag models to assess the size and nature of the interest rate pass through (IRPT) of the central bank's policy rate to average lending and deposit rates in each country. The results reveal heterogeneities in the strength of the transmission channels and IRPT across the countries due to differences in macroeconomic and financial developments; and the conduct of monetary policy. Using bank level data from Malawi the research further provides evidence of heterogeneities in IRPT across financial institutions mainly due to market power, liquidity and risk conditions; and across products on account of menu costs. The findings suggest that in different degrees, all countries need to adopt policies that would improve the effectiveness of monetary policy; and that the authorities of the COMESA-EAC-SADC need to take into account the heterogeneities across the countries when establishing the criteria for harmonisation of economic policies in the region.

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Lastly and most importantly, I thank God for the gift of life and from whom all blessings flow.

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Chapter 1

General Introduction

1.1 Effectiveness of Monetary Policy

Monetary policy is classified as effective when central bank's policy actions achieve their objective of affecting macroeconomic variables such as investment, consumption, output and prices in a desired way as authorities seeks to direct the economy in a certain path. There is less agreement about how exactly monetary policy exerts its influence on the real economy such that the transmission mechanisms of monetary policy has been referred to as a "black box" by Bernanke and Gertler (1995). The need for the central bank to formulate effective policy has led to an increase in theoretical and empirical research in the transmission mechanism of the monetary policy from the instruments used to the main final goals of price stability and economic growth. With effective monetary policy, an economy is able to experience stable prices and economic growth ceterus paribus.

The literature provides several factors that influence the effectiveness of

monetary policy. One of the factors is monetary policy orientation (i.e whether liberal or controlled regime), its level of accountability and transparency. Monetary policy is found to be more effective when authorities do not exert direct control of the targeted variables but rely on the markets to adjust freely after the policy actions have been undertaken (Egert et al 2007). Another factor that influences the effectiveness of monetary policy is related to the health of the financial system (Cottarrelli and Kourelis, 1994), its structure (Thomson, 2006) and efficiency in supporting monetary policy. This is because the financial system acts as a conduit to the transmission process of monetary policy.

Apparently, most countries from the sub-Saharan Africa region started to modernise their monetary policy frameworks during the 1990s. The modernisation processes included opting for market dynamics compared to direct controls, restructuring the financial systems and implementing changes in the conduct of monetary policy. These measures were aimed at enhancing the effectiveness of monetary policy in achieving the goals of price stabilisation and economic development. However, most countries from the region still experience high inflation rates and volatile real GDP growth rates. These conditions have led to the need to further analyse the effectiveness of monetary policy in the region.

In the COMESA-EAC-SADC[1] free trade area of the sub-Saharan Africa region, studies that assess the strength of the channels of monetary policy include Maturu (2010), Mugume (2011), Ngalawa and Veigi (2011), Kabundi and Ngwenya (2011), Zgambo and Chileshe (2014), Lungu (2008), Buigut (2009), Davood et al (2013), Morales and Raei (2013) and Chiumia (2015). These studies present mixed results which are also difficult to compare across the countries because of differences in main points of focus. The studies have used different methods of analysis but the standard vector auto regression (VAR) method is the dominant one (Mishra et al, 2012).

The popularity of the standard VAR analysis in macroeconomic analysis is mainly attributable to their simplicity in the estimation of dynamic responses as all the main variables of interest in the system are endogenous. The interpretation of results is also found to be straight forward due to the use of impulse response and variance decomposition analyses. Moreover, the results from these analyses are found to be plausible and useful. However, a down side of this method is that it uses a limited amount of information although in practice there is a wide set of economic indicators upon which authorities base their policy decisions. According to Sims (1992) one of the effects of not including adequate information in the estimations is that it leads to results that are contrary to theory (puzzles).

[1]COMESA - Common Market for Eastern and Southern Africa; EAC - East African Community; SADC - Southern Africa Development Community.

In order to address the problem of using inadequate information in macroeconomic modelling, other studies use factor augmented vector auto regression (FAVAR) estimation methods. FAVAR models are known for the advantage of addressing problems of over-parameterization while simultaneously using more information. Bernanke et al, (2005), Kabundi and Gwenya, (2011) and Chiumia, (2015) have applied FAVAR models in analysing monetary policy transmission mechanisms. These studies have proved that FAVAR models solve the issue of puzzles and also provide more insights on the dynamics of the transmission. This thesis uses FAVAR models in assessing monetary policy transmission mechanism in 11 countries from the COMESA-EAC-SADC free trade area in order to provide updated evidence and more insights in the transmission mechanisms. The countries are Angola, Botswana, Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania, Uganda and Zambia.

In addition to examination of transmission channels, another area of research on effectiveness of monetary policy focuses on the financial system's role of influencing the effectiveness of monetary policy. Most studies in this area examine the interest rate pass through (IRPT) from the central bank's policy rate to different financial products (Aziakpono et al, 2012; Cas et al, 2011; Karagiannis et al, 2010; Sorensen and Werner, 2006; Sander and Kleimeier, 2004). IRPT studies consider the percentage change

in retail interest rates resulting from a one percentage change in a policy rate. The results of the studies show that the size of the IRPT can be incomplete as the financial institutions may not include the full amount of the change of the policy rate in their interest rates. In some cases IRPT has been found to be symmetric in the sense that the response of the financial institutions did not depend on whether the change on the policy rate was positive or negative, whilst in other cases the results showed asymmetric responses. The literature also provide different results across countries and regions. This shows the importance of empirical studies of IRPT to get specific results which can guide authorities appropriately in every country.

This thesis seeks to provide a uniform approach in studying the interest rate pass through in the above listed 11 countries from the COMESA-EAC-SADC region for comparable results across the countries. The study examines the central bank's policy rate pass through to average lending and deposit rates in each country. The analysis focuses on the size (completeness) of the IRPT in both the short and long run, its evolution over time and predictability (presence of asymmetries). The econometric analysis is conducted on a country by country basis using auto regressive distributed lag (ARDL) models for the period of 1995 to 2015.

More insights on the assessments on the efficacy of the banking system in facilitating monetary policy are found when a deeper analysis is conducted

on how different financial institutions, respond to changes in monetary policy (De Graeve et al, 2006; Fuertes and Heffernan, 2009). Studies on heterogeneities across financial institutions are mostly conducted on developed countries and emerging markets. In developing countries the main challenge for this type of analysis is availability of disaggregated data. This thesis further seeks to contribute to the literature on heterogeneities in IRPT across financial institutions by providing evidence for developing countries using data on Malawi. The next section gives details of the specific contributions of the thesis.

1.2 Thesis' Contribution

In general, this study contributes to the literature by investigating the effectiveness of monetary policy in the COMESA-EAC-SADC free trade area. *Firstly,* the study applies the FAVAR method to a new dataset of 11 countries area for an examination of the transmission channels of monetary policy in the region. Most of the previous studies in the region have used standard VARs which only use limited information in the analysis whilst the FAVAR includes more variables from the central bank's information set. *Secondly,* this research provides comparable results across the countries from the COMESA-EAC-SADC free trade area on the overall transmission mechanism and interest rate pass through as it uses the same approaches in

methods of analysis and choice of exogenous and endogenous variables for all the countries. *Thirdly,* the research investigates how commercial banks in the COMESA-EAC-SADC region facilitate monetary policy in their adjustments of retail interest rates.

Finally, the study uses detailed bank level data for one of the countries, Malawi, and provides further evidence on heterogeneities across financial institutions and retail products in interest rate pass through. This study also provides insights on the influence of bank-specific characteristics on the interest rate pass through in Malawi.

The results provide mixed evidence on the effectiveness of monetary policy in the region. The variations are attributable to different levels of macroeconomic stability, financial development, and also in the conduct of monetary policy among the countries. On the examination of transmission channels, positive shocks to the policy rate results in decreases in both prices and output as expected by theory in Botswana, South Africa, Kenya, Malawi and Zambia. We note that the effects are only statistically significant in countries with deeper financial markets. These are South Africa, Kenya and Botswana. The results also suggest that positive shocks to reserve money raise both output and prices in most countries. These are Angola, Botswana, Kenya, Malawi, Namibia, Tanzania, Uganda and Zambia. The effects are statistically significant in Kenya, Botswana, Malawi, Tanzania and Uganda.

Additionally, our results reveal that the exchange rate channel is important in explaining inflation outcomes in all countries.

We also find heterogeneities in IRPT across countries in terms of completeness of the pass through and presence of asymmetries. The short run pass through (SRPT) is incomplete in all countries but the sizes differ across the countries. The long run pass through (LRPT) to the average lending rate is statistically complete (not different from 1) in Botswana, Namibia and South Africa. In the remaining countries the LRPT is incomplete. In addition to the low levels of financial development in most of these countries, the results further suggest that the transmission is impeded by high concentration in the banking system and poor signalling power of monetary policy. Nonetheless, results from recursive window analysis of IRPT suggest that in most countries the pass through has been improving over time after adopting market based policies and becoming more transparent in their conduct of monetary policy. These findings corroborate Morales and Raei (2013) and IMF (2010).

An investigation on whether banks adjust their interest rates in the same manner regardless of the direction of the change in the policy rate suggest that in Angola, Botswana and Namibia banks respond faster in adjusting lending rates only when the change in the central bank's policy rate is upward. This conduct is called collusive pricing. On the side of deposits, the

results suggest that in Angola and Namibia, banks are reluctant to reduce deposit rates when the change in the policy rate is negative. This type of rigidity in the deposit rates is explained by the customer reaction hypothesis. Asymmetric adjustments are not good as they make the outcome of monetary policy unpredictable and consequently less efficient. In this research, asymmetric adjustment is largely attributed to high concentration levels in the banking market. To a lesser extent, we also attribute the downward rigidity of deposit rates in Angola to high levels of inflation lead to negative real interest rates.

Finally, the results for the bank-by-bank and product-by-product analysis provide evidence for heterogeneities in the IRPT across commercial banks and type of interest rates in Malawi. The heterogeneities across commercial banks are mainly explained by differences in bank characteristics mainly in terms of type of clients, the banks' market power and refinancing needs. Heterogeneities across financial products are attributable to menu costs and balance sheet effects. On the determinants of the LRPT the results suggest that bank size, liquidity level, quality of credit and return of assets have significant influence on the pass through to some of the interest rates. The influence of capital level is not significant in all the banks. The differences in the response to the changes in the policy rate reveal the unpredictability of commercial banks' reactions to changes in the central bank's policy rate

which makes the transmission through the interest rate channel to be less effective in Malawi than in, for example, South Africa.

In general, the study reveals that in different degrees, all countries in this sample need to adopt policies that would improve the effectiveness of monetary policy. The policies should aim at increasing levels of financial development, reducing levels of concentration in the banking sector, adopting market based policies, increasing the level of central bank's independence and adopting a clear strategy of achieving the objectives of monetary policy whilst avoiding conflicts among different goals. The results also suggest that harmonisation of policies for financial and monetary integration in the COMESA-EAC-SADC region need to be approached with caution as it requires taking into account heterogeneities among the countries.

1.3 Organisation of the Thesis

The rest of the thesis is organised as follows;

- Chapter 2 provides a historical review of the conduct of monetary policy and macroeconomic performance for the sampled countries in the region.

- Chapter 3 conducts an empirical investigation of monetary policy

transmission in the region. The main focus is on how shocks to the central bank's policy rate and reserve money influence the output and prices in each of the countries. The study is conducted on a country-by-country basis using the FAVAR method. In implementing the FAVAR, the study largely follows Davood et al (2013)'s approach.

- Chapter 4 examines the efficacy of the banking system in facilitating monetary policy by assessing the central bank's policy rate pass through to average lending and deposit rates in the countries discussed above. In general, the estimation techniques follow Sander and Kleimeier (2004), Sorensen and Werner (2006) and Kwapil and Schaler (2010) where the market rate is regressed on the policy rate based on the Monti-Klein (1971)'s profit maximisation theory for commercial banks. The study is conducted on a country-by-country basis using time series techniques on aggregated quarterly data from 1995 to 2015. The econometric analysis used is the auto regressive distributed lag (ARDL) model in an asymmetric error correction framework. The analysis focuses on the size (completeness) of the IRPT in both the short and long run, its evolution and predictability (presence of asymmetries). Recursive window analysis is used for the investigation of the evolution of the pass through. The study also investigates the presence of asymmetries in the adjustments of the interest rates.

- Chapter 5, uses disaggregated data on Malawi for 10 commercial banks on 5 retail products and examines heterogeneities of the IRPT across the retail products and the commercial banks. It also tracks the performance of the short and long run pass through for each product over time using recursive analysis. Unlike chapter 4, this study uses bank level data which is more detailed hence providing an opportunity for a deeper analysis of the IRPT in the country.

- Chapter 6 concludes the research, provides policy recommendations and areas for further study.

Chapter 2

Macroeconomic Background and the Conduct of Monetary Policy

2.1 Introduction

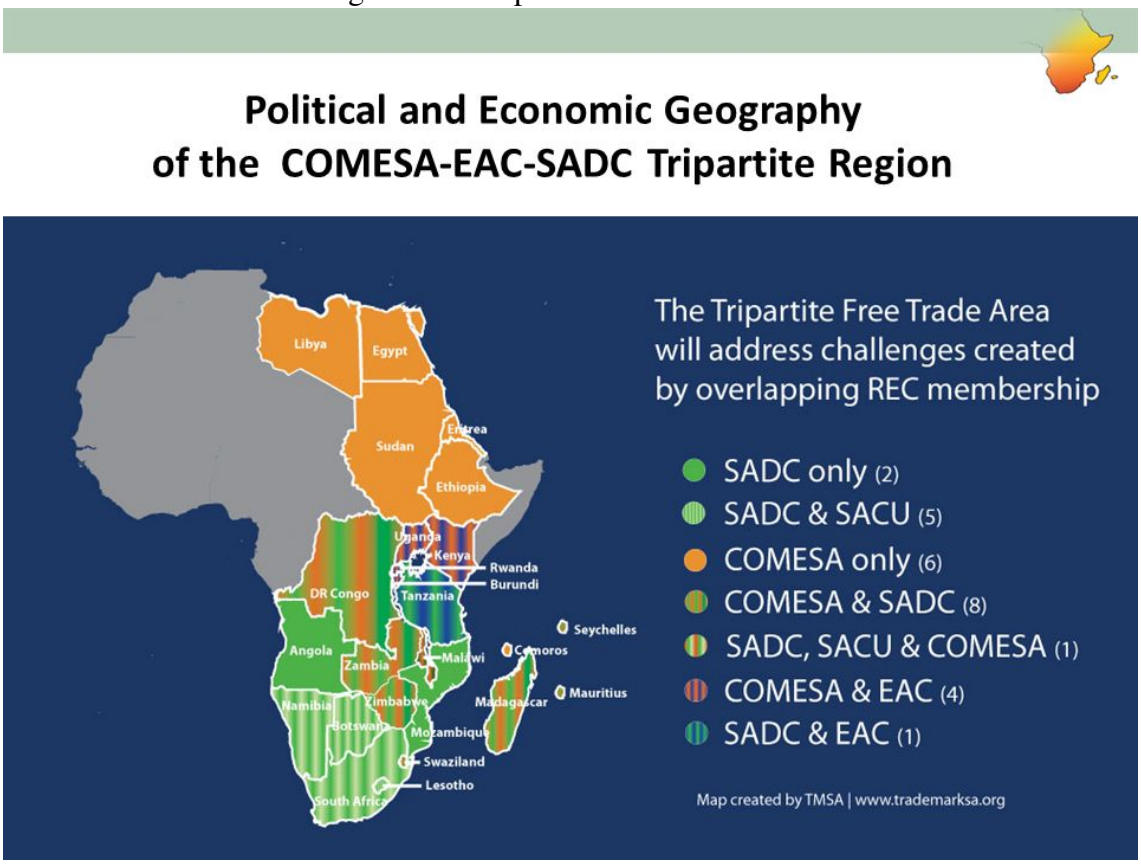
The COMESA-EAC-SADC free trade area was launched on 10th June 2015. The region is comprised of 26 countries from three already existing economic groupings, the COMESA, EAC and SADC [1], as presented in Figure 2.1[2] which shows the geographic location of the free trade area. The main objective of the grouping is to strengthen and deepen economic integration of the region through harmonisation of policies and programs (SADC, 2015). As it can be noted in Figure 2.1, most countries belong to more than one regional economic community (REC). This tripartite free trade area was also created to address challenges that are created by overlapping memberships in the region.

The research is conducted on 11 countries from the COMESA-EAC-SADC free trade area. The countries are, Angola, Botswana, Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland. Tanzania, Uganda and Zambia. Countries in the sample were chosen based on availability of data for the period of 1995 to 2015. Freund and Ornelas (2010) state that a regional trade area is a natural starting point for achieving deeper economic integration. Ehrmann (2000) argues that deeper integration first requires that the economies of the member countries converge

[1] More information about the objectives of each of the regional groupings can be found on https://www.comesa.int/ for COMESA, https://www.eac.int/ for the EAC and https://www.sadc.int/ for SADC.

[2] Map was created by TMSA - www.trademarksa.org; 'REC' stands for Regional Economic Communities. 'SACU' stands for Southern African Customs Union.

Figure 2.1: Map of the Free Trade Area



sufficiently and the criteria for convergence are expected to be based on the existing economic structures across the countries. This chapter provides background information on the similarities and differences in macroeconomic and financial development; institutional structures; and the conduct of monetary policy across the countries.

The rest of this chapter is organised as follows; section 2.2 analyses the countries' performances in macroeconomic and financial development during the study period and section 2.3 reviews the monetary policy frameworks; section 2.4 provides background information on the conduct of monetary policy and 2.5 concludes the chapter.

2.2 Macroeconomic Background

Per Capita GDP and Real GDP Growth Rate

Table 2.1 highlights the macroeconomic conditions in the countries from 1995 to 2015. Per capita GDP has increased, albeit marginally, in all countries. Countries with high per capita GDP as at the end of 2015 are South Africa, Botswana, Namibia and Angola. Notably, these four countries are also rich in natural resources.

Angola is one of the resource rich countries in the sample. It is the largest oil producer in the sub-Saharan Africa and the world's fifth largest producer of diamonds, supplying 7 % to 9% of the global diamond output. The oil sector dominates the economy, accounting for over 80% of the country's total foreign earnings (AfDB, 2011). However, Table 2.1 shows relatively low average per capita GDP from 1995 to 2004. This is attributed to the period of civil war [3] which destabilised the economy. After the war ended in 2002, the country adopted several economic reforms (AfDB, 2011) such that the average real GDP growth rate for the period of 2005 to 2009 reached 15.56% and by the end of 2015 the average per capita GDP was higher than most of the other countries in the sample although inflation was still relatively high.

The main characteristic of the countries with lower per capita GDP is reliance on agriculture as the major sector for steering economic growth.

[3]The war started in 1975 and ended in 2002 with some very short periods of peace in between.

The countries are Malawi, Tanzania, Uganda and Kenya.

Table 2.1: Macroeconomic Description Statistics (in Percent)

		Angola	Botswana	Kenya	Lesotho	Malawi	Namibia	SA	Swaziland	Tanzania	Uganda	Zambia
Per capita	1995-99	0.434	3.09	0.42	0.84	0.19	2.24	3.41	1.63	0.25	0.28	0.39
GDP*	2000-04	0.723	3.72	0.42	0.92	0.23	2.23	3.38	1.79	0.32	0.25	0.41
	2005-09	2.72	5.45	0.78	1.05	0.34	3.97	5.77	2.95	0.55	0.43	1.07
	2010-15	4.27	7.01	1.2	1.28	0.40	5.37	7.01	3.58	0.83	0.65	1.62
Real GDP	1995-99	7.91	6.26	2.93	3.79	6.96	3.59	2.59	2.23	4.04	7.73	3.44
growth	2000-04	3.28	3.13	2.59	3.32	1.89	5.19	3.61	3.45	6.56	6.07	5.54
	2005-09	15.56	3.96	4.55	6.71	4.43	3.83	3.58	3.88	6.45	8.19	8.10
	2010-15	4.52	5.48	6.00	4.42	4.55	5.60	2.34	2.12	6.77	5.46	6.02
Inflation	1995-99		8.74	6.85	3.26	40.92	8.32	7.34	8.01	17.04	5.55	30.73
	2000-04	145.6	7.87	7.82	8.40	17.61	8.23	5.49	8.18	5.29	3.47	21.80
	2005-09	14.94	9.60	14.00	7.12	10.89	6.47	6.76	7.65	8.35	9.39	12.77
	2010-15	10.76	6.05	7.76	4.70	18.21	5.16	5.22	5.97	9.08	8.61	7.73

* (per capita GDP) is in thousands of United States Dollars. The other statistics are in percent.
Source: Datasteam, IFS and World Bank

Table 2.1 shows that these countries have been experiencing low and unstable growth rates of real GDP. Apart from other exogenous factors which affect the economies' main sectors of economic growth, the low levels of economic growth in sub-Saharan Africa have also been attributed to less effective monetary policy due to distortions in the financial system coupled with direct intervention in the markets, large government domestic financing requirements that crowd out credit to the private sector, high levels of inflation and poor quality of institutions that govern the economies (Mishra et al, 2012).

Inflation

Table 2.1 shows that over time, most countries in the sample have managed to bring down inflation levels to single digits. Inflation in Kenya has been

relatively stable (between 7 and 8 percent) for a large part of the period. The highest inflation is recorded during the period of 2005 to 2009 which Sichei (2012) attributed to increased government expenditure on economic recovery programmes after effects of post-election violence, global recession, unfavourable weather conditions, high costs of production and high international crude oil prices. In all the other countries, inflation has been relatively low and stable during the period under review except in Angola (which of course still shows a great improvement as it comes from periods of hyper-inflation) and Malawi.

Average inflation was also very high in Zambia up to 2009. Malawi and Zambia's history of high inflation levels is partly attributed to high transportation costs as they are both landlocked and depend on Mozambique's ports. Both countries were therefore affected by Mozambique's civil war from 1977 to 1992. The rate of inflation started to slow down from year 2000 in both countries, as Mozambique continued to recover from the effects of the civil war. Table 2.1 however shows a reverse of the downward trend of inflation in Malawi during 2010-2015. This is mainly explained by the country's adoption of floating exchange rate in May 2012 soon after its currency was devalued by 49.5 percent.

Apart from the experiences that led to high inflation in Angola, Malawi and Zambia, the literature highlights conflicting policy objectives as the

main challenge for monetary authorities from developing countries which leads to failures in containing inflation. Since the countries start from relatively high inflation levels, there are always conflicts between stabilising inflation and addressing negative output gaps (World Bank, 2018). Developing countries also face frequent supply side shocks such as adverse weather conditions which affect agricultural production and subsequently both inflation and output. In this case stabilising inflation would require sacrificing the output objective (Nguyeni et al, 2017).

Another source of conflict is the lack of central bank independence from fiscal policy. Central banks face pressures to provide cheap financing to governments hence neglecting the objective of price stability (Mas, 1995). Exchange rate policy is also more important in developing countries than in advanced countries and sometimes causes conflicts with the goal of price stability as the countries are not well integrated financially with the global market (IMF, 2006; World Bank, 2018; Mishra, 2012).

Financial Development

Most of the countries in our sample started liberalising their financial systems during the 1990s. The reforms in the financial sector were mainly aimed at increasing the level of competition and widening the range of financial instruments. They were also aimed at deregulating interest rates,

removing credit ceilings, improving the overall process of financial intermediation and gaining efficiency in the mobilisation and allocation of resources (Rono, 2002). Following this, the countries registered increases in financial development but the magnitudes vary across the countries as presented in Table 2.2. South Africa has the highest ratio of financial development indicators (average credit to GDP ratio for the whole period is 66.95% and deposits to GDP ratio is 54.13%.) Other countries with relatively deep financial markets are Namibia, Kenya and Botswana. In these three countries, the average of each indicator of financial development is above 20% whilst in the remaining countries they are below 20%.

Table 2.2: Financial Conditions (in Percent)

		Angola	Botswana	Kenya	Lesotho	Malawi	Namibia	SA	Swaziland	Tanzania	Uganda	Zambia
Credit to	1995-99	1.66	11.54	24.48	17.01	4.94	41.64	62.40	13.56	4.27	5.34	6.91
GDP	2000-04	2.16	18.45	25.86	11.87	4.08	42.47	64.21	10.58	6.21	7.55	6.36
	2005-09	8.49	23.43	24.52	9.13	6.92	48.34	73.82	18.62	10.36	10.52	9.27
	2010-15	19.37	30.26	31.31	16.59	13.07	49.37	68.18	19.21	13.12	13.97	11.96
Deposits to	1995-99	6.57	18.82	30.02	30.04	11.15	38.96	47.95	18.50	13.59	8.55	13.09
GDP	2000-04	8.15	24.31	31.39	26.02	9.66	36.11	50.75	15.29	15.05	12.67	15.98
	2005-09	15.12	39.44	34.89	28.44	10.53	38.99	58.95	18.83	16.58	13.08	17.49
	2010-15	29.85	40.15	45.55	32.26	19.39	54.38	58.85	21.94	18.49	15.29	17.82
Spread	1995-99	42.28	4.96	13.77	7.03	17.22	7.44	4.93	7.57	17.26	10.82	15.63
	2000-04	59.42	5.96	12.56	10.96	22.09	6.53	4.92	7.10	12.29	12.55	20.22
	2005-09	18.87	7.17	8.41	7.95	21.74	4.96	3.86	6.32	8.13	10.26	13.40
	2010-15	12.39	6.35	8.52	7.58	25.25	4.50	3.32	6.33	6.79	10.56	6.91

Source: International Financial Statistics (IFS); Spread is lending rate minus deposit rate; Credit to GDP - commercial banks' total credit to the private sector as a percentage of GDP; Deposits to GDP - total deposits as a percent to GDP.

Table 2.2 further shows that the spread, the difference between lending and deposit rates, also shows that banking market efficiency has improved in Angola, Kenya, Namibia, South Africa, Swaziland, Tanzania and Zambia.

In the other countries, the level of efficiency has worsened such as in Malawi, Botswana and Lesotho; or remained the same as in Uganda.

The above differences in the levels of financial development across the countries are expected to be reflected in the effectiveness of monetary policy across the countries. More successful monetary policy is expected in countries with deeper financial markets, more competitive banking sector and active interbank markets. Heterogeneities in the effectiveness of monetary policy may also be on account of whether the institutional environment that govern the financial systems in terms of existence of laws and their enforcement are strong or not. The degree of the financial system's international integration also influences the effectiveness of monetary policy through levels of arbitrage between domestic and foreign financial assets (IMF, 2006; Mishra et al, 2012).

2.3 Monetary Policy Frameworks and Exchange rate Management Regimes

A monetary policy framework guides the central bank in formulating and implementing monetary policy in order to deliver on its mandate. Four major types of monetary frameworks can be identified. These are direct targeting of interest rates, credit or prices; monetary aggregates targeting; exchange rate targeting, and inflation targeting. Handa (2009) states that the choice of monetary policy framework adopted by a country largely depends on its economic, financial and institutional environment within which the policy is operating.

Table 2.3: Monetary Policy Frameworks and Exchange Rate Management Regimes

	Monetary Policy Framework	De Jure Exchange Rate Management	De facto Exchange Rate Management
Angola	Monetary Targeting	Managed	Managed
Botswana	Composite	Crawling Peg	Crawling peg
Kenya	Inflation Targeting	Floating	Managed Float
Lesotho	Exchange Rate	Conventional peg	Conventional peg
Malawi	Monetary Aggregate	Floating	Managed Float
Namibia	Exchange Rate	Conventional peg	Conventional peg
South Africa	Inflation Targeting	Floating	Managed Float
Swaziland	Exchange Rate	Conventional peg	Conventional peg
Tanzania	Monetary Aggregate	Floating	Managed Float
Uganda	Inflation Targeting	Floating	Managed Float
Zambia	Monetary Targeting	Floating	Managed Float

Source: various IMF publications

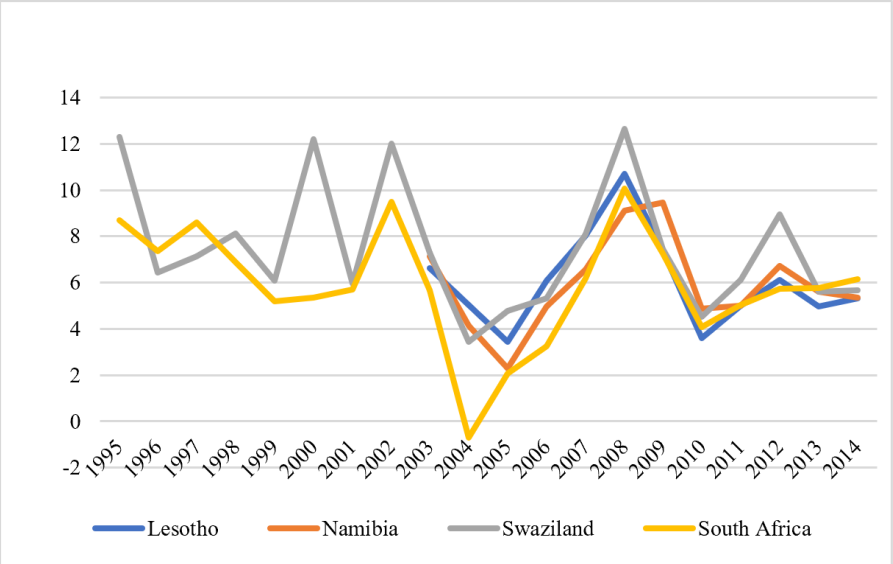
Table 2.3 shows that in our sample, we have three main types of monetary policy frameworks, exchange rate targeting, monetary targeting and inflation targeting with an exception of Botswana which follows a mixed approach.

2.3.1 Monetary Policy Frameworks

Exchange Rate Targeting

Under this framework, the value of domestic currency is fixed to a currency of another country which is expected to have low inflation. The monetary authority of the domestic country buys or sells foreign exchange to maintain the exchange rate at its predetermined level or within a range. The exchange rate thus serves as the nominal anchor or intermediate target of monetary policy.

Figure 2.2: Annual Inflation Rates (in percent per annum)



Three countries, Lesotho, Namibia and Swaziland follow this framework as their currencies are pegged to the South African Rand. The main challenge for this framework is that the country has limited control over monetary policy as it can only respond to shocks that are independent from those of the anchor's country. Basically, in these three countries, the goal of

price stability is therefore achieved by importing stable inflation from South Africa as their anchor country. Figure 2.2 shows that inflation rates in the three countries largely follow South Africa's trend.

Monetary Aggregate Targeting (MAT)

Under this framework, central banks regulate the stock of broad money stock (M2) to levels required to support the theoretical relationship between the price level and output. This is based on the monetarist view that money supply has a major influence on national output in the short run and price level in the long run. The main assumption under this view is that there is a strong relationship between excess money supply growth and inflation and that the central bank can reliably control reserve money through its balance sheet items. Lewis and Mizen (2000: pg 339) note that, "this framework relies on a definable quantity of money, a stable demand for the aggregate and a supply process readily controllable by authorities".

The authorities set broad money as an intermediate target based on macroeconomic policy goals of economic growth and inflation. The intermediate target is not under the perfect control of the central bank but provides a useful signal about prevailing and prospective movements in output and inflation. It is then related to reserve money which is under the control of the central bank. The target for reserve money is set taking into

account assumptions about the money multiplier that relates broad money to reserve money and seasonalities (Davood et al (2013).

Almost all countries in our sample were following monetary aggregate targeting frameworks in the 1990s with the exception of Botswana, Lesotho, Namibia and Swaziland which were targeting the exchange rate. Some of the countries started adopting other frameworks in the 2000s following the failure of the MAT in achieving goals due to instability in velocity and money multiplier as the financial systems were becoming more developed. According to Table 2.3, Angola, Malawi and Tanzania were the only countries that were still following monetary aggregate targeting as at the end of 2015.

Inflation Targeting (IT)

Inflation targeting is a framework whereby a central bank publicly expresses its commitment to controlling inflation as its primary policy objective. The central bank announces an explicit inflation target and implements policy to achieve this target directly. New Zealand was the first country to adopt inflation targeting monetary policy approach in 1990. Over the years, other countries have been adopting IT framework such that by the end of 2015, there were 36 central banks[4] with IT frameworks across the globe. The

[4]IMF 2016 Annual Report on Exchange Arrangements and Exchange Restrictions

empirical literature shows that in most countries, the IT framework has succeeded in lowering the rate of inflation. (Mishkin and Posen, 1998; Mishkin and Schmidt-Hebbel, 2007; Walsh, 2009; Roger 2010; Kumo, 2015).

In our sample, three out of the eleven countries adopted inflation targeting. South Africa started targeting inflation in May 2000, followed by Kenya and Uganda in 2011. Goodhart (1994) argues that inflation targeting is unpopular in Africa because it requires a high level of central bank independence which is very difficult to attain in developing countries. This is because developing countries incur large and persistent fiscal deficits which calls for the central bank to align its policies to the fiscal need. This weakens the central bank's control over monetary policy.

In addition to central bank independence, Mishkin (2004) and Roger (2010) outline other elements that distinguishes the IT framework from the others as follows; (i) declaring explicit quantitative targets for inflation; (ii) high transparency and accountability for policy strategy and implementation; and (iii) a forward-looking approach to policy strategy based on assessment of inflation pressures from a wide set of economic indicators. Section 2.3 on monetary policy conduct shows that the other central banks which do not follow the IT framework have improved their frameworks by adopting some of the above elements. The specific elements

are transparency through increased communication and use of a wide set of economic indicators to assess inflation pressures. These measures are expected to improve the effectiveness of monetary policy.

2.3.2 Exchange Rate Management Regimes

Table 2.3 shows that the *de jure* and the *de facto* exchange rate regimes are different in Kenya, Malawi, South Africa, Tanzania, Uganda and Zambia. Officially, the central banks for these countries report a floating exchange rate regime however, in practice they intervene in the foreign exchange market in order to either influence the level of foreign exchange reserves or for exchange rate stability. This implies that the *de facto* regime in these countries is a managed float. In Angola, Botswana, Lesotho, Namibia and Swaziland, there is no difference between the *de jure* and *de facto* exchange rate regimes. This section discusses expected outcomes of monetary policy based on the *de facto* exchange rate management regimes.

Monetary Policy in a Managed Float Regime

The *de facto* regimes in central banks of Angola, Kenya, Malawi, South Africa, Tanzania, Uganda and Zambia is a managed float. IMF (2008) argues that for policy to become more effective, these counties need to follow "constrained discretion" (Bernanke et al, 1999). This means that

monetary policy should be conducted in a way that "greater discretion regarding monetary targets should be constrained by a clear commitment to price stability." (IMF, 2008: page 34) The outcome of monetary policy in these countries therefore depends on the extent of commitment towards price stability. In Kenya, Uganda and South Africa this can be easily achieved as they follow inflation targeting (IT) framework which holds the central banks accountable to achieving the end objective of low inflation. Other elements of the IT framework such as transparency and a good communication strategy also helps to make monetary policy more effective through formation of inflation expectations which becomes a strong nominal anchor. In Angola, Malawi, Tanzania and Zambia, unconstrained discretion may limit the effectiveness of monetary policy with the managed float exchange rate regime.

Monetary Policy in Fixed Exchange Rate Regimes

As noted in section 2.3.1 under "Exchange Rate Targeting", the countries with fixed exchange rate regimes have limited control over monetary policy. In our sample, we have two types of fixed pegs, the crawling peg in Botswana (the currency is allowed to move within a prescribed band) and the conventional peg in Lesotho, Namibia and Swaziland (the currency is pegged at one to one with the anchor's currency). We expect monetary

policy to be relatively effective in Botswana as their peg allows for some movements to deal with shocks compared to the other three countries which can not adjust the exchange rate. Generally, in the countries with no flexibility in the nominal exchange rate, there is a need to rely on supportive fiscal policy and structural reforms that encourage wage flexibility and promote productivity growth. Monetary policy needs to be consistent with the demands of the exchange rate regime. Limited capital mobility may help to make monetary policy influential in the short run (IMF, 2008).

2.4 The Conduct of Monetary Policy

This section provides the building blocks of the monetary policy framework, focusing on the institutional setup of the central bank, its statutory mandate, governance structure, strategy in the policy formulation, implementation and communication[5]. In terms of ownership, all central banks for the countries in the sample are owned by their government except the central bank of South Africa which is owned by private institutions (SADC, 2014). In most countries the central banks are mandated to formulate and implement monetary policy and also determine the exchange rate policy except in Kenya where formulation is the responsibility of the Minister of Finance; Botswana which is expected to consult government first when formulating monetary policy or determining the exchange rate regime and in Swaziland where the central bank is established as an organisation under the Ministry of Finance.

The subsequent sections provide specific country details on the conduct of monetary policy. More information related to the central banks' legal status, mandate, responsibilities and relationship with government is summarised in Figure 2.1 in the appendix.

[5]The main sources of information for this section are individual central bank websites, SADC (2014) and journal articles.

Angola

The Central Bank of Angola is responsible for the formulation and execution of monetary and foreign exchange policies. The policy targets are aligned to national economic goals that are worked out by the Ministry of Planning and the Ministry of Finance. The main objectives of monetary policy in Angola are to achieve a stable national currency unit and price stability (SADC, 2014).

From 1992, the central bank of Angola was using direct instruments such as credit controls and interest rate ceilings. The system was liberalised in June 1999 and the bank adopted money supply (M2) as its intermediate target and base money as the operational aggregate. The main instruments are open market operations, discount rate and reserve requirements. Angola follows a managed floating exchange rate system since the exchange rate is market determined but the central bank intervenes from time to time to promote orderly conditions in the market.

Botswana

Although the Central Bank of Botswana is solely owned by the Government, it has considerable autonomy in the formulation and implementation of monetary policy. Government only retains the responsibility for major changes related to the exchange rate and currency specifications. The main

objective of Botswana's monetary policy is to achieve a sustainable, low and predictable inflation that will contribute to macroeconomic stability and attainment of a stable real effective exchange rate (REER) and, in turn, support diversified economic growth (SADC, 2014). The Bank's intermediate targets are the nominal effective exchange rate and inflation forecast. The main instruments used are the bank rate and open market operations.

Botswana's currency, the Pula, is pegged to a weighted basket of currencies comprising the United States Dollar, Special Drawing Rights and the South African Rand. Previously, the basket also included the Zimbabwean dollar but it was dropped in 1994 due to a reduction in trade flows between the two countries. Since May 2005, the central bank follows a crawling band exchange rate mechanism in order to maintain stability in the real effective exchange rate and to manage foreign exchange reserves. The crawl is based on the Bank's inflation objective and the partner countries' inflation forecasts. Botswana achieved full capital account convertibility in February 1999 after removal of exchange controls.

Kenya

As with all countries in the sample, initially, Kenya was using direct monetary policy instruments such as interest rate controls and credit

rationing up to 1991. Financial sector reforms commenced with the adoption of indirect instruments for monetary policy, adoption of a market based exchange rate regime in 1993, liberalisation of the current and capital accounts in 1994 and narrowing the scope of the central bank's objectives from multiple goals to price stability and economic growth in 1996 (O'connell et al, 2010; Nyorekwa and Odhiambo, 2014; Sichei, 2012;). Although the above reforms were adopted, Sichei (2012) observes that the institutional framework remained weak as formulation of monetary policy was under the responsibility of the Minister of Finance and implementation and review of progress by only central bank staff members.

In July 2005, a Monetary Policy Advisory Committee (MPAC) was established and was later replaced by Monetary Policy Executive Committee (MPEC) in 2008. In addition to the Governor and the Deputy Governor, the MPEC includes two staff members from key departments, 4 external members who are appointed by the Minister of Finance and 2 government officials as non-voting members. The MPEC meets very two months and decisions are communicated through press releases. The Minister of Finance however retains the power to overrule monetary policy decisions (Morales, 2014). Every six months the committee is expected to present a report that highlights its activities to the cabinet and also prepare a monetary policy statement of the bank for the general public. Instruments used in

implementing the policy decision are cash reserve requirements, discount facilities and open market operations. The central bank of Kenya follows a flexible exchange rate regime but also intervenes in the foreign exchange market to manage the fluctuations.

Malawi

In Malawi, the National Economic Management Committee is responsible for the production of projections of gross domestic product (GDP) growth rates and inflation that supports the country's macroeconomic framework in a given year (RBM, 2016a). The Ministry of Finance leads the committee and other members include the Ministry of Economic Development and the Reserve Bank of Malawi. The projected inflation rate is then taken as a target for monetary policy purposes. The bank seeks to control the growth of money supply as the intermediate target. However, the operating procedure focuses on monitoring growth in reserve money and money market rates. Monetary policy instruments are used to direct other economic variables on the desired path towards the attainment of these targets.

In order to facilitate the formulation of monetary policy, the Monetary Policy Committee (MPC) was established in February 2000. The committee is chaired by the Governor of the Central Bank, and its current membership comprises deputy governors of the central bank, two representatives from

the Government (the Permanent Secretary to the Treasury, and the Permanent Secretary for Development Planning and Cooperation), two representatives of the private sector and one senior economist from academia. The two government officials do not have voting rights. The MPC meets regularly to assess economic and financial developments, and to determine the stance of monetary policy in relation to program targets, (Mangani, 2012; RBM, 2016a). The MPC makes decisions on the policy rate, liquidity reserve requirement and open market operations to be implemented in order to direct the economy on the right path towards the medium term targets. These decisions are based on reports on economic and financial developments and projections of various measures of economic activity written by the staff of the central bank. Policy decisions on interest rates are announced immediately after the meeting. The financial markets department implements the decisions through open market operations.

Malawi's exchange rate system has been through different exchange rate policy regimes. From 1965, it was being fixed to different types of currencies. It was floated in February 1994 for only 11 months then fixed again up to the end of 1997. From 1998, the currency went through several adjustable regimes until it was fixed to the United States Dollar in 2007. In May 2012, the exchange rate was devalued by 50.0 percent and floated. There is a minimum intervention from the central bank for the purpose of

managing the fluctuations.

Lesotho, Namibia and Swaziland

The primary objectives of the central banks for these three countries is to achieve and maintain price stability mainly through maintenance of an adequate level of foreign currency reserves for supporting the peg of their currencies, to the South African Rand. Although these countries pursue a fixed exchange rate regime, they have some scope of monetary policy as their capital accounts are not fully open i.e they use exchange controls which are exercised especially on the financial and capital accounts. The controls are mainly in terms of outward flows whilst all inward financial flows are liberalised (Seleteng and Khoabane, 2015).

In the three countries, the central banks work together with the government in coming up with macroeconomic targets. Although the formulation of monetary policy is under the responsibility of Monetary Policy Committee, adoption of major policies are done in consultation with the Minister of Finance. The composition of the MPCs vary. In Namibia, all members are staff members of the central bank whilst in Lesotho, the committee includes one external member who is appointed by the Minister of Finance and has an experience in monetary and financial economics. In Swaziland, the Governor is the only member of the MPC who is affiliated to

the central bank. The other members of the committee are external individuals with experience in monetary and financial matters and they are appointed by the Minister of Finance. The main instruments that are used are open market operations, reserve requirements, policy rate and moral suasion.

South Africa

Unlike all other central banks in this sample, the South Africa Reserve Bank (SARB) is not owned by the government but by private companies, institutions and persons. It pays company tax to government and it is not involved in development financing. Monetary and fiscal policies are coordinated through regular meetings between the Minister of Finance, the Governor of the SARB, officials from the National Treasury and the SARB where different points of view are taken into consideration (SADC, 2014).

Monetary policy is formulated by the Monetary Policy Committee which was instituted in 1999. The committee is composed of the Governor, three deputy governors, and four senior staff members of the central bank. The committee meets six times every year in an interval of two months between the meetings. Decisions on the stance of monetary policy are based on staff reports on the analysis of domestic and international economic developments and the subsequent inflation forecasts. The MPC produces a statement on

monetary policy decisions which is publicised through a press conference.

The South African Rand floats freely against international currencies. However, the SARB sometimes purchases foreign currency with the aim of managing the level of external reserves. There are no exchange control restrictions on current account transactions and also under the capital account, there are also no restrictions on the inward investment or disinvestment by nonresidents.

Tanzania

Since the establishment of the central bank, the implementation of monetary policy was through direct controls such as provision of cheap finance to the public sector. In 1986 the central bank started to introduce market reforms by eliminating controls in the financial and foreign exchange markets. In the mid 1990s, the Bank of Tanzania adopted indirect instruments in order to support a market based system of economic management. The central bank sets annual monetary targets in consultation with the Government, the Minister of finance. The targets are published in a Monetary Policy Statement which is subjected to a mid-year review on progress towards attaining the targets and make decisions on appropriate measures to be undertaken.

Tanzania's Monetary Policy Committee (MPC) is responsible for monetary policy decisions. The MPC is a sub-committee of the Board of

Directors for the central bank and includes two external members with full voting power (Morales, 2014). Implementation of monetary policy is by the central bank's Liquidity Management committee which meets on a weekly basis. Tanzania also follows a flexible exchange rate management regime with the central bank intervening in the market in order to smooth any fluctuations and maintain the appropriate level of external reserves

Uganda

Before 1993, monetary policy in Uganda operated through direct instruments such as ceilings on commercial bank credit and administered interest rates. During that time, the Minister of Finance was responsible for formulating monetary policy. Uganda started to reform its conduct of monetary policy in the mid-1990s. In 1994, they adopted a flexible foreign exchange regime and instituted an inter-bank foreign exchange market with a minimum intervention by the central bank. Formulation of monetary policy was transferred to the Monetary Policy Committee (MPC) and implementation is done by the Financial Markets Operations department. Previously, the Bank of Uganda was targeting money supply. In July 2011, it changed from targeting the growth in money supply to a partial inflation targeting framework called Inflation Targeting Lite (ITL) (Mugume, 2011). The change was on account of the unstable relationship between money

supply and prices. Under ITL, the Bank of Uganda monetary policy publicly expresses its commitment to maintain low and relatively stable inflation.

Zambia

Just like other countries, during the period from the 1980s to early 1990s, the conduct of monetary policy in Zambia was geared towards achieving multiple objectives such as provision of cheap credit for government's budget and state owned enterprises; and promotion of economic growth through funding of various projects (Zgambo and Chileshe, 2014). To achieve these objectives, direct instruments such as interest rate controls, credit allocations as well as core liquid assets and statutory reserve ratios were used up to 1992 when several economic reforms and policies that aimed at creating a market-based economic system driven by the private sector, were adopted. Some of the measures that were taken included the liberalisation of the foreign exchange market through the removal of exchange controls and the decontrolling of interest rates.

In 1996 the central bank of Zambia's objective was narrowed to promoting price and financial stabilisation. The Ministry of Finance in consultation with the Bank of Zambia developed a medium term plan which highlights various economic targets including output and price level. The central bank of Zambia has the mandate to use monetary policy instruments

at its discretion in order to manage liquidity conditions for achieving the inflation target.

The Bank of Zambia is also responsible for determining the exchange rate policy in conjunction with the Ministry of Finance and National Planning. The exchange rate is market determined but the central bank participates in the market to build reserves and also to manage the fluctuations (Zgambo and Chileshe, 2014). There are no exchange controls on current or capital account transactions (SADC, 2014). In April 2012, the Bank of Zambia changed from targeting monetary aggregates interest rates. The central bank's policy rate is the operating target but broad money remains the intermediate target (SADC, 2014).

2.5 Conclusion

This chapter has provided historical information about the environment under which monetary policy has been operating in this region. Before the 1990s, the countries' implementation of monetary policy was through direct controls such as setting interest rate and credit ceilings. The countries began modernising their frameworks in the mid 1990s when they started adopting reforms that aimed at implementing market based policies. The progress in modernising the frameworks and markets differ across the countries leading

to differences in levels of macroeconomic and financial developments.

Among other features, monetary policy is expected to be more effective in countries with deeper financial markets, greater degree of central bank independence, more transparent strategy, and greater reliance on market based procedures. In our sample, South Africa has almost all of the above characteristics. Kenya has a deeper financial market but a low degree of central bank independence as the Minister of Finance has the authority to overrule monetary policy decisions and this might impede the effectiveness of monetary policy. Other countries with deeper financial markets are Botswana and Namibia however, both of these countries have limited scope of independent monetary policy due to fixed exchange rate regimes.

High degree of effectiveness is also expected in countries with a clear objective of monetary policy and strategy. However, Table A2.1 in the appendix shows that almost all countries pursue multiple objectives. Thus on top of price stability other objectives such as economic growth, and exchange rate stability are also pursued hence creating a source of conflicts that could mask the effectiveness of monetary policy. In summary, the information in this chapter is important to provide insights on country specific results for the empirical investigations of the effectiveness of monetary policy in the individual countries and also in the region as a whole.

2.6 Appendix

Figure 2.3: The Conduct of Monetary Policy in COMESA-EAC-SADC region as at end 2015

	Angola	Botswana	Kenya	Malawi	South Africa	Tanzania	Uganda	Zambia	Lesotho Namibia & Swaziland
A. Legal Status									
Shareholders	Government	Government	Government	Government	Private Institutions	Government	Government	Government	Government
B. Mandate									
1. Primary Objective	Price Stability	Price Stability	Price Stability	Price Stability	Price Stability	Price Stability	Economic Stability	Price stability	Price Stability
2. Other Objectives	Maintaining a stable national currency unit	Maintain exchange reserves for supporting the exchange rate and Economic growth	Financial Stability and support economic Policy	Economic growth, employment creation and exchange rate stability	Sustainable and balanced economic growth	Maintain financial integrity, sound banking conditions and support economic policy		Promoting macroeconomic stability for sustainable economic growth and development	Supporting the fixed exchange rate peg to the South African Rand.
C. Central bank's Statutory Responsibilities									
1. Formulating Monetary Policy	Yes	No. In consultation with government.	No. The Minister of Finance is responsible.	Yes	Yes	Yes	Yes	Yes	Only in Lesotho and Namibia. In Swaziland under the guidance of the Minister of Finance.
2. Implementing Monetary Policy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Determining Exchange Rate Policy	Yes	No. In consultation with government	Yes	Yes but regime is in consultation with the government	Yes	Yes, but in consultation with the Minister of Finance	Yes, but in consultation with the minister of Finance	Yes	Yes, but in Swaziland, in consultation with government.
4. Lending to Government		No. Temporary advanced to government to be paid back within six months.	Yes. Up to 5% of Government revenue	Yes.	Yes	Yes. Up to 12.5% of government revenue.	Yes. Up to 18% of government revenue.		

Source: Individual Central Bank Websites, SADC (2014) and Morales (2014)

…Figure 2.3 Continued

	Angola	Botswana	Kenya	Malawi	South Africa	Tanzania	Uganda	Zambia	Lesotho, Namibia & Swaziland
D. Governing Body for Policy Setting									
1. Governing Bodies for Policy Setting	Not Clear	Monetary Policy Committee (meeting dates not clear)	Monetary Policy Committee (meetings every 2 months)	Monetary Policy Committee (meets once a quarter)	Monetary Policy Committee (meets 6 times every year)	Monetary Policy Committee (Number of meetings not clear)	Monetary Policy Committee (meets 6 times a year)	Monetary Policy Committee (Meets once a quarter)	Monetary Policy Committees)
2. Composition of Monetary Policy Committee		Senior Bank of Botswana staff and advisers	Governor, deputy governor, 2 Senior central bank directors, 4 external members appointed by government, the Principal Secretary of Ministry of finance.	Governor, deputy governors, 2 representatives of the private sector, one academia and 2 ex-officials from the government with no voting rights.	Governor, two deputy governors and 4 senior central bank staff members	It's a sub-committee of the Board of Directors	The MPC is a sub-committee of the Board of Directors	The MPC is a sub-committee of the Board of Directors	Lesotho: Governors, 1 executive director, 2 senior directors and one external member. Namibia: Governors, Directors and Advisor to the Governor Swaziland: Governors, and four external members appointed by the Minister of Finance
E. Government Interference in Monetary Policy									
1. Giving instructions or mandatory consultations	Central bank has operational independence	No government instructions are given. Only Mandatory consultations required.	Yes. Mandatory instructions from the government are given.	Limited operational independence in monetary policy formulation. To consult on exchange rate regime changes.	No government interference in the formulation of monetary policy.	Operational independence but the Minister of Finance and the Governor consult regularly for coordinating fiscal and monetary policy	Yes. Government gives instructions. But not mandatory.	Central bank has operational independence	Operational independence only in Lesotho and Namibia. In Swaziland, the over-seer of the central bank is the Minister of Finance.
2. Appointment of the Governors	The State President	The President	President	President	The President	President	President on the advice from cabinet	President	The prime minister in consultation with the King (in Lesotho and Swaziland).

Source: Individual Central Bank Websites, SADC (2014) and Morales (2014)

Chapter 3

Monetary Policy Transmission in COMESA-EAC-SADC: FAVAR Approach

3.1 Introduction

Chapter 2 shows that almost all countries in the COMESA-EAC-SADC free trade area have price stability and economic growth are the ultimate goals of monetary policy. However, the central banks also target other economic objectives such as financial stability and exchange rate stability. The main instruments are open market operations and the central bank policy rate. Most central banks also intervene in the exchange rate market to manage fluctuations. This chapter aims at investigating how the transmission mechanisms work.

The literature suggests six main channels of monetary policy. The channels are (i) money, (ii) interest rate, (iii) the exchange rate, (iv) asset prices, (v) credit and (vi) the expectations channels. However, it also presents differing views and findings on how the channels of transmission work. The differences are prevalent in studies for both advanced and developing countries. In low income countries, the results are more diverse. Whilst some studies find that monetary policy actions are effective in influencing the final goals, other studies report results that show that the policies are ineffective. This shows that research on monetary policy transmission mechanisms in less developed countries remain an issue worthy of further empirical investigation.

The aim of this chapter is to provide further evidence on the effectiveness of monetary policy in the sub-Sahara African region focusing on 11 countries from the COMESA-EAC-SADC region. The countries are Angola, Botswana, Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania, Uganda and Zambia. In this study, the word *effective* implies that the ultimate goals of monetary policy respond in the theoretically-expected way to shocks in the instruments. Thus prices and output decrease in response to tight monetary policy such as an increase in the policy rate or decline in reserve money. *Weak* means that although the goals may respond in a theoretically-expected way, the results may not be significant; whilst *strong* implies theoretically-expected and statistically significant results.

The chapter uses a factor augmented vector autoregression (FAVAR) models in examining the transmission mechanism. Most studies on monetary policy transmission mechanisms in the sub-Sahara African region use standard vector autoregression (VAR) models (Mishra and Montiel, 2012). Standard VAR models limit the amount of economic variables that are included in the analysis to preserve degrees of freedom and avoid over-parameterization. Sims (1992) argued that failure to control for a wide set of information that is used by policy makers in making decisions may lead to counter-intuitive results (puzzles). The FAVAR method allows

inclusion of more variables in the analysis without subjecting the model to the problem of over-parameterization. This method has however mostly been applied in studies on developed countries and in only a few studies from less developed countries.

The main contribution of this chapter is therefore in the use of the FAVAR method in examining the effectiveness of monetary policy transmission in 11 countries from the COMESA-EAC-SADC region. The investigation is conducted on a country by country basis in order to provide more insights on the way the transmission mechanism works in each country and how country-specific features enhance or impede monetary policy. In general, the results show that monetary policy is effective in most of the countries analysed, but the channels of transmission and their strengths vary across the countries, largely reflecting differences in levels of financial development, monetary policy framework, exchange rate regime or the general conduct of monetary policy (i.e whether transparent or not).

Monetary policy through shocks to the policy rate is more effective in countries with deeper financial markets such as Botswana, Kenya and South Africa. In these countries, both prices and output respond negatively to positive shocks to the policy rates. These results corroborate Mishra and Montiel (2012) who argue that financial development and reforms are key to enhancing the effectiveness of monetary policy. Similar to the findings of

the IMF (2010) for the sub-Saharan Africa region, our results provide further evidence that reserve money shocks are more effective in influencing both monetary policy goals of output and prices in most countries (Angola, Malawi, Tanzania, Uganda and Zambia) than shocks to the policy rate.

In some cases our results show counter-intuitive outcomes which are mainly explained by having multiple objectives of monetary policy. This leads to inconsistent policies which bring confusion to market participants and cause the policy to be ineffective. Overall, based on country level results, we provide recommendations for improving the effectiveness of monetary policy in that country. The findings of this research can provide guidance to the authorities of the COMESA-EAC-SADC free trade area when coming up with the criteria on the harmonisation of economic policies in the region.

The rest of the chapter is organized as follows; section 3.2 provides a literature review; section 3.3 outlines the method, data and estimation technique; Section 3.4 provides a discussion of results firstly as a summary of all results and secondly on a country by country basis. In section 3.5 we conclude the findings of the chapter and provide areas of further research.

3.2 Literature Review

3.2.1 Channels of Monetary Policy Transmission

The monetary policy transmission mechanism is the process by which policy actions feed through the financial and economic system to affect the final goals of output and prices (Lewis and Mizen, 2000). In the literature, there is little agreement about how exactly monetary policy exerts its influence on the real economy, to the extent that the monetary transmission mechanism itself has been referred to as a "black box" by Bernanke and Gertler (1995). Nonetheless, theory points to the existence of six main transmission channels namely the money, interest rate, credit, exchange rate, asset price and expectations (Bernanke and Gertler, 1995; Mishkin, 1996; Taylor, 1995). The following sections provide insights on how the channels operate.

Money Channel

This is the most traditional and oldest channel. It is based on Fisher's quantity theory of money (QTM) which directly links price developments to changes in monetary aggregates. Derived from the "equation of exchange", $MV = PT$, where M is nominal money supply, V is velocity of circulation, P is general price level and T is the volume of transactions in the economy. The equation of exchange shows that the amount of money in an economy

when multiplied by the number of times it is used will equal the value of transactions in the economy (Fender, 2012). Assuming the volume of transactions (T) is constant and equals gross domestic product (Y) for the economy. The equation can further be expressed as $MV = PY$ where Y is nominal GDP and implies that with velocity and nominal GDP constant, the rate of inflation is approximately equal to the rate of growth of money supply. Therefore central banks can control inflation by regulating the growth of money supply. In practice, central banks control the levels of reserve money (which is linked to money supply by a multiplier) through open market operations such as repurchase agreements in bills and bonds. The assumption of stable velocity is the basis for central banks' choice of broad money as their intermediate target in their monetary targeting frameworks (Mishkin, 1998).

Interest Rate Channel

The interest rate channel shows that changes in short-term nominal policy interest rates affect real interest rates, which in turn feed through to aggregate demand and prices by changing firms' and households' investment and consumption decisions. Taylor (1995) shows how the resulting output gap (the deviations of aggregate demand from the potential output) lead to pressures on the general price level. Raising nominal policy

rates leads to higher real short-term and long-term interest rates, thus increasing the cost of capital which lowers the demand for credit and consequently real investment, real consumption and finally reducing real output. Bernanke and Gertler (1995) argue that it is difficult to identify a significant impact of the interest rate on the cost of capital even in developed countries. Mishra and Montiel (2012) state that for developing countries, changes in the interest rate are even less likely to have a strong impact on the cost of capital as many other factors such as cost of doing business and institutional limitations may have a larger influence.

Credit Channel

The role of credit in the transmission mechanism of monetary policy arises as a result of imperfect information between parties in the credit relation. The channel operates when shifts in monetary policy alter the efficiency of financial markets in matching borrowers and lenders to the extent that borrowers face rationing in credit influenced by liquidity constraints (Walsh, 2010: 478). However, according to Bernanke and Gertler (1995), this channel may be perceived "as a set of factors that amplify and propagate conventional interest rate effects". The argument is that information asymmetry between lenders and borrowers puts a wedge between the costs of externally-raised and internally-raised investment funds. This wedge is

called the external finance premium and is positively related to changes in market interest rates due to monetary policy shifts.

Bernanke and Gertler (1995) identify two sub-channels of the credit channel namely the balance sheet and the bank lending channels. The balance sheet channel argues that tight monetary policy affects borrowers' credit worthiness by directly weakening their balance sheets, reducing their collateral on loans and increasing their external finance premium. This in return increases both adverse selection and moral hazard problems which cause a decline in provision of loans by commercial banks. The bank lending channel works through adjustments in the amount of banks' reserves and deposits. Changes in monetary policy alters the banks' ability and willingness to lend especially when they cannot perfectly substitute deposits and reserves with other sources of funds. A tightening of monetary policy will translate into a lower availability of credit, slower growth of aggregate demand and lower inflation.

Exchange Rate Channel

Open macroeconomic models developed by Fleming (1962) and Mundell (1963) explain the link between monetary policy and exchange rates (Dornbusch, 1976) which is also confirmed by Clarida and Gali (1994) in a study on German, Japan, Canada and Britain. Under uncovered interest rate

parity, the difference between the domestic and foreign interest rate is equal to the expected change in the exchange rate. With floating exchange rates and perfect capital mobility, arbitrage between domestic and foreign short-term government securities causes capital flows which change the equilibrium value of the exchange rate required to sustain the uncovered interest parity. Accordingly, the relative price of imports and exports change and this affects aggregate demand and supply.

On the demand side, assuming that the Marshall-Lerner condition holds, monetary policy that lowers domestic interest rates will cause the currency to depreciate, making exports cheaper and imports more expensive. This increase in net exports, positively affect aggregate demand and output (Mishkin, 1996). On the supply side, however, the higher domestic price of imported goods increases inflationary pressure and contracts output (Taylor, 1993; Mishkin, 2001). Morales and Raei (2013) argue that the condition may not hold for developing countries due to closed capital account regimes and low elasticity of exports to changes in the exchange rate. However, even if the condition may not hold, the exchange rate channel could work through the impact on the level of prices and on inflationary expectations.

Asset Price Channel

This channel is developed in two ways, either through Tobin's Q theory

whereby aggregate demand is affected through investment; or through the wealth effects under life cycle hypothesis of consumption. Using Tobin's Q theory, monetary policy can influence the stock market. Expansionary monetary policy raises the money supply and causes the public to consider buying stocks and this leads to an increase in share prices. Higher stock prices will lead to a higher Q and thus to higher investment expenditure (Mishkin, 2001). Another way is through the life cycle hypothesis of consumption which states that consumers smooth out their consumption over time based on their lifetime resources. When an expansionary monetary policy influences stock prices to rise, the value of the consumers' financial wealth increases and consequently, they raise their consumption. The literature questions the applicability of this channel in developing countries due to the absence of highly developed non-bank financial markets and institutions (Cecchetti, 1995) and also due to the presence of weak institutional frameworks (Mishra and Montiel, 2012).

The Expectations Channel

This channel is believed to be fundamental in the working of all channels and key in forward-looking monetary policy. Levels of expenditure increase if output and income are expected to be high in future. Similarly, if inflation is expected to be high in the future, this would stimulate current spending

(Fender, 2012; 189).

Financial market expectations of the future path of monetary policy also affect the structure of market interest rates (Bank of England, 1999). It is therefore believed that a credible and transparent monetary policy strategy is critical as it provides an anchor for expectations about inflation and general economic activity and guides the market along the best possible path. This highlights the important role of central bank communications in the transmission process. In the chapter 2, we noted that countries in the COMESA-EAC-SADC region have started to modernise the conduct of monetary policy during the 2000s through increased communication on monetary policy strategies and outcomes using press briefings, stakeholder meetings and various publications. This is expected to improve the effectiveness of monetary policy in the region.

3.2.2 Empirical Literature Review

Several studies on the effectiveness of monetary policy have been conducted on the channels of monetary transmission in sub-Saharan Africa. Tables 3.1 and 3.2 summarise the main studies that are related to this study. Some of the studies are at an individual country level whilst others are on multiple countries.

Cheng (2006) used structural vector autoregression (SVAR) on monthly data in Kenya for the period of 1997–2005 in a study that investigated the effects of changes in the policy rate to output and prices. He found that an exogenous positive shock to the policy rate resulted to a price puzzle in the initial period and followed by a decline in the price level that is statistically significant for about two years. In a similar fashion, output rises following the tight monetary policy and decreases eventually, though the decline is not statistically significant.

Table 3.1: Studies on Monetary Policy Transmission in COMESA-EAC-SADC

Authors	Country and Sample Period	Method	Policy Variable	Main Findings
Cheng (2006)	Kenya 1997M1 2005M12	Recursive VAR	Policy rate	Shocks to Policy Rate have significant effect on prices and exchange rate but not on output
Saxegaard (2006)	Uganda 1990Q1 2004Q4	Threshold VAR	Money Supply	Negative shocks to money supply lead to a decline in price level and the effect is statistically significant.
Lungu (2008)	Botswana, Malawi Namibia, South Africa and Zambia; 1990M1 2006M12	Recursive VAR	policy rate	Mixed evidence as lending and deposit rates respond significantly to shocks in the policy rate but their influence on prices and output is limited.
IMF (2010)	Sub Saharan Africa	Single equation & Panel VAR	Reserve Money and discount rate	Shocks to reserve money are more effective in influencing both output and prices. Mixed results on shocks to discount rates
Buigut (2010)	Kenya 1979A - 2008A	VECM	T-bill rate	A positive shock on TB rate leads to price puzzle and a negative impact on real GDP
Maturu, Maana Kisinguh (2010)	Kenya 2000Q1 2010Q4	Recursive Structural VAR	M3	No effect on real output, positive effect on prices
Ngalawa and Veigi (2011)	Malawi 1988M1 2005M12	Structural VAR	Bank rate and reserve money	Real output and price level change in the expected direction (negative) following a positive shock in the bank rate. But the effect is insignificant.
Kabundi and Ngwenya (2011)	South Africa 1985M2 2007M11	Structural VAR and FAVAR	Policy rate	Structural VAR: CPI reacts positively to tight monetary policy (puzzle). FAVAR: Real and Financial sector variables respond negatively to tight monetary policy stance. Results are significant and correctly signed.

Source: Compiled by the Author

Table 3.2: Studies in COMESA-EAC-SADC continued

Authors	Country and Sample Period	Method	Policy Variable	Main Findings
Mugume (2011)	Uganda 1999Q1 2009Q1	Recursive VAR	T-bill rate	Tight monetary policy lead to negative effect on output and prices. Only output is significant. Shocks to broad money has no significant effect on output and prices.
Davood, Dixit, Pinter (2013)	Burundi, Kenya Rwanda, Tanzania, Uganda; 2000M1 to 2010M12	Structural Bayesian VAR & FAVAR	Reserve Money Policy Rate	Output increases significantly following positive shocks in reserve money only in Burundi, Rwanda and Uganda. No significant price effect for the other countries. Negative shocks to policy rate increases prices significantly, in Kenya and Uganda and output in Kenya, Burundi and Rwanda.
Morales and Raei (2013)	Burundi, Kenya Rwanda, Tanzania Uganda; 2000Q1 to 2011Q4	VECM	Exchange Rate & T-bill rate	Exchange Rate and Interest rate channels are more effective in explaining the dynamics of inflation and growth in all countries.
Montiel, Adam, Mbowe, O'Connell (2014)	Tanzania 2001M12 to 2010M12	Recursive and structural VAR	Reserve Money	Recursive VAR; small but significant effect on prices only. Structural VAR: Expected effects on output and prices but not significant.
Zgambo and Chileshe (2014)	Zambia 1995Q2 2013Q3	Recursive VAR	Interbank & T-bill rates	Interest rate were ineffective in influencing prices and output. Important channels are Money and exchange rate.
Chiumia (2015)	Malawi 1990Q1 to 2013Q4	Recursive VAR & FAVAR	Policy rate	Recursive VAR:Prices and output respond positively to a rise in policy rate. FAVAR: Price puzzle disappears and results are significant. In both models inflation respond expectedly to reserve money shocks.

Source: Compiled by the Author

Maturu et al (2010) employed both a recursive and non-recursive SVAR model to investigate the effects of a monetary policy shock, using change in M3 as the monetary policy instrument, with quarterly data from 2000 to 2010 for Kenya. They found no effect on real output for an expansionary monetary policy, but there was an effect on the level of prices, where the expansionary policy resulted in rising prices. In another study for Kenya, Buigut (2010) applied a vector error correction model (VECM) to annual data for the period of 1979–2008. His study investigated the effect of changes in the 91-day treasury bills rate on price and output. He found a price puzzle as increases in treasury bills rate raised the level of prices.

Saxegaard (2006) employed a threshold VAR technique on quarterly data from 1999 to 2004 in Uganda using money supply as the monetary policy instrument. The results indicated a negative effect of a contractionary monetary policy on the price level. The effect was statistically significant and the magnitude was larger when commercial banks' excess liquidity was low. Mugume (2011) also examined quarterly data for 1999 to 2009 for Uganda using structural VAR models. A monetary policy shock was identified as a shock to the 91-day treasury bill rate. He found that positive shocks to the treasury bills led to negative effect on output and prices. The effect on prices is not significant whilst the output effect was statistically significant and lasted up to two quarters. He also found that changes in

broad money (M2) had no statistically significant effects on either output or inflation.

Ngalawa and Veigi (2011) applied the SVAR on monthly data from 1988 to 2005 in Malawi. The policy variables were the bank rate and reserve money. Their study controlled for a structural break related to a change from fixed to floating exchange rate in 1994 by splitting the sample into 2 periods. Overall the study found that real output and price levels responded negatively to changes in both policy variables. The impact was more effective when the bank rate was used compared to reserve money. However, all results were not statistically significant. With regard to the effectiveness during the two different sub-sample periods, they found that monetary policy was more effective in the period of floating exchange rate than the fixed exchange rate regime as expected by theory.

Mangani (2012) applied a VAR framework to assess the impact of monetary policy on inflation in Malawi. He found that money has a weak impact on prices but exchange rate has a major impact on inflation. Contrary to Mangani's findings, Simwaka et al (2012), using single equation error correction models for the period of 1995 to 2011, found that money supply growth has an impact on prices with a lag of 3 to 6 months. Both studies however agree that depreciations raise the level of prices with a persistent effect. They therefore recommend targeting exchange rate stability in order

to anchor inflation expectations.

Mwabutwa, et al (2013), used quarterly data from 1981 to 2010 in a time varying parameter vector auto-regressive (TVP-VAR) model to investigate how real GDP and inflation respond to changes in exchange rate, policy rate and credit shocks over time. The study was conducted on Malawi and showed evidence that monetary policy transmission has evolved over time. The transmission mechanism was not observed in the period before the financial reforms; it was blurred during the reforms and performs according to economic theory after the reforms. Chiumia (2015), used a factor augmented vector auto-regressive model (FAVAR) on quarterly data from 1990 to 2013 to examine the transmission mechanism in Malawi. He found that inflation was responsive to money supply and policy rate shocks. The results further indicated that it took less time for inflation and GDP to stabilise under the interest rate shock than they did under money supply shock.

Bova (2009) estimated a six variable cointegrated structural VAR on monthly data from 1996 to 2008 to study the effect of monetary policy on food price inflation in Zambia. Using money supply (measured by broad money) and nominal exchange rate as the instruments, the study found a long run effect of money supply shocks on changes for both food and non-food price levels. However, they found that transmission mechanism

through the money was weak while the exchange rate channel is strong, especially for food prices. Zgambo and Chileshe (2014) used a vector auto regressive framework to study the monetary transmission mechanism for Zambia. The study was conducted on quarterly data from 1995 to 2013. The policy instruments were inter-bank treasury bill rates. The study found that broad money and exchange rate were important channels of monetary policy transmission, while interest rates were found to be ineffective in influencing both prices and output. They recommended continued use of monetary targeting and adoption of polices that aim to promote financial depth before modernising the monetary policy framework to inflation targeting.

For Tanzania, Montiel et al (2012) employed recursive and structural VAR models on monthly data from 2001 to 2010. Reserve money was used as an operational instrument. The findings show that expansionary monetary policy through innovations in reserve money resulted in a positive effect on the price level which was statistically significant. When a structural VAR model was used, the statistical significance disappeared. In both models, the study found no effect of monetary policy on output.

Kabundi and Ngwenya (2011) investigated the effect of contractionary monetary policy on real, nominal and financial variables in South Africa. They used SVAR and FAVAR model on monthly data from 1985 to 2007. The results from SVAR indicated a price puzzle as CPI responded positively

to changes in the policy rate. On the other hand, the FAVAR results show that monetary policy influences the outcomes of key macroeconomic indicators in South Africa. Real and financial sector variables were found to respond negatively to tight monetary policy stance in the economy as expected by theory and the results were significant. Moreover, the the study could not establish the existence of a price puzzle found in the SVAR analysis.

The above literature review was on individual countries. We conclude by reviewing empirical literature on regional studies. Lungu (2008) investigated the existence of the bank lending channel in five countries from the SADC region[1] using monthly data from 1990 to 2006 and the recursive VAR identification. His results were mixed. Bank loans declined in Botswana, Malawi, Namibia and South Africa following a positive shock on the policy rate hence confirming the existence of the bank lending channel in these countries.

Lungu (2008) also found that in all countries, increases in short term interest rates resulted in declines in output within the first quarter and continued to decline for the rest of the period. Similarly, as expected by theory, prices responded negatively to an increase in the policy rate in South Africa, Botswana and Zambia. However, in Malawi and Namibia, he found a positive response of price to changes in interest rate suggesting that

[1]Botswana, Malawi, Namibia, South Africa and Zambia

contractionary monetary policy increases inflation. He attributed the counter-intuitive results to limited amount of information used in the analysis based on the argument by Sims (1992). Our study will extend this literature on SADC by firstly using data that takes into account recent periods and including more variables that are monitored by monetary authorities in making policy decisions.

A study by IMF (2010), on sub-Sahara African countries used single equation and panel VAR models to investigate the effectiveness of monetary policy. The study also found that positive shocks to reserve money led to increased output and price as well as changes in monetary aggregates. On the other hand, the study found evidence for a price puzzle as increases in the discount rate resulted raised prices. Meanwhile, expected results were found on output and exchange rate. Tight monetary policy through a positive shock to the discount rate resulted in a decline in output and also depreciation of the exchange rate. Based on these results, they concluded that use of reserve money as an operational instrument is more effective in controlling inflation in sub-Saharan Africa than the use of interest rates.

Davood et al (2013) studied the transmission mechanism on all countries from the EAC using SVAR, BVAR and FAVAR for the period of 2000 to 2010. The data was on a monthly basis and the instruments were base money and interest rate. Based on the SVAR method, the study found that in

Tanzania, there were no statistically significant effects on output and prices by both instruments. Under the FAVAR, they find significant positive effects of expansionary policy when reserve money was used. Thus suggesting that the central bank takes into account developments in more economic indicators when making monetary policy decisions as FAVAR analysis controls for those variables.

In Uganda, positive shocks in the base money resulted in increases in output over a 2 to 4 months horizon but no effect on prices. On the other hand, positive shocks to the interest rate were found to have no significant effect on output but a persistent negative effect on prices. The same picture was displayed in all the three methods. However, the magnitude of the decrease in prices following a positive shock in the interest rate was larger when FAVAR method was used compared to SVAR and BVAR. In Kenya, Davood et al's study found statistically significant effects on prices following an interest rate shock, but no effect on output. When the base money was used, no significant effect was found on both output and prices. Overall, the results indicated that policy rate was more effective in influencing prices in countries with deeper financial markets such as Kenya and Uganda. We draw extensively on the Davood et al (2013) study in the FAVAR work that follows.

Another study on the EAC region was conducted by Morales and Raei

(2013) using a vector error correction model (VECM) in an investigation of the evolution of the exchange rate and interest rate channels. The study was conducted on two sample periods, firstly, from 2000Q1 to 2011Q4, as the full sample period and secondly, from 2006Q1 to 2011Q4. The results suggested that over time, both channels gained strength in the way they influence prices and economic growth in the region albeit with differences among the countries based on macroeconomic and institutional environments. The improvement in the strength of the channels was higher in Kenya and Uganda than the remaining countries. They attributed these results to open account and flexible exchange rate regimes that enhance the exchange rate channel in both countries. High levels of financial development also enhanced the interest rate channel.

3.2.3 Contribution to Literature

As can be seen, the above literature presents mixed results on the effectiveness of monetary policy in less developed countries. Notably, the studies use different approaches in terms of method of analysis and specific variables included in the analysis. When investigating the interest rate channel, some studies choose the treasury bills rate as the policy rate (Buigut, 2010; Mugume, 2011; Morales and Raei, 2013; Zgambo and Chileshe, 2014) whilst others use the central bank's policy rate (Cheng,

2006; Lungu, 2008; IMF, 2010; Kabundi and Ngwenya, 2011). These differences partly contribute to the variation of results. The studies which use treasury bills and inter-bank markets may be interested in how short-term interest rates affect the final goals of monetary policy. Our study uses the central bank policy rate across all the countries as we aim to find out how exogenous shocks to operational instruments of monetary policy affect the final goals.

The above literature review also shows that most studies on the transmission mechanism of monetary policy in the sub-Saharan Africa use standard vector autoregression (VAR) methods. In macroeconomic analysis the use of VAR methods is important as they take into account interactions of all the variables in the system and the the structure of the model is dynamic. Despite the complexity of the interactions in the system, VARs use simple techniques such as ordinary least squares (OLS) to estimate the models. Interpretation of the results is also practical due to use of impulse response and variance decomposition analyses. However, the standard VAR models mostly use up to a maximum of 6 to 8 variables in order to conserve degrees of freedom especially when the time dimension is short. This means that standard VAR approach to monetary policy analysis use a small amount of information whilst in practice, central banks monitor developments in many economic indicators when making monetary policy decisions. Sims

(1992) argues that sometimes results that are contrary to theory (puzzles) are due to the use of limited information in the analysis. This argument motivated the use of factor analysis in macroeconomic modelling which allows inclusion of a large cross section time series without including all the variables in the model.

Studies on monetary policy transmission mechanisms have used factor augmented vector auto regression (FAVAR) estimation methods in order to address the problems of over-parameterization in VARs whilst simultaneously using more information in the analysis. Bernanke et al (2005) used the FAVAR approach in measuring the effects of monetary policy in the USA. They find that "puzzles" disappear when more variables from the central bank's information set are included in the estimation. Their results also provide a comprehensive picture of the effect of monetary policy on the economy. In the COMESA-EAC-SADC region the studies that have used the FAVAR method include Kabundi and Ngwenya (2011) for South Africa, Davood et al (2013) on East African Community (EAC) and Chiumia (2015) on Malawi.

Kabundi and Ngwenya's study was for the period of 1985 - 2007. Our study uses recent data and provides updated information on South Africa and a comparison with the other countries in the region. Our study also differs from Chiumia (2015) as he only focuses on the effect of the bank rate whilst

in our case in addition to the bank rate, we also include reserve money as one of the operational instruments of the central bank. We also differ on the sample period. His study is quarterly from 1990 to 2013, whilst we employ data at a monthly frequency focusing on the period from 2001 to 2015 when monetary authorities in Malawi were actively using the bank rate as one of the policy instruments.

Our study largely follows Davood et al (2013) approach especially in the implementation of the FAVAR method. However, the two studies differ in 3 ways; (i) Our study includes more variables, 22 in the central bank's information as listed on the data section set whilst their study includes only 12 variables. The variables in their study are real GDP, consumer price index (CPI), reserve money, nominal effective exchange rate, private credit, narrow money (M1), broad money (M2 and M3), United States (U.S) industrial production, U.S federal funds rate, global commodity price index and global food price. (ii) The sample period in Davood et al's study is from 2000 to 2010 whilst ours is from 2001 to 2015. By extending the time period, this study takes into account financial and economic developments and also adjustments in the conduct of monetary policy, in the countries after the year 2010. For instance, Uganda and Kenya modernised their monetary policy frameworks by giving the role of the central bank's policy rate more prominence in 2011. (iii) Our sample applies FAVAR method on

data from a wider group of countries beyond the EAC.

In summary, this chapter contributes to the literature by investigating monetary policy transmission mechanisms in the COMESA-EAC-SADC region using FAVAR approach. This method is data intensive compared to standard VAR methods. Because of this, the FAVAR method has mostly been applied in data-rich countries and a few studies in our region. The study seeks to find out how shocks to monetary policy instruments defined as central bank's policy rate and reserve money get transmitted to real GDP and prices in each country. The study takes into account country-specific features but endeavours to provide results that are comparable across the countries by choosing the same policy instruments and goal variables. The results provide insights on ways of improving the effectiveness of monetary policy in each country. They also provide guidance on the main issues to take into consideration when constructing the criteria for harmonising the economic policies in the region.

3.3 Method

3.3.1 Model: Factor Augmented Vector Auto Regression (FAVAR)

This section largely follows notation from Davood et al (2013) and Bernanke et al (2005). A standard reduced form VAR would use an $M \times 1$ vector Y_t which contains observable economic variables including policy indicators. However, in practice, there is an additional set of economic information that is also monitored by the central bank and taken into account when making monetary policy decisions. That information may represent concepts such as *credit conditions, economic activity* or *price pressures* but not be fully covered by Y_t; nor be represented by any observable series but several series of economic indicators (Bernanke et al, 2005). Let the unobserved factors be contained in a $K \times 1$ vector, F_t, where $K < M$. If the size of the information set is small enough, it can be directly included in Y_t . But if it is large the VAR would suffer from over parameterisation.

Combining the two vectors Y_t and F_t, we model a *factor augmented vector auto regression (FAVAR)* as in Davood et al (2013) as follows;

$$\begin{bmatrix} Y_t \\ F_t \end{bmatrix} = \phi_1(L) \begin{bmatrix} Y_{t-1} \\ F_{t-1} \end{bmatrix} + ... + \phi_q(L) \begin{bmatrix} Y_{t-q} \\ F_{t-q} \end{bmatrix} + \nu_t \tag{3.1}$$

where $\phi_i(L)$ are polynomial lags. The error term ν_t has mean zero with

covariance matrix Σ. If the true system is a FAVAR, estimating a standard VAR system in Y_t excluding F_t will lead to biased estimates. Should the terms $\phi_i(L)$ that relate Y_t to F_t all be zero, then equation 3.1 is also reduced to a standard VAR.

The factors, F_t are interpreted as forces that affect many economic variables but they are unobservable hence equation 3.1 can not be estimated directly. The factors have to be replaced by $\widehat{F}_t$. Supposing that we have a number of *informational* time series that are contained in a $P \times 1$ vector Γ_t where P is large. We assume that the informational time series in Γ_t are related to the unobserved factors, F_t and observed variables Y_t through the following equation;

$$\Gamma_t = \Lambda^f F_t + \Lambda^y Y_t + e_t \tag{3.2}$$

where Λ^f is a $P \times K$ matrix of factor loadings, Λ^y is a $P \times M$ matrix and e_t is a $P \times 1$ vector of error terms that are assumed to be mean zero. Stock and Watson (1998) refer to equation 3.2 as a *dynamic factor model*. Bernanke et al (2005) identifies two approaches to estimating equations 3.1 and 3.2, the single step Bayesian approach and the two-step principal components approach (PCA) used by Stock and Watson (2002). We use the static two step principal component approach. This approach is used by most researchers because it is computationally simple, easy to implement,

imposes few distributional assumptions and allows some degree of correlation in the error term, e_t. Furthermore, it does not exploit the structure of the transition equation 3.2 (Bernake et al, 2005; Stock and Watson, 2002).

In the first step we extract the factors from equation 3.2 using principal component analysis. In the second step, the estimated factors, ($\widehat{F}_t$) replace F_t in equation 3.1 which becomes.

$$\begin{bmatrix} Y_t \\ \widehat{F}_t \end{bmatrix} = \phi_1(L) \begin{bmatrix} Y_{t-1} \\ \widehat{F_{t-1}} \end{bmatrix} + ... + \phi_q(L) \begin{bmatrix} Y_{t-q} \\ \widehat{F_{t-q}} \end{bmatrix} + \nu_t \tag{3.3}$$

However, since the two step approach implies use of *generated regressors* in the second step, a bootstrapping procedure based on Kilian (1998) is implemented in order to obtain accurate confidence intervals that account for the uncertainty of in the factor estimation.

3.3.2 Data

The data are on a monthly basis for the period of 2001 to 2015. The starting period is selected to coincide with the period when most financial sector reforms which started in mid 1990s gained credence in the region. The source of the data is International Finance Statistics (IFS). Table 3.3 provides description of the data and summary statistics are presented in Table 3.6 in the appendix.

Table 3.3: Data Description

Variable	**Description**
Policy Rate (pr)	This is the rate commercial banks borrow from the central bank
Reserve money (rm)	Composed of cash and reserves held by the central bank, vault cash in commercial banks and currency in circulation
Consumer Price Index (cpi)	A proxy of price level
Real GDP (gdp)	Output
Exchange rate (ex)	The nominal exchange rate of the national currency to the United States Dollar. It is the average of buying and selling rates.
private credit (pr)	Commercial banks' loans and advances to the private sector
First Factor($\widehat{F_1}$)	The first principal component of common factors extracted from the central bank's domestic information set. These are, narrow money, broad money, net credit to government from the central bank, commercial banks' net credit to government, treasury bills rate, deposit rate, lending rates commercial banks' net foreign assets, central banks' net foreign assets and dummies.
Second Factor($\widehat{F_2}$)	The first principal component of common factors from US industrial production, US federal funds rate, global commodity price index and global food price and global energy price index. This factor reflects the global information set

Source: The IMF's International Financial Statistics accessed through the Datastream.

The central bank's operational instruments are the policy rate and reserve money and the final goals are the price level and output which are proxied

by cpi and gdp, respectively. There are two intermediate targets that have also been included in the model, these are private credit ($pvtc$) and nominal exchange rate (er). In all countries except Botswana and South Africa, gdp is available at an annual frequency. Following a common practice in the literature, we interpolate the annual series of real GDP to monthly observations. Firstly, the proportional Denton method which interpolates a low-frequency flow time series (in this case GDP) using an associated high-frequency indicator series (in this case Exports which is in quarterly observations), whilst imposing the constraints that the interpolated series obeys the low-frequency total is applied (Baum and Hristakeva, 2001). This gives us real GDP in quarterly observations. Secondly, a cubic spline interpolation method is applied on the quarterly series to get monthly observations of the series. Finally the monthly series is deseasonalised using Census X-12. Other studies that have used interpolated monthly GDP series in VARs include, Cheng (2006); Borys and Hovarth (2007), Ngalawa and Veigi (2011), Davood et al, (2013) and Chiumia (2015).

There are two generated series, $\widehat{F_1}$ and $\widehat{F_2}$. These are factors that are extracted from other economic variables which the central bank monitors to guide them in making their policy decisions. The factors are calculated by principal component analysis. Following Davood et al (2013), the first factor, $\widehat{F_1}$, is the first principal component of common factors extracted from

the domestic information set as listed in Table 3.3. Dummies are also included in $\widehat{F_1}$, to account for structural breaks in each economy. Ehrmann (2000) states that inclusion of country specific dummies is important as it helps to incorporate heterogeneities in the sample, provide a valid picture of the transmission mechanism and improve the statistical fit of the model. The structural breaks are calculated using Bai and Perron (2003) multiple break tests. This test does not assume an apriori known break point. The first extracted factor, $\widehat{F_1}$, is then included in the model as an additional endogenous variable.

The second extracted factor, $\widehat{F_2}$ is the first principal component of common factors from US industrial production, US federal funds rate, global commodity price index, global food price, and global energy price index. This factor reflects the global information set and it is included in the model as an exogenous variable mainly taking into account that the countries included in this sample are too small to influence the variables in this set.

In total, taking into account both the domestic and global information set of the central bank, there are 22 variables that are included in this study. Although Stock and Watson (2002) recommend use of more data, Boivin and Ng (2006) find that fewer data series also lead to better results in forecasting exercise compared to more data. Following this finding, other studies such as

Davood et al (2013) have used a smaller dataset.

All variables are in log levels except interest rates which are in percentages. Unit root tests confirm that all variables are integrated of order 1. Cointegration tests also confirm that the data are cointegrated. This justifies use of levels compared to differences. Apart from the cointegration test results, Sims et al (1990) argue that use of levels rather than first differences preserves any long-run relationship, if present, and does not affect statistical inference. Following their paper, most VAR studies have been conducted in levels such as Bernanke and Mihov (1996; 1998), Lungu (2008), Ngalawa and Veigi (2013) and Davood et al (2013).

3.3.3 Estimation Technique

The study is conducted on a country by country basis. In the first step, the principal component analysis is conducted as described under the data section. The FAVAR is estimated in the second step using equation 3.3 above. The econometric analysis is conducted in Stata. The estimation is conducted in levels to take into account long-run relationships among the variables. All variables are entered in the model as natural logs except the policy rates which are in percentages. The study follows Davood et al (2013) and uses Peersman and Smets (2001) identification whilst taking into account the institutional context of the conduct of monetary policy in the

sub-saharan Africa. Ordering of the endogenous variables starts with $lgdp$ followed by $lcpi$, $\widehat{F1}$, lrm, pr, lpc and lastly lex. The factor, $\widehat{F2}$ is included as an exogenous variable.

This ordering, assumes that $lgdp$ (output) and $lcpi$ (price) react to innovations to the reserve money with a lag whilst reserve money respond contemporaneously to changes in output and prices. The policy rate is ordered after reserve money as an additional instrument to signal the stance of monetary policy. The ordering also shows that most central banks (except South Africa's which follows fully fledged inflation targeting) often use open market operations as they first choose the reserve money path in their programs for achieving the targets. In this case, the policy rate is used as an additional instrument. However, in South Africa, reserve money is ordered after the policy rate. This is to reflect the fact that being an inflation targeting country, the main instrument of monetary policy is the policy rate. In all countries, $\widehat{F1}$ is placed after $lcpi$ as additional information that the central bank monitors in making monetary policy decisions. The model also includes the exogenous factor, $\widehat{F2}$ which is ordered last.

Private credit, lpc is placed after the policy rate pr to allow it to respond to changes in both instruments. This also reflects the fact that commercial banks respond with a lag to changes in monetary policy. The exchange rate, lex, is placed after private credit because it responds to changes in all the

other variables in the system. The lag lengths are determined by the Akaike Information, Shwartz, and Hannan-Quinn criteria.

In the third step, the validity of the FAVAR is assessed through tests for stability. For interpretation of the results, we generate impulse responses using the bootstrapping technique as the model includes generated regressors. Confidence intervals are provided at 90 per cent error bands computed from the bootstrap procedure with 500 repetitions. Impulse responses indicate how a shock to any one variable filters through the model to affect every other variables and feeds back to the original variable itself. The study also calculates variance decompositions for each variable at forecast horizon of one to three years in order to find the contribution of each variable to the fluctuations in prices and output.

3.4 Empirical Results

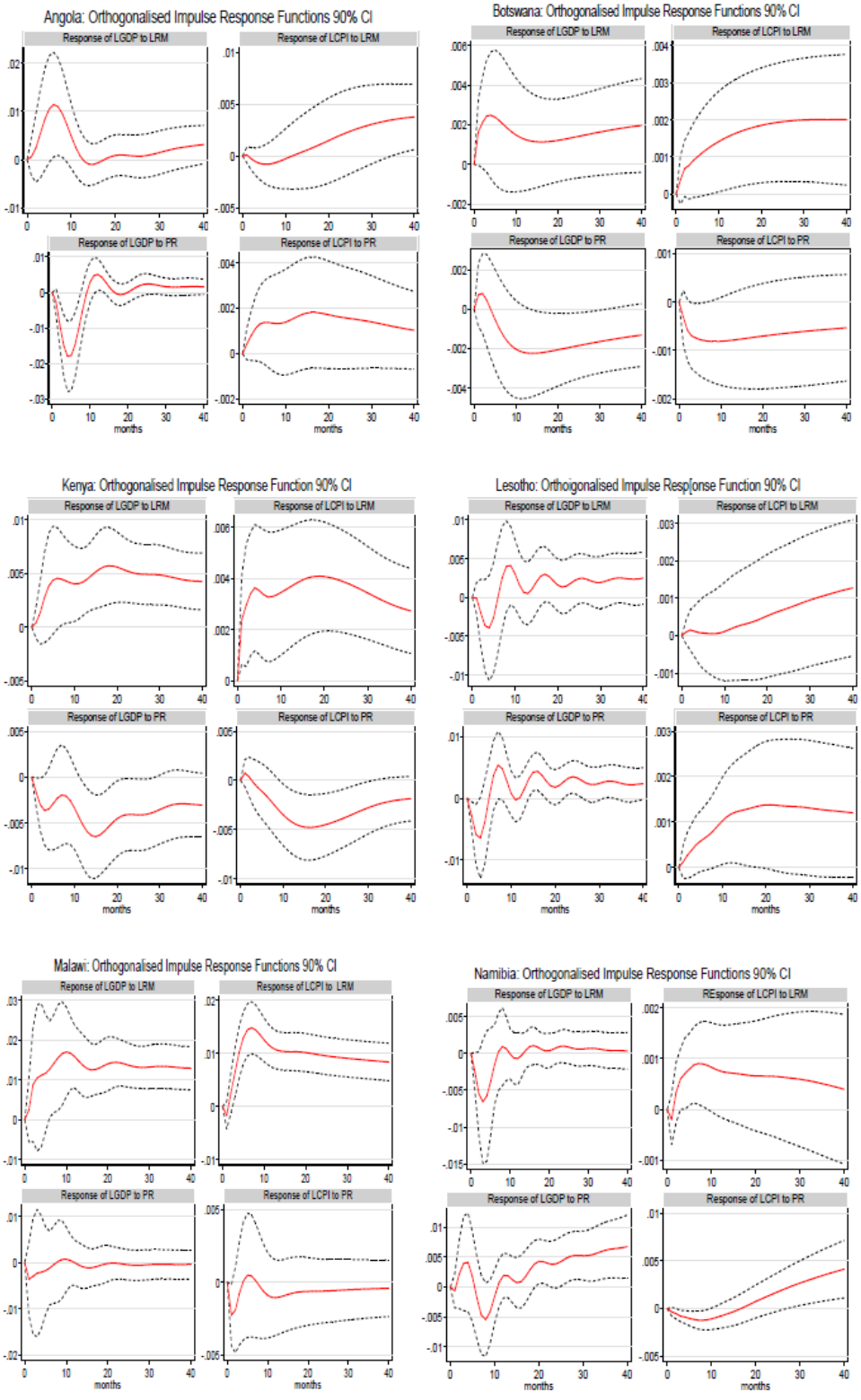
3.4.1 Summary of all Results

The discussion under this section is based on Figure 3.1 which presents impulse response functions that show how price and output respond to a one standard deviation shock on the policy rate and reserve money. A full set of impulse response functions for each country is presented in the appendix

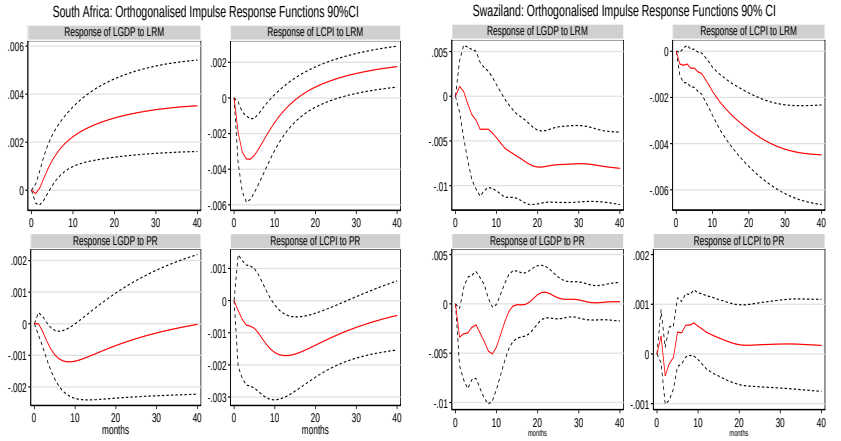
(Figures 3.2 to 3.12) and *country-specific* results are discussed in the next section. In summary, the results show that monetary policy is effective in influencing the ultimate goals in all countries, however, there are differences across the countries in the way the mechanism works.

Shocks to the policy rate are found to affect both prices and output as expected by theory in Botswana , South Africa, Kenya, Malawi, Tanzania and Zambia. Tight monetary policy through a positive shock to the policy rate reduces prices and the level of output. However, it is noted that the effects are only statistically significant in countries with deeper financial markets. These are South Africa, Kenya and Botswana. This outcome is in line with theory and also similar to findings by Davood et al (2013). When the financial sector is small, the link between monetary policy actions and financial variables is weak as well as that of banks' cost of credit and aggregate demand (Mishra and Montiel, 2012). Because of this, the effectiveness of monetary policy is also weak.

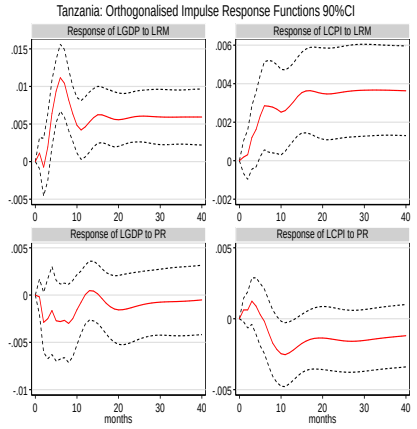
Figure 3.1: Impulse Response Functions - Summarised Results

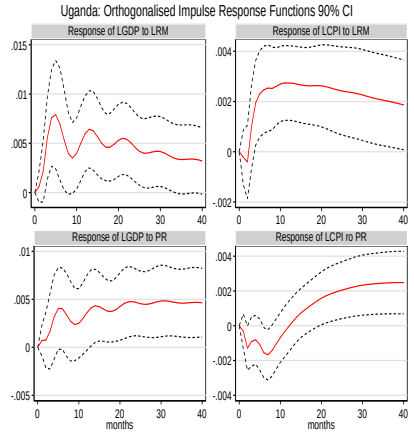


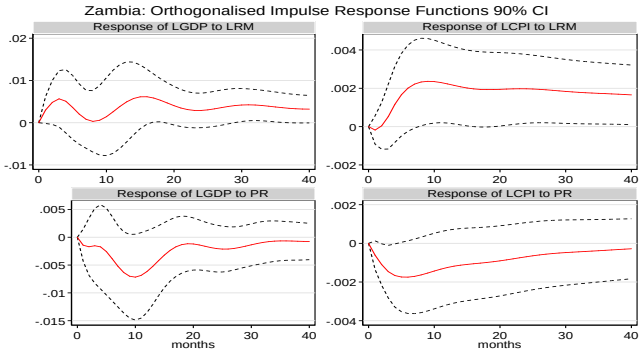
…continued


South Africa: Orthogonalised Impulse Response Functions 90%CI
Response of LGDP to LRM
Response of LCPI to LRM
Response LGDP to PR
Response of LCPI to PR
months

Swaziland: Orthogonalised Impulse Response Functions 90% CI
Response of LGDP to LRM
Response of LCPI to LRM
Response of LGDP to PR
Response of LCPI to PR
months


Tanzania: Orthogonalised Impulse Response Functions 90%CI
Response of LGDP to LRM
Response of LCPI to LRM
Response of LGDP to PR
Response of LCPI to PR
months


Uganda: Orthogonalised Impulse Response Functions 90% CI
Response of LGDP to LRM
Response of LCPI to LRM
Response of LGDP to PR
Response of LCPI ro PR
months


Zambia: Orthogonalised Impulse Response Functions 90% CI
Response of LGDP to LRM
Response of LCPI to LRM
Response of LGDP to PR
Response of LCPI to PR
months

The results also provide evidence that monetary policy as measured by shocks to the reserve money affect both output and prices in most countries, Angola, Botswana, Kenya, Malawi, Namibia, Tanzania , Uganda and Zambia. Expansionary monetary policy through positive shocks to reserve money raises prices and output. This result corroborates well with IMF (2010) which found that the traditional channel of monetary policy is the most effective channel in influencing output and prices in the sub-Sahara African region.

The results for the variance decomposition of the CPI in Table 3.4[2] indicate that in most of the countries, the amount of change in CPI that is explained by shocks to reserve money is larger than the magnitude arising from shocks to the policy rate. This notwithstanding, the effects of shocks in reserve money are statistically significant for both output and prices in Kenya, Malawi, and Tanzania; and in Botswana (prices only). In the remaining countries, the transmission is weak.

[2]Refer to tables 3.6 and 3.7 in the appendix for more detailed information on the variance of decomposition

Table 3.4: Variance Decomposition

		Decomposition of $lgdp$		Decomposition of $lcpi$	
	Month	lrm	pr	lrm	pr
Angola	12	3.87	8.04	0.25	1.29
	24	3.51	7.56	0.67	1.70
	36	3.34	7.09	2.92	1.77
Botswana	12	1.90	0.83	5.31	2.40
	24	0.88	2.43	12.97	3.20
	36	3.40	3.89	19.22	3.34
Kenya	12	5.05	3.14	10.66	4.65
	24	10.51	9.64	16.61	16.08
	36	13.19	10.38	19.26	17.20
Lesotho	12	1.52	2.90	0.06	2.90
	24	1.93	3.91	0.55	5.82
	36	2.52	4.61	0.98	6.03
Malawi	12	3.62	0.07	25.65	0.22
	24	1.42	7.14	34.18	1.25
	36	10.13	0.07	38.32	0.24
Namibia	12	1.70	1.48	3.45	6.04
	24	1.56	2.46	2.42	3.50
	36	1.40	5.30	1.63	10.11
South Africa	12	6.94	2.64	6.79	1.38
	24	13.51	2.03	6.16	3.45
	36	16.25	1.26	7.57	3.75
Swaziland	12	0.33	0.95	10.57	1.75
	24	2.21	2.57	30.76	0.80
	36	9.69	1.93	38.86	0.44
Tanzania	12	16.10	1.79	7.09	3.20
	24	20.13	1.58	15.19	4.53
	36	22.32	1.34	20.37	4.91
Uganda	12	7.18	2.05	12.35	3.24
	24	10.41	4.71	16.62	3.99
	36	10.13	6.70	15.00	6.88
Zambia	12	0.87	1.83	4.89	3.37
	24	2.22	2.03	6.24	2.27
	36	2.82	1.94	7.15	2.27

Each entry shows percent of variance in the log of GDP or the log of CPI from lrm and pr.

Our results also suggest that the exchange rate channel is one of the important channels in influencing output and prices in the region (refer to full impulse response functions presented in figures 3.2 to 3.12 in the appendix). In most countries depreciation has a persistent positive effect on the level of prices. The finding of the exchange rate is consistent with a small open economy in which imports play a key role in production and consumption systems. In a few countries, depreciation increases output through net exports hence reflecting that most exports in the region are price inelastic. This is a common feature of small open countries with agricultural products as their main exports.

Another important result is that although our analysis includes most variables that are monitored by the central bank in its policy decisions, in some of the countries, we still find results that are contrary to theory. Prices increase after a positive shock to the central bank's policy rate in Angola, Lesotho and Swaziland. There are some counter-intuitive results with regard to output effects of changes in the policy rate in Uganda and Namibia. Output increases following a positive shock to the policy rate.

Apart from shallow financial markets, the weak transmission and counter-intuitive outcomes can be attributed to multiple goals of monetary policy which might lead to inconsistent application of policies. The previous chapter shows that in most countries, in addition to price stability and

economic growth, there are other goals of monetary policy such as exchange rate stability. Having multiple objectives can cause monetary authorities to pay attention to both prices and monetary aggregates such as foreign exchange reserves. This may lead to confusing signals being sent to market participants thereby weakening the expectations channel of monetary policy and reducing the effectiveness of the policy. Another explanation which is more attributable to results for Lesotho, Swaziland and Namibia is limited scope of monetary policy autonomy as the currencies of these countries are pegged to the South African Rand. As noted in the previous chapter under the exchange rate targeting framework, in this situation, monetary policy can only respond to shocks that are independent from those of the anchor's country. The next section presents country by country analysis of the results.

3.4.2 Country-Specific Results

A. Angola

We find expected output effects of shocks to both policy instruments. A contractionary policy through an increase in the policy rate leads to a decline in the the level of output. Similarly, an expansionary monetary policy through a positive shock to reserve money increases output. Both effects are significant only up to 12 months beyond which they become insignificant. However, the results show that prices do not respond to reserve money shocks or policy rate shocks in an expected way.

The full set of Angola's impulse response functions are presented in figure 3.2 in the Appendix. The figure shows a strong relationship between the exchange rate and the prices. Exchange rate depreciation leads to immediate increases in price levels in Angola. This effect is significant up to 28 months. On output, the effect is insignificant in the first 12 months after which it significantly raises output. The lagged positive effect on output rightly reflects that Angola's main exports is oil whose prices are determined on futures markets. Depreciation immediately increases import bills and affect output negatively and after twelve months it increases exports more than imports and this get reflected in the high real GDP. Overall, our results suggest that the exchange rate channel is very important in influencing

output and prices in Angola. And that prices only respond to exchange rate movements in the expected way but not to changes in the policy rate or reserve money.

B. Botswana

As expected by theory, we find that in Botswana, tight monetary policy through an increase in the policy rate leads to declines in the price level and output. Similarly, an expansionary policy shock such as in increase in reserve money, raises output and prices. The effect on output is statistically insignificant whilst the effect on prices is significant after 12 months hence showing that both channels are weak. This scenario could be explained by the limited scope of monetary policy autonomy that the country has as its exchange rate is pegged to a basket of currencies composed of the South African Rand, special drawing rights and the United States Dollar. Botswana manages the peg using a crawling band.

C. Kenya

In Kenya, the results suggest that prices decrease following a tight monetary policy through a positive shock in the policy rate. This effect is significant between 10 and 28 months. Output also responds negatively to the decrease in the policy rate. These results suggest that the use of policy rate as a monetary policy instrument is effective in influencing the final goals in Kenya. We

attribute the effective results to higher levels of financial development which facilitate the operations of the interest rate channel. As expected by theory, our results also suggest that expansionary monetary policy through increases in reserve money raises output and prices. Both effects are experienced from the first month and are highly significant thus suggesting that the traditional channel of monetary policy remain the most effective channel in Kenya.

Our results are slightly different from Davood et al (2013) who found counter-intuitive results in the short run with respect to the response of output to both policy rate and reserve money shocks. The improved results can be attributed to inclusion of more variables in our FAVAR analysis and extension of the sample period to 2015. In the preceding chapter, we noted that Kenya modernised its conduct of monetary policy by giving more prominence to the role of policy rate in 2011 and adopting inflation targeting (IT) framework. Therefore this result provides further evidence that IT framework enhances the effectiveness of monetary policy. A further analysis of the rest of the impulse response in the Appendix indicate a negative association between interest rates and shocks to reserve money which shows that movements in money and interest rates are consistent with each other thus portraying consistent application of monetary policy, Davood et al (2013). This could be another contributing factor to the effective results in Kenya.

D. Lesotho

Using the full set of impulse response functions (figure 3.5 in the appendix), we find that exchange rate movements are important in influencing the levels of both output and prices in Lesotho. An increase in the exchange rate (depreciation) leads to increases in prices. This effect is persistent and statistically significant. Depreciation also increases the level of output but this effect is statistically not significant. Overall, the results suggests that the exchange rate channel is important in Lesotho.

The results for Lesotho further suggest a positive shock in reserve money increases both prices and output as expected by theory. However, both impacts are not statistically significant. On the other hand, our findings show that monetary policy through use of central bank's policy rate is ineffective in Lesotho as it leads to puzzles on both price and output. In addition to a shallow financial market, this outcome is also explained by the limited scope of monetary policy as Lesotho's currency, the Loti, is pegged to the South African Rand.

E. Malawi

Results for Malawi portray a strong transmission from the reserve money to the final goals. This is in line with the findings by IMF (2010) for the sub-Sahara African region. Shocks to reserve money yield significant and

expected results on both goals. Expansionary monetary policy through increases in reserve money raises both output and prices. The effect on output is immediate but significant from the 5th month onwards whilst on prices the effect is significant from the first month. The results also shows that price and output respond to changes in the policy rate as expected by theory. Tight monetary policy through increases in the interest rate lead to a decline in prices. A similar result is also observed on output which decreases up to 8 months after-which the impact dies off. However, both effects are not statistically significant. Nevertheless, the results are similar to Ngalawa (2011), Mwabutwa et al (2013) and Chiumia (2015) who also found that monetary policy through positive shocks to the policy rate decreases prices in Malawi.

In addition to low levels of financial development, we attribute the weak interest rate channel to monetary policy's pursuing of multiple objectives during the period. The *maintenance* of exchange reserves seems to be very important in Malawi such that authorities have been found changing the foreign exchange regimes regularly. From 1998 to 2006, Malawi was using flexible exchange rate regime. In 2007, the Malawian kwacha was fixed in United States Dollars up to April 2012. Malawi adopted the floating exchange rate regime in May 2012. These policy reversals in the exchange rate regime could impede the effectiveness of monetary policy as they bring

uncertainties in the market which affect the expectations channel. Nevertheless, using the full set of impulse response functions for Malawi (Figure 3.6 in the appendix) we find that a positive shock to the exchange rate significantly increases the level of prices from the first month. This effect is highly significant up to 24 months. Output also increases with depreciation however, the results are not statistically significant. The results on the exchange rate are similar to Mangani (2012) and Simwaka (2012) and are attributed to Malawi's heavy reliance on imports and exports' inelasticity as they are mainly agriculture primary products.

F. Namibia

In Namibia, we get mixed results. We find evidence of price effects but not output effects of monetary policy. Positive shocks to the policy rate lead to a decrease in prices only up to 18 months. On the other hand, we get the expected positive influence of shocks to reserve money on prices. Both effects are statistically significant only in the short run, up to 10 months. As in Lungu (2008), we do not find output effects from either shocks to the policy rate or reserve money. In general, we attribute the weak monetary policy transmission to the country's limited scope of monetary policy autonomy as the Namibian dollar is pegged to the South African Rand.

G. South Africa

Results for South Africa, indicate that contractionary monetary policy through positive shocks to the policy rate are effective in influencing both prices and output negatively. The effect on output peaks at 7 months and it is statistically significant up to the 10th month. The price effect is statistically significant between the 9th and 27th month but peaks at the 11th month. These results are similar to Kabundi and Ngwenya (2011) and further show that the interest rate channel is relatively stronger in South Africa compared to other countries. We attribute these results to high levels of financial development in South Africa and the use of a clear strategy in policy formulation and implementation of monetary policy that is associated with the inflation targeting framework which was adopted in 2000.

Our results further suggest that expansionary monetary policy through positive shocks to the reserve money only yields effective and significant results on output. A different outcome is found on prices. In the short run, prices decrease following an increase in reserve money but in the long run, the price level increases. These results point to a breakdown in the link between money supply and inflation and can explain why South Africa stopped targeting reserve money in 2000 and opted for inflation targeting framework.

H. Swaziland

In Swaziland, positive shocks to the policy rate decreases output. This effect is only noticed up to 12 months and not significant. The results also display an ambiguous picture on the impact of changes in reserve money on price and output. Both price and output decline significantly after reserve money increases. Prices also seem to increase following a tight monetary policy using a positive shock to the central bank rate.

A number of factors can explain the above counter intuitive results. (i) Monetary policy is not effective because the country also has a shallow financial market; (ii) Authorities have limited autonomy over monetary policy as the country's currency, the Lilangeni, is pegged to the South African Rand; (iii) Monetary policy may be impeded by government's interference. The central bank of Swaziland is not independent as it is incorporated as one of the departments under the Ministry of Finance and receives guidance from the Minister in the formulation of monetary policy. This may bring conflicts between fiscal and monetary policy. Nevertheless, just like in Lesotho, the exchange rate channel seems to be the strongest channel in influencing both output and prices. Exchange rate depreciation increases real GDP and CPI significantly. Since the currency is pegged to the Rand, implicitly, this depreciation is therefore for the South African currency.

I. Tanzania

The results for Tanzania show that monetary policy using both instruments is effective in influencing both prices and output as expected by theory. Expansionary monetary policy through increases in reserve money raise both prices and output significantly, a similar result that was also found by Montiel et al (2014). The results further provide evidence to the argument by IMF (2010) that the shocks through reserve money are more effective in influencing both output and prices in sub-Saharan Africa region. However, the results by Davood et al (2013) showed that in Tanzania it was true for output only. The difference between our results and Davood et al's can be due to inclusion of more economic variables in this study's FAVAR specification. Our results may be providing evidence that the central bank's policy decisions are based on developments of more variables than included in their study. Some of the additional variables that included in this study are the banking system's financing of fiscal budget, the banking system's net foreign assets and market interest rates such as treasury bills, lending and deposit rates.

The findings also suggest that a contractionary monetary policy to the interest rate leads to a decline in both price and output but the effect on prices has a 6 months lag and in both outcomes the results are insignificant. The weak interest rate channel is explained by shallow financial system.

Capital controls could also be one of the factors that weaken the interest rate channel as noted by Davood et al (2013). According to theory, capital controls weaken both the interest and exchange rate channels just like in Tanzania where the exchange rate channel is also found to be very weak (refer to Figure 3.10 the Appendix). Output and prices respond positively to exchange rate depreciations but the response of output has a lag of 4 months and is only significant from 6 to 10 months. Thereafter, the impact remain positive but not significant. In contrast, prices respond negatively to positive changes in the exchange rate. This result is strange showing that the channel is not useful. The effectiveness of monetary policy through both channels can therefore be enhanced by adopting market based policies, further development of the financial system, and opening of the capital account.

J. Uganda

In Uganda we also find a strong transmission mechanism through the use of reserve money. Both output and prices respond positively to shocks in reserve money and the effects are statistically significant and persistent. However, shocks to the policy rate produce ambiguous results on both prices and output. The effect on output is not in line with theory as contractionary monetary policy seems to raise output. The price effect is only negative in the short run up to 12 months. In this case, this result is slightly different to Davood et al

(2013) who found a persistence negative effect of the policy rate on prices which was statistically significant in the first 3 months only.

In general, the inclusion of more information in our FAVAR specification amplifies the strength of the reserve money channel showing that monetary policy decisions are based on developments in more variables than included in Davood et al's study. We however attribute the weak transmission mechanism through the interest rate channel to poor signalling that can be explained by simultaneously choosing quantities and prices as monetary policy anchors. Evidence to this conduct is shown by a highly significant positive response of interest rate to reserve money shocks. As observed by Davood et al (2013) this implies that shocks to the two instruments sometimes move in directions that exert opposing impulses to the targeted variables hence yielding insignificant impacts of either reserve money or policy rate on the targets.

Finally, the findings indicate that although Uganda adopted inflation targeting lite as the policy framework in 2011, they still need to continue working on how to make the framework successful. The effectiveness of the framework can be enhanced by having one anchor such as inflation forecast like in other countries and adopting a clear strategy of achieving the the primary goal of price stability so that no conflicting messages are sent to economic agents.

K. Zambia

For Zambia, we find results that are in line with theory. The results suggest that prices and output decrease after a tight monetary policy through a positive shock in the policy rate. Similarly, expansionary monetary policy through increases in reserve money raise both output and price levels. However, both channels are weak as the results are not statistically significant. These findings are slightly different from Zgambo and Chileshe (2014). While we both find that expansionary monetary policy through increases in the level of money balances increases output and prices, we differ on the response of these variables to changes in the policy rates.

Zgambo and Chileshe found price puzzles whilst we find expected impact according to theory. The variation in the results are firstly attributable to differences in method. Our estimation technique includes more variables taking into account other economic variables that are monitored by the central bank when making policy decisions. The results therefore confirm that the central bank of Zambia include an assessment of other economic variables when making policy decisions. Nonetheless, in both studies, all results are statistically not significant. Overall, just like in the other countries, the weak interest rate channel may be attributed to a shallow financial system.

3.4.3 Robustness Checks

As indicated above, our estimations have been conducted in levels based on Sims et al (1990) as we wanted to preserve long- run relationships. We also conducted the estimations in first differences to compare with the results in levels. The results obtained from the two methods are different but portray the same general message regarding the effectiveness of monetary policy in the region. The main difference is that, impulse response functions from the differenced models die off very quickly compared to the ones in levels. In this case, the forecast horizon in the differenced models may need to be shortened to 12 months only hence losing the long run information.

In general and consistent with the estimation in levels, the results from the differenced data show that the interest rate channel is more effective only in countries with high levels of financial development; that the money channel is more effective in influencing prices and output in most countries in the region; the exchange rate is important in influencing prices in the region. We therefore decided to maintain the discussions based on the estimations in levels. Moreover this specification yields consistent results whilst the differenced method yield inconsistent results since the variables are cointegrated.

3.5 Conclusion

This chapter examined the effectiveness of the channels of monetary policy work in 11 countries from the COMESA-EAC-SADC free trade area. As most previous studies in assessments of transmission mechanisms in the region used standard VARs, this study employed factor augmented augmented vector auto regression (FAVAR) model in order to include many economic variables that monetary authorities monitor in their decision making.

The main focus of the study has been on investigating price and output effects of shocks to central bank's policy rate and reserve money. Our results suggest that monetary policy is effective in influencing the final goals in the region however the main transmission channels differ across the countries. The variations in the channels are due to different levels of financial development and the conduct of monetary policy.

The results indicate that the interest rate channel is more effective in countries with high levels of financial development. This provides further evidence on the role of financial development in monetary policy transmission. However, the majority of the countries in the sample have shallow financial systems. In those countries, monetary policy works through the traditional money channel. This finding is similar to IMF

(2010). Adoption of policies that target financial development is paramount in the region in order to enhance the interest rate channel which is believed to be more effective in signalling the stance of monetary policy to economic agents. The exchange rate also seems to be one of the most important channels especially in influencing prices in the region.

On the conduct of monetary policy, in some countries, the effectiveness of monetary policy is weakened by the pursuit of multiple goals. This also leads to results that are contrary to theory as authorities end up applying inconsistent measures which work contrary to each other and consequently make the monetary policy to be ineffective. Apart from having price stabilisation as the main goal, most countries in the sample also aim at managing foreign reserves which causes the central bank to intervene in the foreign exchange market regularly and this disturbs the transmission mechanism. For enhancing the effectiveness of the channels we therefore recommend narrowing the objective of monetary policy, having a clear strategy of achieving the ultimate goals and adoption of market based policies.

Overall, our results indicate that country specific measures are needed in improving the effectiveness of monetary policy in the region. The authorities of the COMESA-EAC-SADC therefore need to take this into account as they work on the criteria for harmonising economic policies in the region.

3.6 Appendix

Table 3.5: Summary Statistics

		Angola	Botswana	Kenya	Lesotho	Malawi	Namibia	SA	Swaziland	Tanzania	Uganda	Zambia
$lgdp$	mean	14.01	9.83	13.39	8.28	12.20	9.78	13.27	9.00	15.96	15.89	10.02
	s.d	1.02	0.47	0.53	0.43	0.78	0.47	0.38	0.33	0.63	0.66	0.53
	min	11.27	9.01	12.49	7.58	10.73	8.97	12.55	8.24	14.87	14.81	9.03
	max	15.22	10.54	14.40	9.07	13.73	10.62	13.84	9.59	17.04	16.90	10.81
$lcpi$	mean	4.28	4.45	4.46	4.50	4.54	4.50	4.51	4.50	4.52	4.51	4.38
	s.d	0.67	0.32	0.48	0.24	0.50	0.24	0.25	0.27	0.35	0.34	0.42
	min	2.32	3.87	3.69	4.06	3.76	4.07	4.07	4.01	4.01	3.98	3.45
	max	5.15	4.91	5.11	4.87	5.65	4.87	4.92	4.93	5.08	5.04	5.09
lrm	mean	12.79	9.34	12.05	6.65	10.65	7.71	11.57	6.74	7.69	7.48	8.21
	s.d	1.36	0.66	0.55	0.40	0.98	0.67	0.45	0.60	0.77	0.68	0.80
	min	9.81	8.00	11.21	5.89	8.88	6.73	10.71	5.68	6.27	6.39	6.64
	max	14.40	10.09	12.98	7.45	12.35	9.07	12.32	7.69	8.83	8.65	9.74
pr	mean	0.47	0.12	0.10	0.12	0.24	0.08	0.08	0.08	0.13	0.16	0.14
	s.d	0.50	0.03	0.03	0.02	0.10	0.02	0.03	0.03	0.04	0.05	0.07
	min	0.10	0.06	0.06	0.09	0.13	0.05	0.05	0.05	0.04	0.06	0.03
	max	1.50	0.16	0.18	0.17	0.47	0.13	0.14	0.14	0.22	0.29	0.40
lpc	mean	13.03	9.76	13.11	7.34	10.89	10.37	14.23	8.46	8.07	14.93	8.65
	s.d	1.73	0.67	0.72	0.80	1.34	0.52	0.44	0.62	0.94	0.90	1.03
	min	8.92	8.58	12.45	6.07	8.76	9.44	13.39	7.04	6.19	13.47	6.85
	max	15.03	10.81	14.67	8.61	12.87	11.28	14.83	9.29	9.53	16.28	10.30
lex	mean	4.42	2.29	4.39	2.11	5.12	2.11	2.11	2.11	7.19	7.66	1.58
	s.d	0.24	0.23	0.12	0.22	0.55	0.22	0.22	0.22	0.20	0.20	0.22
	min	3.42	1.87	4.13	1.74	4.21	1.74	1.74	1.74	6.82	7.38	1.16
	max	4.91	2.73	4.66	2.71	6.46	2.71	2.71	2.71	7.68	8.21	2.50
N		169	169	169	169	169	169	169	169	169	169	169

Source: IFS, Period (2001 to 2015); $lgdp$ is the log of real GDP; $lcpi$ is the log of CPI; lrm is the log of reserve money; pr is the central bank's policy rate; lpc is the log of commercial bank's credit to the private sector; lex is the log of the exchange rate defined as local currency per US Dollar.

Table 3.6: Variance Decomposition of $lgdp$

	Month	$lgdp$	$lcpi$	lrm	pr	lpc	lex	$\widehat{F1}$
Angola	12	69.47	4.43	3.87	8.04	7.77	5.74	0.72
	24	76.43	7.45	3.51	7.56	1.68	1.25	2.14
	36	69.27	8.72	3.34	7.09	4.59	2.46	4.53
Botswana	12	92.25	0.04	1.90	0.83	1.56	3.28	0.12
	24	84.64	0.88	2.43	2.89	4.79	3.36	1.01
	36	78.35	2.34	3.40	3.89	6.66	3.12	2.23
Kenya	12	62.31	2.70	5.05	3.14	17.29	3.25	6.25
	24	47.08	2.03	10.51	9.64	14.64	8.51	7.58
	36	39.13	1.71	13.19	10.38	14.07	12.10	9.43
Lesotho	12	85.59	6.23	1.52	2.90	0.48	1.05	2.23
	24	77.76	11.22	1.93	3.91	0.71	2.26	2.21
	36	70.91	13.89	2.52	4.61	1.28	4.18	2.62
Malawi	12	83.40	1.26	3.62	0.07	1.73	1.44	8.48
	24	78.21	1.42	7.14	0.07	2.92	1.97	8.26
	36	73.68	1.42	10.13	0.07	3.99	2.49	8.22
Namibia	12	83.29	2.85	1.70	1.48	1.01	6.00	3.66
	24	75.84	5.08	1.56	2.46	2.27	9.30	3.49
	36	65.75	5.88	1.40	5.30	4.16	14.37	3.15
South Africa	12	79.78	0.28	6.94	2.64	6.26	0.35	3.75
	24	60.32	2.47	13.51	2.03	14.01	2.12	5.54
	36	50.40	4.77	16.25	1.26	18.05	4.00	5.27
Swaziland	12	82.99	4.23	0.33	0.95	6.75	4.23	1.33
	24	71.24	3.83	2.21	2.57	14.67	3.70	1.80
	36	54.09	5.46	9.69	1.93	1.14	14.87	2.82
Tanzania	12	65.43	5.09	16.10	1.79	6.00	4.87	0.70
	24	54.55	6.12	20.13	1.58	12.17	4.72	0.72
	36	48.46	5.43	22.32	1.34	16.09	5.39	0.96
Uganda	12	80.99	0.33	7.18	2.05	6.22	2.43	0.80
	24	69.07	0.35	10.41	4.71	7.98	6.24	1.22
	36	64.91	0.28	10.13	6.70	8.50	7.72	1.75
Zambia	12	51.94	9.52	0.87	1.83	9.06	13.84	12.93
	24	42.04	9.15	2.22	2.03	12.51	11.96	20.09
	36	37.82	9.21	2.82	1.94	15.04	10.85	22.30

Each entry shows percent of variance in the log of GDP from shocks in given variables

Table 3.7: Variance Decomposition of $lcpi$

	Month	$lgdp$	$lcpi$	lrm	pr	lpc	lex	$\widehat{F1}$
Angola	12	9.92	54.20	0.25	1.29	16.20	15.66	2.52
	24	7.62	35.88	0.67	1.70	25.61	18.44	10.08
	36	6.48	28.26	2.92	1.77	28.25	15.75	16.57
Botswana	12	1.23	77.97	5.31	2.40	5.70	2.46	4.92
	24	0.97	63.97	12.97	3.20	9.05	1.64	8.18
	36	1.36	54.75	19.22	3.34	10.08	1.27	9.99
Kenya	12	0.32	79.07	10.66	4.65	2.04	3.20	0.07
	24	0.97	56.68	16.61	16.08	1.95	7.07	0.64
	36	1.48	45.91	19.26	17.20	2.33	11.15	2.67
Lesotho	12	8.71	81.88	0.06	2.90	0.37	2.89	3.19
	24	11.07	64.84	0.55	5.82	1.97	8.65	7.10
	36	13.21	57.63	0.93	6.03	2.96	11.23	7.94
Malawi	12	0.08	46.17	25.65	0.22	0.54	21.38	5.96
	24	0.10	33.89	34.18	1.25	1.65	22.23	6.70
	36	0.12	28.23	38.32	0.24	2.95	23.07	7.07
Namibia	12	6.52	46.60	3.45	6.04	0.52	36.60	0.27
	24	3.69	36.21	2.42	3.50	1.19	51.81	1.16
	36	2.05	26.61	1.63	10.11	3.19	55.63	1.14
South Africa	12	7.06	65.99	6.79	1.38	7.04	10.28	1.47
	24	12.49	58.74	6.16	3.45	6.33	10.85	1.97
	36	17.15	52.38	7.57	3.75	6.99	9.26	2.91
Swaziland	12	1.11	71.37	10.57	1.75	7.46	4.77	2.97
	24	5.68	35.91	30.76	0.80	13.49	10.87	2.48
	36	7.41	22.29	38.86	0.44	10.86	17.10	3.05
Tanzania	12	3.70	62.33	7.09	3.20	9.26	1.99	12.42
	24	4.85	55.49	15.19	4.53	10.09	1.24	8.62
	36	6.96	42.34	20.37	4.91	12.02	5.96	7.43
Uganda	12	3.53	56.32	12.35	3.24	16.78	4.79	3.00
	24	20.49	38.83	16.62	3.99	11.46	6.50	2.01
	36	32.91	17.00	15.00	6.88	17.84	8.01	2.37
Zambia	12	1.42	34.58	4.89	3.37	21.24	5.54	28.99
	24	1.14	24.02	6.24	2.72	24.89	4.97	36.02
	36	1.08	20.27	7.15	2.27	28.13	4.09	37.00

Each entry shows percent of variance in the log of CPI from shocks in given variables

Figure 3.2: Impulse Response Functions for Angola

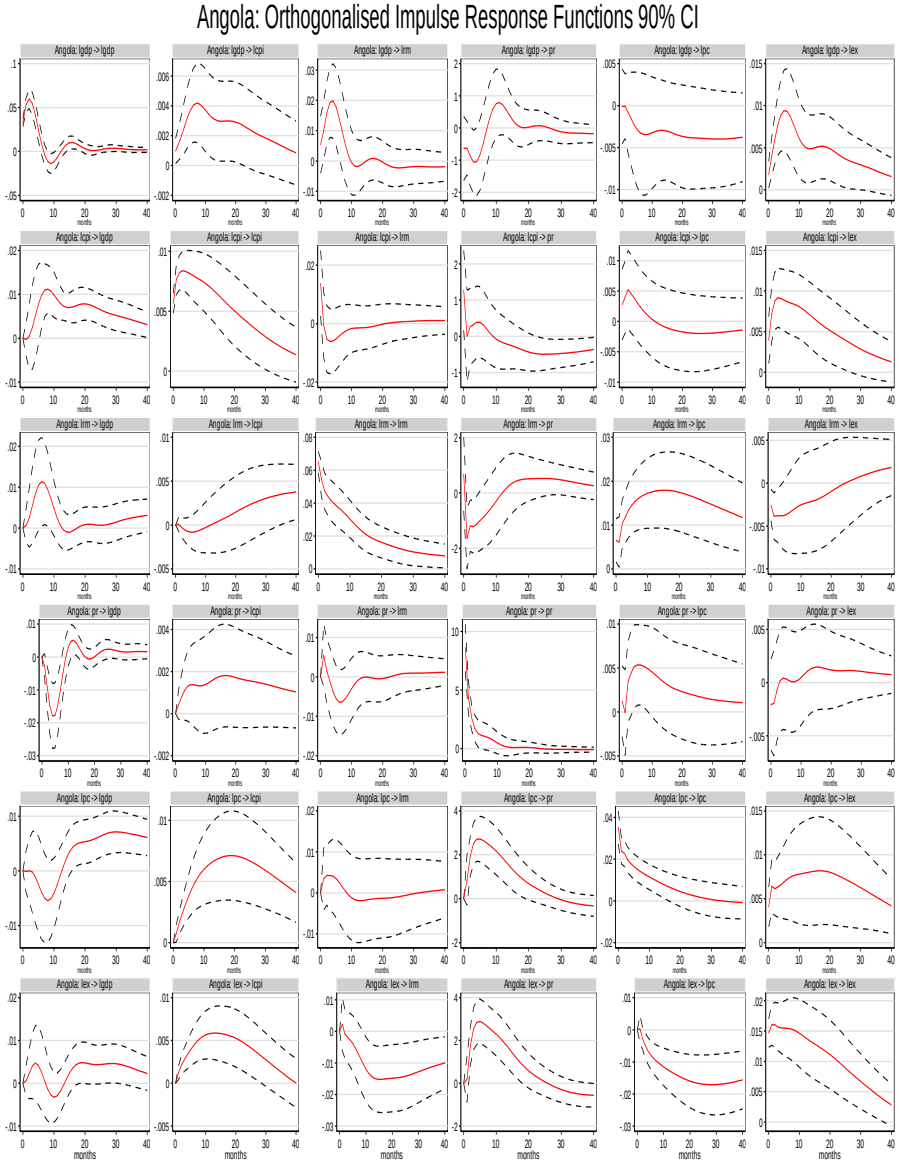


Figure 3.3: Impulse Response Functions for Botswana

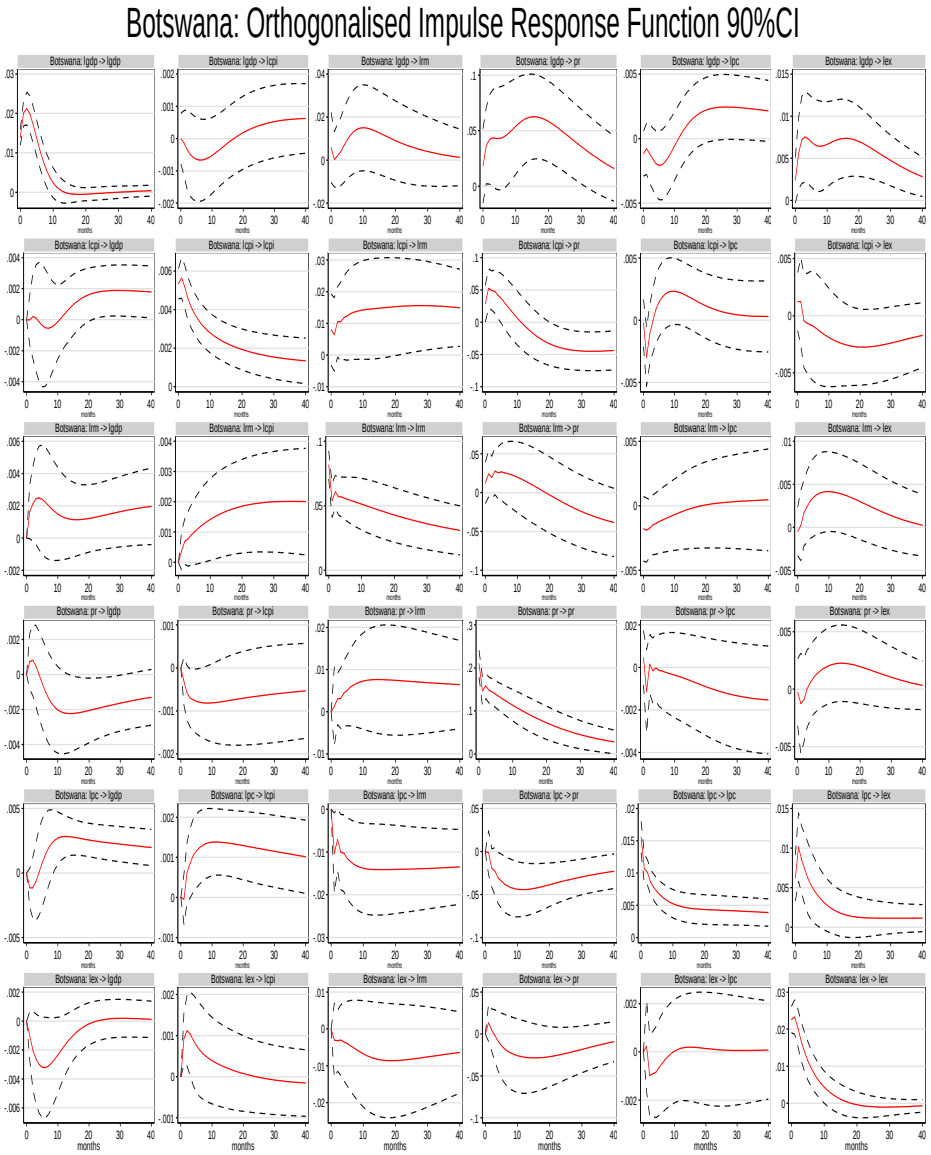


Figure 3.4: Impulse Response Functions for Kenya

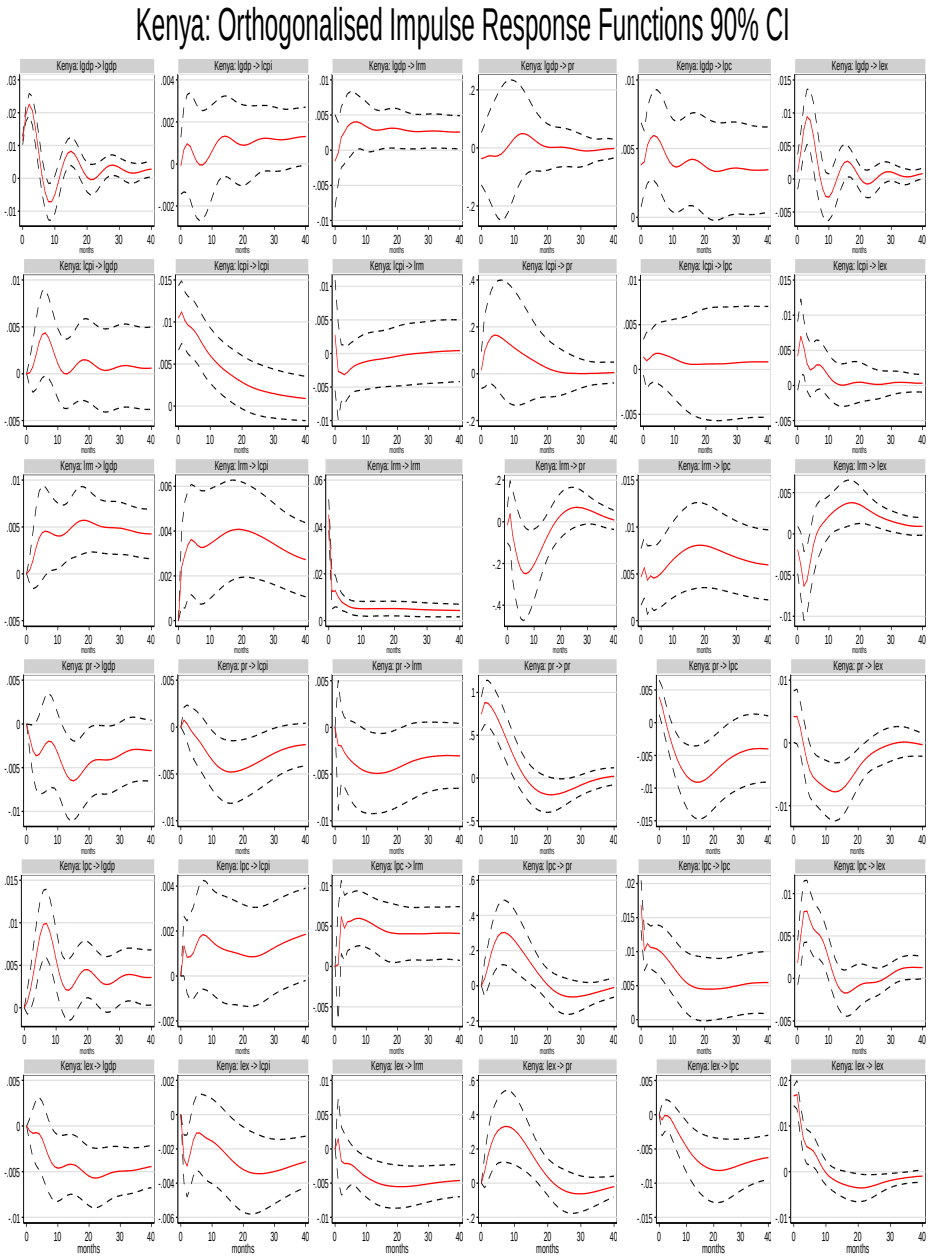


Figure 3.5: Impulse Response Functions for Lesotho

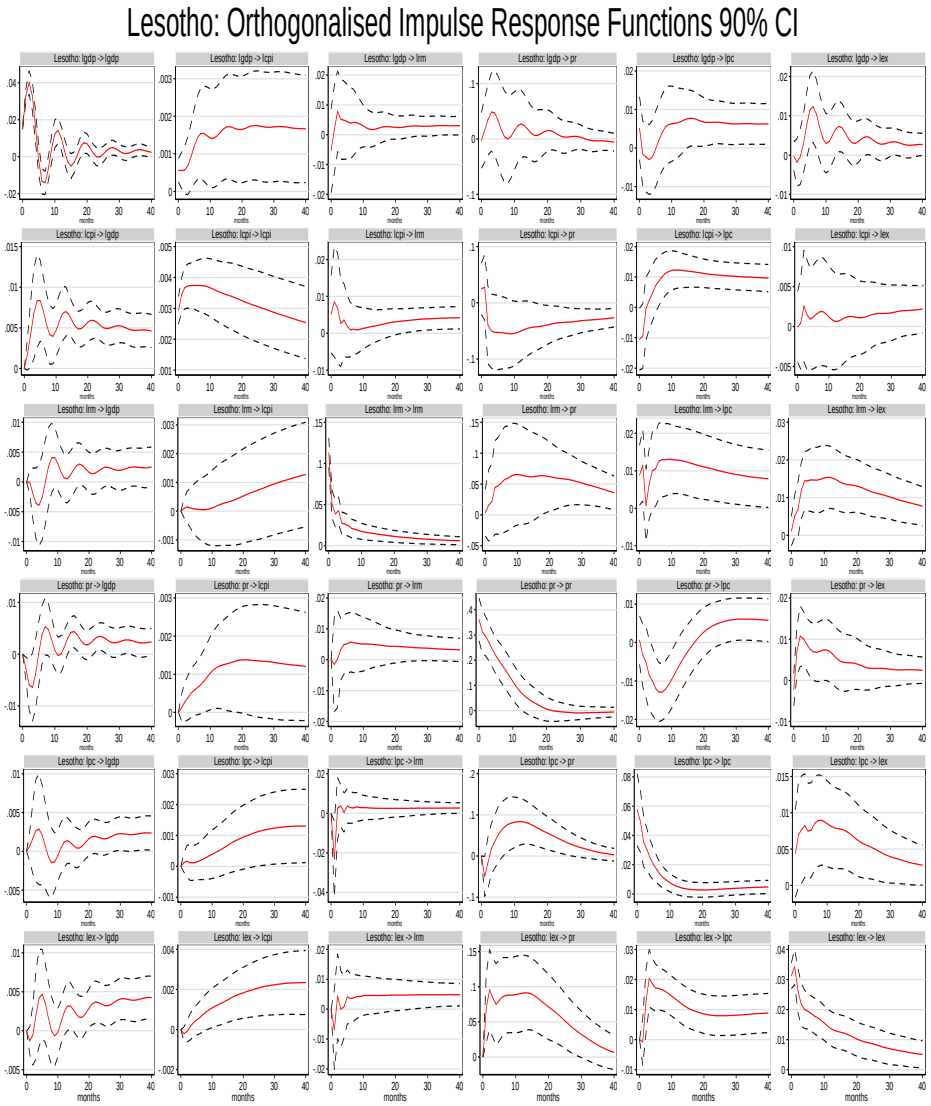


Figure 3.6: Impulse Response Functions for Malawi

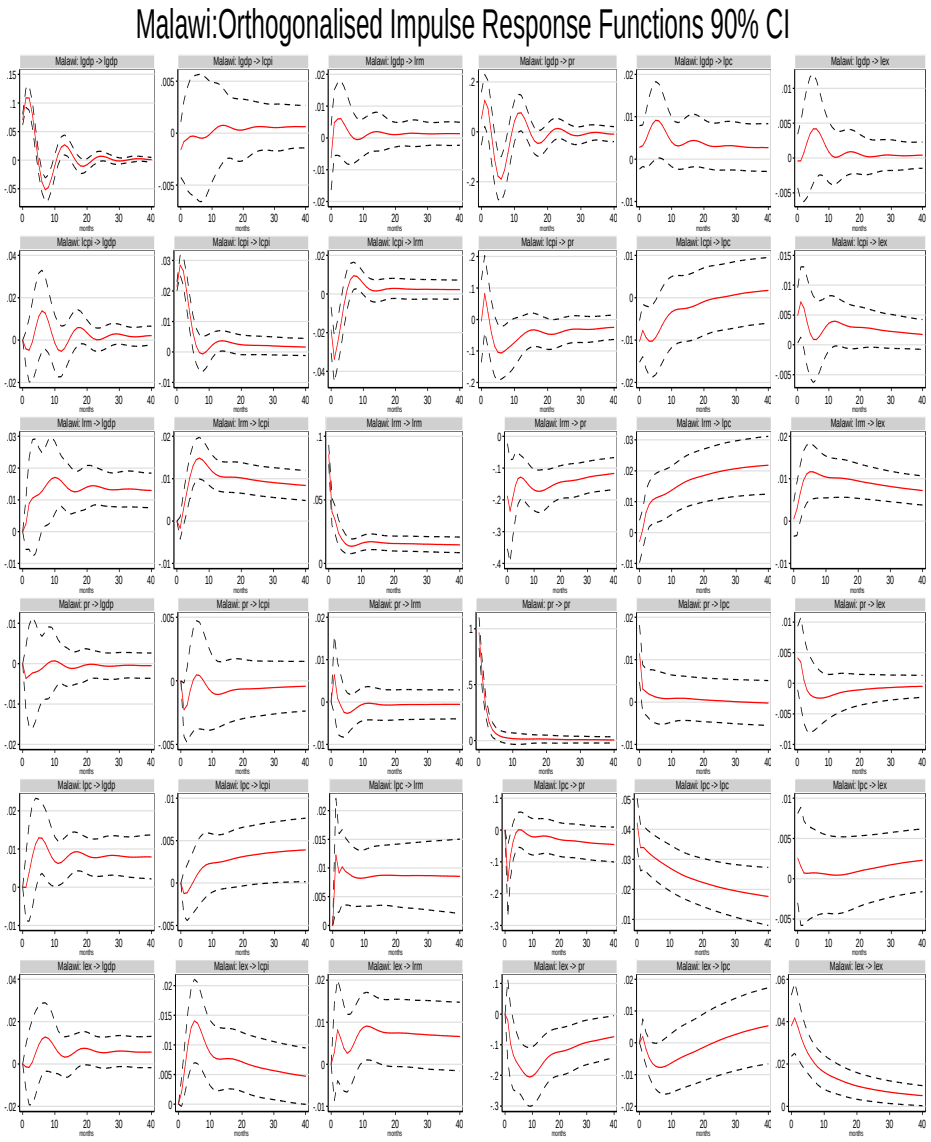


Figure 3.7: Impulse Response Functions for Namibia

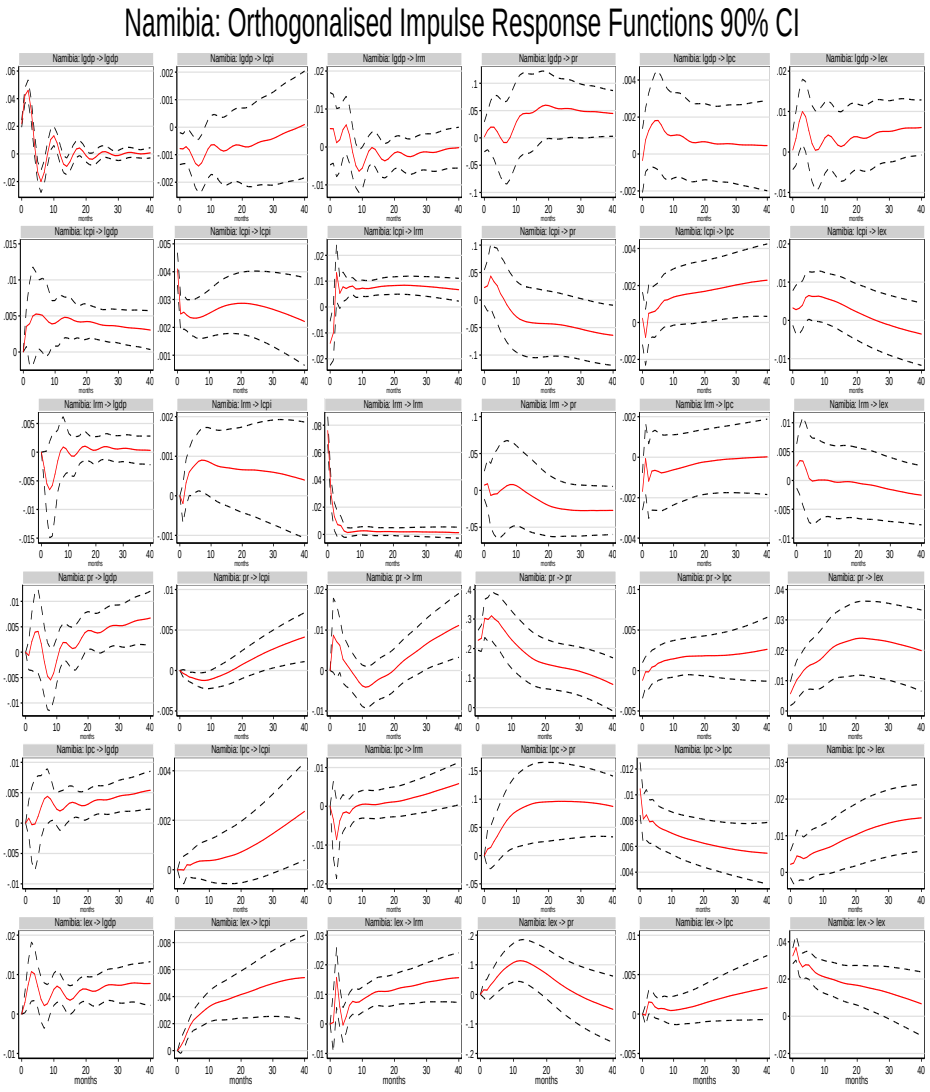


Figure 3.8: Impulse Response Functions for South Africa

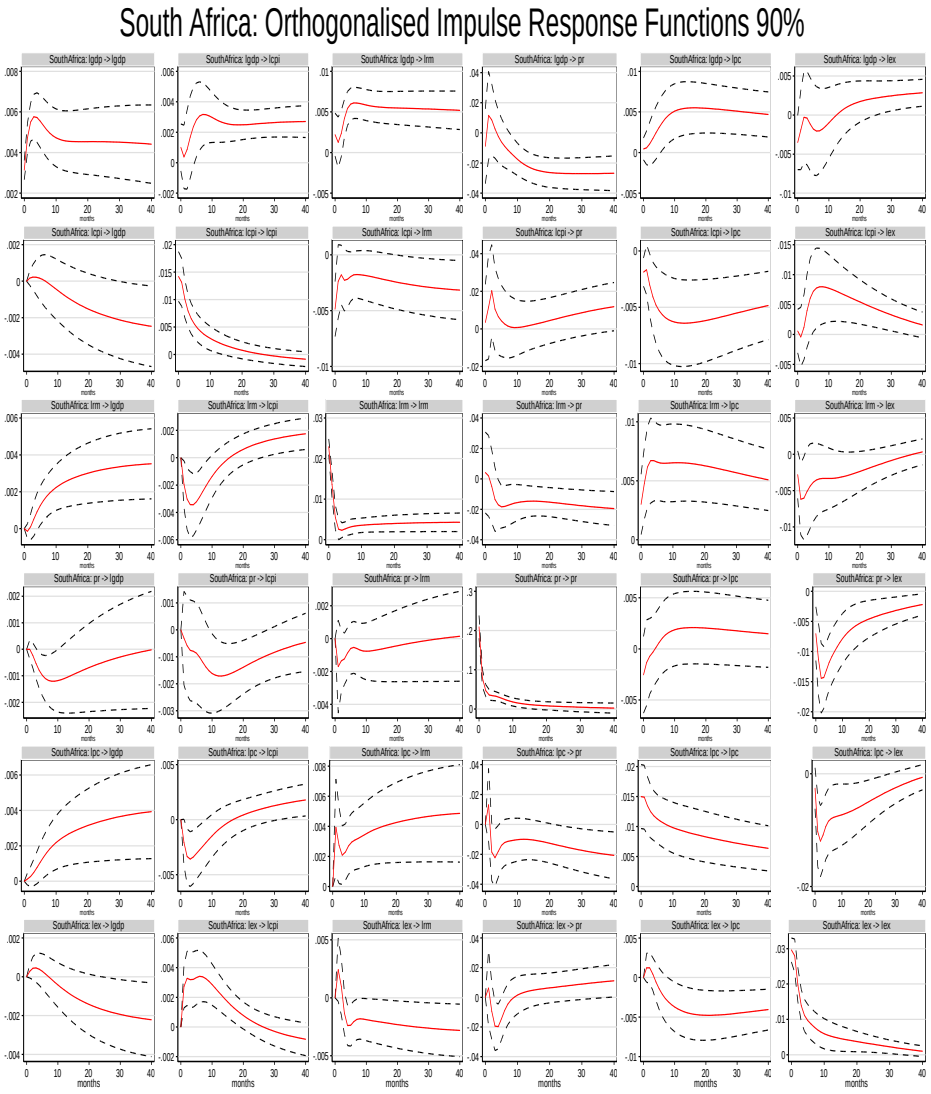


Figure 3.9: Impulse Response Functions for Swaziland

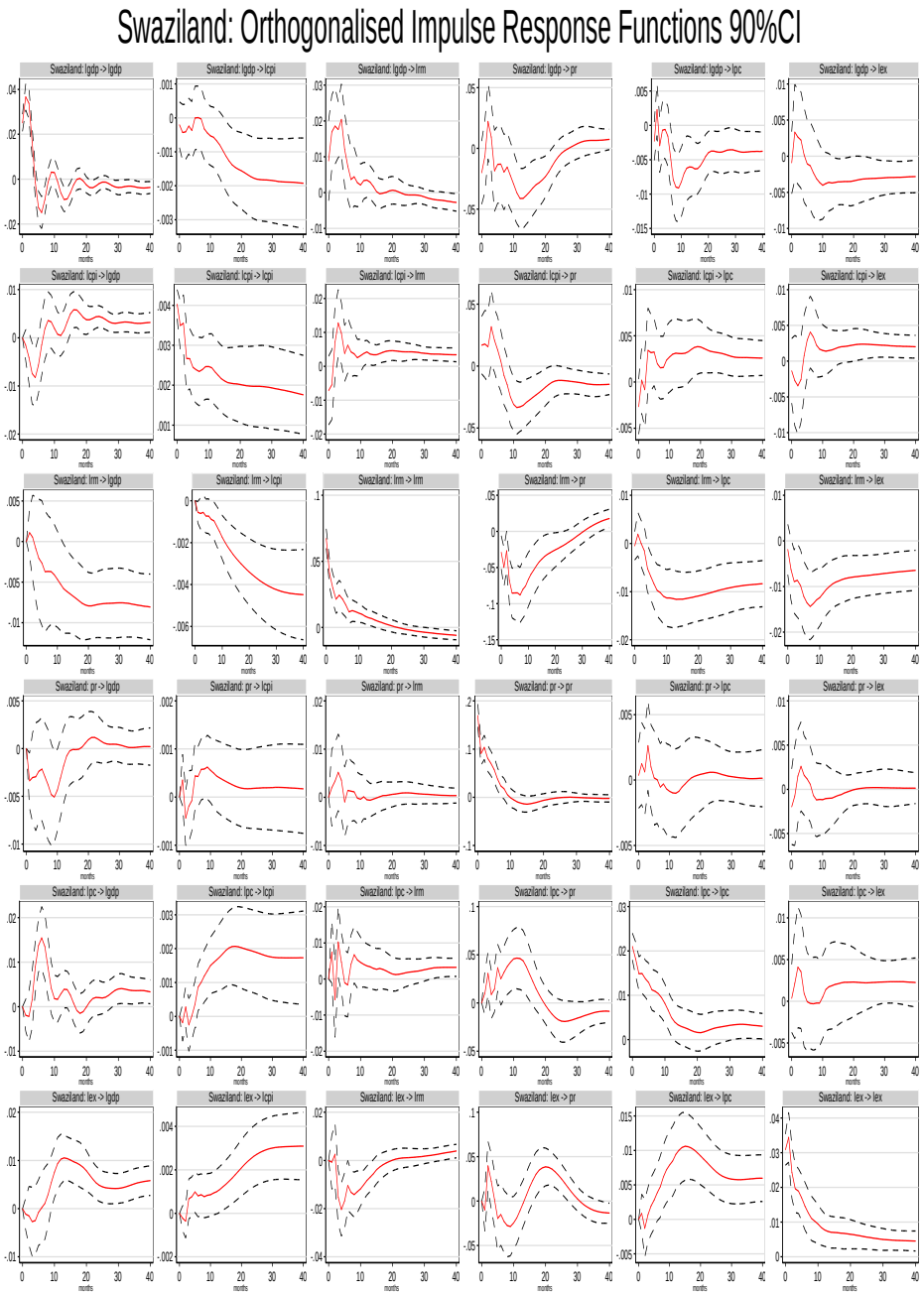


Figure 3.10: Impulse Response Functions for Tanzania

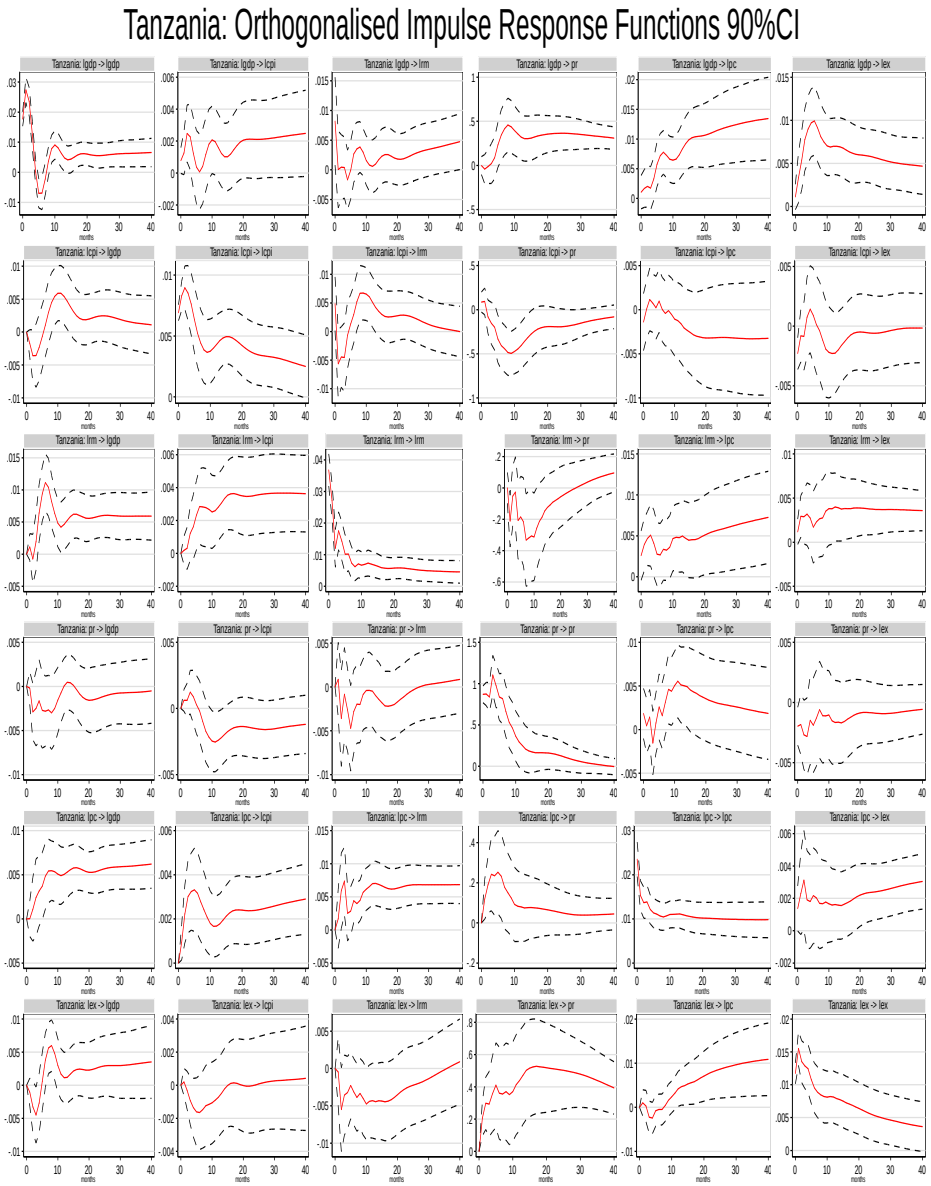


Figure 3.11: Impulse Response Functions for Uganda

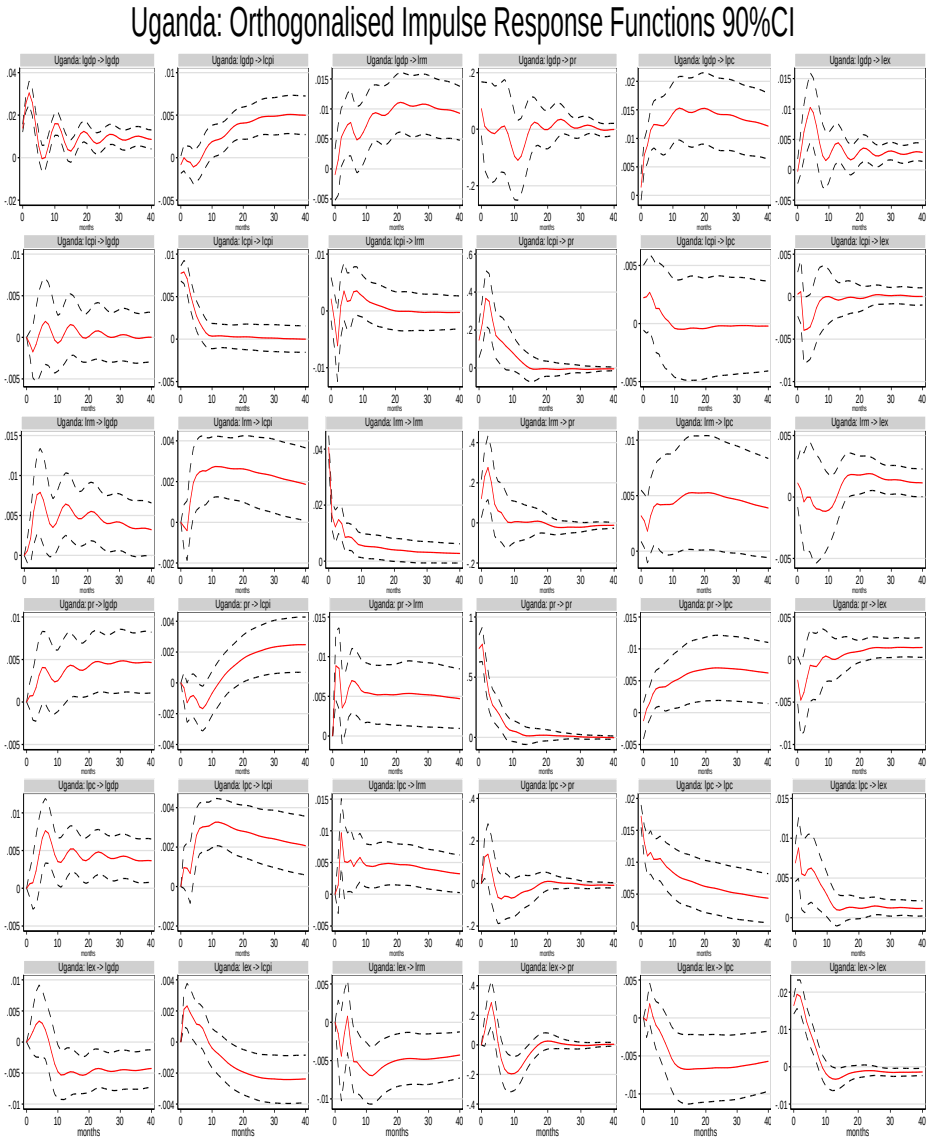
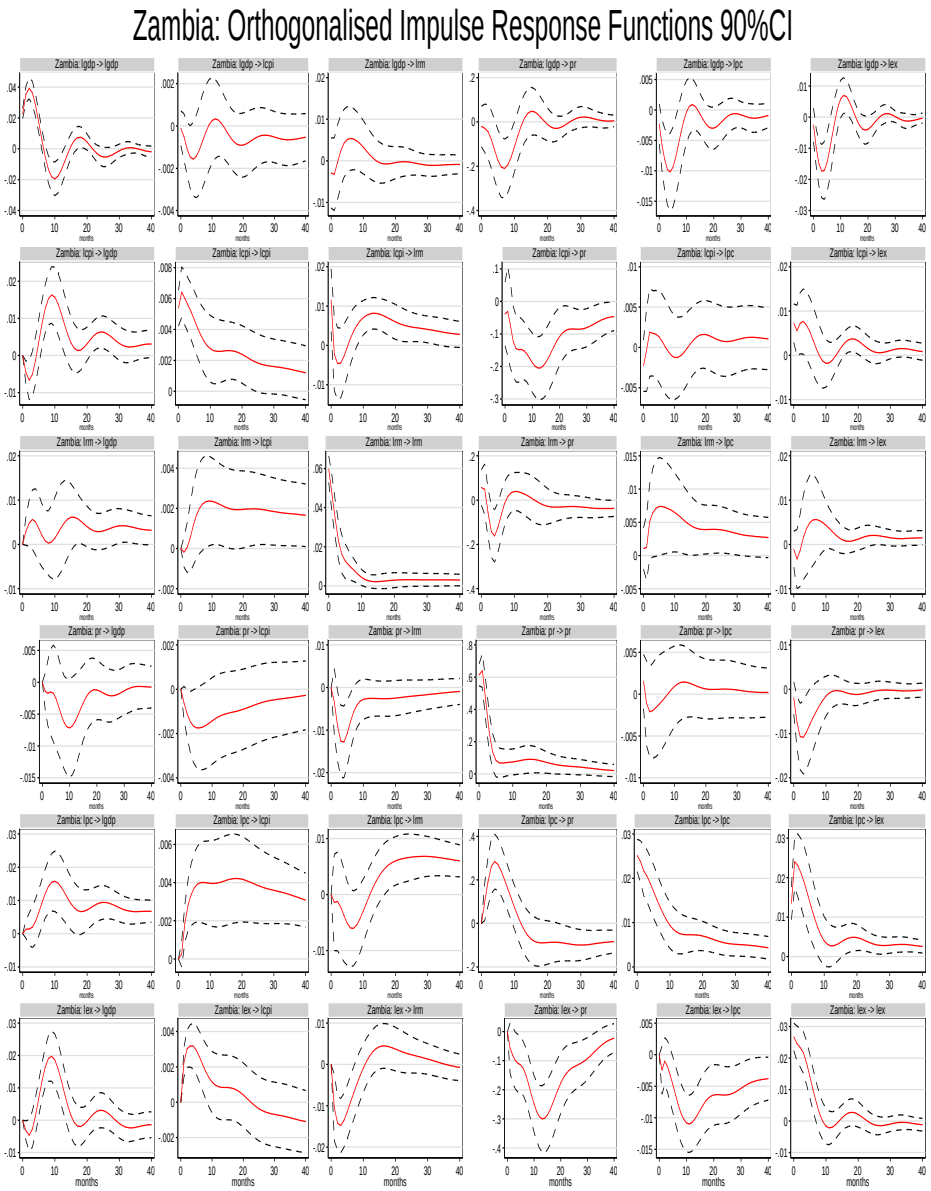


Figure 3.12: Impulse Response Functions for Zambia



Chapter 4

Interest Rate Pass Through (IRPT) in the COMESA-EAC-SADC Region

4.1 Introduction

Among the channels of monetary policy transmission, the interest rate is the most traditional channel and has been subjected to a large volume of empirical research most of which is on interest rate pass through (IRPT). IRPT is a key component of monetary transmission that describes how changes in central bank's policy rate gets transmitted to longer-term retail rates on loans and deposits (IMF, 2011). Studies on IRPT help to provide information on its magnitude and nature in terms of whether it is complete in the short or long run and asymmetric (i.e if the responses of the retail rates are dependent on the direction of the change of market rates or not).

Monetary policy achieves its goals in a shorter period of time when the pass through is symmetric, fast and complete. Information of IRPT is also used to determine the efficacy of the financial system in facilitating monetary policy transmission. Symmetric and complete pass through is associated with a well-functioning, competitive and efficient financial system while an incomplete and asymmetric pass through suggests the opposite (Aydin, 2007; Hofmann 2006; De Bondt, 2005). The determination of the size, speed and nature of the interest pass through is therefore crucial for the central bank to correctly formulate its monetary policy stance for achieving its desired goals efficiently.

The foregoing considerations have led to a substantial amount of empirical research on IRPT. The results point to a wide variation in size, speed and nature across countries and time periods (Liu et al, 2008; Aziakpono and Wilson 2013). Furthermore, IRPT varies depending on the type of the interest rate whether lending or deposit (Cottarelli et al, 1995; Mojon, 2000 ; De Bondt 2002 ; Sander and Kleimeier, 2004; Kwapil and Scharler, 2006). The adjustment of the interest rate may also be symmetric or asymmetric depending on whether the policy innovation is positive or negative, or whether the bank retail rates are below or above the equilibrium level (Mojon, 2000; De Bondt, 2002; Sander and Kleimeier, 2006).

The results from the existing IRPT literature for the sub-Saharan Africa from the existing are difficult to compare across countries as they differ due to different sample periods and methodology. Some studies use the monetary approach which focuses on the transmission of monetary policy impulses into the financial sector, whilst others use the cost of funds approach which focuses on highlighting the role of market structure to the transmission. Sander and Kleimeier (2004) observe that the two approaches are complementary. However, a unifying analysis that allows for a direct comparison of the results is important especially for countries which belong to the same economic region.

This chapter contributes to the literature by providing a cross country

comparison of IRPT for 11 countries[1] in the COMESA-EAC-SADC region. The econometric analysis is done on a country-by-country basis using the auto regressive distributed lag (ARDL) model following the monetary approach by regressing the average lending or deposit rate on the central bank's policy rate. It focuses on the size (completeness) of the IRPT in both the short and long run, its evolution over time and predictability (presence of asymmetries). Similar studies have been done on countries from advanced and emerging markets such as Cas et al (2011); Karagiannis et al (2010); Sorensen and Werner (2006); Sander and Kleimeier (2004); and on South Africa by Aziakpono and Wilson (2013). The following are the main hypotheses:

- There is complete pass through from the policy rate to the lending and deposit rates of commercial banks.
- The response of lending and deposit rates to shocks in the policy rate is symmetric.
- The IRPT has remained the same over time.

The results suggest that the short-run pass through (SRPT) is incomplete in all countries for both deposits and lending rates. However, the long-run pass through (LRPT) to the average lending rate is statistically complete

[1]Just like in the previous chapter, the countries are Angola, Botswana, Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania, Uganda and Zambia

(not different from 1) for Botswana, Namibia and South Africa mainly on account of high levels of financial development. On the other hand, the LRPT to the average deposit rate is statistically complete only in Swaziland and incomplete in the remaining countries. The study also confirms the presence of asymmetries in the loan markets of Angola and Tanzania which is mainly explained by the collusive pricing hypothesis. We also find weak evidence for the customer reaction hypothesis which is confirmed in the deposits market for Angola and Namibia. A recursive analysis shows that in some countries, the IRPT has evolved over time mainly on account of financial and macroeconomic developments and change in the the conduct of monetary policy.

Based on these results we recommend policies that target increasing financial development, raising competition in the banking sector and improving the conduct of monetary policy by adopting market based regimes. Overall, favourable macroeconomic conditions such as low inflation would also enhance the effectiveness of monetary policy in the region.

The rest of the chapter is organised as follows, section 4.2 provides a literature review, section 4.3 provides econometric model, data and estimation procedure; results are discussed in section 4.4; and the study is concluded in section 4.5.

4.2 Literature Review

4.2.1 Conceptual Framework

Conventionally,[2] studies on interest rate pass-through are theoretically based on the Monti-Klein (1971) profit maximizing theory of commercial banks. The theory assumes that, the balance sheet of commercial banks is composed of loans (L) and precautionary reserves (R) on its assets side and deposits (D) and settlement balances (S) on the liabilities side.

The theory is based on the following assumptions; (1) settlement balances are held at the central bank and are used for clearing commitments with other banks; (2) when the balances are in negative, the central bank penalizes the commercial bank by charging interest rate penalty i_p; (3) commercial banks have a fixed cost function μL related to their role of intermediation. The banks face downward sloping demand function for loans and upward sloping supply for deposit functions. Hence the profit function of a commercial bank is given by equation 1 below:

$$\pi(D, L) = i_L L - i_D(L + R - S) - i_P \delta(S - R) - \mu L \qquad (4.1)$$

Where i_L is the price that commercial banks charge on loans and i_D is

[2]This section, 4.2.1 and the next one, 4.2.2 largely benefits from a research proposal by Chipungu (2016), that was submitted for assessment at the University of Birmingham for the Advanced Research Methods module.

the interest rate given to depositors. The choice variables for the bank are the volume of loans granted (L) and the quantity of precautionary reserves to hold (R). Therefore, differentiating equation (4.1) with respect to L and R we get the following first order conditions:

$$\frac{\partial \pi}{\partial L}; i_L - i_D = \mu \qquad (4.2) \qquad\qquad \frac{\partial \pi}{\partial R}; i_D = \delta i_P \qquad (4.3)$$

Combining equations (4.2) and (4.3) we get:

$$i_L = \mu + \delta i_p \qquad (4.4)$$

Equation 4.4 can be presented with parameters of estimation as follows;

$$rr_t = \alpha + \beta pr_t + \epsilon \qquad (4.5)$$

where rr_t is the commercial bank's retail rate, pr_t is the official (policy) or market rate, ϵ is the error term, α is the fixed cost of the bank and β is the multiplier. In a highly competitive market, β is expected to to take the value of 1 and that would imply complete pass-through. De Bondt (2005) argues that β can also be equal to or greater than 1 when banks attempt to offset risks resulting from asymmetric information by charging high interest rates. Empirically, it appears that in most cases, retail interest rates do not adjust

by the same magnitude of the change in policy rates due to factors that are discussed in section 4.2.1.

4.2.2 Factors that influence retail interest rates' adjustments

Several factors have been identified in the literature relating to the way retail interest rates are adjusted following changes in policy rates. The factors are macroeconomic conditions (Gigineishvilli, 2011; Egert and Mac Donald, 2009), the way monetary policy is conducted especially in terms of whether it uses direct controls or depends on market dynamics (Soresen and Werner, 2006; Egert et al, 2007; Cas et al, 2010); and also whether the process of monetary policy is transparent or has formal accountability measures (Sander and Kleimeier, 2006; Liu et al, 2008); the economy's financial structure and level of financial development (Cottarelli and Kourelis, 1994; Thomson, 2006; IMF, 2010; Archer and Turner, 2006). Other factors include menu costs (Hofman and Mizen, 2004; Fuertes and Heffernan, 2009); asymmetric information and adjustment (Stiglitz and Weiss, 1981; Hannan and Berger, 1991; Neumark and Sharpe, 1992) and quality of legal and regulatory institution (Mishra and Montiel, 2012).

Macroeconomic conditions: Banks pass-on changes in policy rates to their retail interest rates faster when there is macroeconomic stability and high

levels of economic growth. High market volatility causes interest rates to be sticky. This is because the information content of policy signals is reduced as noise increases. Consequently, firms wait longer to change their rates Egert and Mac Donald (2009). Contrary to this, Gigineishvilli (2011) argues interest rates may also adjust more frequently during periods of inflation just as all other prices in the economy.

The conduct of monetary policy: Interest rates are found to be rigid where authorities intervene in markets compared to where market forces are allowed to operate freely (Sorensen and Werner, 2006; Egert et al, 2007). Interest rates are therefore less rigid in flexible exchange rate regimes as monetary authorities are able to send clear policy signals to market participants (Cas et al, 2010). Interest rates are found to be more flexible in economies with high degree of central bank independence (IMF, 2010) and high levels of transparency in the conduct of monetary policy. Transparency decreases interest rate volatility and consequently enhances IRPT as market participants become certain of the direction of future short-term rates (Sander and Kleimeier, 2006; Liu et al, 2008).

Financial development and structure: The literature provides evidence that interest rates are flexible in highly developed and open financial systems

than in shallow or closed systems. This is because in deep and open financial markets, banks' reliance on the central bank's accommodation facilities is reduced as they can more easily access external sources of finance. Such a system also provides alternative financial instruments for investors and savers which help to reduce the market power of individual commercial banks (Cottarelli and Kourelis, 1994). In a competitive market, profit maximising behaviour forces banks to follow market conditions closely and respond promptly to changes. Interest rates are therefore more flexible when market forces are strong. Related to this, Thompson (2006) found that interest rates are rigid in economies that are dominated by state owned financial institutions mainly because profit maximising is not their primary objective.

Switching Costs: This hypothesis argues that commercial banks may capitalise on the influence of switching costs on customer's behaviour and not be proactive in changing the retail rates. Customers may be reluctant to switch banks or financial products for the ones with more favourable conditions when "switching costs" are high. These are costs related to access to information on competing products and firms as well as transaction costs for switching to the products and firms with favourable conditions. Interest rates are therefore rigid when switching costs are high

(Lowe and Rohling, 1992).

Menu costs: These are fixed costs that are incurred when changing prices such as printing of new price lists and other costs attached to communication about the revisions. The theory of menu costs predicts that firms will adjust their prices only when the benefits from adjusting are greater than the cost of being out of equilibrium. Because of this, banks consider the menu costs associated with the adjusting of the interest rates. If the associated costs are large, the adjustments will be more rigid than if the costs were less (Hofmann and Mizen, 2004). This also results to differences in the nature of pass through across different products (Fuertes and Heffernan, 2009). The hypothesis of menu costs is explainable at a firm level as such it is included in the next chapter which assesses heterogeneities in IRPT across retail products and across firms in Malawi.

Asymmetric information and adjustment: Asymmetric information causes commercial banks to retain large interest rate spreads between lending and deposit rate in order to defend their profit margins. This conduct causes interest rates to be rigid as the lending rate may be relatively insensitive to small changes in the official rate Stiglitz and Weiss (1981). Rigidity in interest rates is also attributed to asymmetric adjustment in the rates which

are explained by two theories namely collusive pricing arrangements and adverse customer reaction by Hannan and Berger (1991) and Neumark and Sharpe (1992).

Under the collusive behaviour hypothesis, deposit rates move rigidly upward after an increase in the policy rate as the bank tries to avoid higher payments to depositors in order to reduce costs. Lending rates also move rigidly downward after a decrease in the official rate as banks attempt to maintain their revenue and defend their profit margins. The adverse customer reaction hypothesis argues that banks will aim at maintaining their market power by giving their customers favourable terms such as not reducing deposit rates after a reduction in policy rates; or not raising lending rates after an increase in the policy rate.

Quality of Institutions: Mishra and Montiel (2012) argues that a good institutional and regulatory environment helps to strengthen the interest rate transmission mechanism as commercial banks' intermediation costs get reduced on account of quality contract enforcement and reduced levels of asymmetric information.

Overall, IRPT is expected to be faster in sound banking systems and strong economies. This is because when the economy is weak and when risk aversion and information costs rise, the banks could be reluctant to lend

(Archer and Turner, 2006). Moreover, when the health of the financial system is not sound, financially weak banks may respond to expansionary monetary policies by raising their capital, or increasing their provisioning through accumulation of liquidity rather than extending credit, (IMF, 2010).

4.2.3 Empirical literature review

There are a host of studies on interest rate pass-through most of which have been conducted on developed countries since early 1990s. IRPT studies for developing countries started emerging during the late 2000s. In general, the results of the studies have reflected differences in the size, speed and nature of the pass through across countries, time periods and types of products. The variation in the results are found in all regions, within and across the advanced countries, emerging economies and developing countries. In addition to the above factors that affect the adjustment of interest rates, Sander and Kleimeier (2004) also attributes the diversity in the findings to differences in methods especially in the choice of endogenous and exogenous variables across the studies and the design of the analysis. Table 4.1 on the next two pages provide a list of the studies on IRPT.

In advanced countries, one of the oldest studies was conducted by Cottarelli et al (1995) for Italy using error correction models. The sample period was from June 1986 to December 1993. He examined the IRPT from

the discount rate to the lending rate. The study found that the pass through of changes in the discount rate was incomplete in the short run as only 7 % of the change in the discount rate was transmitted to the lending rate. However, in the long run, the transmission was nearly complete at 92 %.

Table 4.1: Studies on Interest Rate Pass Through

Authors	Country	Method & Sample	Policy Rate	Market Rate	Main Findings
Advanced Countries					
Cottarelli et al (1995)	Italy	ECM; 1986M6 to 1993M12	Discount Rate	Lending Rate	Incomplete SRPT (0.07) but nearly complete LRPT (0.92).
Sander and Kleimeier (2004)	Euro zone countries	VAR and VECM; 1993M1 to 2002M10	overnight money market rate and other different rates	Deposit and lending rates	Asymmetric adjustment in most countries. Size of IRPT varies across countries, competition increases pass through to deposit rates.
De Bondt (2005)	Euro area	VECM and VAR; 1996M1 to 2001M5	Overnight interest rate	Deposit and lending rates	Incomplete SRPT for all rates. LRPT is complete for lending rates only. In general, IRPT is faster since the introduction of the euro.
Sorensen and Werner (2006)	Euro zone countries	DSUR; 1999M1 to 2004M12	Various market rates	4 lending rates and 3 deposit rates	High heterogeneity of LRPT and speed of adjustment. Showing no integration of the banking market.
Egert et al (2007)	5 CEE and 3 Euro countries	DOLS, ARDL, EG Cointegration.	Each country's policy rate	Money market rate, lending and deposit rates	IRPT is incomplete for lending and deposit rates, but almost complete for the money market rates. It is larger in CEE than Euro countries but also varies across countries and over time. They also find weak evidence of asymmetric adjustments.
Marrotta (2009)	UK and 9 EMU countries	EG cointegration, ARDL and DOLS; 1994M1 to 2003M9	Interbank rate	Lending rate	Asymmetric adjustment in France and Netherlands. IRPT is incomplete and the sizes vary across the countries.
Kwapil and Schaler (2009)	Euro area and USA	EG cointegrating and ARDL; 1995M1 to 2003M3	3 months money market rate	Deposit and lending rates	In USA, the SRPT and LRPT to the deposit rates is complete whilst in the Euro area is incomplete. SRPT to lending rate is also lower in the Euro area (30.4%) than the USA (56%) but the LRPT is the same at 73% in both regions.

Source: Compiled by Author

...Table 4.1 continued

Authors	Country	Method & Sample	Policy Rate	Market Rate	Main Findings
Emerging Markets					
Jankee (2005)	Mauritius	TAR and M-TAR; 1998 to 2003	Interbank market rate	Lending and deposit rates	Asymmetric adjustments in LRPT for lending rates that was explained by adverse customer reaction hypothesis.
Wang and Lee (2009)	9 Asian countries and USA	Threshold cointegration and EGARCH (1,1); 1998M2 to 2000M12	Money market, interbank and federal funds rates	Deposit and lending rates	Asymmetric PT due to collusive pricing in both lending and deposit rates for Asian countries. IRPT is complete for deposit rates in the USA but incomplete in all rates in Asia.
Aziakpono and Wilson (2013)	South Africa	ARDL, Asymmetric ECM; 1980 o 2007	Bank rate	Deposit rates, lending rates, T-bill rate, govt bond yield	High speed of IRPT during periods of market-oriented reforms. High SRPT in the deposit market despite high concentration of the system. Adjustment is asymmetric showing collusive pricing.
Developing Countries					
Misati et al (2011)	Kenya	Engle-Granger 2 Step procedure; 1993M7 to 2010M9	Interbank market , 91 day treasury bills and repo rate	Average lending and deposit rates	Incomplete IRPT to the lending with a maximum of 7% and 33% in the short and long run, respectively. For deposit rates, the maximum for the SRPT is 14% whilst for LRPT is 18%.
Sheefeni (2013)	Namibia	ARDL ECM; 1998m1 to 2012m12	Interbank, 91 day treasury bill, repo rates	average lending and deposit rates	Incomplete SRPT and LRPT. For the lending rates the SRPT ranges from ranges between 0.4 and 13.6 % whilst LRPT 73.3 % and 76.2 %. SRPT to deposit rates 26.0% and 45.2 % and LRPT is nearly complete ranging from 88.9% to 92.6 %.
Morales and Raei (2013)	EAC countries	ARDL; 2000M1 to 2012M12	Discount and 91 day treasury bills rate	Deposit and lending rates	Pass through has improved in Kenya and Uganda since June 2011 but remain incomplete.
Okello (2014)	Uganda	EG-cointegration; 2005M1 to 2014M5	7 day interbank rate	Lending, deposit and treasury bills rate	Incomplete pass through(PT) to lending and deposit rates. The average PT to lending rates is 43% and lower than to deposit rates, 58%.

Source: Compiled by Author

Sander and Kleimeier, (2004) used vector auto regression (VAR) and VECM models to analyse interest rate pass through in ten countries from the Euro zone. They use both monetary and cost of funds approaches. For the monetary approach, the overnight money market rate is the exogenous variable and various lending and deposit rates are included as endogenous variables. The results provide evidence for asymmetric adjustment in most countries, heterogeneity in the IRPT across the countries, and that IRPT changed over time. The study also included structural determinants of the pass through and found that ”competition, banking market integration, a stable monetary policy regime, a more homogeneous growth performance etc. are important variables for homogenizing the pass-through and thus monetary transmission in the euro zone” Sander and Kleimeier (2004; p.490).

Similar studies that have provided evidence of heterogeneity of IRPT across advanced countries include Sorensen and Werner (2006), Egert et al (2007)and Marrotta (2009) for the Euro area. Kwapil and Schaler (2009) compared USA and Euro area's IRPT of the 3 months money market rate to the deposit and lending rates. Their study used the Engle- Granger (EG) cointegrating model and auto regressive distributed lag (ARDL) model for the period of 1995 to 2003. The results indicated that in the USA the short run pass through to the deposit rate was nearly complete (an average of

97%) and the long run pass through was complete (an average of 101%). However, in the Euro area, average SRPT to deposit rate was 42.8% and LRPT to the deposit rate was 58%. In both regions, the LRPT to lending rates averaged 73% but the SRPT was higher in the USA (56%) than in the Euro area (30.4%).

In another study for the Euro area, De Bondt (2005) provided further evidence that IRPT can change over time. His study used VECM and VAR models for analysing the IRPT of the overnight interest rate to deposit and lending rates using monthly data for the period of 1996 to 2001. The results showed that the pass through from the overnight interest rate to deposit and lending rates was faster since the introduction of Euro. The results also indicated that the SRPT was incomplete for all rates but complete for the lending rate.

In addition to the above evidence on presence of asymmetries, Scholnick (1996) provided further evidence from Malaysia and Singapore. He used co-integration and error correction models in the investigation of the response of deposit rates to changes in the policy rate in Malaysia and Singapore. His results showed asymmetric adjustments in both markets that were explained by collusive pricing by banks as deposits were more rigid when the policy rate was adjusted upwards than downwards.

Karagianis et al (2010) found mixed results for Greece, Bulgaria and

Slovenia. They found symmetric adjustments for both lending and deposit rates in Greece whilst in Bulgaria and Slovenia, they found evidence for adverse customer reaction hypothesis with respect to the loan rates as banks seemed to be rigid in passing increases to their customers. Furthermore, in Slovenia, they also found collusive pricing behaviour in deposit rates as banks were reluctant to pass on reductions in deposit rates.

Jankee (2005) examined how changes in inter-bank market rate were transmitted to lending and deposit rates during the period of 1998 to 2003 in Mauritius using TAR and M-TAR models. In addition to very low and incomplete long run pass through, he finds evidence for asymmetric adjustments in the lending rates that was explained by the adverse customer reaction hypothesis. Wang and Lee (2009) assesses IPT in the USA and nine Asian countries. They report evidence for asymmetries in Hongkong, Taiwan and the Phillipines. The asymmetries are explained by collusive pricing behavior by banks as rates on deposits are rigid on upward adjustments and also reluctant to adjust the lending rates downwards.

Aziakpono and Wilson (2013) conducted an assessment on how changes in the central bank's policy rate get transmitted to six market interest rates in South Africa. They used cointegration and asymmetric ECM models on a sample from 1980 to 2007 and rolling windows analysis to assess the evolution of IPRT over time. Their results generally suggested that IRPT

improved after adoption of inflation targeting in 2000 in South Africa and also showed evidence for asymmetric adjustments in both the credit and deposit markets. The results further indicated that over time, banks in South Africa started to be sensitive to customers' reaction in the credit market. The banks were quick to adjust the lending rates downward than upward. To the contrary, the deposit market was characterised by collusive pricing as the deposit rates were found to be rigid in moving upwards than downwards.

Dube and Zhou (2014) employed autoregressive distributed lag (ARDL) and fully modified least squares (FMLS) models to examine the pass through of the repo rate and treasury bill rate to commercial bank rates and participation mortgage bond rate for the period of January 1998 to January 2011. Results from the ARDL model show over shooting of the pass through from the repo and treasury bill rates to the commercial bank rates. The LRPT of the repo rate to bank rates range from 83% to 121% and the LRPT of the treasury bill rate to participation mortgage bond rate range from 100% to 129% . They attribute the overshooting of the IRPT to developments in the exchange rate market which resulted to increases in all prices in the economy.

Evidence on IRPT from developing countries is provided by Samba and Yan (2010) on the Central African Economic and Monetary Community (CAEMC). Their study assessed the pass through of the central bank's

policy rate to lending and deposit rates using ARDL models for the period of 1990 to 2007. The results showed that the SRPT to lending rates was higher than deposit rates and the LRPT to deposit rates was incomplete but portrayed an overshooting effect on lending rates. In their discussions of the results, Samba and Yan argue that the above results were on account of an under-developed financial markets with excess liquidity and low levels of competition in the banking which lead to incomplete pass through to the deposit rates. They also attributed the overshooting effect on the lending rates to high levels of risk in the market an argument similar to De Bondt (2005).

Misati et al (2011) also provide evidence for incomplete pass through in Kenya for the period of July 1993 to September 2010. Their study examined the pass through of the inter-bank market rate, 91 days Treasury bills rate and repo rate to lending and deposit rate using Engle-Granger 2 step procedure. On the lending rate, short run pass through (SRPT) ranged from -0.08 to 0.07 and the long run pass through (LRPT) ranged between 0.07 to 0.33. The IRPT to the deposit rate was also incomplete and lower than the lending rate's as it ranged between (0.02 to 0.14) in the short run and (0.05 to 0.18) in the long run. Sheefeni (2013) found that in Namibia, SRPT and LRPT to deposit rates nearly complete as the coefficients ranged from 88.9% to 92.6%. On the side of lending rates, LRPT ranged from 73.3% to 76.2%. The SRPT was also

higher in deposit rates (26.0% to 45.2%) than lending rates (0.4% to 13.6%).

Morales and Raei (2013) examined the pass through of the central bank's discount rate and the 91-days Treasury bills rate to commercial banks' deposit and lending rates in the EAC region. They employed the ARDL model on data from January 2000 to February 2012. The results suggested that the pass through of the discount rate to lending and deposit rates has improved over time in Uganda and Kenya. In the investigations of the evolution of the IRPT this study used two sample periods by imposing a break point of June 2011 in the series that related to the period when Uganda and Kenya changed from targeting quantities to prices. They attribute the improvement in the IRPT to adoption of monetary policy frameworks that provide policy signals clearly to market participants.

Okello (2014) investigated the IRPT in Uganda using Engle-Granger cointegration method for the period of January 2005 to May 2014. The study focused on IRPT from the 7-days inter-bank rate to lending, deposits and Treasury bills rates. The results suggest that the IRPT to the lending rate has improved over time as it was statistically not different from zero before the adoption of inflation targeting framework lite regime, and 30 % after the adoption of the regime. The results for the whole sample shows that IRPT to lending rates is incomplete at 43 % and lower than the pass-through to time deposit rates which ranged from 56 to 60 %. He attributed the incomplete

pass through to low levels of competition in the banking sector and recommended for policies that increase competition.

4.2.4 Contribution to Literature

The reviewed literature presents mixed results in completeness of IRPT. The size of IRPT is different between the lending and deposit rates, or short and long run. In some cases IRPT is symmetric whilst in others, it is asymmetric. Some studies also show that IRPT can change over time. This shows the importance of empirical studies of IRPT to get specific results which can guide authorities appropriately in every country. The literature also provide different results across countries and regions. Notably, most studies on IRPT that provide comparison across countries are for advanced countries. This chapter seeks to contribute to the literature by providing comparable results of central bank's policy rate pass through to commercial bank's average lending and deposit rates for countries in the sub-Saharan Africa focusing on the COMESA-EAC-SADC region. Comparability is achieved through the choice of the same exogenous and endogenous variables across the countries.

The above literature also indicates that most studies in the region mainly focused on the assessment of the completeness hypothesis. In addition to the size of the pass through, this study examines the evolution of the IRPT over

time and whether there are asymmetric adjustments in the commercial banks' interest rates. As such, our approach largely follows Aziakpono and Wilson (2013) on South Africa which was conducted on a sample period of 1980 to 2007. Since South Africa is also included in this study, our results provide updated information on the IRPT in this country as our sample period is up to 2015.

This chapter also provides updated evidence on evolution of IRPT in Uganda and Kenya. Morales and Raei (2013) investigated the evolution using a sample from January 2000 to February 2012 and in their analysis, they determined the structural break apriori in June 2011. The problem of imposing a single break point to all countries is that it might not be applicable in other countries a fact previous researchers such as Sander and Kleimeier (2004) have argued against. Our approach in the investigation of evolution of IRPT is different as it does not impose any break points but use recursive analysis to assess if the size has changed.

4.3 Econometric Model and Data

4.3.1 Econometric Model

Size of Pass Through (Completeness)

Conventionally, most studies use the auto regressive distributed lag (ARDL) model as presented in equation 4.6 below;

$$rr_t = \alpha_0 + \beta_0 pr_t + \Sigma_{i=1}^{n} \beta_i pr_{t-i} + \Sigma_{j=1}^{m} \delta_j rr_{t-j} + \epsilon_t \tag{4.6}$$

where rr_t is the commercial bank retail rate (either average lending rate or deposit rate) and pr_t is the central bank's policy rate, n and m are number of lags of the independent and dependent variables, respectively. Equation 4.6 is used if the series are stationary at levels or I(1) with cointegration.

If the variables are I(1) variables but without cointegration, the following equation is used in order to avoid spurious regression.

$$\Delta rr_t = \beta_0 \Delta pr_t + \Sigma_{i=1}^{n} \beta_i \Delta pr_{t-i} + \Sigma_{j=1}^{m} \delta_j \Delta rr_{t-j} + \epsilon_t \tag{4.7}$$

where the symbol, Δ, represents the first difference of the relevant variable. Although equation 4.7 solves the problem of spurious regression, it loses information on the long run relationship. However, if rr_t and pr_t are cointegrated, the information on long run relationship is extracted from a

conditional error form as presented in equation 4.8.

$$\Delta rr_t = \beta_0 \Delta pr_t + \Sigma_{i=1}^{n} \beta_i \Delta pr_{t-i} + \Sigma_{j=1}^{m} \delta_j \Delta rr_{t-j} + \phi \mu_{t-1} + \epsilon_t \qquad (4.8)$$

In equation 4.8, μ_{t-1} is the error correction term which measures the deviation from the long-run equilibrium. It is obtained from the residual of the cointegration equation 4.9 which gives the long-run relationship between the policy rate and the market rate. The parameter, ϕ, is known as the adjustor.

$$rr_t = \alpha + \lambda pr_t + \mu_t \qquad (4.9)$$

When equation 4.8 is used, the value of the long-run pass (LRPT) can be obtained directly from equation 4.9 by the multiplier , λ. Otherwise, when equations 4.6 and 4.7 are used, the long run pass through, λ, is calculated using the following formula from Banerjee et al (1993).

$$\lambda = \frac{\beta_0 + \Sigma_{i=1}^{n} \beta_i}{1 - \Sigma_{j=1}^{m} \delta_j} \qquad (4.10)$$

In all equations 4.6, 4.7 and 4.8, the value of the instantaneous pass through is given by β_0. Other studies that have used this method include Sander and Kleimeier (2004), Kwapil and Schaler (2006) and Aziakpono and Wilson (2013).

Asymmetric Adjustment

Asymmetric analysis is important as it shows whether the response to changes in market rate is based on the direction of the adjustment of the policy rate. We follow Aziakpono and Wilson (2013) to determine the nature of the adjustment depending on whether the market rates are above or below equilibrium level. We therefore split the series of the residuals μ from the cointegrating equation 4.9 into two, μ^+ and μ^- as follows;

$$\mu^+ = \mu \text{ if } \mu > \overline{\mu} \text{ and; } \mu^+ = 0 \text{ if } \mu < \overline{\mu}$$

$$\mu^- = \mu \text{ if } \mu < \overline{\mu} \text{ and; } \mu^- = 0 \text{ if } \mu > \overline{\mu}$$

where $\overline{\mu}$ is the mean of residuals in equation 4.4. The asymmetric specifications are introduced as separate variables (in the form of dummy variables) in the error correction model. Equation 4.11 is therefore a modified version of equation 4.8 as it includes the dummies.

$$\Delta rr_t = \beta_0 \Delta pr_t + \Sigma_{i=1}^{n-1} \beta_i \Delta pr_{t-i} + \Sigma_{j=1}^{m-1} \delta_j \Delta rr_{t-j} + \phi_1 \mu_{t-1}^+ + \phi_2 \mu_{t-1}^- + \epsilon_t \tag{4.11}$$

where ϕ_1 and ϕ_2 are the coefficients of the error correction term when the interest rate is above and below equilibrium, respectively. The presence of asymmetries is tested using Wald test on the restriction that $\phi_1 = \phi_2$ in equation (4.11). If equality is accepted, this implies no asymmetries, while

rejection of equality points to existence of asymmetries. We further follow Scholnick (1996), as well as Doornik and Hendry (1994) to calculate the length of time for the adjustment to be complete using mean lags (ML) as presented in equations 4.12 and 4.13;

$$ML^{+} = (1 - \beta_0)/\phi_1 \qquad (4.12) \qquad ML^{-} = (1 - \beta_0)/\phi_2 \qquad (4.13)$$

The mean lags (ML^{+}) and (ML^{-}) are the asymmetric adjustment lags in the commercial bank's retail interest rates if they are above and below their equilibrium, respectively. In both cases, a high ML implies slow adjustment of the retail interest rates in response to changes in the official rate. If $ML^{+} > ML^{-}$, it suggests that banks are quicker to adjust their rates downwards than they are to adjust them upwards, while if $ML^{-} > ML^{+}$, means that banks would adjust their rates upwards faster than they are to adjust them downwards. According to usual practice in literature , the analysis of asymmetries is conducted on cointegrating equations only. This is because the analysis uses error correction models (Aziakpono and Wilson, 2013; Egert, 2007).

Evolution of the IRPT

We use recursive window analysis in order to assess the evolution of the pass through in each country and per each market rate. This method of analysis is employed firstly, in order to find out if the pass through has changed over time and also to identify periods that registered asymmetric adjustments as explained in the previous section. The first window includes 40 quarters. This width was chosen in order to avoid having a very short time period at the start of the analysis as the study uses time series analysis which favours a long sample period.

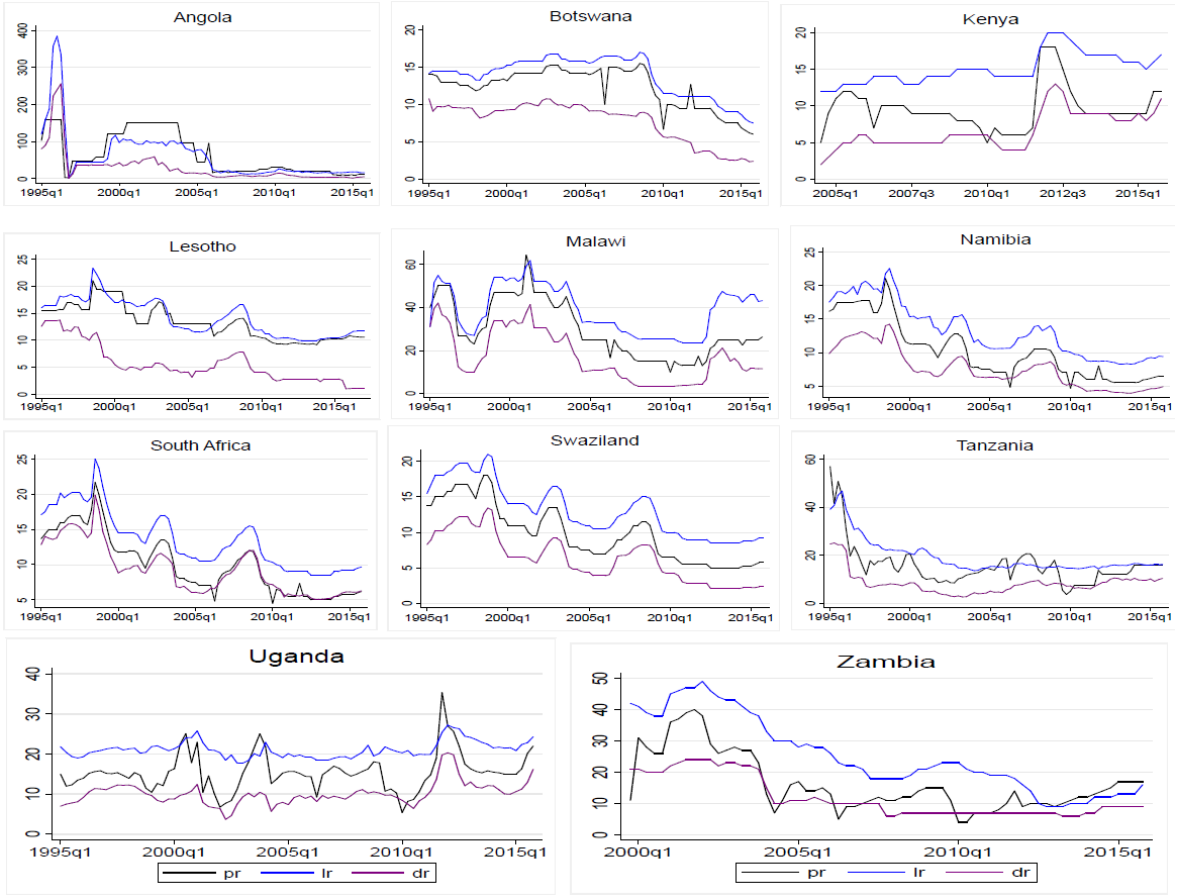
4.3.2 Data

The exogenous variable is the policy rate (pr) used by the central banks to signal the stance of monetary policy. The endogenous variables are average lending rate (lr) and average deposit rates (dr). The source of the data is the International Financial statistics (IFS) database that is compiled by the International Monetary Fund (IMF). The data were accessed through the Datastream. The data are in quarterly observations and runs from 1995 quarter 1 to 2015 quarter 4 for most countries except Kenya (starts from 2004 quarter 3.) and Zambia (from 1999 quarter 4). Summary statistics are provided in Table 4.7 in the appendix.

Figure 4.1 entitled, *Interest Rates by Country*, provides a graphical

presentation of the policy rate (pr), lending rate (lr) and deposit rate (dr) in each country during the period under review. In general, the graphs show that the lending rates and deposit rates have been following the trend of the policy rates.

Figure 4.1: Interest Rates by Country (1995 - 2015) in percent per annum



Time Series Properties

We conduct unit root and cointegration tests to assess the time series properties of the data. Table 4.2 presents results for the degree of stationarity that were examined using the Augmented Dickey Fuller test. It shows that in all countries, all series are integrated of order one $\{I(1)\}$ except in Tanzania and Uganda. The policy rate and the average lending rate in Tanzania are stationary $\{I(0)\}$ and in Uganda the deposit rate is I(0) whilst the policy rate is I(1).

Table 4.2: Augmented Dickey Fuller Unit Root Tests

	Policy Rate		**Lending Rate**		**Deposit Rate**	
	Level	1st difference	Level	1st difference	Level	1st difference
Angola	-1.948	-10.101***	-2.267	-5.462***	-2.590	-6.464***
Botswana	-1.309	13.29***	-1.493	-4.93***	0.4	-8.45**
Kenya	-2.758	-6.057***	-1.354	-3.376***	-1.396	-2.734*
Lesotho	-1.443	-9.774***	-1.196	-7.210***	-1.523	-7.772***
Malawi	-1.545	-8.209***	-1.683	-8.153***	-1.565	-6.695***
Namibia	-1.376	-7.727***	-0.93	-7.027***	-0.878	-5.265***
South Africa	-1.167	-7.111***	-1.084	-6.058***	-1.332	-6.784***
Swaziland	-0.919	-5.135***	-0.731	-4.500***	-0.715	-4.729***
Tanzania	-5.505***		-1.946	-6.218***	-3.480***	
Uganda	-3.64***		-2.485	-8.972***	-2.232	-6.633***
Zambia	-1.849	-6.79***	-0.658	-5.393***	-1.068	-5.437***

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 4.3 presents results for cointegration tests using Engle Granger, Johansen and ARDL Bounds techniques. Cointegration was confirmed in the lending rate equations for Angola, Botswana, Namibia, South Africa,

Swaziland and Tanzania and deposit rate equations for Angola, Malawi, Namibia and South Africa.

Table 4.3: Cointegration Test Results

		Johansen (Trace)		Engle Granger 2 Step	ARDL Bounds		Decision
		r=0	r=1	t-stat	F-stat	t-stat	
Angola	lr			-3.029**	30.2	-7.712	Cointegrated
	dr			-2.684*	12.3	-4.938	Cointegrated
Botswana	lr	34.259	0.005**	-5.12**	12.163	-4.443	Cointegrated
	dr	10.811**	0.435	-4.33**	0.808	-1.136	No
Kenya	lr	15.437	1.675**	-1.44	1.792	-1.846	No
	dr	19.869	0.667**	-2.42	1.495	-1.414	No
Lesotho	lr	14.044*		-3.065	2.861	-2.369	No
	dr	13.774*		-2.082	2.725	-1.643	No
Malawi	lr	9.546**		-1.73	2.698	-2.029	No
	dr	30.488	7.213	-3.25	12.615	-4.678	Cointegrated
Namibia	lr	20.815	2.219**	-3.38**	8.860	-4.126	Cointegrated
	dr	14.2418**		-1.79	5.466	-3.283	Cointegrated
South Africa	lr	26.497	3.026**	-4.54**	10.900	-4.635	Cointegrated
	dr	15.289**		-3.62**	5.952	-3.215	Cointegrated
Swaziland	lr	39.0325	2.4582*	-5.810***	16.244	-5.693	Cointegrated
	dr	11.3182*		-3.595**			
Tanzania	lr	31.438	14.721	-0.43	43.548	-7.527	Cointegrated
	dr	21.011	6.239	-1.72	2.210	-1.961	No
Uganda	lr	33.631	9.403	-1.87	5.700	-3.226	No
	dr	22.714	8.623	-1.17	3.468	-2.625	No
Zambia	lr	14.776**		2.55	4.712	-2.695	No
	dr	21.449	7.058	1.7	5.69	-3.339	No

** $p < 0.05$; Critical Values for Johansen $r = 0$ is 15.41; $r = 1$ is 3.76; and for Engle Granger is -3.37. For Bounds Test the Critical Values are 5.73 for F-stat and -3.22 for t-stat. No means the decision is that the series are not cointegrated.

4.3.3 Estimation Procedure

The econometric analysis *firstly* estimates the size of the pass through coefficients in each country and for each type of rate to assess the completeness. In total, we estimate 22 equations thus 11 equations per retail

rate. As explained under the section entitled econometric model and also based on the results for unit root and cointegration tests, *equation 4.6*, the ARDL model in levels, was used for estimating pass through to the deposit rate in Tanzania because the policy rate and deposit rate series were stationary in levels but not cointegrated with each other.

Equation 4.7, the ARDL model in first differences, was applied in estimating the pass through to the lending rate in Kenya, Lesotho, Malawi, Uganda and Zambia. The same model was employed for estimating pass through to the deposit rates in Botswana, Kenya, Lesotho, Uganda and Zambia. This is because the series were found to be integrated of order one I(1) but not cointegrated with the policy rate. In both cases, equation 4.10 was used for the calculation of the long run pass through (LRPT) and the standard errors are based on the delta method.

Equation 4.8, the error correction model, was used for lending rate equations of Angola, Botswana, Namibia, South Africa, Swaziland and Tanzania as this variable was cointegrated with the policy rate and both are I (1). This equation was also used for estimating the pass through to the average deposit rate in Angola, Malawi, Namibia and South Africa for the same reasons. In all cases, the number of lags were chosen empirically using the *Akaike Information Criteria.*

Secondly, all models are subjected to recursive window analysis in order

to examine the evolution of the pass through over time. *Thirdly*, we conduct asymmetric analysis for all retail rates that are cointegrated with the policy rates. This analysis uses *equation 4.11.* The countries that were subjected to the asymmetric analysis on their lending rate equations are Angola, Botswana, Namibia, South Africa, Swaziland and Tanzania. On the deposit rate equations, the countries include Angola, Malawi, Namibia and South Africa. Where asymmetric adjustment is confirmed, the results are explained with reference to collusive pricing arrangements and adverse customer reaction hypotheses as defined in the literature review.

4.4 Results

We find heterogenous responses of average lending and deposit rates to changes in the central bank's policy rate across the countries in the COMESA-EAC-SADC region. The differences are mainly explained by the diversity in macroeconomic conditions, levels of financial development and the conduct of monetary policy among the countries.

4.4.1 Size of policy rate pass through to average lending Rates

Table 4.4 summarises [3] results for the econometric analysis on policy rate pass through to the lending rate. The results indicate differences in the sizes of the adjustor, short and long-run pass through across the countries.

Short Run Pass Through (SRPT) to the lending rate

In all countries the SRPT is incomplete but statistically significant except in Tanzania. The values of the SRPT are heterogeneous ranging from 10.5% to 75.1% when Tanzania is excluded. The SRPT is less than 50% in 7 out of the 11 countries. This shows that the banks are reluctant to pass on the changes in the policy rate to their lending rates in the short run. The results suggest that the SRPT is the highest in South Africa where 75.1% of the shock in

[3] Detailed Results are in Appendix tables 4.8 and 4.9

Table 4.4: Policy Rate Pass Through to Lending Rate

	Angola	Botswana	Kenya	Lesotho	Malawi	Namibia	SA	Swaziland	Tanzania	Uganda	Zambia
SRPT	0.385***	0.196**	0.205**	0.574***	0.593***	0.414***	0.751***	0.562***	0.012	0.105***	0.308***
	(0.07)	(0.04)	(0.07)	(0.21)	(0.11)	(0.05)	(0.05)	(0.03)	(0.04)	(0.04)	(0.10)
	82.78	*402.20*	*123.57*	*4.12*	*14.93*	*131.13*	*33.67*	*177.29*	*706.06*	*576.27*	*45.57*
	[0.00]	[0.00]	[0.00]	[0.04]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Adj	-0.276***	-0.18***				-0.326***	-0.604***	-0.623***	-0.199***		
	(0.03)	0.04				(0.08)	(0.13)	(0.11)	(0.03)		
LRPT	0.717***	1.084***	0.397***	0.682***	0.802***	0.973***	0.963***	0.939***	0.166	0.36***	0.505***
	(0.09)	(0.08)	(0.09)	(0.16)	(0.11)	(0.04)	(0.02)	(0.01)	(0.12)	(0.06)	(0.14)
	9.64	***1.08***	*46.78*	*17.56*	*8.10*	***0.62***	***3.48***	*44.89*	*50.06*	*122.32*	*12.88*
	[0.00]	**[0.30]**	[0.00]	[0.00]	[0.03]	**[0.43]**	**[0.07]**	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.86	0.48	0.70	0.46	0.67	0.66	0.82	0.94	0.69	0.39	0.42
Model	ECM	ECM	BASIC	BASIC	BASIC	ECM	ECM	ECM	ECM	BASIC	BASIC

Robust Standard Errors in Parenthesis; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SRPT is short run pass through $(\widehat{\beta_0})$ and LRPT is the long run pass through $(\widehat{\lambda})$. Adj implies the adjustor $(\widehat{\phi})$. This is the coefficient of μ_{t-1} in equation 4.8. Statistics in italics are F or $Chi-square$ statistics for the testing completeness hypothesis. The null is that the parameters for SRPT or LRPT, β_0 or λ, respectively is satisically equal to 1 and the $P-Values$ for this test are in the square brackets. ECM means equation 4.8, the error correction model whilst BASIC means equation 4.7 the ARDL model in first differences. For the Basic ARDL model, the standard errors for the long-run pass-through are calculated according to the delta method (Greene, 2000, p.330).

the policy rate is transmitted to the average lending rate in the short run. The statistics in italics are $F-Statistics$ for testing the completeness hypothesis. For the SRPT, the null is that β_0 is equal to 1. Using the 0.05 significance level, the results suggest that the SRPT of the policy rate to lending rate is statistically incomplete in all countries.

The Adjustor (Coefficient for the Error Correction Term)

The adjustor, ϕ, has the correct sign and is highly significant in all countries where cointegration was confirmed. The countries are Angola, Botswana, Namibia, South Africa and Tanzania. This confirms that long run forces are in operation of restoring equilibrium after a shock in the policy rate. The

speed of restoring the equilibrium is fast in Swaziland where 62.3% of the imbalance is corrected in the next period whilst Botswana has the lowest speed of 18.0%.

Long Run Pass Through (LRPT) to the lending rate

Botswana, Namibia and South Africa record the highest LRPT of 108%, 97.3% and 96.3%, respectively (refer to Table 4.4). Furthermore, the results suggest that the LRPT is complete as we fail to reject the null hypothesis that λ is equal to 1. According to macroeconomic and financial background presented in the previous chapter, the outcomes for these countries are as expected. This is because their financial systems are relatively more developed than in the other countries as shown in Tables 2.1 and 2.2 of chapter 2.

Angola and Malawi's LRPT to the average lending rates are 71.7% and 80.2%, respectively, whilst the other countries except Zambia record less than 50%. Angola and Malawi's results are interesting as both countries have unfavourable macroeconomic and financial conditions almost in all indicators and for the whole sample period (refer to Tables 2.1 and 2.2 in chapter 2). Therefore, according to the literature, their policy rate pass

through was expected to be low. The high LRPT to lending rate in these countries could be explained by high inflation which causes prices to change fast. It may also reflect the prevalence of high risks in the credit market that are associated with unstable macroeconomic conditions. In such an environment banks would calculate high risk premiums and incorporate them in the loan prices (Sander and Kleimeier, 2004; De Bondt 2002; 2005).

Results for Kenya suggest that the LRPT is incomplete and low at 39.7% despite the country having relatively high levels of financial development. These results are similar to the findings by Misati et al (2011) who attributed the stickiness of the interest rate to inefficiencies in the banking system that are associated with high concentration in the banking market.

The results for Tanzania are statistically insignificant and very low (1.2% SRPT and 16.6% LRPT.) These findings are in line with our results in chapter 3 and also Davood et al (2013) both of which showed that the interest rate channel is very weak in Tanzania because of capital controls, low levels of financial development and a framework that targets monetary aggregates.

4.4.2 Size of the policy rate pass through to deposit rates

Table 4.5 summarises[4] results for the econometric analysis on policy rate pass through to the deposit rate. It shows that the size of the pass through differ across the countries. The results also suggest that the short and long-run pass through of the policy rate to the deposit rate is incomplete in all countries except for Swaziland's long run pass through.

Table 4.5: Policy Rate Pass Through to Deposit Rate

	Angola	Botswana	Kenya	Lesotho	Malawi	Namibia	SA	Swaziland	Tanzania	Uganda	Zambia
SRPT	0.464***	0.109**	0.202***	0.198***	0.608***	0.31***	0.675***	0.532***	0.207**	0.279***	0.181*
	(0.06)	(0.05)	(0.02)	(0.06)	(0.06)	(0.04)	(0.06)	(0.09)	(0.08)	(0.04)	(0.09)
	80.66	*364.09*	*132.38*	*189.33*	*47.24*	*361.17*	*33.67*	*28.73*	*98.70*	*407.31*	*82.11*
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Adj	-0.203***				-0.374***	-0.198***	-0.269***				
	(0.04)				(0.08)	0.06	(0.08)				
LRPT	0.337***	0.256**	0.435***	0.316***	0.777***	0.684***	0.766***	0.91***	0.429***	0.425***	0.356**
	(0.12)	(0.11)	(0.06)	(0.11)	(0.05)	(0.05)	(0.06)	(0.05)	(0.11)	(0.08)	(0.16)
	6.86	*89.69*	*63.87*	*36.16*	*22.27*	*47.59*	*16.73*	***3.54***	*25.04*	*59.57*	*17.00*
	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	**[0.06]**	[0.00]	[0.00]	[0.00]
R^2	0.78	0.36	0.77	0.33	0.67	0.70	0.73	0.87	0.54	0.62	0.43
Model	ECM	BASIC	BASIC	BASIC	ECM	ECM	ECM	BASIC	BASIC	BASIC	BASIC

Robust Standard Errors in Parenthesis; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; SRPT is short run pass through $(\widehat{\beta_0})$ and LRPT is the long run pass through $(\widehat{\lambda})$. Adj implies the adjustor $(\widehat{\phi})$. This is the coefficient of μ_{t-1} in equation 4.8. Statistics in italics are F or $Chi-square$ statistics for the testing completeness hypothesis. The null is that the parameters for SRPT or LRPT, β_0 or λ, respectively is satisically equal to 1 and the $P-Values$ for this test are in the square brackets. ECM means equation 4.8, the error correction model whilst BASIC means equation 4.7 the ARDL model in first differences. For the Basic ARDL model, the standard errors for the long-run pass-through are calculated according to the delta method (Greene, 2000, p.330).

Short Run Pass Through (SRPT)

The coefficient of the SRPT is statistically significant in all the countries. In terms of size, we find that the SRPT to the deposit rate is less than 50 % in

[4]Detailed results are in tables 4.10 and 4.11 in the appendix.

all countries except for South Africa (67.5%), Malawi (60.8%) and Swaziland (53.2 %). The SRPT to the deposit rate is very low in Botswana at 10.9%.

The adjustor(The coefficient of the error correction term)

The coefficient of error correction term, ϕ, is statistically significant in all the countries that used the error correction model (Angola, Malawi, Namibia and South Africa). The results show that the disequilibrium gets corrected faster in Malawi as the value of the adjustor is the highest at 37.4%. In South Africa the size of the adjustor is 26.9% this shows that in this country, the speed of reverting to the long run equilibrium is slower in deposit rates than in lending rates (60.4%).

Long Run Pass Through (LRPT)

Swaziland, Malawi, South Africa and Namibia record relatively large LRPT of the shocks in the policy rate of the deposit rates of 91.0%, 77.7%, 76.6% and 68.4%, respectively. Nonetheless, in all countries, results for completeness test reject the null hypothesis that the LRPT, (λ), is equal to 1 except for Swaziland. In the other countries, the pass through is below 50% with Botswana recording the lowest at 25.6%. Unlike the low and insignificant results on IRPT to lending rate in Tanzania, the results on

deposits are statistically significant. The LRPT for Tanzania is 42.5% and compares well with results for most of the countries.

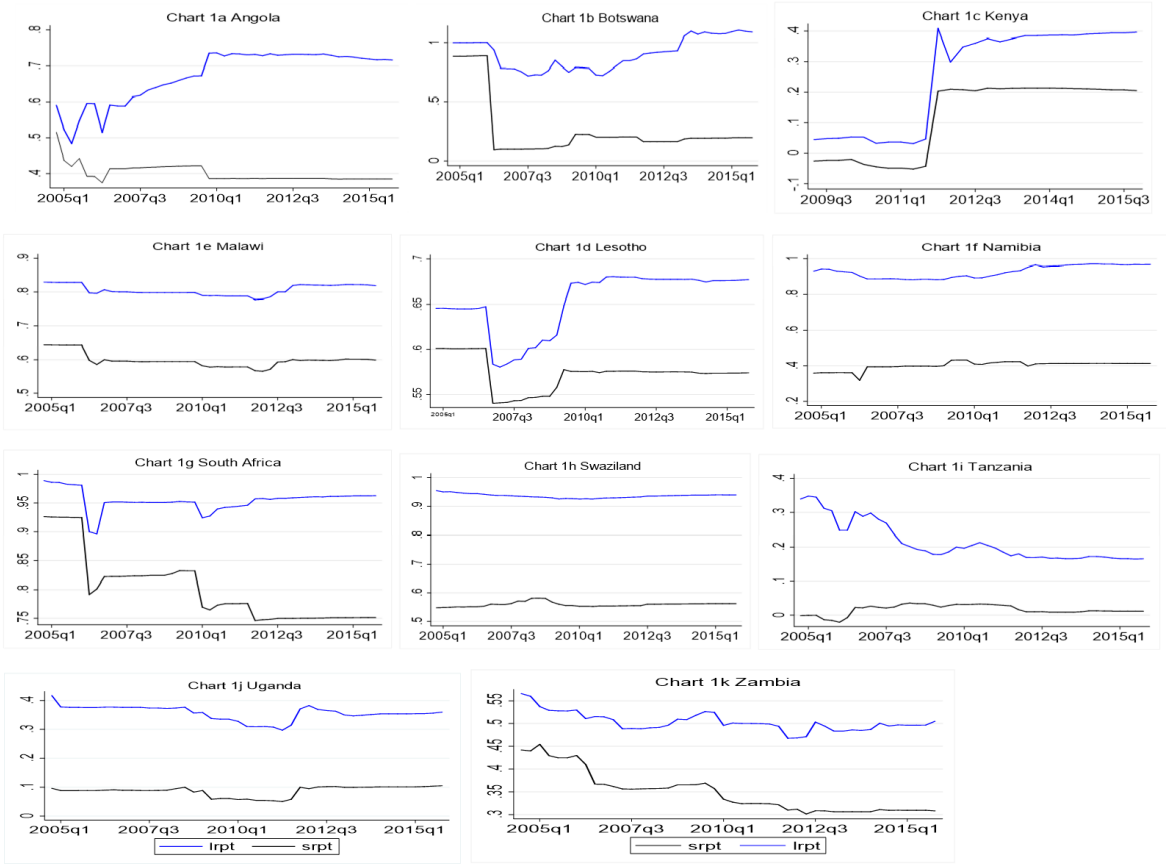
In general, the incomplete and low values of IRPT for most of the countries in our study is in line with the literature. This is because with an exception of South Africa which is an emerging market all the others are low income countries. South Africa has complete LRPT in the lending rate and relatively large SRPT and LRPT to the deposit rate firstly because of high levels of financial development. Additionally, as discussed in the previous chapter, during this period, monetary policy had a sole objective of price stability and authorities had adopted inflation targeting framework whose elements enhances the interest rate channel of monetary policy. We therefore attribute the incomplete IRPT in the low income countries to low levels of financial development and weak signalling power of monetary policy. Poor signalling is mainly caused by the pursuit of multiple objectives and adoption of less transparent frameworks such as monetary aggregate targeting that is followed by Angola, Malawi, Tanzania and Zambia (refer to Table 2.3 in chapter 2).

4.4.3 Results for the Evolution of the Pass Through

In the *recursive* window analysis, we track the progress of the pass through coefficients over time in all the countries. The first window has 40 quarters and we add one period at a time to the end of the sample period. The results are displayed in Figures 4.2 and 4.3 which contain country-specific charts of SRPT and LRPT to the lending and deposit rates, respectively. Overall, the results suggest that on the lending rate, the size of the pass through has increased in 5 countries namely Angola, Botswana, Kenya, Lesotho and Malawi; remained unchanged in Namibia, South Africa and Uganda and declined in Tanzania and Zambia. In most countries, the improvement in IRPT is associated with periods when the countries changed conduct of monetary policy either by becoming more transparent, or using market based regimes. For IRPT to deposits, the results suggests that the degree of the IRPT to the deposit rates has only increased in Uganda and declined in most of the countries.

Chart 1a under Figure 4.2 shows a decline in the SRPT over time in Angola but a gradual increase in the LRPT from 2006 quarter 4 up to 2009 when the LRPT stabilises around 72 %. Although the pass through has increased, it remains incomplete in both the short and long run. Chart 1b for Botswana shows a different picture. Both SRPT and LRPT drops in the third second of 2006 and remains low up to the first quarter of 2010 after which

Figure 4.2: Evolution of IRPT to Lending Rate by Recursive Analysis



The time displayed on the x-axis is the end period of the recursive window

the LRPT starts increasing and overshoots from 2012 quarter 4 onwards whilst the SRPT remained low. The interesting issue is that the drop in SRPT and LRPT which occurred in the second quarter of 2006 is similar to developments in Lesotho and South Africa as displayed by charts 1d and 1g. We therefore attribute this result to developments in the exchange rate market of South Africa since the Pula and Maloti (currencies for Botswana and Lesotho, respectively) are liked to the South African Rand. Notably, the Rand depreciated sharply in May 2006 (Venter, 2009). This might have

resulted to uncertainties in the financial market and affected the IRPT negatively.

Chart 1c for Kenya indicates that the LRPT to the lending rate increased in the fourth quarter of 2011 from below 10 % to above 30% up to the end of the 2015. This increase is explained by Kenya's change of monetary policy framework from targeting monetary aggregates to prices interest rates. Our results are similar to Morales and Raei (2013) who split their sample in June 2011 to indicate the change in the framework as a structural break. They found that the pass through increased in Kenya after they adopted a new framework of monetary policy. Chart 1c shows that the IRPT remains incomplete in Kenya showing that market inefficiencies still exist in the economy some of which might be arising from high concentration in the banking system.

Chart 1d for Malawi shows that both SRPT and LRPT dropped in 2006 quarter 1 and remained low up to the second quarter of 2012 when it started increasing. Although the changes in the SRPT and LRPT in Malawi are not large, the picture clearly mirrors developments in the exchange rate market in the country. The IRPT in Malawi was lower between 2006 and 2012 when the country's currency was fixed to a United States Dollar value. The country adopted a floating exchange rate regime in the second quarter of 2012. This shows that the IRPT is high in periods when the country followed flexible

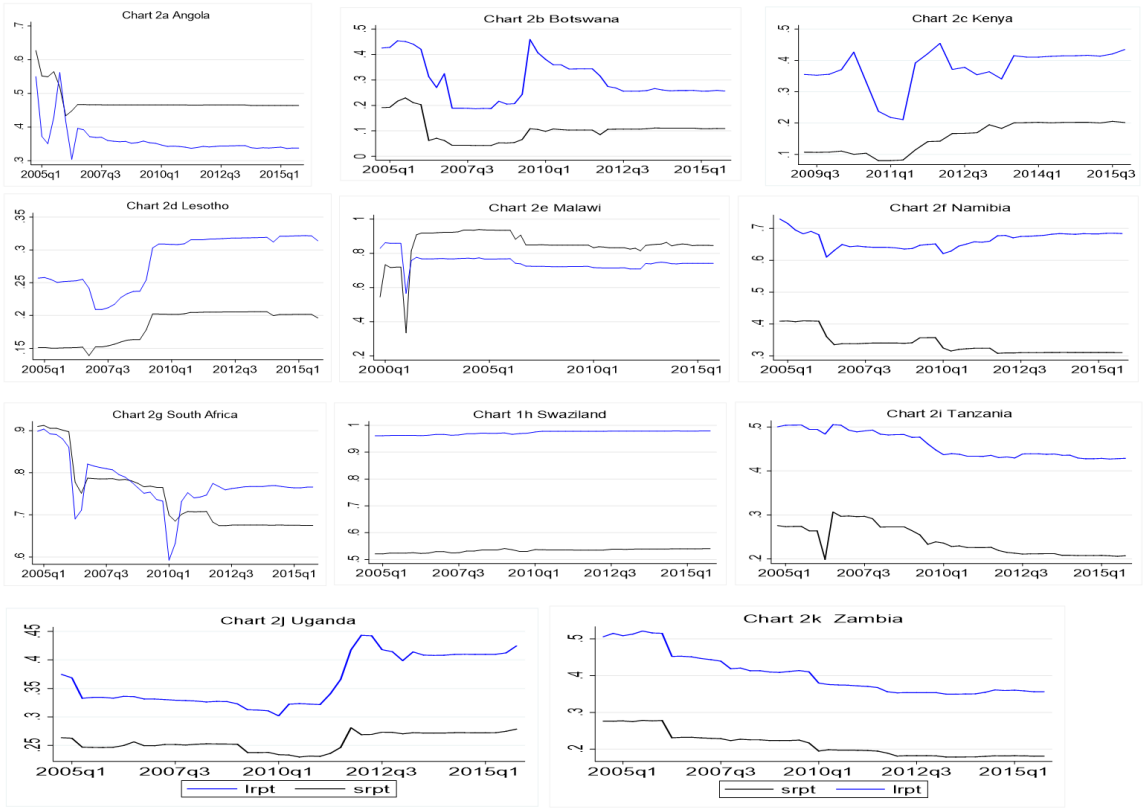
exchange rate regimes.

Chart 1i, 1j and 1k for Tanzania, Uganda and Zambia shows a general decline in the SRPT and LRPT to the average lending rate. However, an interesting trend is displayed in Chart 1j for Uganda. The charts show a gradual decline in SRPT and LRPT up to the first quarter of 2011 after which they both shift upwards. This period coincides with the adoption of inflation targeting lite. Our results corroborate Morales and Raei (2013) whose study split the sample period January 2000 to February 2012 into two periods based on a predetermined break point, June 2011 that was related to the change of monetary policy framework. Their results suggested that IRPT was higher in the post break-date period.

Chart 1g for South Africa shows that over time the SRPT to the lending rate has decreased from above 90% before 2006 to around 75% from 2012 to 2015. However a different pattern is displayed in the LRPT to the lending rate. It also drops in the second quarter of 2006 but it does not continue to decline rather remains strong (above 90 percent) and statistically complete by the end of 2015.

Figure 4.3 shows the results for evolution of the deposit rate. The patterns for SRPT and LRPT in charts for Botswana (2b), Kenya (2c), Lesotho(2d), Namibia (2f), Tanzania (2i), Uganda (2j) and Zambia (2k) are largely the same as displayed in the evolution of IRPT to lending rates. The

Figure 4.3: Evolution of IRPT to Deposit Rate by Recursive Analysis



The time displayed on the x-axis is the end period of the recursive window

most interesting result is for South Africa as displayed by chart 2g. The coefficients of the SRPT rapidly decline just as in the chart 1g for lending rates. The trend for LRPT are different from the second quarter of 2006 to the first quarter of 2012. During this period, decline is rapid in LRPT to deposit rate compared to lending rate.

To sum up, the recursive analysis has provided further evidence of heterogeneities in IRPT within the same country over time and also across the countries. All coefficients for LRPT were tested for stability using cusum analysis. The results for stability tests are included in the appendix in

Figure 4.4 for the LRPT to the lending rate, and Figure 4.5 for the LRPT to the deposit rate. Overall, the cusum plots confirm that the coefficients are stable at 95% confidence interval in all countries except for Uganda's deposit rate which shows a structural break in 2012 (refer to chart 2u under Figure 4.5).

4.4.4 Results for the Asymmetric Analysis

Table 4.4 presents results for the assessment of whether there are asymmetric adjustments in the interest rates based on the direction of change in the policy rate. As explained in section 4.3, this analysis was only conducted on the retail rates which are cointegrated with the policy rates. The investigation uses the Wald test, by testing the equality between the coefficients of the positive and negative lagged residuals in the asymmetric error correction model in equation 4.6. The table also shows results for mean lags equations 4.7 and 4.8 that provide more information on the direction of rigidity. In general, The results suggest that the adjustment is symmetric in most countries with the exception of Angola and Tanzania.

The results for Angola and Tanzania suggest that the response of the lending rate to changes in the policy rate is more rigid when there are expansionary shocks. These results are statistically significant at 5%, and 1% critical values, respectively. The asymmetric mean lags show that in

Table 4.6: Results for Analysis on Presence of Asymmetries

	μ^{+}_{t-1}		μ^{-}_{t-1}		Wald Test		Mean Lags		IRPT	Adjustment
	coef.	se	coef.	se	F-Stat	P-Value	ML^{+}	ML^{-}	Mechanism	Rigidity
Lending Rate										
Angola	-0.40	(0.06)	-0.16	(0.09)	4.36	0.04	1.63	4.12	Asymmetric	Downward
Botswana	-0.16	(0.10)	-0.12	(0.10)	0.70	0.41	5.10	6.77	Symmetric*	More downward
Namibia	-0.31	(0.13)	-0.20	(0.12)	0.28	0.60	1.93	3.02	Symmetric*	More downward
South Africa	-0.59	(0.14)	-0.55	(0.22)	0.03	0.87	0.42	0.45	Symmetric	-
Swaziland	-0.46	(0.15)	-0.30	(0.14)	0.76	0.39	1.01	1.52	Symmetric	-
Tanzania	-0.30	(0.05)	-0.06	0.04	19.65	0.00	3.30	18.60	Asymmetric	Downward
Deposit Rate										
Angola	-0.28	(0.07)	-0.10	(0.09)	1.74	0.19	2.10	5.57	Symmetric*	More downward
Malawi	-0.37	(0.16)	-0.36	(0.17)	0.00	0.99	0.97	0.98	Symmetric	-
Namibia	-0.24	(0.11)	-0.07	(0.08)	1.06	0.31	2.87	10.21	Symmetric*	More Downward
South Africa	-0.21	(0.15)	-0.20	(0.14)	0.00	0.99	1.53	1.56	Symmetric	-

se means standard errors. The symbol, ”*” ,implies although the Wald test indicate symmetric mechanism, the value of the mean lag indicate some rigidity.

Angola, it takes more than four quarters for the commercial banks to respond fully to downward adjustment in the policy and less than two quarters in terms of upward adjustment of the policy rate. In Tanzania, in the loan market commercial banks take just over 3 quarters to fully respond to tight monetary policy but over 18 quarters when the policy rate is adjusted downwards. This is evidence for collusive pricing hypothesis in the loan market showing that commercial banks in Angola and Tanzania endeavour to make as much profit as possible by maintaining high interest rates on loans.

The results also provide weak evidence of collusive pricing in Botswana and Namibia when we refer to the values of the the asymmetric mean lags. In Botswana, commercial banks take close to 7 quarters to fully respond to expansionary monetary policy compared to 5 quarters in case of tight monetary policy. Similarly, in Namibia the commercial banks take relative

more time (about 3 quarters) when the shocks on the policy rate are negative than with positive shocks (less than 2 quarters). Since the F-Statistics are insignificant in both of these countries, we consider this evidence of collusive pricing to be weak. Nonetheless, we recommend that commercial banks should aim at responding correctly to monetary policy signals in order to enhance the transmission mechanism.

In contrast, there is weak evidence of symmetric adjustment in Angola's deposit market as the F-Statistic for the Wald test is not statistically significant. However, the asymmetric mean lags suggest that the adjustment is more rigid downwards. This is weak evidence for customer reaction hypothesis which shows that commercial banks more concerned with defending their market power in the deposit market. This downward rigidity can also be explained by the commercial banks' avoidance of negative real interest rates on deposits due to high levels of inflation in the country. Weak evidence for customer reaction hypothesis is also registered for Namibia's deposit market. We attribute Namibia's results to commercial banks' efforts to defend their market power in a highly concentrated market.

Strong evidence for symmetric adjustments is found in lending rates for South Africa and Swaziland; and deposit rates for Malawi and South Africa. We note that the Wald tests reject the presence of asymmetries and the mean lags also point to symmetric adjustments. This implies that the commercial

banks in these countries responded in an expected manner when adjusting the given retail rates following shocks of either direction in the policy rate. Thus the commercial banks were able to respond to expansionary monetary policy (that was expressed through downward adjustment of the central bank's official policy rate) by cutting their rates on loans and deposits; and also responded to contractionary monetary policy by raising the lending and deposit rates. This conduct of commercial backs enhances the effectiveness of monetary policy.

Our results for South Africa are similar to the findings by Aziakpono and Wilson (2013) in a rolling window analysis for the period of 2000 to 2007. They attributed the symmetric adjustment to improvements in the accountability and transparency of the monetary policy following the adoption of inflation targeting framework in the year 2000. Since their analysis was only for the period up to 2007, our results provide further evidence for the period up to 2015.

Overall, the study finds evidence for asymmetries in some markets within the COMESA-EAC-SADC region. In the loans market, the most prevailing conduct is collusive pricing. This can be attributed to the fact that the banking systems in these countries are very concentrated hence no competitive behaviour among the banks. This conduct of the commercial banks make monetary policy to be less effective. Increasing the level of

competition in the credit market is key to remove collusive pricing in the loans market. We also find evidence for customer reaction hypothesis in some of the deposit market in the region. Under this hypothesis, commercial banks are reluctant to adjust deposit rates downwards (Hannan and Berger, 1991; Neumark and Sharpe, 1992). In addition to low levels of competition in the markets, we also attribute the results to high prevalence of inflation in the region which might restrict the banks to reduce deposit rates downwards in order to avoid negative real interest rate in the deposit market.

4.5 Conclusion

This chapter also used aggregated data on a cross country analysis of the central bank's policy rate pass through to average lending and deposits rate in 11 countries from the COMESA-EAC-SADC region. It employed time series techniques on a country-by-country basis for the period of 1995 to 2015. The model that is used is the auto regressive distributed lag model (ARDL). The analysis focused on the completeness, evolution and also presence of asymmetries.

The results provide evidence of heterogeneity in the size of the pass through of the central bank policy rate to lending and deposit rates across countries. However, in all countries, the short run pass through of the central bank's policy rate to both average lending and deposit rates is statistically

incomplete. The pass through of the policy rate to average deposit rate is also incomplete in all countries (except Swaziland) with most of them recording very low magnitudes. The findings further suggest that the long run pass through of the central bank's policy rate to average lending rate is statistically complete in Botswana, Namibia and South Africa and incomplete in the remaining countries. In general, these results provide evidence that IRPT to the lending rates is larger in countries with high levels of financial development than in others.

Asymmetric analysis provides strong evidence for collusive pricing arrangements in the loan markets in Angola, and Tanzania. In these markets, commercial banks take longer in responding to declines in the policy rate. There is also weak evidence of the same hypothesis for Botswana and Namibia as lending rates are relatively more rigid to downward adjustments of the central bank's policy rate. The results further suggest that in Angola and Namibia, deposit rates are adjusted faster when the shocks in the policy rate are positive than when they are negative hence supporting the customer reaction hypothesis. The main contributing factor to asymmetric adjustments is low levels of competition in the banking sector. In Angola, high inflation levels have also led to downward rigidity of deposit rates as commercial banks avoid negative real interest rates.

The assessment on the evolution of the pass through reveals that in some

countries, Angola, Botswana, Kenya, Malawi and Uganda the IRPT has increased over time whilst in Tanzania and Zambia it has declined. In most countries, the main factor that has led to the increase in the IRPT is improvement in the conduct of monetary policy by increasing transparency in the conduct and adoption of market based policies.

Overall, the results for this chapter give further evidence that the interest rate channel in the COMESA-EAC-SADC region is weak as the pass through of the central bank's policy rate to commercial bank's average lending and deposit rates is incomplete for most countries and in some countries not predictable because of asymmetric adjustments. Based on these findings we recommend policies that target increasing financial development, raising competition in the banking sector and improving the conduct of monetary policy by adopting market based regimes. Favourable macroeconomic conditions such as low inflation would also enhance the effectiveness of monetary policy in the region.

4.6 Appendix

Table 4.7: Summary Statistics-Quarterly data from 1995q1 to 2015q4

		Mean	Std. Dev.	Min	Max	Obs.
Policy Rates						
	Angola	64.82	56.37	2.0	160.0	84
	Botswana	12.27	2.69	6.0	15.5	84
	Kenya	9.42	3.02	4.58	18.0	46
	Lesotho	13.40	3.16	9.18	21.00	84
	Malawi	29.70	13.19	10.0	64.26	84
	Namibia	10.21	4.36	4.67	21.08	84
	South Africa	10.09	4.26	4.5	21.68	84
	Swaziland	9.79	4.01	5.0	18.0	84
	Tanzania	15.60	8.72	3.7	56.87	84
	Uganda	15.43	4.72	5.40	35.33	84
	Zambia	16.28	9.18	4.20	40.4	65
Lending Rates						
	Angola	62.01	71.19	1.83	385.0	84
	Botswana	13.82	2.64	7.5	17.0	84
	Kenya	15.12	2.10	12.2	20.21	46
	Lesotho	14.30	3.38	9.92	23.33	84
	Malawi	38.89	11.25	23.75	61.67	84
	Namibia	13.32	4.09	8.26	22.58	84
	South Africa	13.52	4.15	8.5	25.0	84
	Swaziland	13.14	3.76	8.5	21.0	84
	Tanzania	19.28	7.26	13.56	46.67	84
	Uganda	21.09	2.01	17.73	27.22	84
	Zambia	25.21	11.99	9.23	48.57	65
Deposit Rates						
	Angola	29.76	46.56	0.5	256.0	84
	Botswana	7.70	2.69	2.3	10.76	84
	Kenya	6.60	2.47	2.19	12.88	46
	Lesotho	5.95	3.41	1.03	13.73	84
	Malawi	17.05	11.63	3.25	42.0	84
	Namibia	7.53	2.94	3.92	14.24	84
	South Africa	9.30	3.61	5.09	19.85	84
	Swaziland	6.30	3.31	2.08	13.43	84
	Tanzania	8.25	4.60	2.7	25.13	84
	Uganda	10.13	2.84	3.71	20.32	84
	Zambia	11.99	6.36	6.23	24.3	65

Source: Datastream IFS

Table 4.8: Detailed Results for Policy Rate Pass Through to Lending Rate (lr) by ECM

	Angola	Botswana	Namibia	South Africa	Swaziland	Tanzania
Δpr	0.385***	0.196***	0.414***	0.751***	0.562***	0.012
	(0.068)	(0.040)	(0.052)	(0.048)	0.033	0.037
Δpr_{t-1}	0.075		0.238***	0.155	0.142	0.001
	(0.081)		(0.077)	(0.100)	(0.087)	(0.035)
Δpr_{t-2}	-0.218***					-0.023
	(0.076)					(0.032)
Δlr_{t-1}	0.484 ***	0.463	-0.137	-0.008	-.034	-0.056
	(0.058)	(0.103)	(0.084)	(0.104)	(0.081)	(0.085)
Δlr_{t-2}	-0.033	0.012			0.093**	-0.068
	(0.056)	(0.115)			(0.041)	(0.077)
Δlr_{t-3}	-0.083*	-0.228				-0.231***
	(0.05)	(0.103)				(0.074)
Cons	0.964	0.044	1.073	2.291***	2.42***	2.718
	(2.055)	(0.211)	(0.327)	(0.499)	(0.426)	(0.344)
Lags (lr, pr)	(4,3)	(4,1)	(2,2)	(2,2)	(3,2)	(4,3)
R^2	0.861	0.484	0.661	0.820	0.939	0.692
SRPT(β_0)	0.385***	0.196***	0.414***	0.751***	0.562***	0.012
	(0.068)	(0.040)	(0.052)	(0.048)	0.033	0.037
ECM (ϕ)	-0.276****	-0.18***	-0.326***	-0.604***	-0.623***	-0.199***
	(0.034)	(0.04)	(0.079)	(0.130)	(0.109)	(0.026)
LRPT (λ)	0.717***	1.09***	0.973***	0.963***	0.939***	0.166
	(0.091)	(0.088)	(0.041)	(0.020)	0.009)	(0.118)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; Robust standard errors in parenthesis.

Table 4.9: Results for Policy Rate Pass Through to Lending Rate by Basic ARDL

	Kenya	Lesotho	Malawi	Uganda	Zambia
Δpr	0.205***	0.574***	0.592***	0.105***	0.308***
	(0.072)	(0.208)	(0.105)	(0.037)	(0.102)
Δpr_{t-1}	0.142	0. 025	0.259***	0.150***	0.035
	(0.40)	(0.098)	(0.087)	(0.034)	(0.073)
Δpr_{t-2}				0.113***	0.021
				(0.033)	(0.029)
Δpr_{t-3}				0.071**	
				(0.028)	
Δpr_{t-4}				0.034	
				(0.030)	
Δlr_{t-1}	0.197	0.201	-0.029	-0.317**	0.226*
	(0.148)	(0.153)	(0.098)	(0.141)	(0.127)
Δlr_{t-2}	-0.072	-.079	-0.032		0.053
	(0.095)	(0.067)	(0.079)		(0.078)
Cons	0.093	-0.014	0.095	0.046	-0.190
	(0.067)	(0.075)	(0.231)	(0.107)	(0.188)
R^2	(0.698)	0.464	0.666	0.387	0.424
Lags(lr, pr)	(2,1)	(2, 1)	(2,1)	(1,4)	(2,2)
SRPT (β_0)	0.205***	0.574***	0.593***	0.105***	0.308
	(0.072)	(0.208)	(0.105)	(0.037)	(0.102)
LRPT (λ)	0.397***	0.682***	0.802***	0.360***	0.505***
	(0.089)	(0.258)	(0.112)	(0.058)	(0.138)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; Robust standard errors in parenthesis.

Standard errors for the LRPT(λ) are computed using the delta method.

Table 4.10: Results for Policy Rate Pass Through to Deposit Rate by ECM

	Angola	Malawi	Namibia	South Africa
Δpr	0.464***	0.608***	0.31***	0.675***
	(0.059)	(0.057)	(0.036)	(0.056)
Δpr_{t-1}	0.086	0.153***	0.103	
	(0.075)	(0.051)	(0.063)	
Δpr_{t-2}	-0.195**			
	(0.074)			
Δdr_{t-1}	0.310***	0.253***	0.163*	-0.146
	(0.072)	(0.067)	(0.081)	(0.102)
Δdr_{t-2}	0.184**			
	(0.072)			
Δdr_{t-3}	-0.215***			
	(0.061)			
CONS	-0.348	-2.407***	0.109	0.412**
	(1.94)	0.852	(0.108)	(0.174)
Lags (dr, pr)	(4,3)	(2,1)	(2, 2)	(2,2)
R^2	0.778	0.671	0.702	0.734
SRPT (β_0)	0.464***	0.608***	0.31***	0.675***
	(0.059)	(0.057)	(0.036)	(0.056)
ECM (ϕ)	-0.203***	-0.374***	-0.198***	-0.269***
	(0.041)	(0.080)	(0.06)	(0.084)
LRPT (λ)	0.337***	0.777***	0.684***	0.766***
	(0.117)	(0.047)	(0.046)	(0.057)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; Robust Standard errors in parenthesis

Table 4.11: Policy Rate Pass Through to Deposit Rate by Basic ARDL

	Botswana	Kenya	Lesotho	Swaziland	Tanzania	Uganda	Zambia
Δpr	0.109**	0.202***	0.198***	.532***	0.207**	0.279***	0.181*
	(0.047)	(0.024)	(0.058)	(0.087)	(0.080)	(0.036)	(0.09)
Δpr_{t-1}	0.068	0.142**	0.067	0.438***	0.177**	0.093**	0.072*
	0.063)	(0.054)	(0.084)	(0.128)	(0.082)	(0.045)	(0.036)
Δpr_{t-2}	0.044	0.133***	0.235		0.175***	0.025	
	0.043)	(0.045)	(0.079)		(0.048)	(0.016)	
Δpr_{t-3}					-0.028	-0.032	
					(0.057)	(0.041)	
Δpr_{t-4}						0.003	
						(0.045)	
Δdr_{t-1}	0.260	0.484**	0.161	-0.207	-0.039	0.125	0.186
	(0.120)	(0.222)	(0.144)	(0.155)	(0.144)	(0.111)	(0.181)
Δdr_{t-2}	-0.125	-0.243*		-0.101	-0.102	-0.344	0.033
	(0.064)	(0.138)		(0.079)	(0.082)	(0.103)	(0.134)
Δdr_{t-3}		-0.031		-0.022			
		(0.151)		(0.064)			
Δdr_{t-4}							
Cons	-0 .050	0.122	-0.107	0.007	-0.023	0.052	-0.091
	(0.031)	(0.084)	(0.061)	(0.031)	(0.093)	(0.117)	(0.107)
R^2	0.362	0.767	0.314	0.865	0.543	0.617	0.435
Lags(dr, pr)	(2,2)	(3, 1)	(1,1)	(3,2)	(2,3)	(2, 4)	(2,2)
SRPT (β_0)	0.109**	0.202***	0.198***	0.532***	0.207 **	0.279***	0.181
	(0.047)	(0.024)	(0.058)	(0.087)	(0.080)	(0.036)	(0.090)
LRPT (λ)	0.256**	0.435***	0.316***	0.905***	0.429***	0.425***	0.356**
	(0.113)	(0.062)	(0.112)	(0.050)	(0.114)	(0.075)	(0.156)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; Robust standard errors in parenthesis are computed using the delta method.

Figure 4.4: Cusum Plot for LRPT to Lending Rate

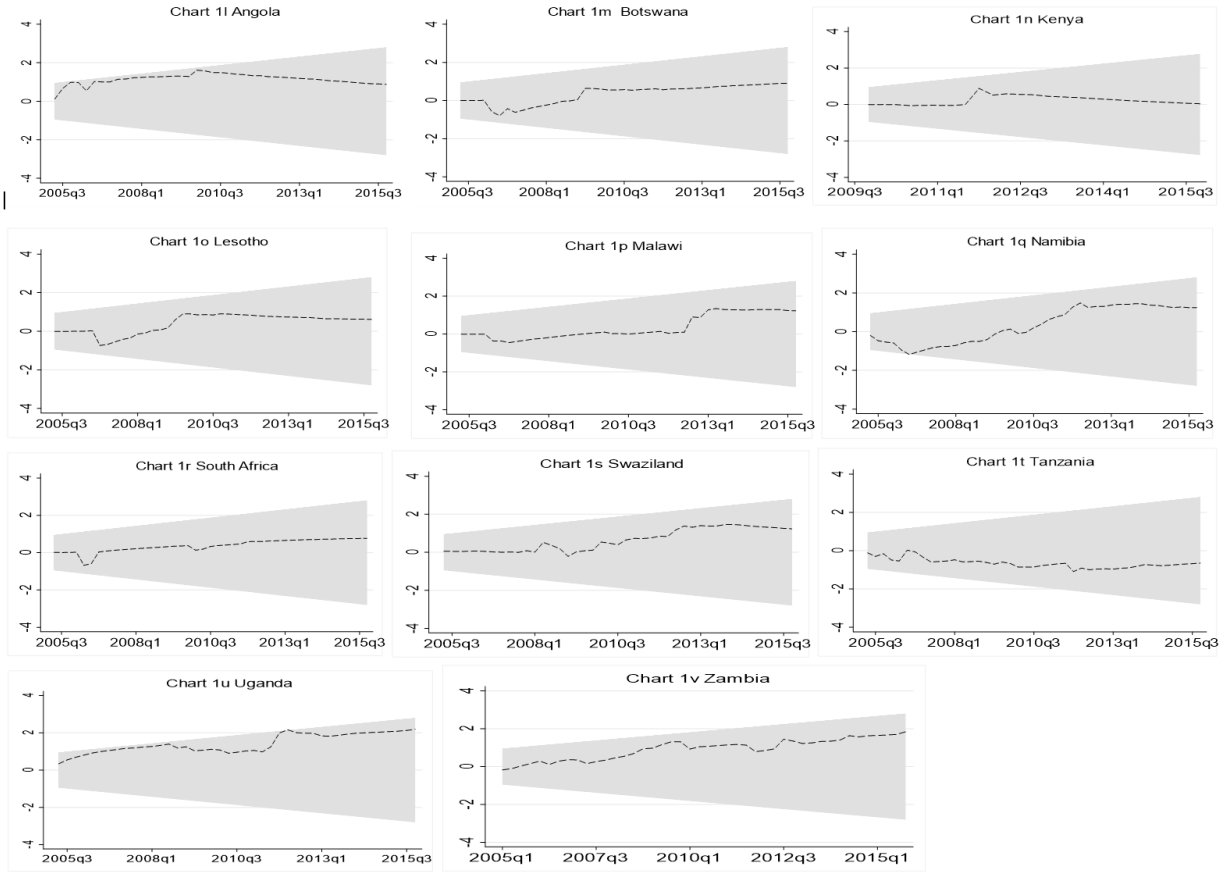
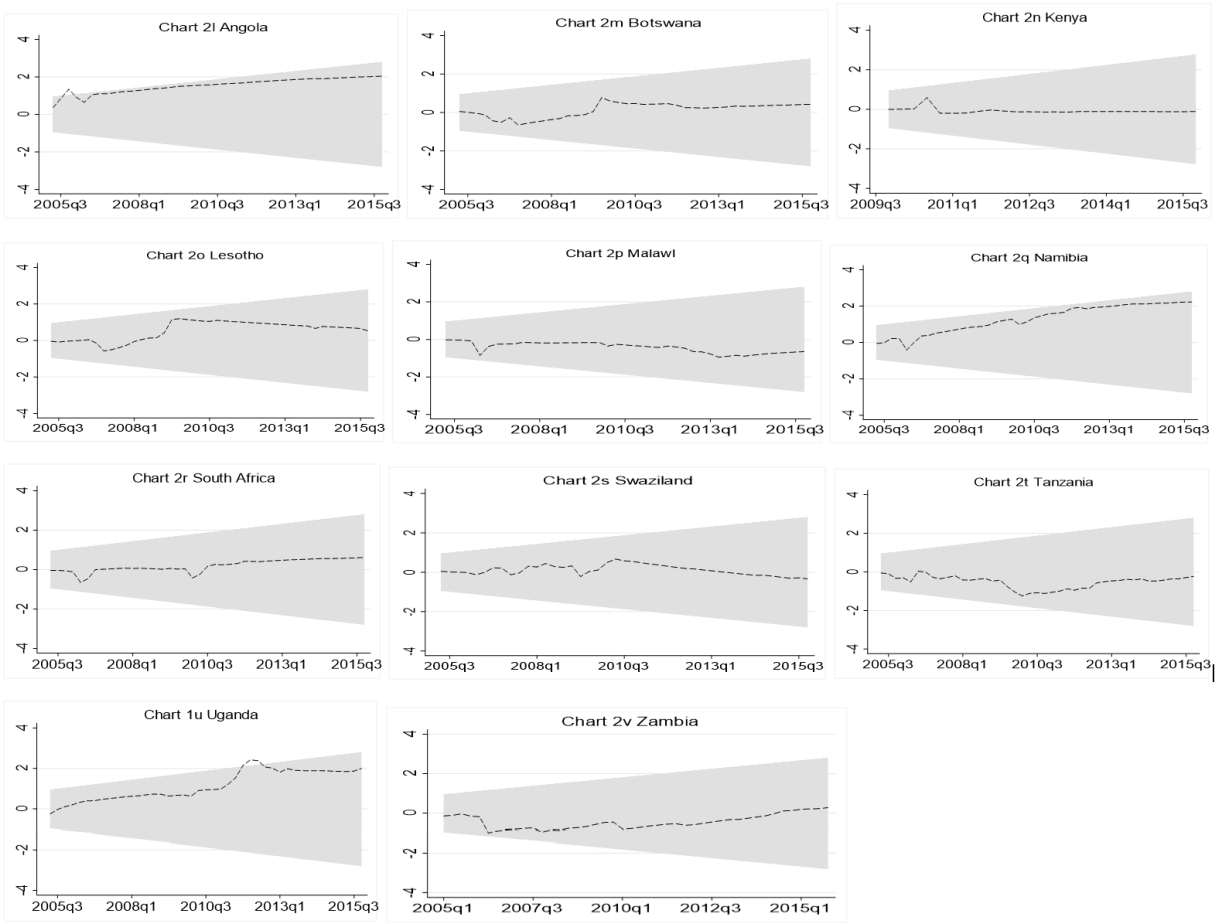


Figure 4.5: Cusum Plot for LRPT to Deposit Rate



Chapter 5

Heterogeneities across Commercial Banks and across Retail Products in Interest Rate Pass Through (IRPT) in Malawi

5.1 Introduction

In chapter 4, we examined the interest rate pass through for the central bank's policy rate to average lending and deposit rates. The literature further shows that banks' financial structures might cause heterogeneities in their pricing policies and cause variations in the policy rate pass through to retail interest rates (Gambacorta, 2008; Fuertes and Heffernan, 2009; Stanisławska, 2014; Holton and Rodriguez, 2015). However, the empirical literature present mixed results on the nature of the influence of individual bank characteristics on the strength and speed of the policy rate pass through to retail rates. This shows the importance of examining the hypothesis empirically in all countries and regions.

This chapter uses bank level data from Malawi to investigate the presence of heterogeneities in the interest rate pass through (IRPT) from the central bank's policy rate to interest rates on five retail services in ten commercial banks. The analysis is conducted on monthly observations for the period of 1995 to 2015 using time series analysis on a bank-by- bank and product-by-product basis. The study assesses heterogeneities on the size of the short run pass through (SRPT) and long run pass through (LRPT) across banks and across different products per bank using auto regressive distributed lag model. We also use recursive window analysis to examine the evolution of

the IRPT per retail product in each commercial bank.

This research contributes to the literature on IRPT in three ways. *Firstly,* it uses a novel data-set from Sub-Saharan Africa to provide more evidence on the hypothesis of heterogeneity of the IRPT across commercial banks and products. Most studies that have tested this assumption are on developed countries and emerging countries. Research on developing countries, and in particular, the Sub-Saharan region mostly use aggregated data due to the challenges in finding more detailed data for all commercial banks in each country. Our results confirm heterogeneities in the size of the IRPT in both the short and long run across commercial banks. In some commercial banks, the IRPT is complete whilst in other banks it is incomplete. The variations in the size of IRPT are also noticed over time across the commercial banks. Overtime and on a given retail rate, we find the IRPT getting stronger in some banks while not changing, or weakening in others.

Secondly, the study examines the nature of the pass through across different products within the same bank. This analysis is important as De Graeve et al. (2007) argue that differences in the price setting behaviour over products may be the source of differential responses of consumption and investment to shocks hitting the economy. Our findings suggest marked differences in the magnitude of the IRPT across type of products within the same bank. An earlier study by Chiumia and Palamuleni (2016) concluded

that big banks' IRPT was complete in lending rate and deposit rates. This study sheds more light by showing that the high IRPT from the big banks was only to deposits with a longer term whilst IRPT to short term deposits is low. The variation is also reported in the evolution of the PT in a way that in some rates, the size has increased, in others decreased or remained unchanged. This shows that interest rates may respond differently to changes in macroeconomic and financial conditions.

Thirdly, the study investigates the influence of specific bank characteristics on the IRPT. This analysis provides more insights on the dynamics of the pass through in relation to specific characteristics of the commercial banks. The IRPT to the lending rate is found to be positively associated with the size of the bank and levels of non performing loans. However, contrary to the literature on insignificance of the size effect in the long run (Gambacorta, 2008), we find that the size effect is significant in both the short and long run on the lending rate. On the side of deposits, there are mixed results. There is a negative association between size and IRPT to all the deposits in the long run. However, in the short run, the IRPT to the 3 months time deposit rate seems to be positively associated with the size of the bank. This result is similar to Chiumia and Palamuleni (2016) who found that big banks passed on most of the changes in the policy rate to deposits rates.

The rest of the chapter is organised as follows; Section 5.2 provides a

literature review, section 5.3 discusses Malawi's financial system followed by section 4 which describes the data and the method used. The results are discussed in 5.5 and the chapter is concluded in section 5.6.

5.2 Background Literature

The empirical literature provides evidence of heterogeneities in interest rate transmission mechanisms to retail rates across products and also across financial institutions. Most of these studies are for advanced countries and emerging economies. However, the literature provide mixed results on the way bank-specific characteristics affect interest rate pass through to retail rates. This shows the importance of testing the hypothesis before coming up with any conclusions in any country or region.

Table 5.1 presents a summary of reviewed literature. We have split the literature into two sub-sections namely heterogeneities across commercial banks and across products for easy referencing.

Table 5.1: Studies on Heterogeneities in the Interest Rate Pass Through

Authors	Country	Sample	Policy Rate	Market Rate	Main Findings
Heterogeneities across Commercial Banks					
Weth (2002)	German	1993 to 2000; 350 institutions	interbank overnight rates	long term corporate rates and fixed mortgage rate	Fast speed of adjustment in big banks compared to small banks.
De Graeve (2007)	Belgium	1993m1 to 2002m12; a panel of 31 banks	Money market rate	Deposit and lending rates of 13 products	Well capitalised and high liquid banks react less to changes in policy rates.
Gambacorta (2008)	Italy	1993q3 to 2001q3; a panel of 73 banks	Repo rate and ECB rate	Short term lending and deposit rates rate	No significant size effect but more liquid and well capitalised banks do not respond quickly to changes in policy rates.
Fuertes and Heffernan (2009)	United Kingdom	1993m1 to 2004m12	central bank's policy rate	various deposit and lending rates	Speed of IRPT vary across financial firms due to differences in profitability and cost functions .
Gigineishvilli (2011)	81 countries	2005M12 to 2010M10	91 day treasury bill rate	1 to 2 year corporate lending rate	Level of non-performing loans is negatively associated with IRPT as banks demand high risk premium.
Stanislawska (2014)	Poland	2005m1 to 2008m8 and 2009m1 to 2013m7; 17 banks	interbank market rate	various lending and deposit rates	LRPT to lending rates is high in banks with better credit quality. High LRPT to the deposit rates in banks with low liquidity, assets and deposit base.
Holton and Rodriguez (2015)	Euro zone	2007m8 to 2012m6; 188 banks	money market rate (Eonia)	lending rates on shot term loans	High LRPT of 78% to banks will high liquidity compared to 67% for less liquid banks. However, the difference was not statistically significant.
Chiumia and Palamuleni (2016)	Malawi	2005 to 2015; 9 banks	Central bank's policy rate	average savings and lending rates for 9 banks	Large banks have a large pass through to both lending and deposit rates compared to small banks.

Source: Compiled by Author

Table 5.1 Continued

Authors	Country	Method & Sample	Policy Rate	Market Rate	Main Findings
Heterogeneities across products					
Sander and Kleimeier (2004)	Euro Zone	1993 to 2003	overnight money market rate	4 loan and 3 deposit products	LRPT is higher in corporate than personal loans.
Hofmann and Mizen (2004)	United Kingdom	1985m1 to 2001m12	commercial bank's base rate	Mortgage and 90 day term deposit rates	Complete LRPT to products with low menu costs (mortgage rates) but incomplete to the deposit rate due to high menu costs.
Fuertes and Heffernan (2009)	United Kingdom	1993m1 to 2004m9	central bank's policy rate	Different term deposit rates, mortgages and rates on other loan products	IRPT is faster in high interest rates for unsecured debt compared to secured debt products. On the deposit side IRPT is larger on deposits with longer maturity.
Chiumia and Palamuleni (2016)	Malawi	2005 to 2015	Central bank's policy rate	average savings and lending rates	IRPT is complete to average lending rate but incomplete to savings rate.

Source: Compiled by Author

5.2.1 Heterogeneities across Commercial Banks

Weth (2002), conducted his study on the German financial market for the period from April 1993 to December 2000. His results show a fast speed of adjustment in big banks. He attributes the result to different types of customers, in particular, the fact that big banks deal with large firms which have better access to other sources of financing such as trade credit and corporate bonds. This compels the big banks to follow market developments very closely in order to retain their clients. In another study by Gambacorta (2008) for Italy, no significant size effect is found on overall pass through.

He therefore concludes that the size effect is only present in the short run.

De Graeve et al (2007) examine heterogeneities in pricing across banks in Belgium for the period before the financial crisis. They find that well capitalized and high liquid banks react less to changes in policy rates. Their results are similar to Gambacorta (2008) for Italy. In contrast, Holton and Rodriguez (2015) find that banks with less liquidity had a lower overall pass through (67 %) compared to banks with high liquidity (78 %) in the Euro Area. However, the difference was not statistically significant. A significant difference is reported in the speed of adjustment. More liquid banks correct the deviation from the long run equilibrium faster (32 %) than the less liquid (19 %). For capital and reserves, Holton and Rodriguez (2015) also find a negative association between capital and the size of IRPT both in the short and long run; and also with the speed of adjustment.

Fuertes and Heffernan (2009) use error correction models to test for heterogeneities across financial firms and seven retail rates for deposit and loan products using monthly data for the period of 1993 to 2004 in the United Kingdom. The results provide significant evidence for variations in the speed of the IRPT across financial firms that were explained by managerial performance indicators such as profitability and cost. Gigineishvilli (2011) find that lending rates are rigid to cost of funds as banks are able to charge higher premiums and deviate from marginal cost

pricing.

Stanisławska (2014) investigates the dynamics of the IRPT in Poland from market rates to banks' deposit and lending rates based on individual bank's data. He uses error correction models and pooled ordinary least squares techniques to assess the presence of heterogeneities across banks.The results confirm the presence of heterogeneities with banks which have lower assets, lower liquidity ratio and weaker deposit base recording high LRPT to the deposit rates. The LRPT to lending rates, is higher in institutions with a better quality of credit. Gigineishvilli (2011) and Sander and Kleimeier (2004) find that the level of non-performing loans (NPL) is negatively associated with IRPT as banks with high NPLs demand high risk premium which raises the lending rates. This result implies that credit quality improves the pass through.

5.2.2 Heterogeneities Across Products

This section provides a review of studies that assess for heterogeneities across products. Sander and Kleimeier (2004) analyse IRPT in eight transition economies from Europe from January 1993 to December 2003 on four loan and three deposit products. They find that the pass through is higher in corporate loans and smaller in personal loans and deposit rates. De Graeve et al (2007) find similar results from their study on six loan and

seven deposit products for 31 banks in Belgium. Corporate loan rates are reported to be more responsive to adjustments in the money market rates than consumer credit across banks. The outcomes in these studies are attributed to the effects of *type of client* and *menu costs*. Corporate customers are believed to have easy access to alternative financing such that banks are keen to reflect market developments in their pricing to avoid losing their customers to other competitors. Additionally, personal loans are smaller in magnitude than corporate loans such that banks find menu costs associated with adjustments of interest rates on personal loans relatively higher than on corporate loans.

A study by Hofmann and Mizen (2004) on UK's mortgage and 90-days term deposit rates find complete pass through on the IRPT to mortgages but not deposits. They use the base rate for the four major clearing banks as a proxy for the policy rate. In another study for the UK, Fuertes and Heffernan (2009) find that financial institutions adjusted the rate for the 90 days household savings faster than the mortgages rate. They however noted that during their sample period the Bank of England's policy rate was generally declining. This result was therefore attributed to literature on asymmetric adjustments based on the direction of the policy change.

De Graeve et al (2007) also provides evidence of *term effect* where products with a longer maturity record higher pass through than the ones

with short maturities. Fuertes and Heffernan (2009) find similar results as 53.3 % of their financial institutions record high LRPT for deposits with longer maturity. Their tests are on 30, 60 and 90 days term deposits. Their study also provides evidence for *collateral effect* as a larger LRPT is found on interest rate for credit cards (87 %) than on rates for mortgages (42.9 %). They conclude that LRPT is high on credit cards because the debt is unsecured whilst mortgage loans are secured by collateral.

In developing countries the most available empirical evidence is the variation in the size of the IRPT between the average lending rate and the average deposit rate. Chiumia and Palamuleni (2016) examines the pass through of central bank policy rate to the lending and deposit rates on nine banks in Malawi for the period of 2005 to 2015 using an ARDL model. Their results indicate complete pass through to the lending rate whilst the deposit rate record incomplete pass through. In section 4.4, the results for the central bank's policy rate pass through to average lending and deposit rates in eleven countries show that the IRPT to the lending rate was higher than the IRPT to the deposit rate in nine countries. This outcome is attributed to commercial banks' behaviour of defending profit margins by maintaining a high interest rate spread. Low levels of competition in the banking sector and limited alternative sources of investment cause customers to remain price takers and stick with their banks.

The above studies show that the transmission varies across financial firms and retail products. Significant evidence of heterogeneities entails less predictability on the transmission mechanism hence less effectiveness of monetary policy.

5.2.3 Contribution to the literature

This study seeks to provide further evidence on heterogeneities in IRPT across commercial banks and financial products in Sub-Saharan Africa using Malawi as a case study. Our study is different from Chiumia and Palamuleni (2016) *firstly* because the interest rates are more disaggregated than theirs. They use averages at each bank's level. For instance, their lending rate is the average of the minimum and maximum rate on loans and their savings rate is an average of deposits with maturity of more than one year. In this study we use the base lending rate. This is the rate which the commercial banks announce as the minimum rate for loans. The maximum rate is not included in this study because it also depends on other factors such as risk associated with different customers approaching the banks. On the deposit side, we also use disaggregated data on four different products, the ordinary savings rate (this is a rate on savings with no maturity profile), two demand deposit rates (the 7 days demand deposit rate and the 30 days demand deposit rate), and one time deposit rate (the 3 month's time deposit rate). The increase in

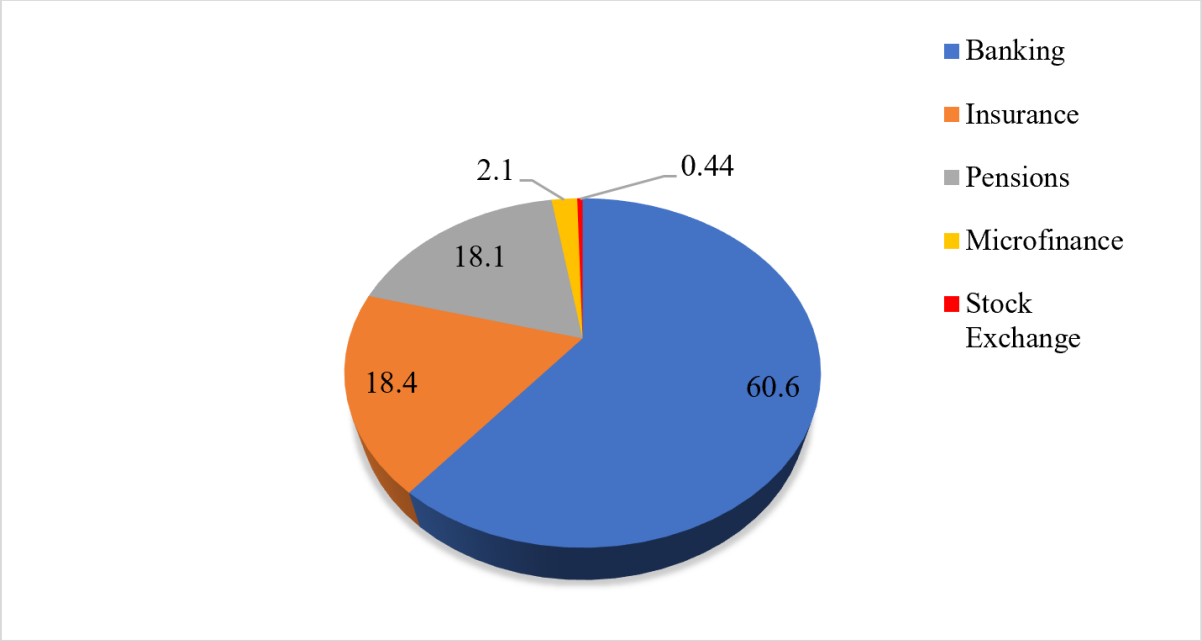
the number of products on the deposit side provides an opportunity for testing for heterogeneities across retail products within a commercial bank.

Secondly, in addition to completeness of the pass through, this study also assesses the evolution per rate as the sample is longer by 10 years (from 1995 to 2015). This analysis provides further insights in the way each product's pass through has been changing following changes in macroeconomic and financial conditions over time. Lastly, it also applies econometric methods in investigating the effects of specific commercial bank characteristics on the strength of the IRPT in both the short and the long run for all the retail products. The variables included are size of the commercial bank, capital adequacy ratio, liquidity level, credit quality (level of non performing loans) and profitability (return on assets). The results from this analysis provide a solid basis for drawing recommendations on how to enhance the effectiveness of monetary policy in Malawi.

5.3 Stylized Facts for Malawi's Financial System

Figure 5.1 presents the distribution of assets in Malawi's financial system. The banking system is the largest sector with a total of 61.0 % followed by the insurance and pension funds that hold about 18.0 % of the assets each. The rest of the assets are shared between microfinance institutions and the Malawi Stock Exchange (MSE). This research is conducted on the banking system only.

Figure 5.1: Distribution of Assets as at end 2015



Source: Author's compilation; Assets per sector as a percent of total assets in the system

As outlined in Mwabutwa et al (2016) and Ngalawa and Veigi (2011), the financial sector in Malawi has undergone three major periods: the repression period (1964-1986), the financial liberalisation period (1987-1994) and post

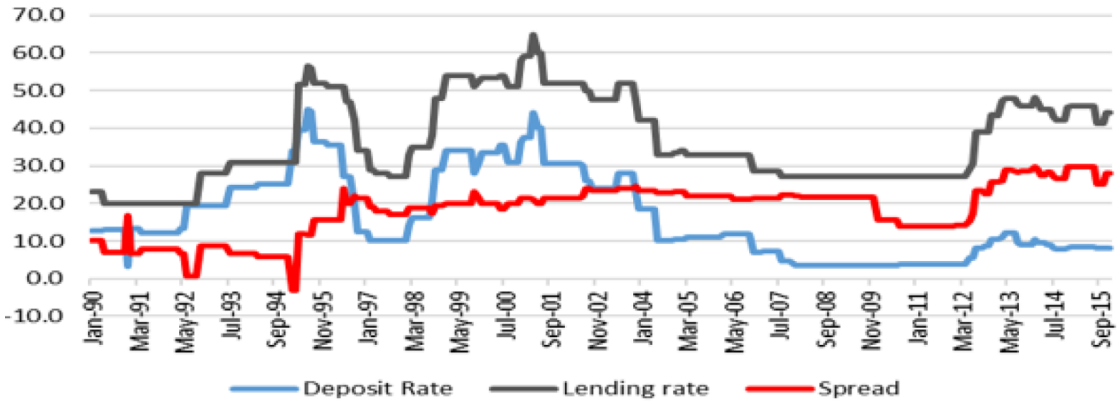
liberalization period (1995-to present). Several financial and monetary policy reforms were implemented in different periods. The reforms comprised of removing direct controls on credit and deregulation of interest rates, adopting market based exchange rate regimes, introducing indirect monetary policy instruments, reviewing the legal and regulatory framework of the banking system, and removing capital controls. Our study focuses on the post liberalisation period.

During the time of financial repression (1964 to 1988), the banking system was composed of four commercial banks with two of the banks holding over 70 % of assets. Malawi went into structural adjustment programs (SAP) supported by the International Monetary Fund (IMF) beginning the second half of 1988. The SAP included the development and diversification of financial institutions; and the elimination of direct controls for indirect techniques. Credit ceilings and rationing was stopped by 1989. Financial institutions were given the power to set their own prices guided by the central bank's discount rate; and grant credit based on their own risk management techniques, (Chirwa (2001)). Following this, other commercial banks started to enter the system in the mid 1990s. By the end of 2015, the banking system was composed of twelve banks compared to four banks during the 1980s.

Mlachira and Chirwa (2002) investigates the impact of the above

financial sector reforms on interest rate spreads (defined as the difference between the average lending and average deposit rate) in the banking system in Malawi. Their panel regression results point to high monopoly power, high reserve requirements, high central bank discount rate and high inflation as determinants of high interest rate spreads in Malawi. Their period of analysis is from 1989 to 1999. Figure 5.2 shows that interest rate spreads remain high beyond the period of their analysis to 2015.

Figure 5.2: Interest Rate Spread in percent (1990-2015)



Source: Reserve Bank of Malawi; Spread is lending rate minus deposit rate.

The degree of monopoly power in the banking system has been improving however the market remains concentrated as three (out of thirteen) commercial banks hold 64.3 % of the market share in terms of assets, deposits and loans. In terms of ownership, as at the end of year 2015, government had shares in two banks, five banks were foreign owned and the other six were domestically owned.

The banking system is also characterized by structural excess liquidity. This is because the interbank market is segmented with big banks lending to each other at low interest rates while charging very high interest rates to small banks. This behaviour affects the level of activity on the market and also its efficiency as very often some banks seek access to central bank's financing facilities whilst other banks are holding volumes of liquidity (RBM, 2016).

The Malawi Stock Exchange (MSE) was established in 1994 in order to deepen the financial sector through provision of a capital market where companies could raise equity. The companies listed on the MSE cover a number of sectors such as financial services, tourism, manufacturing telecommunications and real estate. As at the end of 2015, only four commercial banks (out of thriteen) were listed on the stock exchange.

According to RBM (2016b), the MSE has been growing slowly over the years. The slow growth is due to macroeconomic instability, poor economic infrastructure and stagnation in economic diversification. However, other basic foundations for a successful exchange are in place. These are, government support, sound regulatory framework enacted through Financial Services Act, 2010 and the Securities Act 2010. Additionally, there is good governance structure in place as the Registrar of Financial Institutions only has an oversight role whilst the Board of the Exchange and market participants are responsible for day-to-day operations.

5.4 Method and Data

5.4.1 Econometric Framework

This study employs a two steps method following Sander and Kleimeier (2004) and Fuertes and Heffernan (2009). In the *first stage,* a series of pass through coefficients are calculated from a regression that only includes the commercial bank retail interest rate and the central bank's policy using auto regressive distributed lag (ARDL) model. In this stage we also run a recursive analysis to track the performance of the coefficients over time and also to extract the values of short run pass through (SRPT) and long run pass through (LRPT) for use as dependent variables in the next stage. In order to avoid unnecessary repetitions, we do not describe the ARDL model as it has already been described in section 4.3.1 of chapter 4 and the same techniques are used.

The *second stage* of the econometric analysis involves an investigation of the influence of different commercial bank characteristics on SRPT and LRPT. This analysis is implemented using panel estimation techniques. Following Weth (2002) and Stanslawska (2014) the characteristics are entered in the equation one at a time for each product's IRPT using the following equation;

$$Y_{it} = \alpha + X_{it}^{'}\beta + \nu_{it} \tag{5.1}$$

where Y is a series of either SRPT or LRPT that was extracted from the recursive analysis in the first stage for a specific retail rate, i is the commercial bank and X is the specific bank characteristics and t is time, α is the intercept, the effect of X on Y is given by β, and ν is the error term.

5.4.2 Data

The study is conducted on monthly retail interest rates for five products for the period of January 1995 to December 2015. We use bank level data on interest rates as submitted by commercial banks to the central bank of Malawi. The data are on 10 commercial banks (out of a total of 13 in Malawi). In terms of coverage, the included banks cover approximately 91.3 % of the market. The commercial banks have been coded numerically from 1 to 10 for confidentiality reasons. The retail interest rates are the base lending rate (lr), ordinary savings rate (osr), 7 days demand deposit rate ($ddr7d$), 30 days demand deposit rate ($ddr30d$) and the 3 months time deposit rate ($tdr3m$). The choice for type of product was based on the availability of a long series for the product in each bank. The explanatory variable in the first stage is the central bank's policy rate. Table 5.2 presents summary statistics for the interest rates.

Table 5.2: Summary Statistics

Rate	Bank	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Base	Mean	32.36	32.02	33.10	38.41	31.21	32.87	27.81	33.28	32.73	27.32
Lending	Std.dev	13.38	10.98	11.18	11.64	11.14	11.05	8.84	11.26	10.90	8.20
	Min	17.75	17.75	17.75	18.25	17.0	17.75	17.5	17.75	17.75	18.0
	Max	62.0	53.0	56.0	59.75	51.0	60.0	45.0	53.0	58.0	46.0
	Obs.	180	235	252	252	185	252	159	252	252	151
Ordinary	Mean	5.92	14.60	8.34	n.a	9.59	13.96	13.58	7.17	13.41	n.a
Savings	Std.dev	2.8	9.30	5.73	n.a	5.49	11.08	9.18	3.45	11.23	n.a
	Min	3.5	4.5	3.5	n.a	4.0	2.5	4.5	4.0	2.5	n.a
	Max	12.0	36.0	25.0	n.a	18.0	38.0	38.0	18.0	39.0	n.a
	Obs.	103	235	161	n.a	180	252	252	145	252	n.a
7 Days	Mean	12.91	12.4	10.71	14.36	7.69	12.43	11.82	10.77	12.40	8.15
Demand	Std.dev	10.92	8.91	9.37	9.27	4.71	10.06	7.91	8.68	10.00	2.57
	Min	3.5	3.00	2.50	5.00	3.53	1.75	3.00	3.00	2.5	5.0
	Max	39	34.50	40.00	30.00	22.00	40.00	29.50	33.00	39.0	12.0
	Obs.	193	235	185	204	161	252	249	193	252	139
30 Days	Mean	14.93	14.63	15.73	16.54	9.45	14.34	n.a	n.a	14.25	10.47
Demand	Std.dev	11.61	9.53	11.44	9.43	5.90	10.56	n.a	n.a	10.62	5.00
	Min	5.00	4.00	3.00	6.00	5.00	2.75	n.a	n.a	3.5	5.5
	Max	42.00	36.50	42.00	35.00	27.00	42.00	n.a	n.a	41.0	26.0
	Obs.	193	235	252	204	161	252	n.a	n.a	252	151
3 Months	Mean	n.a	16.65	17.95	27.31	14.59	16.71	17.03	17.58	16.02	11.54
Time	Std.dev	n.a	10.44	12.51	10.69	10.0	11.55	11.35	12.51	12.46	6.28
	Min	n.a	4.5	4.0	11.5	5.50	3.25	4.5	3.5	2.0	5.0
	Max	n.a	36.5	46.0	46.5	37.0	45.0	45.0	46.25	45.0	28.0
	Obs.	n.a	235	252	156	185	252	252	252	252	151

	Mean	Std.dev	Min	Max	Obs.
Policy Rate	29.75	13.10	13.00	75.53	252

Source: Reserve Bank of Malawi; n.a means the product is not available for that commercial bank.

Table 5.3 further presents the balance sheet characteristics of the commercial banks. Following Gigineishvilli (2011) and Stanisławska (2014), $capital$ is represented by total capital adequacy ratio which shows how well a bank is equipped in relation to the risk it is taking. It is compiled as a ratio of total capital to total assets. We use the log of total assets for

each bank as the $size$ variable and it also represents market power. $Liquidity$ is calculated as the ratio of liquid assets to deposits and short term liabilities. The variable representing credit quality is calculated as the ratio of non-performing loans (NPL) to total assets whilst profitability is represented by return on assets (ROA).

Table 5.3: Summary of Bank Characteristics

	Mean value	No. of Banks	Bank Codes
$Capital$ (*Full Sample*)	*20.90*		
High Capital Adequacy Ratio	25.10	6	2,4,6,8,9,10
Low Capital Adequacy Ratio	15.73	4	1,3,5,7
Liquidity (Full Sample)	*52.11*		
High Liquidity Ratio	61.41	6	1,2,4,6,8,9
Low Liquidity Ratio	40.39	4	3,5,7,10
Size (Full Sample)	*10.11*		
Log of bank assets (Big banks)	11.12	3	2,6,9
Log of bank assets (Small banks)	9.65	7	1,3,4,5,7,8,10
NPLs (Full Sample)	*3.29*		
Low non-performing loans	2.21	5	3,6,8,9,10
High non-performing loans	5.01	5	1,2,4,5,7
ROA (Full Sample)	*3.63*		
High Return on Assets	6.21	5	2,4,6,8,9
Low Return on Assets	2.03	5	1,3,5,7,10

Source: Author's Calculations; Banks have been coded from 1 to 10

Just for the purpose of understanding the structure of the banking system, each indicator is split into two groups of high or low level of the values as in Holton and Rodriguez (2015). The splitting has been based on the full sample mean at the 50th percentile. All banks with a higher mean than the 50th percentile mean of the whole sample are in one group. Similarly, the

banks whose mean is below that benchmark are in one group. The table shows that for the balance sheet indicator $capital$, the 50 percentile mean for the full sample is 20.90 %. Specifically, there are 6 banks with high $capital$ and their sub-sample mean is 25.10 % whilst the mean for the group with lower $capital$ is 15.73 %. Six banks which are in the group of high $liquidity$ have a sub-sample mean of 61.41 % whilst the lower group, consisting of 4 banks, has a mean of 40.39 %.

With respect to $size$, there are only three big banks and the average of their total assets in logs is 11.12 and 7 small banks with a mean of 9.65 for their log of assets. Five banks have a high credit quality (low NPL) with an average ratio of non performing loans to total assets of 2.21 % whist the other five banks have an average of 5.01 % implying low credit quality. For return on assets (ROA), we have five banks in each category and in the high profitability group ROA has a mean value of 6.21 % whilst compared to 2.03 in the group of low profitability. As stated above, the splitting is only for the purposes of understanding the structure of the market and not included in the estimations.

5.4.3 Time Series Properties

The time series plots in Figure 5.3 in the appendix portray some co-movements between all retail rates and the policy rate in all banks. We

conduct formal unit root tests on each rate using the augmented Dickey Fuller test and the Bounds Wald procedure developed by Pesaran et al, (2001) to test for cointegration. The coefficients of the IRPT are calculated on a bank-by-bank and product-by-product basis, whilst the coefficients of determinants of the IRPT are calculated using panel estimation techniques.

Table 5.4: Results for Unit Root tests

Bank		Base Lending	Ordinary Savings	7 Days Demand	30 Days Demand	3 Months Time
1.	level	-2.24	-1.04	-1.38	-1.44	-1.64
	Δ	-12.32	-9.32	-13.41	-13.01	-13.82
2.	level	-1.54	-1.62	-1.76	-1.81	-1.75
	Δ	-13.38	-13.69	-14.12	-14.31	-14.08
3.	level	-1.53	-3.08	-2.06	-1.69	-1.85
	Δ	-15.07	-11.06	-15.14	-16.39	-15.74
4.	level	-1.55		-1.57	-1.71	-1.88
	Δ	-14.69		-14.79	-15.86	-11.57
5.	level	-1.36	-1.73	-2.67	-3.56	-2.51
	Δ	-12.05	-14.03	-11.59	-18.77	-19.40
6.	level	-1.60	-1.81	-1.70	-1.69	-1.84
	Δ	-16.09	-15.36	-16.45	-16.25	-16.20
7.	level	-1.46	-1.75	-1.95		-1.75
	Δ	-11.35	-15.60	-15.67		-15.12
8.	level	-1.510	-3.251			-1.89
	Δ	-15.36	-11.95			-15.54
9.	level	-1.57	-1.83	-1.57	-1.59	-1.67
	Δ	-14.79	-14.86	-15.07	-15.30	-14.42
10.	level	-1.89		-1.88	-3.27	-2.98
	Δ	-11.43		-11.64	-12.18	-11.91
Policy Rate		level	-1.69		Δ	-17.24

Critical Values;1% (-5.711); 5%(-5.155); 10% (-4.8609). Δ means first difference.

Tables 5.4 displays results for unit root tests. The results show that the policy rate and all retail rates are integrated of order one I(1). Table 5.5

presents results for cointegration tests.

Table 5.5: Cointegration Results

Rates	Bank	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Base Lending	T-Stat	-1.81	-1.74	-2.04	**-4.27**	-0.92	-2.38	-1.25	-2.24	-2.14	-1.28
	F-Stat	2.36	2.21	2.61	**9.18**	0.92	3.59	1.07	3.14	3.04	0.84
Ordinary Savings	T-Stat	-2.04	-1.89	-1.93	n.a	n.a	-2.92	-2.91	-1.87	-2.26	n.a
	F-Stat	3.77	2.58	4.57	n.a	n.a	6.26	6.11	-2.85	4.99	n.a
7 Days Demand	T-Stat	-2.71	-1.75	-1.91	**-4.11**	-2.4	-2.5	**-4.67**	n.a	-2.56	-1.83
	F-Stat	3.72	2.47	3.36	**8.6**	3.2	4.57	**11.25**	n.a	4.79	2.07
30 Days Demand	T-Stat	-2.65	-2.84	**-3.92**	**-4.8**	**-3.59**	**-4.41**	n.a	n.a	-2.59	-3.23
	F-Stat	3.61	4.58	**8.39**	**12.0**	**7.52**	**10.87**	n.a	n.a	4.75	5.24
3 months time	T-Stat	-0.269	**-3.77**	**-4.06**	**-3.87**	**-3.50**	**-4.58**	**-3.31**	**-3.78**	-2.46	n.a
	F-Stat	3.85	**7.40**	**9.19**	**7.49**	**6.33**	**11.70**	**6.58**	**8.00**	5.04	n.a

Critical Values; T-Stat 1% (-3.82); 5%(-3.22); 10% (-2.91); F-Stat 1%(7.84), 5%(5.73), 10% (4.78).
n.a means product not included for that bank. Bold colour indicate evidence for cointegration at 0.05 significance level.

Cointegration of the retail interest rate with the policy rate is confirmed for the prime lending rate in bank 4, the 7 days demand deposit rate in banks 4 and 7, the 30 days demand deposit rate in banks 3, 4, 5 and 6. The 3 months time deposit rate is cointegrated with the policy rate in almost all banks with an exception of banks 1,and 9. Just like in chapter 4, these results guide us to use equation 4.7 where there is no evidence of cointegration and equation 4.8 for the cointegrated variables. In both cases, the number of lags is chosen by minimising the the Akaike information criteria.

5.5 Empirical Results

5.5.1 Heterogeneities Across Commercial Banks

Table 5.6 displays results for *policy rate pass through to the base lending rate* in each bank. The findings confirm that banks respond differently in their immediate response to changes in the central bank's policy rate on their base lending rates.

Table 5.6: SRPT and LRPT to the Base Lending Rate (lr)

Bank	SRPT	LRPT	Adjustor	R-sq.	**Completeness Test**	
					SRPT	LRPT
1.	0.44***	0.91**	-	0.23	13.10	0.05
	(0.16)	(0.43)	-		[0.000]	[0.825]
2.	0.42***	0.62 ***	-	0.35	21.16	4.98
	(0.13)	(0.17)	-		[0.000]	[0.025]
3.	0.39***	0.64***	-	0.29	22.59	3.81
	(0.13)	(0.18)			[0.00]	[0.041]
4.	0.21***	0.83***	-0.14***	0.18	19.83	159.45
	(0.05)	(0.07)	(0.03)		[0.000]	[0.000]
5.	0.28***	0.41***	-	0.27	48.67	14.54
	(0.10)	(0.16)	-		[0.000]	[0.000]
6.	0.43***	0.66***	-	0.32	18.96	5.14
	(0.13)	(0.15)	-		[0.000]	[0.000]
7.	0.88***	1.07***	-	0.63	1.36	0.26
	(0.10)	(0.14)	-		[0.244]	[0.613]
8.	0.34***	0.63***	-	0.27	32.52	6.85
	(0.12)	(0.14)	-		[0.000]	[0.000]
9.	0.40***	0.66***	-	0.29	22.83	3.92
	(0.12)	(0.17)	-		[0.000]	[0.043]
10.	0.96***	1.11***	-	0.66	0.11	0.62
	(0.13)	(0.14)	-		[0.739]	[0.432]
Average IRPT	0.48	0.75				
Range of IRPT	{0.28, 0.96}	{0.41, 1.11}				

Robust standard errors in parenthesis. Standard error for LRPT calculated by the delta method. ** $p < 0.05$; *** $p < 0.01$; Range of the pass throughs in curly brackets. The null hypothesis for the completeness test of SRPT is $H_0 : \beta_0 = 1$; and for LRPT is $H_0 : \lambda = 1$. In square brackets are the P-Values for this test.

The SRPT ranges from 21 % in bank 4 to 96 % in bank 10. Results for the test of the completeness hypothesis indicate that at the 0.05 significance level, the SRPT is equal to 1 in banks 7 and 10. In the remaining 8 commercial banks, the SRPT is incomplete.

Similarly, the range of the results for the LRPT confirm heterogeneity in the response of the base lending rate. The range is from 41% in bank 5 to 111 % in bank 10. It can be noted that there is an over-reaction in banks 7 and 10. Table 5.3 indicate that the two banks share the same characteristic of low liquidity level and low return on assets. The results also suggest that in bank 1 the LRPT is statistically complete as at 0.05 significance level, we fail to reject the null hypothesis that λ is equal to 1. This bank is characterised by high non-performing loans, low return on assets and low capital. The high LRPT of the central bank's policy rate to the base lending rate in this bank may therefore be explained by De Bondt (2005)'s argument of the bank's effort in trying to offset risks by charging high interest rates on loans.

Table 5.7 displays results for *policy rate pass through to the ordinary savings rate.* The SRPT ranges from 18 to 67 % whilst the LRPT spreads from 38 % to 69 %. The averages are 39 % for the immediate pass through and 52 % for the overall pass through in the whole banking system.

Table 5.7: SRPT and LRPT to the Ordinary Savings Rate (osr)

	SRPT	LRPT	R-sq.	**Completeness F-Stat**	
Bank				SRPT	LRPT
1.	0.38***	0.41***	0.40	32.59	28.04
	(0.11)	(0.11)		[0.000]	[0.000]
2.	0.***	0.44***	0.31	75.54	22.52
	(0.08)	(0.12)		[0.000]	[0.000]
3.	0.67***	0.65***	0.78	20.04	15.42
	(0.08)	(0.09)		[0.000]	[0.000]
6.	0.32***	0.53***	0.26	45.27	12.03
	(0.10)	(0.13)		[0.000]	[0.000]
7.	0.18***	0.38***	0.17	136.59	23.21
	(0.07)	(0.13)		[0.000]	[0.000]
8.	0.67***	0.69***	0.74	11.72	11.54
	(0.08)	(0.09)		[0.000]	[0.000]
9.	0.25***	0.56**	0.22	86.94	4.04
	(0.08)	(0.22)		[0.000]	[0.014]
Average IRPT	0.39	0.52			
Range of IRPT	{0.18, 0.67}	{0.38, 0.69}			

Robust standard errors in parenthesis. Standard error for LRPT calculated by the delta method. Banks 4, 5 and 10 not included for this product. Range of the pass throughs in curly brackets. The null hypothesis for the completeness test of SRPT is $H_0 : \beta_0 = 1$; and for LRPT is $H_0 : \lambda = 1$. In square brackets are the P-Values for this test.

The test for the completeness hypothesis indicate that the pass through of the central bank's policy rate to ordinary savings rate is incomplete in all banks both in the short and long run.

Further evidence of heterogeneity across commercial banks is reported in Table 5.8 which presents the *policy rate pass through to 7 day demand deposit rate.* The SRPT ranges from 20 % in bank 7 to 37 % in bank 10 whilst the LRPT disperses from 38 % to 69 %. The averages for the whole banking system are at 34 % and 53 %, for the immediate and overall reaction, respectively.

Table 5.8: SRPT and LRPT to the 7 Days Demand Deposit Rate ($ddr7d$)

	SRPT	LRPT	Adjustor	R-sq.	**Completeness Test**	
Bank					SRPT	LRPT
1.	0.23***	0.38**	-	0.14	25.17	53.57
	(0.09)	(0.17)	-		[0.000]	[0.000]
2.	0.34***	0.43**	-	0.36	38.69	10.51
	(0.11)	(0.18)	-		[0.000]	[0.000]
3.	0.28***	0.38***	-	0.42	41.72	17.09
	(0.11)	(0.15)	-		[0.000]	[0.000]
4.	0.22***	0.67***	-0.16***	0.19	37.52	279.56
	(0.04)	(0.04)	(0.04)		[0.000]	[0.000]
5.	0.64***	0.69***	-	0.70	10.53	7.53
	(0.11)	(0.11)	-		[0.001]	[0.001]
6.	0.41***	0.64***	-	0.35	19.82	6.99
	(0.13)	(0.14)	-		[0.000]	[0.008]
7.	0.20***	0.56***	-0.17***	0.21	41.10	252.04
	(0.03)	(0.04)	(0.04)		[0.000]	[0.000]
9.	0.35***	0.59***	-	0.31	34.31	8.06
	(0.11)	(0.14)	-		[0.000]	[0.005]
10.	0.37*	0.43**	-	0.26	7.65	6.67
	(0.23)	(0.22)	-		[0.007]	[0.009]
Average IRPT	0.34	0.53				
Range of IRPT	{0.20, 0.37}	{0.38, 0.69}				

Robust standard errors in parenthesis. Standard error for LRPT calculated by the delta method. ** $p < 0.05$; *** $p < 0.01$; Bank 8 is not included for this product. The range of the pass throughs is in curly brackets. The null hypothesis for the completeness test of SRPT is $H_0 : \beta_0 = 1$; and for LRPT is $H_0 : \lambda = 1$. In square brackets are the $P - Values$ for the test.

In terms of completeness of the pass through, the results suggest that both SRPT and LRPT are incomplete in all banks.

In Table 5.9, the contemporaneous pass through to the 30 days demand deposit rate ranges from 23 % in bank 1 to 105 % in bank 5. The results also show that the speed of adjustment varies across the banks. In bank number 3 only 16 % of the deviation from the long run equilibrium gets corrected in the next period whereas in bank 5, up to 30 % of the deviation is corrected.

Table 5.9: IRPT to the 30 Days Demand Deposit Rate ($ddr30d$)

	SRPT	LRPT	Adjustor	R-sq.	**Completeness Test**	
Bank					SRPT	LRPT
1.	0.23***	0.38**	-	0.15	68.53	12.01
	(0.09)	(0.18)	-		[0.000]	[0.000]
2.	0.36***	0.54**	-	0.31	33.19	3.41
	(0.11)	(0.25)	-		[0.000]	0.048]
3.	0.37***	0.78***	-0.16***	0.27	63.34	178.22
	(0.05)	(0.06)	(0.04)		[0.000]	[0.000]
4.	0.27***	0.68***	-0.25***	0.22	42.78	539.94
	(0.04)	(0.03)	(0.05)		[0.000]	[0.000]
5.	1.05***	0.55***	-0.30***	0.46	1.08	58.71
	(0.13)	(0.07)	(0.08)		[0.28]	[0.000]
6.	0.34***	0.71***	-0.17***	0.29	64.14	196.18
	(0.04)	(0.05)	(0.04)		[0.000]	[0.000]
9.	0.35***	0.65***	-	0.30	40.56	26.32
	(0.10)	(0.23)	-		[0.000]	[0.028]
10.	0.71***	0.87***	-	0.42	4.12	0.76
	(0.14)	(0.15)	-		[0.041]	[0.383]
Average IRPT	0.46	0.65				
Range of IRPT	{0.23, 1.05}	{0.38, 0.87}				

Robust standard errors in parenthesis. Standard error for LRPT calculated by the delta method. ** $p < 0.05$; *** $p < 0.01$; Bank 7 is not included for this product. The range of the pass throughs is in curly brackets. The null hypothesis for the completeness test of SRPT is $H_0 : \beta_0 = 1$; and for LRPT is $H_0 : \lambda = 1$. In square brackets are the $P - Values$ for the test.

The completeness test fail to reject hypothesis for the SRPT in bank 5 and LRPT in bank 10. Low liquidity conditions as indicated in Table 5.2 may be the driving factor for high pass through to this product in these two banks.

Table 5.10 presents results for the *policy rate pass through to the 3 months time deposit rate.* The immediate pass through ranges from 22 % in bank 4 to 74 % in bank 10. The overall pass through disperses from 48 % in bank 1 to 100 % in bank 10.

Table 5.10: IRPT to the 3 Months Time Deposit Rate ($tdr3m$)

Bank	SRPT	LRPT	Adjustor	R-sq.	**Completeness F-Stat** SRPT	LRPT
1.	0.28**	0.48**	-	0.12	34.44	9.44
	(0.12)	(0.23)	-		[0.000]	[0.000]
2.	0.37***	0.74***	-0.14***	0.23	52.29	104.99
	(0.05)	(0.07)	(0.04)		[0.000]	[0.000]
3.	0.41***	0.83***	-0.16***	0.24	56.12	149.99
	(0.05)	(0.07)	(0.04)		[0.000]	[0.000]
4.	0.22***	0.85***	-0.17***	0.21	7.33	37.82
	(0.08)	(0.14)	(0.04)		[0.008]	[0.000]
5.	0.36***	0.71***	-0.22	0.26	22.69	90.44
	(0.08)	(0.07)	(0.06)		[0.000]	[0.000]
6.	0.40***	0.77***	-0.18***	0.29	66.91	197.13
	(0.05)	(0.05)	(0.04)		[0.000]	[0.000]
7.	0.28***	0.70***	-0.11***	0.19	32.84	59.82
	(0.05)	(0.09)	(0.03)		[0.000]	[0.000]
8.	0.38***	0.79***	-0.13	0.22	49.47	84.81
	(0.05)	(0.09)	(0.03)		[0.000]	[0.000]
9.	0.37***	0.66***	-	0.25	62.88	29.09
	(0.12)	(0.12)	-		[0.000]	[0.000]
10.	0.74 ***	1.00 ***	-	0.27	3.30	0.12
	(0.14)	(0.21)	-		[0.072]	[0.732]
Average IRPT	0.42	0.75				
Range of IRPT	{0.22, 0.74}	{0.48, 1.00}				

Robust standard errors in parenthesis. Standard error for LRPT calculated by the delta method.The range of the pass throughs is in curly brackets. ** $p < 0.05$; *** $p < 0.01$;The null hypothesis for the completeness test of SRPT is $H_0 : \beta_0 = 1$; and for LRPT is $H_0 : \lambda = 1$. In square brackets are the $P - Values$ for this test.

The results indicate that in bank 10 the central bank's policy rate pass through to the 3 months time deposit rate is complete in both the short and

the long run SRPT and LRPT as we fail to reject the hypothesis of unity pass through in both cases.

Overall, our results in tables 5.6 to 5.10 the standard errors show that all coefficients of the SRPT and LRPT are statistically significant in all banks and the values of the $R - Squared$ are similar to other findings in literature[1]. The findings provide evidence of heterogeneities in the SRPT and LRPT across commercial banks for the same type of products as the range of the pass throughs are wide and statistical tests fail to reject the completeness hypothesis in some banks whilst in others the hypothesis is rejected. We therefore summarise the statistics of the SRPT and LRPT from these tables in Table 5.11 to proceed in assessing heterogeneity across products in the next section.

Using Table 5.11 presented in the next subsection, further evidence of differences across commercial banks in the adjustment of interest rates is noted. Only banks 3 and 8 have lower IRPT to the lending rate than to the ordinary savings rate both in the short and long run. It is noted that both of these banks are small in size suggesting that high interest rate spreads are propagated more by big banks. These results can be explained by an interaction market power and type of clients. Big banks have large market power and alternative avenues for external financing. They also prefer to deal

[1] See Fuertes and Heffernan (2009)

with corporate (or big) clients who do not mainly keep ordinary savings but time deposits. The banks therefore focus on the products for their preferred clients. In contrast, small banks have limited sources of financing and most of their customers keep ordinary savings hence pass on the changes in monetary policy to the deposit rates.

5.5.2 Heterogeneity Across Products

Table 5.11 presents results for intra-bank heterogeneities across products. The results show that in most banks, the pass through to the lending rate is on the high side compared to almost all deposit rates except the 3 months time deposit rate. This result is in line with literature and its attributed to commercial banks' efforts of safeguarding their profit margins by keeping the interest rate spread wide.

Among the deposit rates we find evidence for *maturity effect*. We find that in 75 % of the commercial banks, the LRPT to the 30 days demand deposit rate is higher than LRPT to the 7 days demand deposit rate. This effect is clearer when we compare the LRPT to the 3 months time deposit rate with both the 7 days and 30 days demand deposit rates. In all commercial banks the LRPT to the 3 months deposit rate is the highest compared to these two retail products. The high IRPT in the 3 months time

Table 5.11: SRPT and LRPT Per Interest rate for each Commercial Bank

Bank	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
SRPT										
Lending Rate	0.44	0.42	0.39	0.21	0.28	0.43	0.88	0.34	0.40	0.96
Savings Rate	0.38	0.28	0.67	n.a	n.a	0.32	0.18	0.68	0.25	n.a
7 Days Demand Deposit	0.23	0.34	0.28	0.22	0.64	0.41	0.20	n.a	0.35	0.37
30 Days Demand Deposit	0.23	0.36	0.37	0.27	1.05	0.34	n.a	n.a	0.35	0.71
3 Months Time Deposit	0.28	0.37	0.41	0.22	0.36	0.40	0.28	0.38	0.37	0.74
LRPT										
Lending Rate	0.91	0.62	0.64	0.83	0.41	0.66	1.07	0.63	0.66	1.11
Savings	0.41	0.44	0.65	n.a	n.a	0.53	0.38	0.68	0.56	n.a
7 Days Demand	0.38	0.43	0.38	0.67	0.69	0.64	0.56	n.a	0.59	0.43
30 Days Demand	0.38	0.54	0.78	0.68	0.55	0.71	n.a	n.a	0.65	0.87
3 Months Time	0.48	0.74	0.83	0.85	0.71	0.77	0.70	0.79	0.66	1.00

This is a summary from tables 5.3 to 5.7; n.a means the product is not available

deposit rate can also be explained by the availability of a competing product, the 90 days Treasury bills on the market which serves as an alternative avenue for investment. Commercial banks therefore reflect changes to the central bank's policy rate in their retail product in order to avoid losing their customers to the government product.

5.5.3 Evolution of the IRPT

Recursive analysis was conducted in the same way as in the previous chapter in order to track the performance of the coefficients over time. Results of recursive window analysis are presented on rate-by-rate basis from Figures 5.4 to 5.8 in the appendix. The graphs present the evolution of the SRPT and LRPT for a particular interest rate per commercial bank. The figures suggest the trend of the IRPT to the base lending rate is largely homogenous across the banks whilst on the part of deposits, the evolution is mixed hence reflecting differences in refinancing strategies across commercial banks in Malawi.

Figure 5.4 is for the evolution of SRPT and LRPT to the base lending rate in each bank. The figure shows that both SRPT and LRPT increased markedly in almost all banks. The increases are noted in 2005 (in all banks) and in the year 2012 except for bank number 4. However, a test for structural breaks only confirmed the change in 2012 and not in 2005. The break is associated with a major change in the foreign exchange management policy by the central bank.

In May 2012, the foreign exchange rate was devalued by 49.0 % and the central bank adopted a free floating exchange rate regime after six years of a fixed regime. The previous regime was associated with a wide exchange rate misalignment between the formal and informal sectors and shortages of

foreign exchange in the system which led to an accumulation of import backlogs in the private sector. Soon after the foreign exchange regime change, the banking system experienced a liquidity crunch as the private sector was clearing the imports backlog. The decline in liquidity is one of the factors that explains the increase in the IRPT to the lending rate. Furthermore, a review of the central bank's conduct of monetary policy during this period also shows that it became more transparent in its conduct of monetary policy. This could have contributed to the improvement in the strength of IRPT as Sander and Klemeier (2006) and Liu et al (2008) find that increased transparency in the conduct of monetary policy enhances the degree of the IRPT.

Figure 5.5 is for ordinary savings rate. The graphs do not show a clear pattern. The IRPT decrease in three banks (1, 3 and 8) and remain stable over time in banks 2, 6, 7 and 9. A closer look at graphs for banks 3 and 8 shows that a major decrease occurred in the year 2012. Similarly, the pass through to the 7- day demand deposit rate also shows no clear pattern in Figure 5.6 The IRPT increase in 3 banks (1,2 and 3), decreases in banks 3 banks (4, 5 and 10) and remain relatively stable in the rest banks 4, 6, 7 and 9). On the other hand, graphs for the 30 days demand deposit rate in Figure 5.7 are relatively stable in all banks with an exception of 1 and 2 both of which show an increase. The graphs for the 3 months time deposit rate that are displayed

in Figure 5.8 are relatively stable except in two banks, 1 and 10 which record increases from the year 2012.

An overall assessment on the individual responses on the side of deposit products provide evidence of heterogeneity in the evolution of the IRPT for each retail rate on products across the commercial banks. We also note that the responses were mostly contrary to theory. Following the developments in the year 2012 as described above, commercial banks were expected to be aggressive in attracting deposits by raising interest rates as the central bank had adopted tight monetary policy and the system was hit by a liquidity crunch. The subdued response to the central bank's actions could firstly, be attributed to the central bank's introduction of unconventional monetary policy by extending uncollateralized loans to stressed banks during the period of liquidity crunch. Secondly, the continued decline in the IRPT could be explained by a noncompetitive behaviour of commercial banks in an oligopolistic market. This behaviour further explains the increase in interest rate spread from May 2012 onwards in Chart 2 under section 5.3.

In summary, the recursive analysis has revealed that over time IRPT to the lending rate has increased in all banks whilst IRPT to most deposit rates has decreased in most banks.

5.5.4 Influence of Specific Bank Characteristics

This section uses Table 5.12 which reports a summary of the results of the analysis of the influence of specific bank characteristics on the pass through of the policy rate in both the short and long run. We find weak evidence (coefficients are too small in size) of the effects of the balance sheet characteristics on the IRPT. The results also show random effects hence a summary of Breusch and Pagan Lagragian Multiplier test results are reported separately in Table 5.13 in the appendix.

Table 5.12: Effect of Bank Characteristics on IRPT

	Dependent variable: Short Run Pass-Through (SRPT)				
	Base Lending	Ordinary Savings	7 Days Deposits	30 Days Deposits	3 Months Deposits
Bank Size	1.861***	-0.141	-0.683	-1.912	0.691*
	(0.371)	(0.275)	(0.101)	(1.671)	(0.31)
Liquidity	-0.043**	-0.026	-0.012	0.091	-0.041***
	(0.023)	(0.031)	(0.056)	(0.089)	(0.011)
Non-perfroming loans (NPL)	0.39***	0.158	-0.906	-1.104	0.591***
	(0.012)	(0.262)	(1.111)	(1.287)	(0.204)
Capital	-0.042	0.002	-0.036	0.014	-0.031
	(0.039)	(0.003)	(0.056)	(0.018)	(0.044)
Return on Assets	0.141	0.118	0.252	0.044	0.132**
	(0.124)	(0.099)	(0.261)	(0.051)	(0.062)
	Dependent Variable: Long Run Pass-Through (LRPT)				
Bank Size	3.041***	-0.027	-0.861	-1.542	-0.399
	(0.665)	(0.299)	(1.11)	(1.322)	(1.09)
Liquidity	-0.033	0.021	-0.042	0.072	0.037
	(0.029)	(0.019)	(0.038)	(0.073)	(0.033)
Non-perfroming loans (NPL)	2.52***	-0.026	-0.968	-1.042	0.474
	(0.196)	(0.299)	(1.229)	(1.017)	(0.956)
Capital	-0.134	0.042	-0.113	0.098	0.141
	(0.129)	(0.039)	(0.109)	(0.101)	(0.137)
Return on Assets	0.149	0.125	0.292	-0.049	0.112
	(0.002)	(0.001)	(0.274)	(0.056)	(0.096)

Robust Standard errors in parentheses,* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; coefficents have been scaled up by 100

In general, on the specific bank characteristics that are included in this analysis, the results suggest that bank size, liquidity level, non-performing loans (NPL) and return of assets (ROA) have significant influence on the

pass through to some of the interest rates. The influence of capital level is not significant in all the equations. Our results are slightly different from Horvath and Podpiera (2012) in the sense that our coefficients are smaller compared to theirs. This can be attributed to differences in estimation techniques. In their estimations, they stack all the bank products together whilst our panel estimations are conducted on a product by product basis.

Bank Size: The results suggest a positive influence of size of the bank on the pass through to the base lending rate both in the short and long run. This implies that big banks are able to transmit most of the changes in the policy rate to the lending rate. This result can be attributed to different types of clients between the large and small banks. Larger banks usually cooperate with larger companies, which have better access to other sources of credit. Competitive behaviour causes the banks to reflect market conditions in the pricing of their products as a way of trying to retain their customers. We find that these results are significant in both the short and the long run. This is contrary to findings by Gambacorta (2008) and Horvath and Podpiera (2012) whose results suggests that the size effect was only significant in the short run.

On the side of deposit rates, we find that bank size has a negative influence on the long run pass through of all the deposit rates. However, in the short run, bank size seems to affect the pass through to the 3 months deposit rate

positively and in the short run only. It must be noted that our results give more details on the effect of bank size on deposit rates in addition to the information provided by Chiumia and Palamuleni (2016) study. Their results indicated that big banks pass on much of the change in the policy rate to the average deposit rates which was proxied by an average of deposits with a maturity of more than one year. This study indicates that such a reaction is accorded only to deposits with longer maturity as big banks are found to be rigid on the part of deposits with shorter maturity.

Liquidity level: This variable shows a significant effect on the pass through to the lending rate and the 3 months deposit rate. However, in both cases, the coefficients are very small thus showing a very weak association. Nonetheless, in both cases the negative sign imply that more liquid banks are rigid to pass on changes in policy rate to their prices on loans and deposits. The results are similar to Gigineishvilli (2011), Sorensen and Werner (2006) and Kashyap and Stein (2000).

Non-performing loans (NPL): Our results show a positive relationship between the level of the NPL and the strength of the pass through to the lending rate both in the short and the long run. The coefficients are statistically significant. This implies that the IRPT to the lending rate is stronger in banks with high NPLs (low credit quality) than banks with high quality of credit. These results are in line with the argument by De Bondt

(2002; 2005) that IRPT can be large where there are high risks as commercial banks incorporate high levels of risk premium in the lending rates. On the side of deposits, our results suggest that non-performing loans positively influences the short run pass through to the 3 months time deposit rate only.

Capital: The influence of capital to all the interest rates is insignificant in both the short and long run. The insignificance can be explained by the fact that this variable is also used for regulatory purposes by the central bank such that all banks are subjected to penalties if they do not meet a required level. This could make the variable inflexible to other market conditions. Nevertheless, the signs show that capital negatively influences the pass through to the base lending rate in both the short and long run. This is in line with literature that well capitalised banks respond less to market conditions Kashyap and Stein (2000).

Return on Assets: The coefficient on return on assets has a positive sign in all interest rates for the five products except in the LRPT for the 30 days demand deposit rate. Thus higher returns on assets are associated with a stronger pass through in both the short run and the long run for the most of the interest rates. Intuitively interest rates for commercial banks that operate in a non-competitive environment are expected to be less elastic to changes in market conditions as they are able to charge higher premiums and deviate

from marginal cost pricing (Gigineishvilli, 2011). Our results are contrary to this literature but they are also not statistically significant.

5.6 Conclusion

The objective of this chapter was to investigate the presence of heterogeneities across commercial banks and products in the IRPT of central bank's policy rate to various retail interest rates. Most of the studies on IRPT in the Sub-Saharan Africa region use aggregate retail rates hence assume homogeneity in the IRPT across commercial banks. The study is conducted on monthly bank level data on interest rates for five retail products of ten commercial banks in Malawi for the period of 1995 to 2015. In terms of market coverage, the ten banks cover 91.3 % of the whole banking system. The retail interest rates are base lending rate, ordinary savings rate, 7 days demand deposit rate, 30 days demand deposit rate and 3 months time deposit rate. The heterogeneities are assessed on the size of the short and long run pass through across the banks and also across the products. A recursive window analysis is also conducted to provide an evolution of each interest rate per bank over time. Lastly, it examines the effect of bank specific characteristics on the strength of the IRPT. The bank specific variables that are considered are bank size, liquidity, level of non performing loans, capital adequancy ratio and return on assets.

On average, the results show incomplete pass-through of the policy rate to both the lending rate and all the retail deposit rates. However, an inter-bank

examination provide evidence for the presence of heterogeneities across the commercial banks in the IRPT to the base lending rate and all interest rates for the deposits. The heterogeneities are explained by market power, banks' refinancing needs and level of non-performing loans. There is also evidence for heterogeneities across retail products within a bank that are explained by menu costs and balance sheet effects.

With regard to the IRPT to the base lending rate, the results show that the LRPT overshoots in two banks whilst the rest of the banks record incomplete pass through. Both of these commercial banks are small and hold low liquidity levels. Additionally, one of the banks also has high levels of non performing loans. These factors explain the over pass through of the central bank's policy rate to the base lending rate due to high risk assessment at the banks. The positive effect of level of non-performing loans and IRPT to the base lending rate is statistically confirmed in an analysis on the determinant of the IRPT to the base lending rate thus reflecting inclusion of high risk premiums on the interest rates for loan when the quality of credit is poor. In line with the literature, we also find a negative association between the level of liquidity and the IRPT to the lending rate. The results also shows a positive association of the magnitude of the IRPT to the base lending rate and the size of the bank in both the short and long run. These results are attributed to the influence of type of customers associated with

the banks and menu costs as big banks deal with large clients with large amount of loans compared to small banks.

The heterogeneities in the IRPT across banks are also confirmed for all retail deposit rates. There are wide variations across banks in both the SRPT and LRPT for each retail product. This shows the differences in refinancing strategies across the commercial banks. With regard to the determinants of the IRPT, significant results are recorded for bank size and liquidity on the 3 months deposit rate only. The size effect is positive whilst the liquidity effect is negative but very small in magnitude. In all the other deposits, there is a negative association between bank size and IRPT to deposit rates. Relating this to the results on lending rates, our findings show that market power contributes to high levels of interest rate spreads in Malawi as big banks are more flexible on adjustments for interest rates on loans but rigid on deposits.

The results also reflect heterogeneities in the strength on the IRPT across the retail products within the same banks. Generally, there is evidence for the balance sheet effect where IRPT to interest rate on assets (lending rate) is higher than to liabilities (deposit) as banks try to safeguard their profit margins. There is also evidence for the maturity effect in all commercial banks as the LRPT is higher for deposits with longer maturity.

On the evolution of the IRPT, there is a homogeneous pattern which is

displayed for the IRPT to the base lending rate across banks in a way that over time, the IRPT has increased in almost all banks. However, on the part of deposits the evolution of IRPT is mixed but mostly showing a decreasing trend in most retail products and commercial banks.

In sum, our study confirms heterogeneities in the IRPT of the central banks policy rates to interest rates across commercial banks and retail products in Malawi. It is also noted that over time, there has been an improvement in the size of the IRPT only on the side of lending rates and worsened on the size of deposits.

Policy Recommendations

Overall, the main findings of this chapter indicate that the interest rate channel is less efficient in transmitting monetary policy as the pass through is incomplete and less predictable because of heterogeneities across banks and products. Because of this, monetary policy is bound to miss its targets when controlling inflation using this channel. To a certain extent[2], these results therefore provide more insights to high inflation levels in Malawi during the study period.

The incomplete and less predictable pass through is attributed to a highly concentrated banking system with a limited range of financial products and

[2]Other factors that explain high levels of inflation in Malawi are discussed in Chapter 2 section 2.2

alternative sources of financing in the economy. Additionally, the banking system operates in an unstable macroeconomic environment which affects its effectiveness in supporting monetary policy. The following policies are therefore recommended in order to improve the transmission through the interest rate channel.

- Adoption of policies that aim at increasing the level of financial development is highly recommended. This is because a deep financial system provides alternative financial instruments to investors and savers. In line with the literature (IMF, 2010; Cottarelli and Kourelis, 1994; Fuertes and Heffernan, 2009), this research find that the pass through to a specific product is high where there is a similar product in the market. Adoption of such policies would therefore help to address the challenge of incomplete pass through.

- Adoption of policies that are geared towards increasing the level of competition in the banking system is also recommended as IRPT is also believed to be high in highly competitive markets (IMF, 2010; Thomson, 2006). This would help to deal with heterogeneities across commercial banks. In a competitive market, profit maximising behaviour causes banks to respond economic and market developments in an expected manner to avoid losing their clients to their competitors.

- It is further recommended that the Reserve Bank of Malawi should continue to improve the conduct of monetary policy by relying on market dynamics and also increasing transparency and communication. This is because the results for the evolution of the interest rate pass through has revealed that the size of the IRPT increased from 2012 after the central bank adopted market based policies especially in the foreign exchange rate management policy and also mordenised its general conduct by increasing communication of its strategies.

5.7 Appendix

Figure 5.3: Commercial Banks' Retail Interest Rates

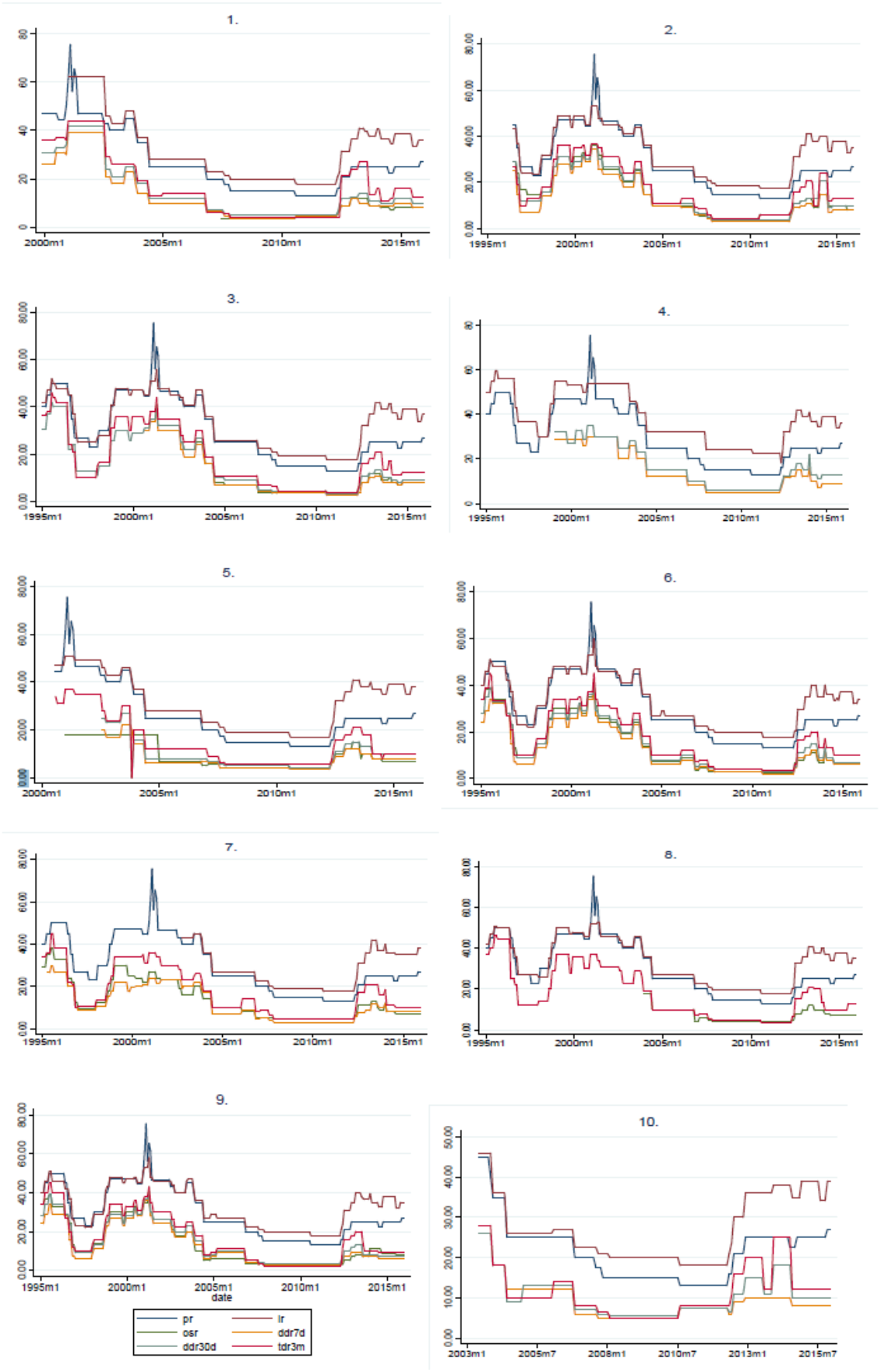


Table 5.13: Breusch and Pagan LM Test Results for Random Effects

	Dependent variable: Short Run Pass-Through (SRPT)				
	Base Lending	Ordinary Savings	7 Days Deposits	30 Days Deposits	3 Months Deposits
Bank Size	6358.43	6547.00	5082.72	6358.43	6547.00
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Liquidity	5887.09	3816.32	4695.47	4162.25	5587.20
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-perfroming loans (NPL)	6298.3	3791.66	5027.15	6342.61	6540.39
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Capital	6149.42	4246.04	4682.46	5505.72	6667.44
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Return on Assets	5883.04	3948.31	4451.49	5910.17	6219.54
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	Dependent Variable: Long Run Pass-Through (LRPT)				
Bank Size	5619.05	4259.31	4086.01	5517.74	6461.58
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Liquidity	5343.92	5343.92	3980.97	4752.56	5909.16
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Non-perfroming loans (NPL)	5648.00	4283.39	4770.78	5453.10	6500.69
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Capital	5318.34	6149.42	5021.39	5124.19	5278.42
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Return on Assets	4998.48	4308.82	4759.04	4886.60	6082.85
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

P-values in square brackets

Figure 5.4: SRPT and LRPT to the Base Lending Rate per Bank

Figure : Evolution of the lending Rate per Bank

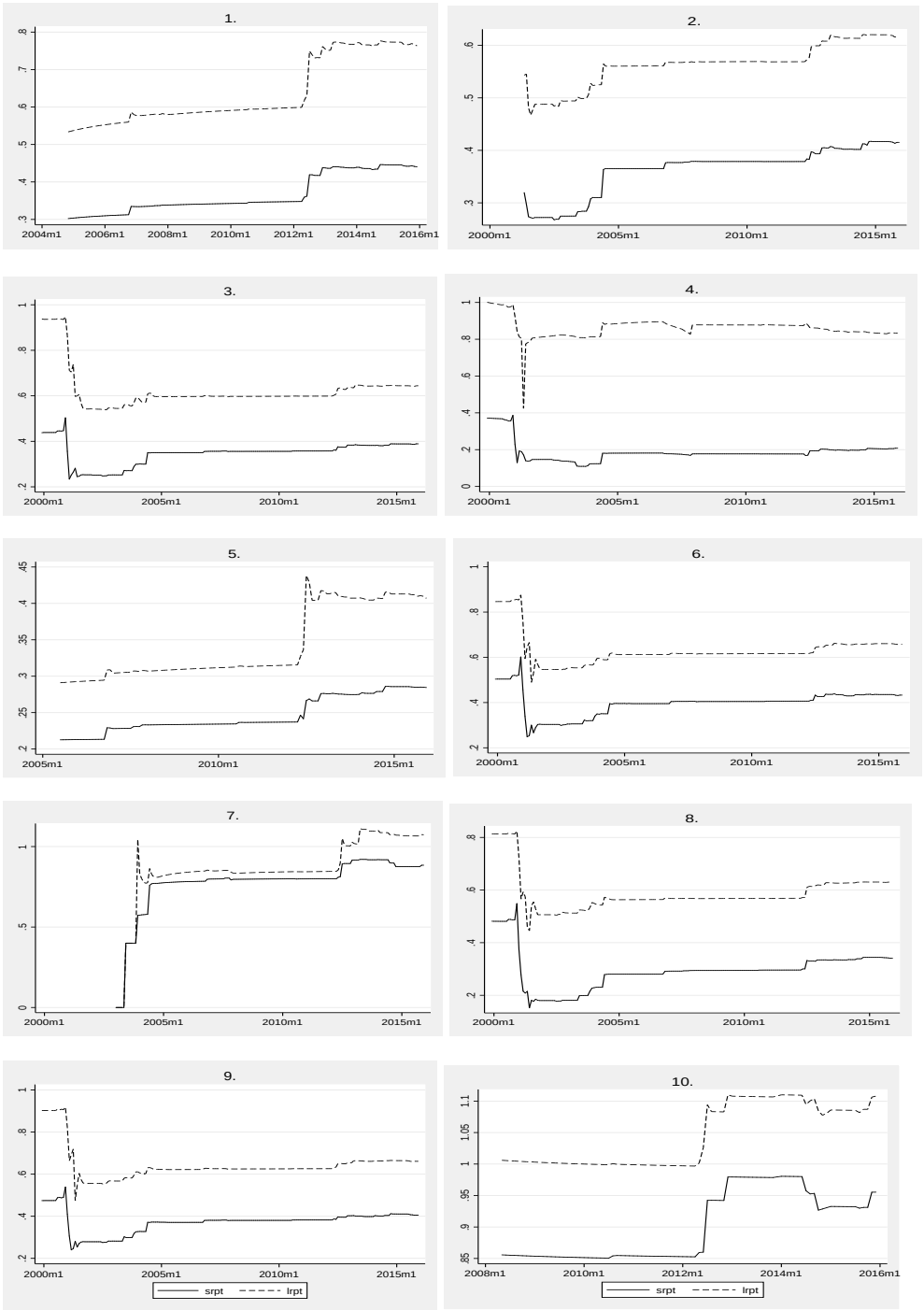


Figure 5.5: SRPT and LRPT to Ordinary savings Rate per Bank

Figure: The Evolution of Pass Through to Savings Rate per Bank

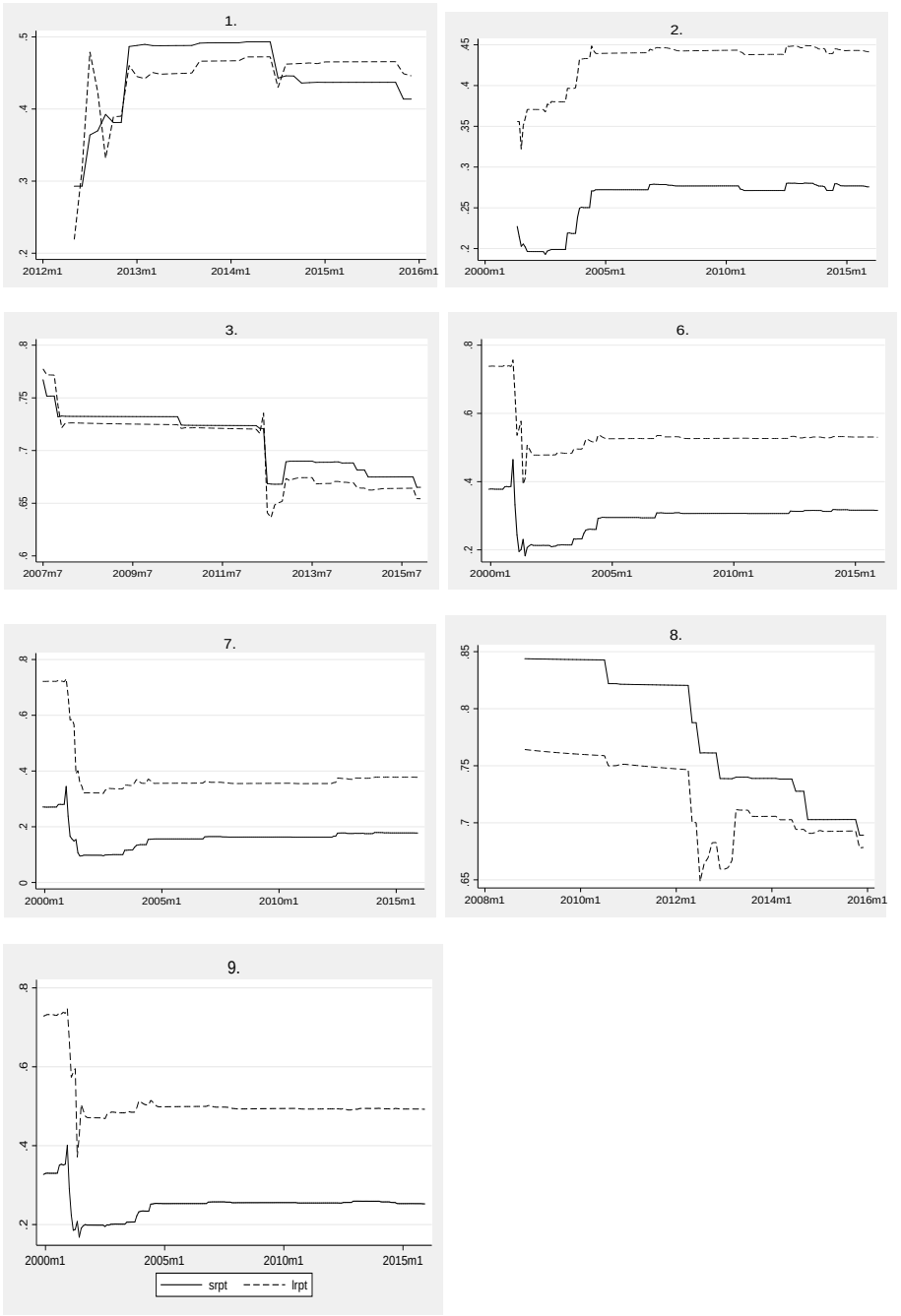


Figure 5.6: SRPT and LRPT to the 7 Days Demand Deposit Rate per Bank

Figure: Evolution of the Pass Through to the 7 days Deposit Rate

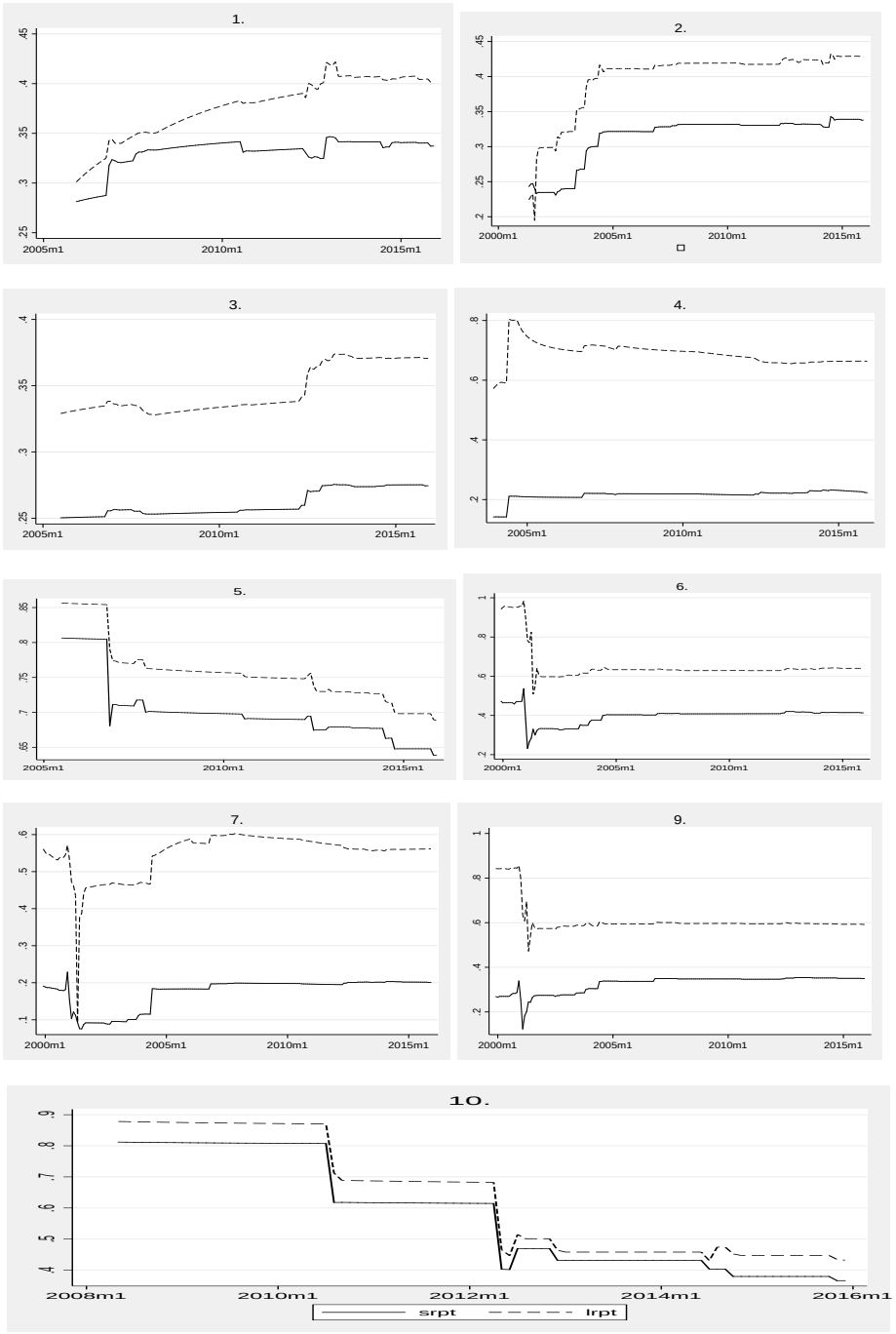


Figure 5.7: SRPT and LRPT to the 30 Days Demand Deposit Rate per Bank

Figure: Evolution of The Pass Through to the 30 Days Deposit Rate

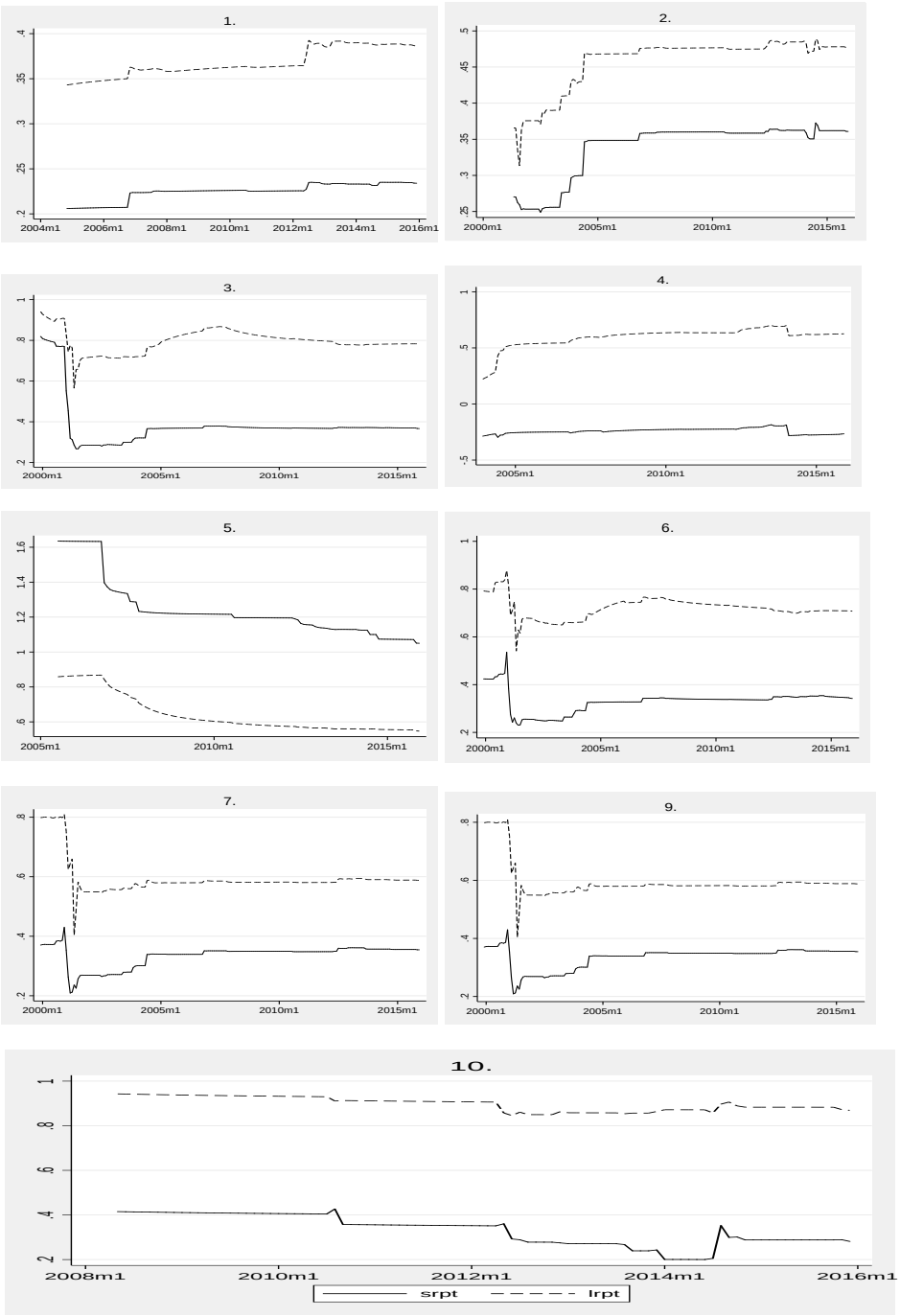
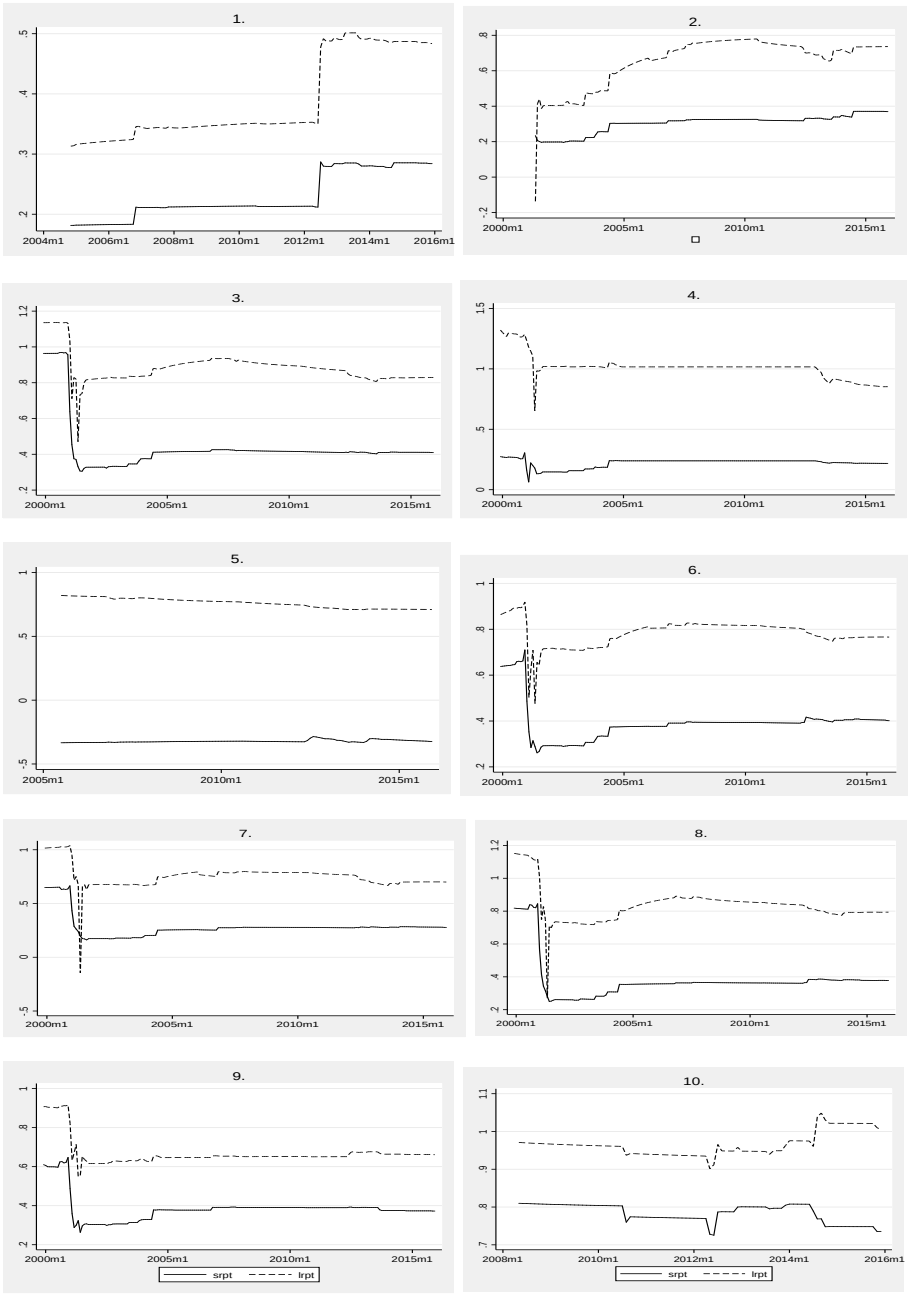


Figure 5.8: SRPT and LRPT to the 3 Months Time Deposit Rate per Bank

Figure: Evolution of the Pass Through to the 3 Months Time Deposit Rate



Chapter 6

General Conclusion

This research has used multivariate and single equation econometric methods to investigate *the effectiveness of monetary policy* in 11 countries from the COMESA - EAC - SADC free trade area of the sub-Saharan Africa region from 1995 to 2015. The countries are Angola, Botswana, Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania, Uganda and Zambia. The main objective of the trade area is to strengthen and deepen economic integration of the region through harmonisation of policies and programs.

The research firstly provided historical information which revealed differences in the levels of macroeconomic and financial developments in the region. As expected of an emerging country, South Africa has high levels of economic and financial development compared to the rest as they are low income countries. Notably, Botswana, Kenya and Namibia also have relatively higher levels of financial development compared to the rest. Differences were also noticed in the degree of central bank independence and the conduct of monetary policy across the countries. South Africa's

central bank is independent as it is instituted as a private entity whilst in all the other countries the central banks are public institutions.

The research also finds that in addition to price stability and economic growth, some countries' monetary policy have additional objectives such as management of foreign exchange reserves and stable exchange rate. The countries with multiple objectives are Angola, Botswana, Malawi, Tanzania, Lesotho, Namibia and Swaziland. The multiple objectives become sources of conflicts in the conduct of monetary policy.

We also find different monetary policy frameworks among the countries. South Africa follows Inflating Targeting (IT) since 2000, Kenya and Uganda adopted the IT from 2011. Monetary aggregate targeting is followed by Angola, Malawi, Tanzania and Zambia whilst the rest follow exchange rate targeting with an exception of Botswana which follows a composite framework. Overall, these differences are reflected in our empirical investigation of the effectiveness of monetary policy in the region.

Results from a factor augmented vector auto regression (FAVAR) analysis of the influence of changes in central bank's policy rate and reserve money on real GDP and prices suggest that monetary policy is effective in influencing the final goals however, transmission mechanism differ in channels and their strengths across the region. In line with the literature, we find that the interest rate channel is strong in countries with high levels of

development. These are South Africa, Kenya and Botswana. The channel is also effective in influencing the final goals but generally weak (not significant) in Malawi, Tanzania and Zambia mainly on account of low levels of financial development and weak signalling power of monetary policy due to multiple objectives and less transparent framework. Our results further corroborate IMF (2010) that the traditional monetary channel is effective in influencing both output and prices in most of the countries. Tight monetary policy through negative shocks to reserve money decreases output and prices in Angola, Botswana, Kenya, Malawi, Namibia, Tanzania, Uganda and Zambia. The effects are statistically significant in Botswana (only on price), Kenya, Malawi and Tanzania. The findings also shows that the exchange rate channel is important in explaining price developments in region.

Our examination of the pass through of central bank's policy rate to commercial banks' retail rates reveal heterogeneities across countries in terms of completeness and presence of asymmetries. The long run pass through to the lending rate is statistically complete in Botswana, Namibia and South Africa whilst in the remaining countries it is incomplete. This result echoes the importance of high levels of financial development in the interest rate channel of transmission mechanism. The pass through is incomplete in the short run in all countries and also to deposit rates.

Recursive analysis suggest that over time the pass through has been increasing in most of the countries due to adoption of market based policies and modernising the conduct of monetary policy by becoming more transparent. Asymmetric analysis of the pass through indicate collusive pricing of the lending rates in Angola, Botswana, Namibia and Tanzania that is explained by high concentration levels in the banking system. On the deposit side, it provides weak evidence for customer reaction hypothesis in Angola and Namibia.

Finally, a bank level analysis on Malawi provide evidence for heterogeneities across commercial banks and products. Interest rate pass through is large in banks with low liquidity levels, high levels of non-performing loans and big in size. On the part of deposits, the heterogeneities across products are explained by menu costs and balance sheet effects.

Overrall, our research suggest that the effectiveness of monetary policy in the COMESA-EAC-SADC region is generally impeded by low levels of macroeconomic and financial development, the practice of trying to achieve multiple objectives and use of less efficient frameworks in the conduct of monetary policy. It also suggests that the financial systems are less efficient in facilitating monetary policy due to high levels of concentration in the banking system. Overall, the implications of the less effective monetary

policy are reflected in high levels of inflation and low levels of economic growth in the region as reflected in Table 2.1 in chapter 2. Strengthening of monetary policy transmission mechanism in the region is therefore paramount and based on the gathered evidence through this research it requires addressing the following factors;

- Narrowing the goals of monetary policy to price stability and economic growth and adopting a clear strategy to achieving the goals in order to send clear signals to market participants.
- Monetary authorities may need to adhere to the requirements of their chosen frameworks by ensuring that operating instruments are consistent with intermediate targets for instance when targeting money, interest rate must be allowed to be endogenous and vice-versa.
- Authorities must also avoid interfering with market dynamics by adopting flexible regimes and increasing operational independence of the central banks.
- Modernising the frameworks to increase transparency is also important to remove uncertainties in the market and enhance the expectations channel of monetary policy.
- Adopting policies that aim at increasing financial development in order to widen the range of financial products and refinancing avenues for

market participants.

- Adopting policies that aim at increasing competition in the banking system in order to address the issues of market power and consequently enhance the response of the commercial banks to monetary policy.

- Authorities also need to adopt policies that strengthen legal and other institutions that help to reduce information asymmetries and enforce adherence contracts. This will assist to reduce risks in the banking system.

Overall, based on the about findings, it is recommended that the authorities of the COMESA-EAC-SADC free trade area must take into account the country differences highlighted in this study in their design of the criteria for harmonising economic policies in the region as one strategy might not fit all the countries.

This study has been conducted on 11 out of 23 countries that belong to the COMESA-EAC-SADC region. An obvious starting point of extending this literature is to include all countries in the region in order to have a more balanced view of the effectiveness of monetary policy in the whole region. This literature can also be extended by building on the results for IRPT analysis in chapter 4 to empirically investigate the determinants of IRPT for the whole region as in Sander and Kleimeier (2004) and the extent of

banking market integration in the region as by Aziakpono et al (2012) for SADC. Lastly, the study in chapter 5, on heterogeneities across financial institutions can be extended to all countries in the region to get country specific results.

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