

How have world shocks affected the business cycles of Africa's frontier economies?

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ABSTRACT

This paper builds on earlier work in business cycle theory, particularly in the growth cycle tradition of (Lucas, 1976), to analyse business cycles in Africa's Frontier Market Economies (FMEs), which include the following countries: Botswana, Ghana, Kenya, Mauritius, Mozambique, Nigeria, Tanzania, Uganda and Zambia. This paper extends the work of (Agenor, McDermott, & Prasad, 2000), (Rand & Tarp, 2002) and (R. L. Male, 2009) who have established a set of stylised facts for the fluctuations of business cycles in developing countries, to examine the impact of world shocks on the FMEs through the development of the stylised facts for these economies. This paper goes on to assess the suitability of the stylised facts that have been established for developing countries for Africa's FMEs. This thesis makes an important contribution to the literature, by focussing on Africa's FMEs which are also considered to be the anchors of growth and future development for the continent. In accordance with existing business cycle literature, this study examines the impact of endogenous and exogenous factors on the business cycles of the FMEs, to assess firstly how these factors impact the FMEs business cycles, and secondly whether there are similarities with other developing countries in terms of how these business cycles react to these impacts. The analysis is conducted through the examination of the volatility, persistence and cross-correlation between domestic output (gross domestic product) and a large group of macroeconomic variables (including consumption, fiscal variables, trade variables as well as monetary variables) to establish the stylised facts for the FMEs, which are then compared to the generalised stylised facts established for developing countries. The results indicate that only selected stylised facts for the analysis of business cycles of developing countries are valid for the FMEs, such as the volatility of output, public sector revenue and expenditure, and consumption. However, many aspects of the business cycles of these economies are significantly different to the stylised facts such as the lower than expected volatility of investment, as well as the volatility of exports which is double the expected value. The policy implications of the findings for Africa's FME's are also reflected upon.

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CHAPTER 1. INTRODUCTION

1.1 Background

The phenomenon of globalisation has resulted in countries across the globe being intrinsically linked to each other through trade in goods and services across borders, international capital flows, and global setting of best practices, which are all pillars of regional and global integration. This has, however, also resulted in economies becoming more vulnerable to exogenous shocks that emanate from several different sources beyond their own borders, that includes fluctuations in terms of trade, commodity prices, world interest rates, world demand, real exchange rates and capital flows. The impact of exogenous shocks on a country's macroeconomic conditions and business cycle depends on a number of factors, including the extent of international integration of the country via trade and financial channels, the health and structure of its sectoral balance sheets, and the ability of policymakers to mitigate the impact of shocks through policy decisions (Tiongson et al., 2008). World interest rates and world demand are purely exogenous factors, as they are not influenced by any domestic factors. In contrast, terms of trade, commodity prices, real exchange rates and capital flows, are influenced by both external and domestic factors. In ensuring that the analysis provides a true and balanced reflection of the role that exogenous factors play in the macroeconomic conditions of developing countries, it is necessary to consider both exogenous and endogenous factors that influence the business cycles. The analysis of the impact of these shocks on the business cycles of countries, is underpinned by stylised facts that have been established for developed and developing countries respectively, which include the analysis of both internal and external factors that influence economies.

(Cesar Calderón & Fuentes, 2010) state that the economies of developing countries are generally characterised by their macroeconomic volatility. These economies exhibit sharper, more frequent and more sudden fluctuations in output, exchange rates and current account balances than developed economies, and that “country specific factors such as the lack of economic diversification, a narrow tax base, poor economic policies and weak institutions have been posited as the reasons for the volatility of the business cycles of developing economies” (Cesar Calderón & Fuentes, 2010, p. 2). There is expanding literature suggesting that a highly unstable domestic macroeconomic environment is one of the primary reasons for poor economic growth in African countries over the last thirty years (Ramey & Ramey, 1987) and (Loayza, Rancie, & Serve, 2007). Developing countries not only face more macroeconomic volatility than do developed countries, but the effects of the volatility are also larger, resulting in particularly large welfare costs in these countries. The negative impact of macroeconomic volatility on output growth and future consumption is further exacerbated in poor countries that have underdeveloped financial

institutions and are unable to conduct countercyclical fiscal policies (Loayza et al., 2007). The macroeconomic stability in developing countries are vulnerable to both endogenous and exogenous shocks as a result of the structures of their economies (commodity-based exports), their institutional frameworks, and their ability to identify, develop and implement the necessary policy responses to address the impacts of macroeconomic volatility.

(Loayza et al., 2007) found that business cycles in developing countries stemmed from three sources: “firstly, developing countries receive bigger exogenous shocks; secondly, developing countries experience more domestic shocks, generated by the intrinsic instability of the development process and self-inflicted policy mistakes; and lastly, developing countries have weaker shock absorbers so external fluctuations have larger effects on their macroeconomic volatility” (p346). Small open economies, which are integrated to some extent into the global economy, but have weaker shock absorbers (Loayza et al., 2007), are more susceptible to exogenous shocks than larger industrialised countries.

A thorough understanding of the macroeconomic volatility in developing countries requires an understanding of the sources of the volatility such as real shocks (e.g., shocks to commodity prices and to the country’s external demand), financial shocks (sudden stops due to changes in global liquidity considerations) and natural disasters (César Calderón & Yeyati, 2007).

Through examining the business cycles of countries, researchers aim to determine why economies go through recession and recovery periods, through assessing what shocks are the most important in disturbing the economy and what economic structure is necessary for propagating these shocks (Basu & Taylor, 1999). (Backus, Kehoe, & Kydland, 1995), explicitly discussing international business cycles, highlight that research in this area focusses on “the economic connections amongst countries and on the impact that these connections have on the transmission of aggregate fluctuations”(p.331). Stylised facts have been established for both developed and developing economies, to assist with the analysis of business cycle fluctuations, (Agenor et al., 2000), which include the analysis of both endogenous and exogenous factors that influence business cycles.

Understanding whether macroeconomic volatility is as a result of exogenous or endogenous shocks to demand, supply or monetary policy, is important if policy makers are to make the correct policy changes (Dees, Pesaran, Smith, & Smith, 2010). The inability of policy makers to firstly anticipate the impact of both exogenous and endogenous shocks and secondly to affect the necessary policy changes to mitigate the negative effects of economic downturns in an effective

manner, impacts the persistence of economic fluctuations. Persistent fluctuations imply greater economic hardship during downturns, therefore they are also of great interest to policy makers.

The macroeconomic volatility experienced in African countries is apparent when considering the volatility of economic growth experienced by countries in sub-Saharan Africa (SSA) since 2000. SSA recorded growth rates of between 5 and 7 percent in the lead up to, and for the duration of the 2008 global crisis, however, these growth rates plummeted to 3.5 percent in 2015 and declined further to an average of 1.4 percent in 2016, the lowest in two decades (International Monetary Fund, 2017). Clearly countries in the region have experienced substantial fluctuations in their business cycles, it is however important to understand the sources of these fluctuations if policy makers are to make the correct policy changes.

This study focuses on the nine countries in SSA that have been identified by the International Monetary Fund (IMF) as frontier market economies (FMEs). These are African countries with developing financial markets that are likely to attract institutional financial investors and are promising candidates to become part of a second generation of emerging market (EMs) countries. FMEs are characterised as countries which fulfil the following conditions: developed domestic financial markets; reduced restrictions on external capital flows; favourable general and institutional conditions and evolution; and offer competitive investment environments to attract investments (International Monetary Fund, 2013). By this classification Botswana, Ghana, Kenya, Mauritius, Mozambique, Nigeria, Tanzania, Uganda, and Zambia are categorised as FMEs in SSA. As discussed in section 1.2 and 3.5, developing countries are more susceptible to exogenous shocks as they are unable to cushion against these impacts, which is particularly relevant when considering the FMEs as three of these countries – Mozambique, Tanzania and Uganda – continue to be classified as lower income countries (LIC's), with the remaining six countries middle income countries. As the FMEs become more integrated into the global economy and financial system, they continue to experience significant fluctuations in their business cycles, and remain vulnerable to exogenous shocks, however, the extent to which exogenous shocks contribute to the fluctuations in their business cycles remains unclear.

1.2 Statement of research problem

The business cycle is commonly recognised as the periodic fluctuation of aggregate economic activity. There has been a great deal of research conducted on the business cycles of developed countries, through which characteristics and statistical properties have been identified (termed stylised facts), which are essential for the analysis and understanding of business cycles. Key to

policy makers and market participants is to have a comprehensive understanding of the causes of the cyclical patterns in economic activity. This is of particular importance in developing countries, where there is limited capacity to absorb the impact of exogenous or endogenous shocks, and, in the absence of full risk-sharing mechanisms, swings in business cycles result in high economic and social costs. Therefore, a detailed understanding of the business cycle and its interaction with policies is crucial for the development of macroeconomic stabilisation policies, which remains a critical policy objective in many developing countries.

In their seminal paper (Burns & Mitchell, 1947:3) defined the business cycle as:

A cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic.

This is referred to as the *classical* cycle in the literature, which is the first of two distinct methodologies for the description of the business cycles. The classical cycle, as per the definition of (Burns & Mitchell, 1947), can be defined as the sequential pattern of expansions and contractions in aggregate economic activity. The second approach, known as the *growth* approach, can be defined as the deviations of aggregate real output from the trend (Lucas, 1976) and (Kydland & Prescott, 1990).

The works of (Agenor et al., 2000), (Rand & Tarp, 2002) and (Aguilar & Gopinath, 2007), and (Male, 2009) provide the foundation of the analysis of business cycles of developing countries through the identification of stylised facts for the business cycles of these countries. This literature posits that the output fluctuations in developing countries are positively correlated with economic activity in the main industrialised countries; that the business cycles in developing countries are not significantly shorter rather more volatile than those of developed countries; and the studies find a clear relationship between the timing of business fluctuations and periods of significant regional crisis.

Further to the development of the stylised facts of the business cycles, (Uribe & Yue, 2006) found that exogenous factors such as interest rate shocks in the United States (US) and country spreads, explain between 12 and 20 percent of movements in aggregate activity in developing economies. (Kose & Riezman, 1999) found that trade shocks account for approximately 50 percent of the

volatility in aggregate output. This is particularly significant as the volume of international trade, which is mainly based on primary commodities, is found to account for more than 50 percent of the aggregate output in these countries. Revenue collection from international sources is therefore also generally unstable in these countries, because of regular and high commodity price fluctuations. Commodities continue to play an important role in these African FMEs, as they derive the merchandise export revenues from a single commodity or several commodities, with the share of commodities in total exports in the average developing country more than double that of advanced economies (Fernandez, Gonzalez, & Rodriguez, 2015). The importance of these commodities in these economies stems from their importance as a source of foreign exchange revenue and being responsible for employment in large parts of the labour force in the country, particularly in countries that are reliant on agricultural products. This continued reliance on commodities by African countries, makes them more vulnerable to changes in international trade patterns which generally display patterns similar to those of fluctuations in global demand. (Wild, Wild, & Han, 2006) state that “Slower world economic output slows the volume of the international trade and higher output propels trade” (p 165). Therefore, global output, which is generally used as a proxy for global demand, can have a significant impact on the output of African countries.

High levels of indebtedness continue to be a key characteristic of developing countries which is clear when considering that the stock of SSA government bonds on the international market grew from less than US dollar (USD) 1 billion in 2008 to more than USD25.8billion in 2014 (Africa Research Institute, 2014). With developments in the global economy, such as the appreciation of the USD, the slump in commodity prices and the fall in global demand, particularly that of China, the debt stock in the FMEs rose significantly, with the external debt stock of Kenya, Nigeria and Zambia increasing by over 35 percent between the end of 2013 and 2015 (Ncube & Brixiová, 2015). These high levels of indebtedness increase the vulnerability of FMEs to fluctuations in world interest rates. As highlighted by (Moore & Thomas, 2010, p.216), “high levels of debt, can hamper the ability of countries to repay their past loans, and can lead to reduced investment owing to uncertainty and lead to capital flight. Debt overhang can also reduce the incentive to carry out structural and fiscal reforms, owing to pressures to repay foreign creditors, and consequently, economic growth.”

A thorough understanding of the sources of macroeconomic fluctuations in African economies requires a good grasp of the impact of both external and internal factors that contribute towards

the business cycle fluctuations in these countries. Analysing business cycles can also provide guidance to researchers in choosing leading indicators for economic activity, and provide a set of “regularities” which macroeconomists can use as a benchmark to examine the validity of numerical versions of theoretical models (Canova, 1998). Limited work has been undertaken in the business cycles of SSA countries, with (Agenor et al., 2000) and (Aguilar & Gopinath, 2007) each including only one country from SSA, while (Rand & Tarp, 2002) and (Male, 2009) both included five SSA countries in their respective analysis. To the best of my knowledge no work has been undertaken to assess the impact of exogenous shocks on Africa’s FMEs.

1.3 Research questions and objectives

In accordance with the stylised facts established in existing business cycle literature, this study seeks to establish how endogenous and exogenous factors impact the business cycles of FMEs, as well as to determine the similarities with other developing countries in terms of how the business cycles react to these impacts. This study will endeavour to answer the following research question:

- i) Do the stylised facts developed for the analysis of business cycles of developing countries, which include endogenous and exogenous factors, apply to Africa’s FMEs?

This study further seeks to achieve the following objectives:

- i) To determine the stylised facts for Africa’s FMEs which includes the analysis of the impact of both endogenous and exogenous factors on the business cycles of FMEs.
- ii) To compare the stylised facts for Africa’s FMEs against those obtained for developing countries in the existing literature.

Based on the abovementioned objectives, this study hypothesises that:

- i) The business cycles of Africa’s FMEs are impacted by both endogenous and exogenous factors.
- ii) The stylised facts developed for the analysis of the business cycles of developing countries are comparable with those established for Africa’s FMEs.

1.4 Justification of the study

Africa’s FMEs can be considered as the continent’s growth anchors for future development, however little research has been conducted on the nature of their business cycles. Limited attention has been paid in the existing literature as to whether the stylised facts, as formulated for

developing countries, are suitable for the analysis of the business cycles of the FMEs. Understanding the business cycles of these economies, and how exogenous or endogenous factors influence them, will assist both policy makers and market participants in having a better understanding of which factors contribute to economic fluctuations. This will enable policy makers to develop suitable stabilisation policies and mechanisms to cushion any negative impacts that economic downswings may result in.

The analysis of business cycles can assist policy makers and researchers in “choosing leading indicators for economic activity, and provide a set of “regularities” which macroeconomists can use as a benchmark to examine the validity of numerical versions of theoretical models” (Canova, 1998, p.476). Understanding the role of exogenous shocks in driving economic activity is especially important in the design and conduct of macroeconomic policies. In particular, analysis of the implications of government policies aiming to stabilise economies (Kose & Riezman, 1999).

This study will contribute towards the existing body of literature, through firstly assessing whether the stylised facts developed to analyse the business cycles of developing countries are suitable assessing the business cycles of FMEs. Secondly, this study will also provide empirical evidence on the impact that global shocks have on these FMEs, and whether the fluctuations in business cycles can be attributed to these shocks.

1.5 Organisation of the study

This paper is organised in six main chapters, including this introduction. Chapter 2 contains a comprehensive literature review on theories underpinning the analysis of business cycles, as well as the impacts of exogenous shocks on business cycles. Chapter 3 provides a detailed overview of the research approach and strategy, as well as the methods applied to compute the stylised facts for the Africa’s FMEs. Chapter 4 goes on to discuss the findings of the study and their policy implications, with Chapter 5 providing the conclusion for the study and identifying areas for future research.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of the literature on business cycles of developing countries covering three areas. This chapter provides an outline of the two different methodologies that underpin business cycle theory, namely the classical cycle theory and the growth cycle theory as well as the economic theory that underpins each of these theories, namely new Keynesian and Classical economic theory. Lastly, this chapter reviews the literature on the existing stylised facts for developing countries, as well as the impact of exogenous shocks on the business cycles in in developing countries.

2.2 Approaches to business cycle analysis

Two methodologies are articulated by (Harding & Pagan, 2005) that can be applied in the analysis and description of business cycles, each using completely different styles of analysis. The first of these is the *classical* cycle, which can be defined as the sequential pattern of expansions and contractions in aggregate economic activity. This definition of the business cycle extends from the seminal work of (Burns & Mitchell, 1947) as follows:

“Business cycles are a type of fluctuation in the aggregate economic activity of nations that organise their work mainly in business enterprises. A cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge in the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years.” (p.3)

Generally, the business cycle is identified through defining the turning points (troughs and peaks) in aggregate output, which separate periods of relative prosperity and relative decline in economic activity. “A full cycle is defined either from trough to trough or from peak to peak, and consists of two phases, an expansion (trough to peak) and contraction (peak to trough)” (Du Plessis, 2006, p.4). This approach focuses on the duration of the business cycle and the levels of aggregate economic activity, however, it does not take cognisance of the underlying causes or nature of the change (Rand & Tarp, 2002). (Lucas, 1976) criticised the classic cycle approach as it does not recognise the potential impact of governmental countercyclical policy, with his view being that government has a critical role to play in eliminating the inherent volatility of business cycles. Another common criticism of this approach, which was repeated by (Stock & Watson, 1999), is that it does not have a statistical foundation. They go on to explain that the construction of the classical cycle is sensitive to the underlying trend growth rate in the economy, particularly in

instances where countries, such as post-war Japan, exhibit growth cycles but exhibit few classical business cycles because the cycles have rare absolute declines, therefore growth cycle analysis may be more robust and useful for policy purposes.

The *growth* cycle is the second methodology, which can be defined from (Lucas, 1976) and (Kydland & Prescott, 1990) as the analysis of cyclical fluctuations in economic time series data around their long-term trends. (Blanchard, 1989) operationalised the growth cycle approach with his interpretation that trends are that part of the aggregate output which is due to permanent shocks (trend component), while the cycle is that part of the output that results from short-term cyclical fluctuations (cyclical component) which are commonly referred to as growth cycles. The trend component should be removed from the aggregate output data, enabling the analysis of the cyclical component (Male, 2009). The identification of the permanent component is crucial to this method, and a number of different filters have been utilised in different studies, including the Hodrick-Prescott (HP) filter, the Band Pass (BP) filter, and the Beveridge-Nelson filter. (Harding & Pagan, 2002) however argue that detrending data may lead to the loss of critical information, particularly the removal of a stochastic trend, as is done by the HP filter; and that applying these detrending techniques result in a cycle that is unrecognisable from the original form.

2.3 Conceptual models

There are two main schools of thought regarding the most accurate approach to developing a model that can assist in the analysis of business cycles, namely the new Classical business cycle theory (new Classical theory) and the Growth cycle theory (new Keynesian theory).

The new Classical theory postulates that self-equilibrating mechanisms will return the economy back to its full employment equilibrium without further intervention (Ernst & Stockhammer, 2003). The theory is centred around Say's law (supply creates its own demand) and the Quantity Theory of Money (the general price level of goods and services is directly proportional to the amount of money in circulation), with no importance ascribed to the role of government, as fluctuations in the business cycle are optimal responses by private agents to shocks (Chari, Kehoe, & McGrattan, 2008). (Mankiw, 1989), (Mankiw, 2008) and (Thoma, 2012) identify the following assumptions that underpin the new Classical theory: (i) that wages and price are flexible; (ii) prices adjust quickly to clear markets; (iii) optimisation of private sector actors; (iv) markets are efficient; (v) rational expectations; (vi) the natural rate hypothesis; and (vii) that agents have imperfect information. The real business cycle (RBC) is an incarnation of the new Classic theory and its origins can be traced to the monetary equilibrium business cycle (MBC) model developed by (Lucas, 1975) and (Lucas, 1976). The MBC emphasises the role of monetary shocks, but fails to

adequately explain observed fluctuations in business cycles, which propagated the development of the RBC, which emphasises the importance of real shocks (Mullineux & Dickinson, 1992).

In their seminal work, (Kydland & Prescott, 1982) attempted to integrate the growth cycle approach and the business cycle theory through the development of the RBC model, which assumes that consumers have perfect information and rational expectations, there is perfect price flexibility, and only real disturbances impact the fluctuations in output and employment (nominal shocks are not taken into consideration). In addition to these assumptions underpinning the model, (Eichenbaum & Singleton, 1986) highlight that fiscal policy actions are also assumed not to have a significant impact on the business cycle. The RBC model generally considers technology shocks as the only exogenous shock that impacts the business cycle and places emphasis on the role that the optimisation decision of consumers has in choosing between work and leisure on the supply in the economy. The RBC model has received a great deal of criticism, as explained by (Eichenbaum & Singleton, 1986) as “when they are subjected to formal methods of estimation and inference, which incorporate a fairly comprehensive set of moment restrictions, the results are not supportive of the models” (p.15).

These sentiments are shared by (Summers, 1986), who went further to raise the following concerns with the RBC model: (i) the microeconomic foundations of the parameters that were introduced into the RBC model by (Prescott, 1986) are questionable; (ii) the technological changes are unable to account for all the downturns in aggregate economic output; (iii) the model does not take prices into consideration, which is unrealistic in a real world economy, making it impossible to distinguish between supply and demand shocks; and (iv) the RBC model ignores the role that partial breakdowns in the exchange mechanism (e.g. breakdown in the credit and labour markets) would have on cyclical fluctuations. (Kydland & Prescott, 1990), building on their previous work, attempted to explain the basic features of a business cycle on the US economy using stochastic equilibrium models capable of generating artificial data, finding that the patterns displayed by the statistics of the model economy are inconsistent with theory and that the major components of output tend to move together over the cycle. (Mankiw, 1989) states that the RBC does not provide an empirically plausible explanation of economic fluctuations and, to the extent that it trivialises the social costs of observed fluctuations, is potentially dangerous as policy makers using this model may conclude that certain macroeconomic policies are unnecessary.

The second school of thought is the new Keynesian theory. It rejects Say’s law and the Quantity Theory of Money, and instead postulates the existence of under-full-employment (Colander, 1992). This theory has three principle characteristics. The first of these is that the economy takes

time to adjust to economic fluctuations caused by both supply and demand side shocks, particularly because it suffers from a perpetual lack of aggregate demand to clear out the labour market (Ernst & Stockhammer, 2003). Therefore, unlike the RBC theory, which assumes market efficiency and excludes nominal shocks from the analysis, the new Keynesian theory maintains that both real and nominal shocks should be taken into consideration when analysing business cycles. Secondly, (Eichenbaum & Singleton, 1986) and (Zarnowitz, 1992) identify inherent frictions associated with incomplete markets, imperfections of competition, information and capital markets, being the main propagation mechanisms, as the principle causes of rigidity and stickiness in prices and wages, therefore the economy takes time to revert back to equilibrium after a shock has occurred. This can explain the existence of unemployment as well as the strong influence of monetary policy on economic activity (Mankiw, 2008). This contrasts with the RBC theory that postulates that markets are efficient and revert to equilibrium and that prices and wages are flexible. Thirdly, in the new Keynesian theory, the government is also considered to play a critical role in restoring full employment through fiscal and monetary impulses (Eichenbaum & Singleton, 1986), in contrast to the RBC theory which ascribes no role to fiscal and monetary interventions. As the Keynesian theory developed into the new Keynesian theory, the rational expectations framework (like that of the new classical theory) was adopted, however the sluggish movement of prices and wages are still considered to be frictional elements (giving monetary policy its power) that prevents the economy from immediately adjusting back to equilibrium once a shock has occurred.

The new Keynesian model has also received criticism, particularly for being too complex for policy analysis (Chari et al., 2008). Furthermore, similarly to the new Classical theory, the new Keynesian theory has also been criticised for focusing on aggregate macroeconomic fluctuations, and not being grounded in microeconomic theory, particularly the degree of price rigidity, which remains a controversial issue (Rand & Tarp, 2002). (Lucas, 1976) questions the emphasis of the role of institutional instability as a source of economic fluctuation; and the real impact of fiscal policies are also questioned, given that only short-run imbalances are considered (Ernst & Stockhammer, 2003).

Despite the differences between the new Classical and new Keynesian theories, (Chari et al., 2008) highlight that there has been agreement between the two schools of thought on the need for a structural model (which evolved into the dynamic stochastic general equilibrium model), the importance of efficiency and labour in generating productivity shocks and that monetary policy has a role to play in bringing about a state of equilibrium. Regardless of the progress made in reaching consensus in some areas, there are still disagreements on the traditions of model building

- simple versus complex. The primary disagreement between the new classical and new Keynesian theories is over how quickly prices adjust (Duarte, 2015).

2.4 Empirical research findings: Stylised facts of business cycles of developed countries

Stylised facts have evolved from the observation that although some economic relations are not numerically constant, they have been revealed relatively stable (Duarte, 2015). These stylised facts consider both internal and external factors that influence the macroeconomic stability of countries. (Kaldor, 1955) introduced the terminology of stylised facts as his view was that they are needed to guide the theoretical analysis. The importance of stylised facts as outlined by (Canova, 1998) is first, that they provide a summary of the complex co-movement that exists between aggregates in the economy, allowing for the calculation of the magnitudes of the fluctuations of economic variables and secondly, they provide a set of regularities according to which macroeconomists can benchmark the validity of numerical versions of theoretical models. Stylised facts were quickly adopted into business cycle terminology, but questions have been raised by a number of authors about the non-rigorous and approximate empirical evidence, and the modern use of stylised facts also expresses an “ambiguity between data and phenomena, an ambiguity between the observable and the inferred” (Duarte, 2015, p.5). (Mankiw, 1989) states that stylised facts are “an empirical claim that is widely believed but the evidence for which is only mixed” (p.29). (Burnside, 1997) also disagreed with the development of a single set of stylised facts, stating “the idea that there exists a single set of stylized facts about business cycles is misleading” (p.537).

(Kydland & Prescott, 1990) developed the first set of stylised facts on business cycles, which in turn have been used to provide an empirical basis for the formulation of theoretical models of the business cycle. Since this seminal work, the stylised facts for developed economies have become well established, with a substantial body of literature documenting a wide range of empirical regularities amongst these countries (Kydland & Prescott, 1990), (Backus & Kehoe, 1992), (Backus et al., 1995), (Basu & Taylor, 1999) and (King & Watson, 1996). The stylised facts for industrial countries, as summarised by (Male, 2009), are as follows:

- “Persistent real output fluctuations and real exchange rate fluctuations (in recent years). Real exchange rates are also typically volatile.
- Volatility of output, consumption and net exports very similar (consumption and net exports slightly less volatile than output) whilst investment is consistently 2 to 3 times more volatile and government expenditures are significantly less volatile than output (by around half).
- A remarkably stable relationship between output, consumption and inflation.

- Consumption, investment, employment, inflation and money velocity are all generally procyclical.
- Increasing procyclicality of the real wage, whilst price is consistently countercyclical, and inflation is generally procyclical.
- Ratio of net exports to output is generally countercyclical.
- Government expenditures are typically acyclical.
- International comovement in output, consumption and investment, but output correlations are generally higher than consumption correlations.
- Correlations between real exchange rate and aggregate quantities, in particular relative consumption, are fairly small” (p.46).

Table 1. Properties of business cycles in OECD countries (1970 - 1990)

Country	Ration St.Dev to St Dev										
	St Dev (%)		of Y				Correlation with Y				
	y	nx	c	i	g	n	c	i	g	nx	n
Australia	1.5	1.2	0.7	2.8	1.3	0.3	0.4	0.7	0.2	0	0.1
Austria	1.3	1.2	1.1	2.0	0.4	1.2	0.7	0.8	-0.2	-0.5	0.6
Canada	1.5	0.8	0.9	2.8	0.8	0.9	0.8	0.5	-0.2	-0.3	0.7
France	0.9	0.8	1.0	3.0	0.7	0.6	0.6	0.8	0.3	-0.3	0.8
Germany	1.5	0.8	0.9	2.9	0.8	0.6	0.7	0.8	0.3	-0.1	0.6
Italy	1.7	1.3	0.8	2	0.4	0.4	0.8	0.9	0	-0.7	0.4
Japan	1.4	0.9	1.1	2.4	0.8	0.4	0.8	0.9	0	-0.2	0.6
Switzerland	1.9	1.3	0.7	2.3	0.5	0.7	0.8	0.8	0.3	-0.7	0.8
UK	1.6	1.2	1.2	2.3	0.7	0.7	0.7	0.6	0.1	-0.2	0.5
US	1.9	0.5	0.8	3.3	0.8	0.6	0.8	0.9	0.1	-0.4	0.9
Europe	1.0	0.5	0.8	2.1	0.5	0.9	0.8	0.9	0.1	-0.3	0.3

Source: (Backus et al., 1995, p 334; Table 11.1). Notes: Variables are y-real output, c-real consumption, i-real fixed investment, g-real government purchases, nx-ratio of net exports to output (both at current prices), and n-civilian employment.

Table 1. reports the results of the analysis by (Backus et al., 1995) on OECD countries, and reveals that the business cycles of these countries have similar properties. Considering the ratio of the volatility of the respective variables, to that of output, investment is clearly 2 to 3 times more volatile compared to output. The results for consumption, investment and employment infer a significantly higher volatility than output, with government expenditure only being marginally more volatile. Real government consumption is acyclical as shown by the measures of correlation with output which are all close to zero across the countries, consumption, investment and employment are all procyclical as evidenced by the positive correlation measures, whereas net exports are countercyclical.

2.5 Empirical research findings: Stylised facts of business cycles of developing countries

In their seminal work, (Agenor et al., 2000) were the first to develop stylised facts for developing countries, when they studied the business cycles of 12 developing countries (Colombia, Chile, India, Korea, Malaysia, Mexico, Morocco, Nigeria, the Philippines, Tunisia, Turkey and Uruguay) for the period 1978:1 - 1995:4. (Agenor et al., 2000) found that there are significant differences between the business cycles of developed countries and developing countries. The major stylised facts, as established by (Agenor et al., 2000), are as follows: (i) output volatility is, on average, much higher than in developed countries and exhibits considerable persistence in fluctuations; (ii) developing countries are significantly affected by activity in developed countries, as measured by world output and the world real interest rate; (iii) government expenditure is countercyclical and government revenue is generally acyclical, which yields a countercyclical fiscal impulse (defined as the ratio of government spending to government revenue); (iv) similarly to developed countries, real wages are procyclical; (v) contrary to developed countries where prices are documented to be countercyclical, there is no consistent relationship between output fluctuations and deviations in inflation or the price level in developing countries; (vi) the velocity of broad money is strongly countercyclical in developing countries, whereas it is weakly procyclical in most developed countries; (vii) there is no robust relationship between the trade balance and output. Where the trade balance is procyclical, this “may indicate that fluctuations in industrial output are driven by export demand and that imports are not as sensitive to domestic demand fluctuations as they are in industrial economies” (Agenor et al., 2000, p.12). Furthermore, terms of trade are strongly procyclical suggesting much of the fluctuation in output in developing countries can be explained by terms of trade shocks, which was also suggested by (Mendoza, 1995); and (viii) there is no systematic pattern for the correlation of nominal or real effective exchange rates and industrial output.

In subsequent research, (Rand & Tarp, 2002) studied a sample of 15 developing countries (five in SSA¹, five in Latin America and five in Asia and North Africa), with a quarterly dataset for the duration analysis (1980:1 - 1994:4) and an annual dataset for the cross-correlation and volatility analysis (1970 - 1997), examining specifically the duration of the business cycles, the volatility of the 15 variables identified as well as a cross-correlation analysis. They combined the classic and the growth cycle methods, using industrial production as a proxy for aggregate economic activity. The first analysis undertaken by (Rand & Tarp, 2002) was to find the turning points for the levels of aggregate economic activity in these economies by using the dating algorithm of (Bry &

¹ South Africa, Malawi, Nigeria, Cote d’Ivoire and Zimbabwe

Boschan, 1971). The key result from this examination was that the business cycles of developing countries are significantly shorter than those of developed countries.

In their second analysis, (Rand & Tarp, 2002) used their findings on the duration of the business cycle to recalibrate the HP filter to construct growth cycles for their sample of countries. Similarly to (Agenor et al., 2000) they find that the business cycles of developing countries are considerably more volatile than those of developed countries, particularly for countries in SSA, as well as that shocks in developed countries have a significant impact on the economies of developing countries. Contrary to the findings of (Agenor et al., 2000), they find that inflation and price levels are countercyclical, therefore supply shocks play a significant role in the business cycles in developing countries. (Rand & Tarp, 2002) also found that governments play a limited role in stabilising the economies of developing countries as no consistent relationship was established between the public sector variables and economic growth, which is also a significant departure from the findings of (Agenor et al., 2000). It was also found that consumption, money and private sector credit are highly volatile, with monetary policy being used to pursue goals other than pure stabilisation, and they were the first to establish that consumption and investment are strongly procyclical which is similar to developed countries. The study goes on to establish that terms of trade is not as significant a destabilising factor in developing countries, as often assumed, and lastly that aid and foreign direct investment appear to be highly volatile and show no signs of being procyclical (Rand & Tarp, 2002).

(Pallage & Robe, 2003) examined the business cycle properties of foreign aid flows received by a sample of 63 countries, 38 of which are African countries, between 1969 and 1995. In addition, 18 countries from the Organisation for Economic Cooperation and Development (OECD) that belong to its Development Assistance Committee (DAC) were also included in the study when the cyclical behaviour of aid was analysed from the donor's perspective. Contrasting with the finding of (Rand & Tarp, 2002), they observed that aid flows is a major source of income in developing countries, that is procyclical and highly volatile particularly in the African countries in their sample. These divergent findings could be a result of the samples for the studies, as the sample of (Pallage & Robe, 2003) includes 38 African countries whereas the sample of (Rand & Tarp, 2002) only include 5 African countries, of which only Malawi was highly reliant on aid for the duration of their analysis.

Examining a sample of 21 industrialised and 55 developing countries, (Kose, Prasad, & Terrones, 2003) analysed the dynamics of volatility and co-movement of business cycles from 1960-1999 using per capita real gross domestic product (GDP) as a proxy for aggregate economic output.

Similarly to both (Agenor et al., 2000) and (Rand & Tarp, 2002), they find that economic fluctuations in developed countries have a significant impact on the economies of developing countries, particularly the increased volatility of consumption and economic growth, ascribing this to stronger trade and financial integration. However, contrary to the findings of (Rand & Tarp, 2002), (Kose et al., 2003) find that the volatility of output and investment growth declined on average, while also observing a decline in the co-movement of developing country business cycles with world aggregates.

(Cashin, 2004) examined the business cycles of the 6 fund members of the Caribbean Currency Union, (Antigua and Barbuda, Dominica, Grenada, St Kitts and Nevis, St. Lucia, and St Vincent and the Grenadines) for the period 1963-2003, using the logarithm of annual real GDP to measure real output of each country. Both the classic and growth cycle theories are used, and the findings are compared. As found by (Agenor et al., 2000), (Rand & Tarp, 2002) and (Kose et al., 2003), these countries exhibit high volatility in economic growth rates, and the business cycle fluctuations in these countries are correlated with the cycles of output of developed countries. Interestingly, the study also finds that the growth cycles of the sample countries are synchronised and symmetric in duration and amplitude.

(Aguiar & Gopinath, 2007) considered a sample of 13 developing countries (Argentina, Brazil, Ecuador, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Slovakia, South Africa, Thailand and Turkey) over a period of 40 quarters. In addition to finding that output is more volatile in developing countries than in developed countries, as is found by (Agenor et al., 2000) and (Rand & Tarp, 2002), the volatility is found to be on average double that in developed countries and that similar degrees of output persistence are presented between developing countries. Consumption in developing countries is found to be on average 40 percent more volatile than in developed countries, which is similar to the findings of (Rand & Tarp, 2002), however in contrast to (Rand & Tarp, 2002), (Aguiar & Gopinath, 2007) find that the volatility of investment is similar to that found in developed countries. As also documented by (Rand & Tarp, 2002), consumption and investment are strongly procyclical, similarly to developed countries. (Aguiar & Gopinath, 2007) also find the trade balance for developing countries to be strongly countercyclical, in contrast with the findings of (Agenor et al., 2000). The study goes on to establish for the first time in the analysis of business cycles of developing countries that net exports are approximately three times more volatile than output.

Building on the research of the above-mentioned authors, (Male, 2010) contributed to business cycle literature by generalising the stylised facts through the application of both classic and growth

cycle methodologies to a larger set of developing countries, consisting of thirty-two developing countries (5 from SSA, four North African, 9 Latin American, 8 Asian and six Eastern European)² plus the United Kingdom (UK), the US and Japan as developed country benchmarks. Significantly, (Male, 2010) found that the business cycles of developing countries are not substantially shorter than those of developed countries which is in stark contradiction with the finding of (Rand & Tarp, 2002). This difference may be because of the larger sample of countries considered by (Male, 2010). Similarly to the findings of (Agenor et al., 2000) and (Rand & Tarp, 2002), developing countries with countercyclical price levels are also found to exhibit countercyclical inflation, and real wages are procyclical in both developed and developing countries, with the volatility of prices and wages being similar to that of developed countries. Contrary to the findings of (Neumeier & Perri, 2005), (Aguiar & Gopinath, 2007), (Uribe & Yue, 2006), the study finds that average interest rates are procyclical and not countercyclical in developing countries, and that they are less volatile than in the developed countries. Also, in contrast to the findings of (Agenor et al., 2000), the study concludes that broad money is either acyclical or weakly procyclical in developing countries, whereas it is strongly procyclical in developed countries, and it is found to lead the business cycle in some countries. Domestic credit was also found to lag rather than lead the business cycle, implying that fluctuations in credit are influenced by output, which is consistent with the findings of (Rand & Tarp, 2002) and (Agenor et al., 2000). Most of the developing countries exhibit strong procyclical terms of trade, which corroborates the results of (Agenor et al., 2000) and (Rand & Tarp, 2002); and persistent output fluctuations are a key characteristic of developing country cycles, however the magnitude of the persistence is lower than that for developed countries.

As discussed above, the findings of existing research regarding the stylised facts of developing countries are generally consistent. Although some similarities have been identified with the business cycles of developed countries, several contrasts have also come to the fore requiring the development of specific stylised facts for developing countries.

A key finding through existing research is that economic fluctuations in developed countries have a substantial impact on the business cycles of developing countries, this is further emphasised by the inclusion of exogenous factors into the established stylised facts for developing countries, particularly terms of trade, world interest rates, real exchange rates, and world demand.

1. Cote d'Ivoire, Malawi, Nigeria, Senegal, South Africa, Israel, Jordan, Morocco and Tunisia, Argentina, Barbados, Brazil, Chile, Colombia, Mexico, Peru, Trinidad and Tobago, and Uruguay, Bangladesh, Hong Kong, India, South Korea, Malaysia, Pakistan, the Philippines and Turkey, Hungary, Lithuania, Macedonia, Romania, the Slovak Republic and Slovenia.

(J. D. Sachs, 1989) considers the impact of global shocks on developing country debt and emphasises that global factors such as world interest rates, exchange rates and commodities have a major impact on the macroeconomic performance of countries; particularly those that rely heavily on the export of commodities. The study highlights that when interest rates are below export growth rates, borrowers can access the necessary funds to service loans without suffering a rise in the debt-to-export ratio, however, once interest rates increase rise above export growth, then any borrowing will impact the debt-to-export ratio. This would have serious implications for GDP levels, as countries need to redirect resources to finance debt repayments instead of investment.

Examining the relationship between terms of trade and the business cycles of developing countries, (Mendoza, 1995) considered the business cycles of the 7 largest industrial economies (G7) and 23 developing countries between 1955-1990 for the former group of countries and 1960-1990 for the latter group of countries. The study integrated the RBC framework with the intertemporal approach to analyse the effects of terms of trade. A number of the findings made in the study relate to those made by (Agenor et al., 2000) and (Rand & Tarp, 2002). A significant finding is that terms of trade shocks account for 45 to 60 percent of the volatility of GDP and real exchange rates and that they are persistent and weakly procyclical, which is consistent with the findings of (Agenor et al., 2000). Furthermore, similarly to (Agenor et al., 2000) and (Rand & Tarp, 2002), (Mendoza, 1995) found that the macroeconomic aggregates such as growth, investment and consumption display higher volatility than observed in developed countries, however similar characteristics in the variability ratios are noted. The correlation between net exports and terms of trade are found to be low and positive, and they are not systematically related to cross-country differences in terms of trade autocorrelations. In contrast to the findings of (Agenor et al., 2000) and (Rand & Tarp, 2002), (Mendoza, 1995) finds that the business cycles of industrial and developing countries exhibit similar characteristics of variability ratios and measures of co-movement and persistence in output, consumption, investment, real exchange rates and net exports.

In examining the macroeconomic fluctuations in 23 SSA countries, (Hoffmaister, Roldós, & Wickham, 1998) compare Common Franc Area (CFA) franc and non-CFA countries for the period between 1971-1993 and found that terms of trade and world interest rates have a minimal impact on output growth movements in the non-CFA country group, however their impact was larger in the CFA group. This contrast in the findings could be attributed to the fact that most countries in the CFA sample group have longer-term external debt with a fixed exchange rate and that they have limited access to international capital markets. (Hoffmaister et al., 1998) also found that terms of trade did not play a dominant role in macroeconomic fluctuations, and that “fiscal shocks play

a dominant role in the behaviour of exchange rates in the short run, with external shocks taking over this role in the long run. Both fiscal and external shocks are important sources of trade balance movements” (p.144).

(Deaton & Miller, 1995) analysed how 12 SSA countries (Cameroon, Ivory Coast, Ghana, Kenya, Madagascar, Nigeria, Senegal, Sudan, Tanzania, Democratic Republic of Congo, Zambia and Zimbabwe) dealt with fluctuations in the prices of commodities over the period 1980-1990. This analysis aimed to assess the causes of poor macroeconomic results in these countries and assess whether they are because of the difficulty in predicting commodity price fluctuations, or flawed internal political and fiscal arrangements. They find that a large portion of the variation in unit prices that determine the terms of trade, at a national level can be explained by world price fluctuations of the underlying commodities.

(Kose & Riezman, 1999) considered the effects of trade shocks (relative prices of capital goods to primary goods and relative prices of intermediate good to primary goods) on macroeconomic fluctuations in African countries. This was accomplished through examining the cyclical behaviour of trade shocks and their co-movement with aggregate output and the trade balance of twenty-two non-oil exporting African countries for the 1970-1990 period. Consistent with the findings of (Deaton & Miller, 1995), this study found that international trade shocks have a significant role in driving macroeconomic fluctuations in African economies, with up to 45 percent of fluctuations in aggregate output being explained by world price shocks. International trade shocks are also found to account for almost 87 percent of the variation in aggregate investment. (A. Kose & Riezman, 2001), also find that world interest rates do not have a significant effect on aggregate output. Consumption is also found to be more volatile than output, which is consistent with the findings of (Rand & Tarp, 2002). The trade variables consisting of imports, export and the trade balance are found to be highly volatile, with the trade balance being identified as the most volatile series.

In examining the vulnerability of African countries to exogenous shocks such as the 2008-2009 financial crisis, (Berman & Martin, 2012) focussed on the impact of the financial crisis on the exporters within SSA, considering data of five African countries (Benin, Burkina Faso, Mali, Togo, and Zambia) and thirteen non-African countries (Australia, Chile, the Peoples Republic of China, Ecuador, Hong Kong, India, Japan, New Zealand, Panama, Singapore, Taiwan, the US, and the Republic of Yemen) for the period between 2005-2009. African countries are found to be particularly vulnerable to any financial crisis that affects their key trading partners, particularly their export destinations.

(Neumeyer & Perri, 2005) examine the relationship between real interest rates and business cycles in EMs by conducting a statistical analysis of the business cycles of a sample of small open EMs (Argentina, Brazil, Korea and the Philippines) in contrast to a set of small open developed economies (Australia, Canada, Netherlands, New Zealand and Sweden). Their findings are similar to the stylised facts documented by (Agenor et al., 2000) and (Uribe & Yue, 2006) which were discussed in section 2.4. That is, real interest rates in developing economies are found to be not only on average 40 percent more volatile than in developed countries, but also to be countercyclical and lead the business cycle, which contrasts with developed economies where real interest rates are acyclical and lag the cycle. This finding is in contrast with that of (Mendoza, 1995), which could be as a result of the small sample of developing countries analysed by (Neumeyer & Perri, 2005). Output, and consumption both display high levels of volatility, which is on average higher than in developed countries, and finally, net exports are more strongly countercyclical than in developed economies.

(Yildirim & Ivrendi, 2016) highlight the importance of the role that exchange rates play in transmitting the effects of both domestic monetary policy and foreign shocks to the macroeconomy, “Firstly, a domestic monetary policy shock influences an economy’s macroeconomic indicators by inducing exchange rate movements; Secondly, developments in global financial markets are quickly conveyed to these economies through exchange rate appreciation or depreciation” (p.679). (Yildirim & Ivrendi, 2016) find that although the trade balance improves through the depreciations of the exchange rate, that it typically leads to high inflation and recession. The effects of exchange rate volatility are generally transmitted through supply-side channels, particularly through the cost of imports. (Broda, 2004) found that the types of exchange rate regime enforced by a country, has a significant impact on the impact that exchange rate volatility has on the business cycles of countries.

2.6 Summary of stylised facts

Although there is growing body of business cycle literature for developing countries, there is a dearth of research on stylised business cycle facts for frontier markets. To assist with the analysis of the stylised facts for Africa’s FMEs, the key findings for the stylised facts for developing countries have been summarised in Table 2.

This section reviews the existing research regarding the stylised facts of developing countries, providing an estimation of how endogenous and exogenous factors impact the business cycles of developing countries. The findings in the existing research are generally consistent and find that

developing countries are vulnerable to both endogenous and exogenous factors which can cause significant volatility in the aggregate output. The research on the stylised facts for the business cycles of developing countries continues to grow, however, there is no research specific to the FMEs.

Table 2. Summary of stylised facts for developing countries

	Stylised facts for developing countries
GDP	Output is more volatile than developed countries, but there is a similar degree of persistence in output fluctuations
CON	Consumption is more volatile than output, and generally weakly procyclical
INV	Investment volatility is two to three times higher than output volatility and is generally weakly procyclical
GEX	No clear relationship between output and government expenditure
CPI	Prices are not consistently countercyclical
CCPI	Inflation is not consistently procyclical and has a volatility similar to developed countries
LR	Real interest rates are countercyclical and lead the cycle. Real interest rates are also significantly more volatile in developing countries
BM	Generally weakly procyclical
DCR	Private sector credit is on average less volatile than in developed countries, and is generally weakly procyclical
EXP	Net exports are about three times more volatile than output
TOT	No clear relationship between terms of trade and output
RER	Real exchange rate volatility is similar to that for developed countries, and no clear relationship between real effective exchange rates and output
WGDP and WIR	Activity in developed countries, as measured by world output and world interest rate, has a significantly positive influence on output in most developed countries

2.6 Summary and conclusions

It has been established that the fluctuations in the business cycles of developing countries are significantly different from the fluctuations of developed countries' business cycles. This has led to the development of separate sets of stylised facts for the business cycles of developed and developing countries respectively. There is general agreement in the literature that economic fluctuations in developed economies can hold significant implications for the business cycles of developing countries, and that they can be transmitted through several channels including terms of trade, world interest rates, changes in global output and demand. There is, however, no consensus on how individual developing countries will respond to exogenous shocks. As discussed in section 1.1, Africa's FMEs are considered to be the continent's next anchors of growth, however no research has been conducted on whether their business cycles conform to the stylised facts for developing countries, or the impact that exogenous shocks would have on these economies which are becoming more integrated into the global trade and financial markets.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter outlines the research design and methodology that will be used to explore the research questions stated in the introductory chapter of this paper. The chapter starts with the description of the research approach, strategy and design that have been employed in this analysis. The chapter goes on to describe the variables and the data used in the study, as well to provide an analysis of the relevant economic features of the FME countries. The data analysis methods are then discussed, articulating the approach taken to characterise business cycles in terms of the volatility, persistence and correlation. Finally, the measures taken to ensure the reliability and validity of the research are described, as well as an overview of the limitations of the study.

3.2 Deductive research approach: Correlation research

The purpose of this research is to determine whether the established stylised facts for developing countries are suitable for the analysis of the business cycles of FMEs. This will include the examination of how both endogenous and exogenous factors impact the business cycles of the sample countries. This research objective underpinned the development of the following research question, “Are the business cycles of Africa’s FMEs the same as those of other developing countries?”. The following sub-questions were then developed to explore aspects of the overarching research question:

Do the stylised facts developed for the analysis of business cycles of developing countries, which include endogenous and exogenous factors, apply to Africa’s FMEs? This study utilises a deductive research approach, more specifically, a correlational approach which is aimed at trying to determine if there is a relationship, or covariance between two variables (Leacock, Rose, & Warrican, 2009). This approach was deemed the most appropriate as it would not be possible to draw conclusive findings on the causal relationships between the variables because the business cycles of the FMEs can be influenced by a myriad of different factors that fall outside of the scope of this study (Duarte, 2015).

3.3 Quantitative research strategy

A quantitative study was deemed the most appropriate research strategy for the exploration of the research problem, as the study seeks to test established theories by examining the relationship between variables related to the business cycles of FMEs, that are measured with quantitative economic indicators. More specifically, the purpose of the study is to explore the volatility, persistence and correlation between quantifiable macroeconomic variables and the GDP, which is the generally accepted indicator for the business cycle, using predetermined categories of statistical data and indicators, from which generalisable comparisons can be drawn. Qualitative

methods, in contrast, make use of written or spoken language, or observation to collect data which are then transcribed and analysed through the identification and categorisation of themes, and hence are not consistent with achieving the objectives of this study (Terre Blanche, Durrheim, & Painter, 2006).

3.4 Research design

As indicated, the purpose of this research is to examine the driving factors of business cycles, considering both endogenous and exogenous factors, over a period. Furthermore, analysis is being conducted on a cross-section of country units within Africa, referred to as Africa's FMEs.

Time series data is data for one or more variable that has been collected over a period of time (Brooks, 2008). In this study cross-country time series data collected for multiple variables is utilised in the analysis of the FMEs business cycles. The multiple variables represent the economic measures (as to be explained further in section 3.5), annually over the period 1984-2014 for each of the nine countries in the sample. The nature of this data is discussed in detail in the following section.

3.5 Data description and country information

This study makes use of secondary data from the World Bank, in the World Development Indicators (WDI), the Human Development Index (HDI) published by the United Nations (UN) as well as the World Penn Tables. The time frame for the analysis is 1984 to 2014, as data is not available for periods prior to this, however the analysis of 31 years gives a sufficiently long horizon to cover troughs and peaks in the business cycles of the nine countries in the sample. A number of studies in the relevant literature make use of quarterly data, however due to data availability, this study uses annual data in the examination of FMEs business cycles, which was also used by (Aguiar & Gopinath, 2007).

There are nine countries included in the sample (Botswana, Ghana, Kenya, Mauritius, Mozambique, Nigeria, Tanzania, Uganda and Zambia), and, as discussed in Chapter 1, have been selected primarily on the basis that they are classified as Africa's FMEs. Table 1 provides summary information about the countries included in the analysis, including: GNI per capita and World Bank income classifications, HDI scores and the development classifications of the UN, and average GDP and GDP per capita growth rates.

As per Table 3. Ghana, Kenya, Nigeria and Zambia are classified as lower middle-income countries, as well as having a medium HDI ranking. Mozambique, Tanzania and Uganda, however, are classified as low-income countries, with Mozambique and Uganda also being ranked as countries that have a low HDI. This provides insight into the levels of development and poverty in

these countries, and their susceptibility to exogenous shocks. The lower-income countries find themselves particularly vulnerable to exogenous shocks as they have less capacity to protect themselves from global volatility. Shocks that affect food prices tend to have the highest impact on poor households, since they spend a larger portion of their income on food than higher income households (Kabundi, 2012). Table 3 goes on to illustrate that only limited progress has been made by Mozambique, Tanzania and Uganda in terms of improving their GNI and HDI rankings between 1994 and 2014, illustrating their continued vulnerability to international shocks.

Table 3. Summary information for FMEs

	GNI per Capita			HDI			GDP	GDP per Capita
	1994	2004	2014	1994	2004	2014		
Botswana	2770	3790	7350	0.581	0.593	0.698	4.89	2.82
Ghana	380	390	1580	0.470	0.499	0.575	5.71	2.95
Kenya	260	460	1260	0.460	0.474	0.550	3.77	0.76
Mauritius	3230	5040	9790	0.643	0.704	0.799	4.86	4.09
Mozambique	160	310	620	0.222	0.341	0.414	7.76	4.53
Nigeria	170	610	2980		0.463	0.525	5.88	3.09
Tanzania	160	350	920	0.367	0.432	0.519	5.53	2.30
Uganda	180	270	670	0.314	0.429	0.488	6.92	3.27
Zambia	350	450	1170	0.401	0.467	0.576	4.70	1.72

	<u>GNI per Capita Classification</u>			<u>HDI Classification</u>	
	1994	2004	2014		
Low income	<=725	<=825	<=1.045	Low human development	HDI<0.500
Lower middle income	726-2,895	626-3.255	1.046-4.125	Medium Human development	0.500<HDI<0.799
Upper middle income	2,896-8,955	3.256-10.065	4.126-12.735	High Human development	0.800<HDI<0.899
High income	>8.955	>10.065	>12/735	Very high human development	HDI>0.900

Note: The average GDP and GDP per capita growth rates are calculated from the GDP growth rates (annual %) and GDP per capita growth rate (annual %), respectively, from the World Bank World Development Indicators (WDI) for the period 1990-2014, GNI per capita (Atlas method, current US\$) from the World Bank WDI, and the income classifications are taken from the World Bank GNI per capita Operational Guidelines and Analytical classifications. Human Development Index (HDI) rankings and classifications are from the UN Human Development Reports. Following the UN classification, all countries with an HDI below 0.900 are classified as developing countries, whilst countries with an HDI above 0.900 are classified as developed economies.

GDP is generally used as a measure of the aggregate business cycle, however, due to challenges in the availability of reliable GDP data for a number of developing countries, several studies make use of industrial production as a proxy for GDP (Agenor et al., 2000) and (Male, 2009). This was justified on the basis that the manufacturing sector contributed substantially to the GDP of the countries in the relevant samples. However, an analysis of the African FMEs examined in this study shows that the proportion of total GDP which is accounted for by the manufacturing sector varies from a country level average of 19 percent for Kenya to 43 percent for Botswana, for the period between 1995-2015, with a sample average of 28 percent for the same period. Figure 1. shows the composition of the GDP for the sample countries. From Figure 1 and Table 4, services contribute the largest portion of the average GDP for all countries, apart from Nigeria, and that in

most of the sample countries, agriculture continues to make a significant contribution to the GDP of the sample countries. Therefore, using industrial production as a proxy for GDP in this study would not be appropriate and would be likely to yield inaccurate results. Therefore, GDP is used as the measure of the aggregate business cycle in the countries examined in this sample. This data was sourced from the Penn World tables, which is a standard source of data on real GDP across countries, and converts GDP at national prices to a common currency – US dollars – making them comparable across countries.

The primary data source is the World Bank's WDI and the Penn World Table for the collated economic series. There is generally good data coverage for the sample period between 1984-2014, however there are some missing data, for which the effected country or variable is excluded from that particular analysis to ensure the validity of the results.

To examine the stylised facts of the African FMEs, the relationship between key macroeconomic variables and the GDP, as the established proxy for the business cycle, needs to be explored. These variables, as outlined in Table 3, were selected following (Agenor et al., 2000) and include the main contributors to the calculation of GDP, namely public and private consumption, government outlays (revenue and expenditure), investment, as well as the balance of trade (imports and exports), to measure the impact and determine the possible relationships between these variables and GDP. Monetary variables, such as the real effective exchange rate and broad money, are also included in the study to assess whether monetary policy contributes to the fluctuations in domestic output. Lastly, to assess the sensitivity of the FME business cycles to exogenous shocks, as well as to identify possible channels of transmission of these exogenous shocks, the world GDP and world interest rates are also included in the analysis. Due to limited or no data coverage, the following variables that were included in (Agenor et al., 2000) were excluded from this paper: real wage rates; money market rates; and the nominal effective exchange rate. In addition, the analysis of the following variables could only be conducted on a few countries in the sample due to challenges with data availability - government revenues, fiscal impulse, interest rates - with only Kenya and Mauritius having adequate data to conduct an analysis. Detailed information on the availability of country level data for each variable is included in the discussion of the findings in Chapter 4. The other variables selected for analysis are outlined in Table 5.

Figure 1. Composition of FMEs GDP

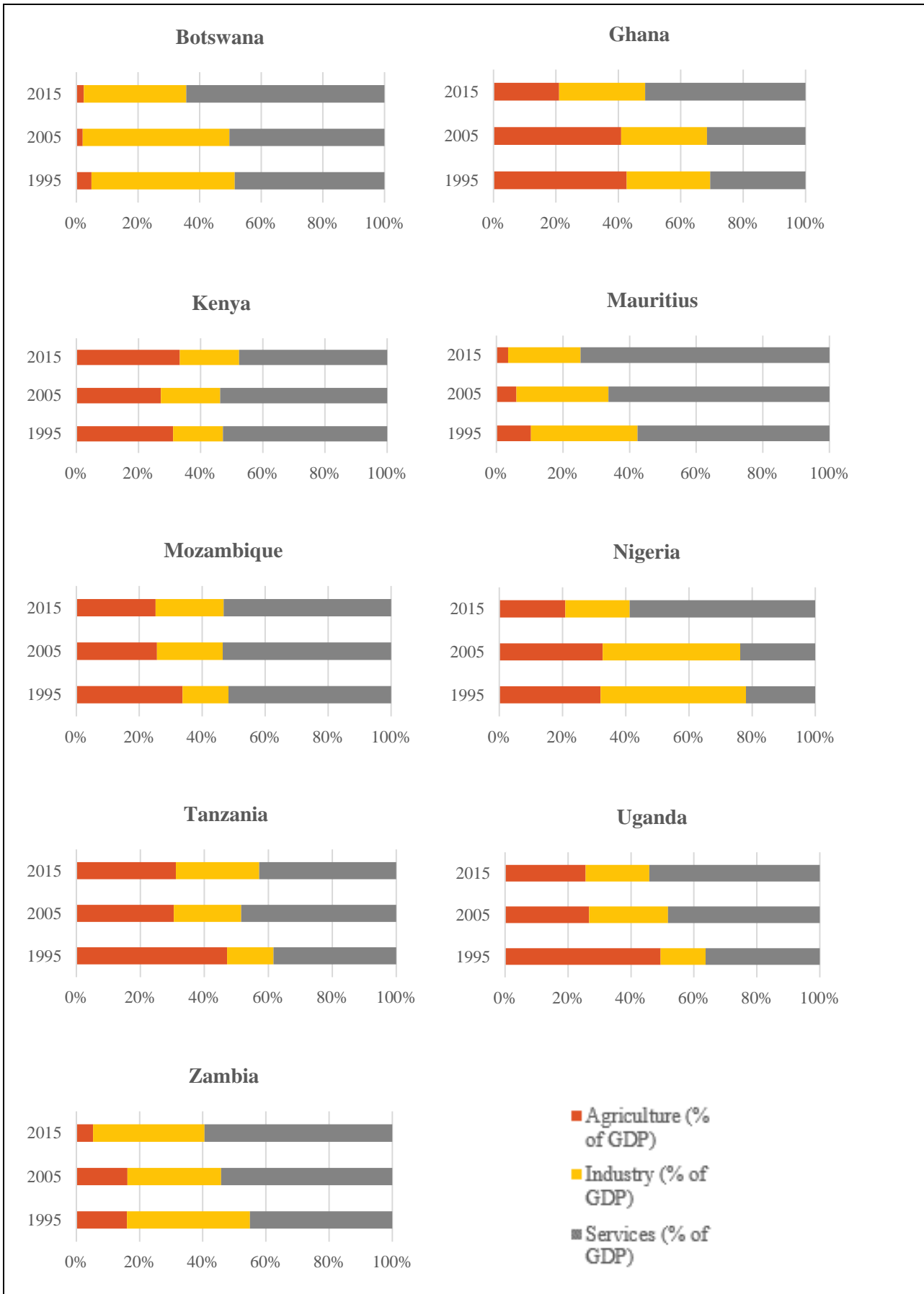


Table 4. Average GDP composition by country (1995-2015)

	Agriculture (% of GDP)	Industry (% of GDP)	Services (% of GDP)
Botswana	2.95	43.19	53.86
Ghana	34.28	26.08	39.64
Kenya	29.06	19.02	51.92
Mauritius	6.07	27.63	66.30
Mozambique	27.77	20.16	52.07
Nigeria	31.17	36.51	32.32
Tanzania	34.27	20.86	44.86
Uganda	30.25	22.10	47.66
Zambia	13.98	32.36	53.66

Source: WDI, World Bank

Table 5. Variables and data sources

Variable	Indicator	Data Source
GDP	Real Gross Domestic Product	Penn World Tables
Prices	CPI	WDI
Inflation	Measured as change in CPI	Calculated
Government expenditure	General government final consumption expenditure	WDI
Government revenue	Government revenue, excluding grants	WDI
Fiscal impulse	Government expenditure/ Government revenue	Calculated
Broad money	Broad money	WDI
Private sector credit	Domestic credit to private sector	WDI
Interest rate	Lending interest rate	WDI
Investment	Real investment	Penn World tables
Imports	Real imports of goods and services	WDI
Exports	Real exports of goods and services	WDI
Trade balance	Real exports/real import	Calculated
Import unit value	Price level of imports	Penn World tables
Export unit value	Price level of exports	Penn World tables
Terms of trade	Export unit value/ Import unit value	Calculated
Real effective exchange rate	Price level of GDP	Penn World tables
Real consumption	Real consumption of households and government	Penn World tables
World interest rates	Libor (3-month)	Macrotrends
World GDP	World GDP	WDI

Note: The GDP, absorption, consumption and investment are measured at constant 2011 national prices. The import and export unit values are measured at price level of US GDP in 2011=1. The exchange rate is measured at national currency/USD (market + estimated). The rest of the variables are calculated by (% GDP values in WDI) x (GDP from Penn World tables).

3.6 Data analysis methods

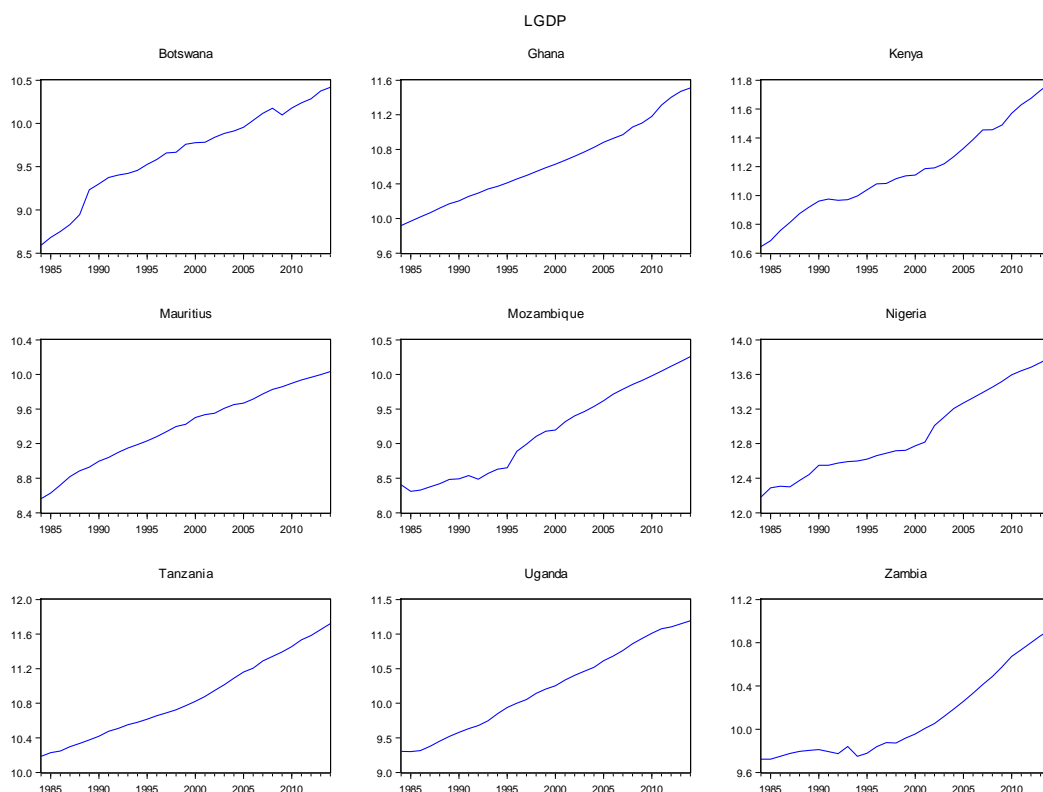
As established above, the research strategy and design employed in this paper is a quantitative analysis on time series data across several different countries. The methodology applied in this paper follows the standard practice for analysing the stylised facts of business cycles as summarized in (Agenor et al., 2000), (Aguiar & Gopinath, 2007), (Rand & Tarp, 2002) and (Male, 2010). The paper focuses on three main statistics to assess business cycle properties of the relevant time series as articulated in (Agenor et al., 2000): (i) volatility; (ii) cross-correlations between variables and GDP and; (iii) persistence. These statistics are regarded in business cycle literature

as standard statistics for business cycle research, particularly when the growth approach, as discussed in Chapter 2, is adopted.

3.6.1 Unit root tests

The importance of the stationarity of the variables is emphasised by (Agenor et al., 2000), as a number of empirical characterisations of the data, including cross-correlations, are only valid if the data is stationary. This is because trends in the data could lead to spurious correlations which indicate a relationship between the variables where one does not exist (Brooks, 2008). This is illustrated in Figure 2. with the GDP of the countries in the sample clearly appearing to be non-stationary, as the data does not revert to a long-run mean over time. This study conducts a standard set of unit root tests, namely the Augmented Dickey Fuller (ADF), on each of the variables to test for stationarity of the series in levels over the relevant sample period. The ADF test is based on the model of the first-order autoregressive process, and tests for stationarity at level, first difference and second difference to account for the problem of serial correlation. The null hypothesis of the ADF is that the time series contains a unit root and therefore it is not stationary, with the alternative hypothesis being that the time series does not contain a unit root and is stationary (Arltová & Fedorová, 2016). The test equations will not include a trend or an intercept as the HP filter would account for this, with the Schwarz Info Criterion being used to select the optimal lag lengths for the ADF tests. The ADF test is conducted on the both the unfiltered and HP filtered variables.

Figure 2. FME logged GDP



In line with the best practice in business cycle analysis as indicated in (Agenor et al., 2000) and (Male, 2010), the natural logs of each of the series are taken under the assumption that macroeconomic series are multiplicatively separable³.

3.6.2 Univariate detrending

As discussed in section 2.2, examining the stylised facts of business cycles necessitates that the growth approach to business cycles is applied, as articulated by (Lucas, 1976): the business cycle component of a variable is defined as its deviation from the trend, making it necessary to decompose all of the series into their stationary (cyclical) and non-stationary (trend) components.

As also highlighted in Chapter 2, the HP and the BP filters are generally used in the business cycle research to detrend the data and obtain the cyclical and trend components. The differences in the time series properties that can be yielded by the application of both the HP and BP filters are articulated by (Canova, 1998) and (Burnside, 1997).

The HP filter is a linear filter designed to optimally extract “a trend which is stochastic but moves smoothly over time and is uncorrelated with the cyclical component” (Canova, 1998, p.485). (R. L. Male, 2009) states that, “Assuming that the time series y_t can be decomposed into a cyclical component c_t and trend component g_t , extracting the trend component will yield a stationary cyclical component, which can be used to examine the business cycle” (p.51). This can be seen as follows:

$$Y_t = c_t + g_t \text{ for } t = 1, \dots, T \quad (1)$$

The trend component, g_t , is determined by minimising:

$$\sum_{t=1}^T c_t^2 + \lambda \sum_{t=2}^T [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2 \quad (2)$$

where the smoothing parameter, λ , penalises variability in the trend (Male, 2009). According to (Canova, 1998), the smoothing parameter “is chosen a priori to isolate those cyclical fluctuations which belong to the specific band which the researcher wants to investigate” (p.52).

Both (Male, 2010) and (Rand & Tarp, 2002) state that the advantage of the HP filter is that it does not amplify high-frequency noise. (Male, 2010) goes on to emphasise the following disadvantages to using the HP filter which include: “it excludes a substantial amount of the high-frequency noise from the business cycle frequency band; it has a tendency to underestimate the cyclical component;

³ Logarithms are not taken of the series which are measured in percentage points, such as the consumer price index, inflation and interest rates.

the estimates of the trend at the end points of the time series are imprecise; it cannot capture structural breaks in data series and it can induce spurious cycles in filtered series and lastly, the HP filter relies on an arbitrarily chosen smoothing parameter λ " (p.52).

The HP filter remains the most commonly applied detrending technique in business cycle literature, regardless of all the criticism, and is therefore the one applied in this paper. The optimal value of λ continues to be a controversial point of discussion amongst researchers, with papers such as (Rand & Tarp, 2002) expressing that the λ smoothing parameter should be adjusted lower when analysing the business cycles of developing countries, whereas (Male, 2010) and (Kydland & Prescott, 1990) find that the default values provide results that are similar to those obtained with the conventional BP filter. This paper will use the default values of λ of 100 for annual data when detrending the data.

The cyclical components derived from the detrended data, must be stationary and hence these are also tested for the presence of a unit root.

3.6.3 Volatility, persistence and correlations

The volatility, persistence and cross-correlations of business cycles are generally referred to as stylised facts and will be the focus of the statistical analysis of this paper. Following the standard practice of real business cycle literature, all references to variables in the subsequent analysis refer to the cyclical components. The study follows the methodology outlined by (Agenor et al., 2000) and (Male, 2009).

Volatility is measured by the standard deviation of the variable and reports the magnitude of fluctuations around the mean of the variables of interest as shown below:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2} \quad (3)$$

Where μ = mean of all the values; x_i = individual x values; and N = sample size.

The relative volatility (σ_R), that measures the fluctuations of the variables of interest (σ_{y_t}) in relation to that of GDP (σ_{x_t}), is generally reported on in business cycle literature, and is the ratio of the standard deviation of the variable of interest to that of GDP, this can be seen as follows in a derived notation:

$$\sigma_R = \frac{\sigma_{y_t}}{\sigma_{x_t}} \quad (4)$$

Variables have the same cyclical amplitude as the aggregate business cycle (as proxied by GDP), if they have a relative volatility of one. A variable is more volatile than the aggregate business cycle if it has a greater cyclical amplitude than the aggregate business cycle as reflected by a relative volatility of more than one while the opposite is true if the relative volatility is less than one.

Persistence is measured by the autocorrelation function of the cyclical component of the variable. The Ljung-Box portmanteau (Q) test for white noise is used to measure the significance of the persistence and can be seen as follows (Brooks, 2008):

$$Q = T(T + 2) \sum_{k=1}^m \frac{\hat{\tau}_k^2}{T - k} \sim X_m^2 \quad (5)$$

Where T =sample size, m =number of lags being tested; k =number of lags; $\hat{\tau}_k$ =sample autocorrelation coefficient at lag k , $X_m^2 = Q$ statistic is asymptotically distributed as X_m^2 under the null hypothesis that all m autocorrelation coefficients are zero.

The null hypothesis for the Q test is that the autocorrelation functions have no significant elements for lags one through that specified by the lags options. A rejection of the null hypothesis (if the p-value < 0.05) indicates that at least one autocorrelation function is significant, the series is not a white noise process and hence there is persistence. In contrast, if the statistic has a p-value > 0.05 then the test statistic is not significant and is considered to imply that there is little or no persistence in the cyclical component.

The correlations between the stationary components of (y_t) and (x_t) are analysed through the examination of the contemporaneous and intertemporal cross-correlations. The contemporaneous correlation, where $(j = 0)$, signals the cyclicity of the variable of interest with GDP. The purpose of the analysis of intertemporal cross-correlations $(j > 0)$ is to establish whether the variable of interest leads or lags the business cycle.

The magnitude of the correlation coefficient $\rho(j)$, $j \in \{0, \pm 1, \pm 2, \dots\}$ measures the degree of co-movement between the variables of interest (y_t) with GDP (x_t) : if the contemporaneous coefficient $\rho(0)$ is positive then (y_t) is considered to be procyclical; (y_t) is considered to be cyclical if the contemporaneous coefficient $\rho(0)$ is zero; and (y_t) is considered to be countercyclical if the contemporaneous coefficient $\rho(0)$ is negative (Male, 2009). Following (Agenor et al., 2000) there is a strong contemporaneous correlation between the series (y_t) and

the business cycle if $0.26 \leq |p(0)| < 1$; a weak contemporaneous correlation if $0.13 \leq |p(0)| < 0.26$ and contemporaneously correlated if $0 \leq |p(0)| < 0.13$ ¹⁰.

The phase shifts of (y_t) relative to the cycle of GDP (x_t) are analysed through the cross-correlation coefficients $\rho(j)$, $j \in \{0, \pm 1, \pm 2, \dots\}$. “Series (y_t) is considered to lead the cycle by j periods if the largest cross-correlation coefficient arises from a negative j (i.e. a lagged value of y_t), be synchronous with the cycle if the largest cross-correlation coefficient arises at $j=0$ or lag the cycle by j periods if the maximum cross-correlation arises for a positive j ” (Male, 2009, p.54).

To assess the impact of the exogenous shocks, particularly world interest rates and world output on the business cycles of the FMEs, the correlation between these variables and GDP is assessed using the same methodology discussed above to assess contemporaneous and intertemporal cross-correlations.

3.7 Research reliability and validity

The methodology employed in this study is a standard and commonly accepted approach in business cycle research (Agenor et al., 2000), (Rand & Tarp, 2002) and (Male, 2010), however it focusses on a different set of countries, although the sample is smaller. This study does not make any attempt to introduce new methodologies. The value of this study is that it focusses on a specific set of countries that are classified according to the criteria of an FME, and to test whether the stylised facts for developing countries hold true for this sample as well. Time series data was collected for 31 years for each of the sample countries, to ensure the increased validity of the statistical findings.

The internal validity of the research could be negatively impacted by the lack of randomisation of the sample collected.

3.8 Research limitations

The study was limited by the following considerations:

- Availability of data: There is very limited quarterly macroeconomic data available for African countries. Although annual data is more readily available, it is also often incomplete, which limited not only the number of overall observations, but also impacted the numbers of variables.
- Quality of data: The validity of the reported data also cannot be guaranteed, as the challenges in reporting data in the region are well known.

- Exogenous variables: The list of variables that have an impact on the business cycle are not exhaustive, therefore although relationships are inferred in the study, there may be additional exogenous factors that could contribute significantly to the fluctuations in the business cycles of the FMEs.

3.9 Conclusion

This chapter provides the overview and justification for the research approach and strategy, the selection of data and the research methodology employed in the paper. In addition, the reliability and validity of the research, as well as the potential limitations to the analysis have been articulated. The analysis of stylised facts of the FME's, as well as the research findings are discussed in Chapter 4.

CHAPTER 4: RESEARCH FINDINGS, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter applies the methodology discussed in Chapter 3 to the selected data. It explores and analyses the empirical results as a basis for providing conclusions to the research problem posed in Chapter 1. The results of the analysis to assess the relationship between the identified macroeconomic variables and the business cycles of the FMEs are discussed and compared to the established stylised facts for business cycles of developing countries as presented in Chapter 2.

4.2 Unit root test results

As discussed in Chapter 3, it is critical that the data used in the analysis of business cycles is stationary to ensure the validity of the empirical characterisations of the data, particularly the cross-correlations. To this end, the ADF test was performed on raw data. The results of these tests indicate that calculating the correlations on the raw data would not be appropriate as most of the series were non-stationary in levels over the relevant period and therefore the HP filter is applied to separate the cyclical and trend components. Once the cyclical components had been obtained using the HP filter, the same unit root tests were applied to confirm the stationarity of the filtered data. The results of these unit root test are reported in Table 34 in the Appendix, and indicate that the cyclical components are stationary.

4.3 Main features of macroeconomic fluctuations in FMEs

The results of the analysis of volatility of the variables, as well as relative volatility, measured as the volatility of the respective variables to GDP, are reported in Tables 6 and 7 respectively. The results reported in these tables are used to underpin the discussion of volatility throughout the discussion of the analysis in the rest of Chapter 4.

Table 6. Volatility

	GDP	CON	INV	GEX	GRV	FI	CPI	CCPI	LR	BM	DCR	IMP	EXP	TB	TOT	RER
BTW	4,86	5,68	2,76	6,74	-	-	17,93	25,34	1,35	14,04	16,61	11,04	11,71	15,71	6,94	11,71
GHA	1,63	4,76	2,03	14,03	-	-	42,36	25,42	-	9,43	15,21	14,18	17,65	8,54	3,40	14,57
KYA	2,28	3,38	0,91	6,27	8,40	8,17	67,14	136,07	3,18	5,19	6,48	8,03	12,27	0,80	5,91	10,30
MUS	4,59	4,77	4,37	14,64	1,82	6,67	69,42	293,56	1,89	8,88	17,55	21,41	20,15	15,67	4,29	13,89
MOZ	1,49	2,41	1,07	4,55	-	-	\	98,79	-	4,48	5,37	6,83	6,60	5,36	2,88	6,84
NGA	4,34	9,59	2,54	28,50	-	-	61,02	91,07	2,77	21,18	25,76	21,08	20,64	24,38	8,83	14,30
TZA	1,20	4,86	2,78	15,11	-	-	27,52	29,99	-	10,25	43,42	14,41	17,09	11,63	2,30	8,18
UGA	2,35	3,66	1,77	14,37	-	-	50,80	1596,61	-	13,77	9,45	8,03	16,01	15,75	5,74	14,16
ZMB	2,35	8,27	1,27	-	-	-	34,27	36,20	-	180,57	14,42	10,09	9,64	12,49	3,39	15,04
Avg	2,79	5,26	2,17	13,03	5,11	7,42	46,31	259,23	2,30	29,75	17,14	12,79	14,64	12,26	4,85	12,11

Note: Volatility is measured as the standard deviation (%). Note: BW – Botswana, GHA-Ghana, KYA-Kenya, MUS-Mauritius, MOZ-Mozambique, NGA-Nigeria, TZA-Tanzania, UGA-Uganda, ZMB-Zambia, GDP-gross domestic product, CON-consumption, INV-investment, GEX-government expenditure, GRV-government revenue, FI-fiscal indicator, CPI-consumer price index, CCPI-inflation, LR – real lending rate, BM – broad money, DCR -private sector credit, IMP-real imports, EXP-real exports, TB-trade balance, TOT-terms of trade, RER- real effective exchange rate. The same abbreviations are used in all remaining tables.

Table 7. Relative volatility

	CON	INV	GEX	GRV	FI	CPI	CCPI	LR	BM	DCR	IMP	EXP	TB	TOT	RER
BTW	1,17	0,57	1,39	-	-	3,69	5,21	0,28	2,89	3,42	2,27	2,41	3,23	1,43	2,41
GHA	2,92	1,25	8,63	-	-	26,04	15,63	-	5,80	9,35	8,72	10,85	5,25	2,09	8,96
KYA	1,48	0,40	2,75	3,68	3,58	29,44	59,66	1,40	2,28	2,84	3,52	5,38	0,35	2,59	4,51
MUS	1,04	0,95	3,19	0,40	1,45	15,13	63,99	0,41	1,93	3,83	4,67	4,39	3,41	0,94	3,03
MOZ	1,62	0,72	3,06	-	-	39,69	66,39	-	3,01	3,61	4,59	4,43	3,60	1,93	4,60
NGA	2,21	0,59	6,56	-	-	14,05	20,97	0,64	4,88	5,93	4,85	4,75	5,61	2,03	3,29
TZA	4,04	2,32	12,57	-	-	22,89	24,95	-	8,53	36,12	11,98	14,22	9,67	1,92	6,81
UGA	1,56	0,76	6,12	-	-	21,64	680,05	-	5,86	4,02	3,42	6,82	6,71	2,45	6,03
ZMB	1,89	0,54	-	-	-	14,60	15,41	-	76,89	6,14	4,30	4,10	5,32	1,44	6,41
Avg	1,99	0,90	5,53	-	-	20,80	105,81	0,68	12,45	8,36	5,37	6,37	4,80	1,87	5,12

4.3.1. Domestic output (GDP)

Volatility

The magnitude of fluctuations of domestic output with specific macroeconomic variables are of particular interest in developing countries, as macroeconomic volatility has particularly high welfare costs for developing countries. In their seminal paper, (Ramey & Ramey, 1987) observed a statistically and economically significant relationship between volatility and growth. These findings have been further analysed by a number of researchers such as (Hnatkovska & Loayza, 2004), who found that a one-standard-deviation increase macroeconomic volatility results in a lower per capita growth of over half a percentage point in the whole sample of countries. This finding was further substantiated by the work of (Dabusinskas, Kulikov, & Randveer, 2012), which found that a 50 percent increase in volatility translates into a 0.4 percentage point lower per capita growth. (Loayza et al., 2007) attribute the more volatile output in developing countries to three key factors: “firstly, developing countries are more susceptible to larger exogenous shocks from either the financial or goods markets; secondly, developing countries experience more domestic shocks resulting from poor policy decisions; lastly, developing countries have less capacity to absorb shocks, therefore they have a larger macroeconomic impact than in developed countries” (p.346). The consistency of these findings is tested here to see whether they are suitable to the FME countries in the sample.

The examination of the volatility for domestic output for the FMEs, as reported in Table 6, yields mixed results. Botswana, Mauritius and Nigeria, which are classified as middle-income countries by the World Bank, as discussed in Chapter 3, exhibit high volatility in their output, averaging at 4.6 percent, compared to the average of 1.9 percent which is attained for the rest of the sample. This finding is in contradiction of that made by (Male, 2009), namely that output is particularly volatile amongst the low income countries, as the low income countries included in the sample,

namely Mozambique, Tanzania, and Uganda, have an average output volatility of 1.7 percent, lower than the middle income countries previously mentioned. (Male, 2009) also found that industrial countries (proxied by the UK, US and Japan), had an average domestic output volatility of 3.1 percent, which is higher than the average volatility of 2.79 percent for the African FMEs. Therefore, the empirical evidence in this study implies that at an aggregate level, the stylised fact that the volatility of output is higher for developing countries, does not apply to Africa's FMEs.

However, when considering the results of the analysis at a country level, the volatility of domestic output in Botswana, Mauritius and Nigeria are significantly higher than that found for the aggregate of 3.1 percent for developed countries found by (Male, 2009). The negative impacts of macroeconomic volatility on output growth will also negatively impact on future consumption.

Persistence

The results of the examination of the autocorrelations of domestic output levels, as reported in Table 8, reveal that domestic output fluctuations for the business cycles of FMEs exhibit significant output persistence, which was also established by (Agenor et al., 2000) as a stylised fact. When examining the autocorrelation coefficient at lag one, it is observed that the magnitude of the persistence is highest for Tanzania, however Zambia experiences the persistence for the longest period of time, with it being the only country to record a continued persistence at lag four with a coefficient of 0.021.

Table 8. Persistence – GDP

Country	GDP							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.482	7.8816**	0.029	7.8976*	-0.126	11.058*	-0.239	17.410**
Ghana	0.560	10.684**	0.102	11.048**	-0.131	11.674**	-0.260	14.234**
Kenya	0.609	12.642**	0.098	12.981**	-0.201	14.453**	-0.379	19.895**
Mauritius	0.424	6.1423*	0.424	6.2223*	-0.153	7.0763	-0.282	10.084*
Mozambique	0.409	5.6955*	0.153	6.5199*	-0.071	6.7046	-0.332	10.869*
Nigeria	0.656	14.660**	0.316	18.176**	-0.021	18.192**	-0.182	19.447**
Tanzania	0.667	15.151**	0.464	22.753**	0.227	24.634**	-0.134	25.311**
Uganda	0.445	6.7634**	-0.075	6.9636*	-0.237	9.0181*	-0.234	11.100*
Zambia	0.360	4.4122*	0.154	5.2446	0.162	6.1989	0.021	6.2162

Note: The Ljung Box Q-statistic at each lag is cumulative (i.e. at lag 2 it includes the autocorrelation functions at both lags 1 and 2 etc). The Significance is denoted by * if $p < 0.05$ and ** if $p < 0.01$. The same methodology applies to the remaining analysis related to persistence. The same convention is adopted in the remaining tables reporting the results of persistence analysis.

4.3.2. Consumption and investment (CON, INV)

Volatility

The results of the analysis of the volatility and relative volatility are reported in Tables 6 and 7 respectively. From the reported results, consumption in the FMEs is on average twice as volatile as output, with Ghana and Tanzania exhibiting the highest levels of volatility in the sample, their levels of consumption being respectively three and four times as volatile as domestic output. These results suggest that the stylised fact for developing countries that consumption is more volatile than domestic output, is applicable to the FMEs. It should be noted, however, that the observed levels of consumption volatility for the FMEs are significantly higher than the findings of (Male, 2009) who reported that the volatility in African countries are on average 50 percent more volatile than domestic output. The volatility of consumption suggests that the consumption smoothing inherent in the permanent income hypothesis appears absent in FMEs (Rand & Tarp, 2002). (Loayza et al., 2007) highlight that the macroeconomic volatility has a large welfare cost for developing countries, and that there could be significant welfare gains, of between 5 and 10 percent, from reducing consumption volatility.

Turning to investment, from the existing stylised facts it is expected that the volatility in investment would be two to three times higher than domestic output volatility. The findings for the FMEs, as reported in Table 7, are significantly different from this stylised fact, with investment being only on average 90 percent as volatile as domestic output, and only Tanzania exhibiting investment volatility close to the expected level at two times that of domestic output. For the rest of the sample, investment is on average 10 percent less volatile than domestic output. These findings are in contradiction of the findings of (Rand & Tarp, 2002), who find that investment is significantly more volatile than output. This could be explained by the economic structure of these countries, particularly with less developed domestic capital markets, limiting the extent of capital in-and outflows. Investment in these economies is more likely to be project related and therefore fixed in nature, therefore limiting the impact that it has on the business cycles of the FMEs.

Persistence

No clear pattern of persistence can be established for consumption in the FMEs. The examination of the autocorrelations results, reported in Table 9, reveal that consumption is significantly persistent over four lags in Botswana, Mauritius, Tanzania and Zambia, and that they are negatively correlated, with the autocorrelation coefficient reversing from positive to negative values after the first or second lags.

In divergence with the results for consumption, the autocorrelation results for investment, as reported in Table 9, reveal that investment is persistent in each of the FMEs, and that this persistence is maintained over a period of four lags. In examining the autocorrelation coefficients, Tanzania has the highest magnitude of persistence and a shock to investment only dissipates after lag three, whereas the investment will revert to its trend after the second lag in the rest of the FMEs. As alluded to under the volatility of investment discussion, this persistence could be attributed to the type of investment being made in these economies.

Table 9. Persistence: investment and consumption

Country	<u>INV</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.696	16.535**	0.143	17.252**	-0.356	21.871**	-0.567	34.041**
Ghana	0.681	15.808**	0.228	17.646**	-0.017	17.656**	-0.084	17.920**
Kenya	0.716	17.470**	0.309	20.847**	-0.101	21.218**	-0.354	25.973**
Mauritius	0.472	7.5813**	0.065	7.7306*	-0.198	9.1642*	-0.255	11.620*
Mozambique	0.625	13.324**	0.109	13.742**	-0.170	14.797**	-0.263	17.418**
Nigeria	0.534	9.7132**	0.054	9.8177**	-0.101	10.189*	-0.249	12.544*
Tanzania	0.774	20.420**	0.419	26.606**	0.073	26.801**	-0.205	28.398**
Uganda	0.675	15.558**	0.249	17.737**	-0.049	17.826**	-0.311	21.500**
Zambia	0.641	14.010**	0.214	15.627**	-0.092	15.934**	-0.210	17.609**

Country	<u>CON</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.701	16.744**	0.296	19.825**	-0.086	20.096**	-0.333	24.293**
Ghana	0.135	0.6231	-0.233	2.5398	-0.335	6.6447	-0.316	10.419*
Kenya	0.269	2.4764	-0.077	2.6859	-0.256	5.0892	-0.320	8.9805
Mauritius	0.611	12.725**	0.133	13.349**	-0.206	14.905**	-0.324	18.883**
Mozambique	0.191	1.2485	-0.140	1.9396	-0.102	2.3169	-0.054	2.4286
Nigeria	-0.053	0.0951	-0.008	0.0972	-0.359	4.7974	-0.219	6.6143
Tanzania	0.431	6.3276*	0.064	6.4743*	-0.199	7.9200*	-0.325	11.913*
Uganda	0.263	2.3659	-0.170	3.3873	-0.222	5.1899	-0.000	5.1899
Zambia	0.474	7.6569**	-0.019	7.6693*	-0.242	9.8170*	-0.274	12.667*

Cross-correlation

The examination of the contemporaneous correlations reported in Table 10 (as shown in lag 0 in the table) between the real total consumption of households and government and domestic output reveals that the contemporaneous correlation is positive and between $0.26 \leq p(0) < 1$, for all FMEs, therefore a robust procyclical relationship between these variables. Only Tanzania exhibits signs of a positive, but weaker relationship between consumption and domestic output than observed for the rest of the region, with a contemporaneous correlation between $0.13 \leq p(0) < 0.26$. These findings are consistent with those of (Rand & Tarp, 2002) and (Male, 2009). There is evidence that the movements in consumption are synchronised to those of domestic output in Botswana, Kenya, Mauritius, Uganda and Zambia, with the largest cross-correlation

coefficient arising at $t_j=0$. However, the role of consumption in Ghana, Nigeria and Tanzania is significant in that it leads output in these countries, particularly in Nigeria where it peaks in the first lag at (0,4248), with the largest cross-correlation coefficient arising at a negative j .

The results for investment, as reported in Table 11, are quite different, with only Botswana, Ghana and Kenya having a strongly positive contemporaneous correlation between investment and GDP, while investment is observed to be countercyclical in Mauritius, Nigeria, Uganda and Zambia. These observations are in contrast to those of (Rand & Tarp, 2002) and (Male, 2009), who found that investment is procyclical for developing countries.

Table 10. Cross-correlations: domestic output, consumption

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.1009	-0.3185	0.0723	0.3539	0.7110*	0.5254	0.1437	-0.3089	0.2303	<i>5.4442</i>
GHA	0.0072	-0.1040	0.0967	0.3531	0.3385*	-0.1026	-0.2143	-0.1419	-0.0011	1.9374
KEN	0.0974	-0.2863	0.1338	0.4497	0.6085*	0.2902	-0.1897	-0.3166	0.3738	<i>4.1296</i>
MOZ	0.0420	-0.1676	-0.0555	-0.1387	0.4018*	0.1484	-0.1066	0.1343	-0.1106	<i>2.3625</i>
MUS	-0.1334	-0.0920	0.0533	0.2198	0.5471*	0.4997	0.1089	-0.3174	0.1663	<i>3.5199</i>
NGA	0.0307	-0.2476	0.1820	0.4248	0.2952*	0.1021	-0.0970	-0.0981	-0.3945	1.6641
TZA	-0.2928	0.2753	0.3796	0.1783	0.1349	0.0802	-0.0854	-0.0292	-0.1018	0.7330
UGA	-0.1351	-0.2008	-0.1683	0.3575	0.7542*	0.3122	-0.0627	-0.0288	-0.3813	<i>6.1853</i>
ZMB	0.0557	-0.0185	0.1567	0.4715	0.5041*	0.3192	0.2096	0.0582	-0.1599	<i>3.1429</i>

Notes: The correlations reported above are between the contemporaneous values of the first variable (domestic output) and the j 'th lag of the second variable (consumption), with both variables detrended using the HP filter. The analysis was conducted for 16 lags but due to space constraints, results are reported only for lags 0, 1, 2, 4 and 8. A negative lag denotes a lead. The numbers marked in bold indicate weak contemporaneous correlation and numbers marked in bold with a * indicate a strong contemporaneous correlation. The Significance of the t-statistic is denoted by italicized number if $p<0.05$. The same convention is adopted for all the remaining tables reporting the results of the cross-correlation analysis. The data and sources are described in Chapter 3.

Table 11. Cross-correlations: domestic output, investment

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.0879	-0.3797	-0.4621	-0.0230	0.5258*	0.7183	0.5504	-0.0273	-0.1424	3.3286
GHA	-0.2006	0.0202	0.0805	0.4053	0.7560*	0.6940	0.3555	-0.2442	-0.0493	6.2188
KEN	0.0378	-0.1020	-0.3040	-0.0537	0.3039*	0.4589	0.3893	-0.0450	-0.0702	1.7176
MOZ	-0.0219	0.0104	-0.0344	-0.0213	0.0623	0.0681	0.0516	0.1028	-0.2935	0.3361
MUS	0.1970	-0.0062	-0.3139	-0.4027	-0.2018	0.2213	0.3818	0.1558	-0.0105	-1.1096
NGA	0.2498	-0.1947	-0.2360	-0.1278	-0.1484	-0.1358	-0.2295	-0.1080	0.2571	-0.8081
TZA	-0.0955	-0.5772	-0.3842	-0.0931	0.1640	0.3169	0.4050	0.4387	0.1487	0.8952
UGA	-0.0485	-0.4890	-0.3012	0.1218	0.6752	0.5877	0.3348	0.0384	-0.3058	<i>4.9294</i>
ZMB	-0.0351	0.0221	0.0190	-0.0317	-0.0304	0.1382	0.2831	0.3729	-0.0740	-0.1638

4.3.3. Public sector variables: Government expenditure and revenue (GRV, GEX and FI)

Volatility

The importance of examining the relationship between aggregate economic activity and public sector expenditure and revenue is articulated by (Agenor et al., 2000), as it has a significant role to play in the development of stabilisation programmes. Although fiscal policy could be a source

of business cycle fluctuations, if it is effectively managed by governments, it could be used to smooth out business cycle fluctuations. According to (Afonso & Furceri, 2008) this could be effected through making discretionary changes in fiscal policy which could positively affect private investment and long run-growth. Although public expenditure can play an important role in stimulating economic growth, lower levels of public spending would imply that less revenue should be generated through taxes, which would also stimulate economic growth. A challenge particularly prevalent in developing countries is the use of fiscal policy, particularly public expenditure for motives other than macroeconomic stability, which could result in fiscal policy itself becoming a source of volatility. In the development of macroeconomic stabilisation programmes, it is essential to have an understanding of the relationship between the business cycle and government revenue and expenditure respectively. Temporary changes to fiscal policy can have far reaching consequences for macroeconomic stability, as it may have a significant impact on interest rate volatility, that would reduce long-run growth (Aiyagari, Christiano, & Eichenbaum, 1992). In attempting to quantify the impact of increased volatility of government expenditure on growth, (Afonso & Furceri, 2008) found that “a 1 percent increase in government expenditure business cycle volatility determines a decrease of 0.78 percentage points in the long-run rate of growth” (p.12).

The analysis of public sector variables, namely government expenditure and revenue, for the FME countries was hindered by the lack of data availability, with the analysis of government revenue only possible for Kenya and Mauritius, while the government expenditure analysis was possible for all countries except Zambia. The results of the analysis of relative volatility are reported in Table 7 and it is observed that the volatility of government expenditure is on average 5.53 times more volatile than domestic output, with the results varying at a country level with Tanzania having a government expenditure 12.53 times more volatile than output, to Botswana’s government expenditure being only 39 percent more volatile.

(Male, 2009) finds that industrial countries exhibit an average relative volatility of 1.1 for government expenditure, whereas this study finds that the average relative volatility of government expenditure for FMEs is 5.53. The stylised fact for developing countries, that public sector variables are 4 times more volatile than output, would therefore be appropriate for the FMEs, particularly in the case of government expenditure. From the findings of (Afonso & Furceri, 2008), as articulated above, the excessive volatility in public expenditure particularly, would have a significant negative impact on the long-run growth rate in these countries. This would also suggest that the government may aggravate the business cycle, rather than smooth it.

Similar to their finding on the impact of government expenditure on the business cycle, (Afonso & Furceri, 2008) find that a percentage point increase in the share of total government revenue would decrease output by 0.12 and 0.13 percentage points respectively for OECD and the European Union countries. From the results of the analysis of relative volatility of government revenues in this study, as reported in Table 7, the government revenues in Kenya are 3.68 times more volatile than domestic output. In contrast, the results for Mauritius, indicate that government revenue is less volatile than output.

Persistence

When considering the persistence of the effects of shocks to the public-sector variables, there are mixed results for government expenditure, as reported in Table 12. It is observed that fluctuations in government expenditure are persistent in 5 of the countries examined, with only Mauritius, Mozambique and Uganda not showing any signs of persistence. Kenya experiences the highest magnitude of persistence, however, the persistence continues to lag three in Nigeria, whereas expenditure reverts back to the trend after lag two for the remaining countries.

No persistence in government revenues was observed for Kenya and Mauritius as documented in Table 12. However, due to the lack of available data on the other countries, no definitive conclusions could be drawn for Africa's FMEs.

Table 12. Persistence: government revenue, government expenditure

Country	<u>GRV</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	-		-		-		-	
Ghana	-		-		-		-	
Kenya	-0.191	0.9898	-0.225	2.4255	0.142	3.0288	-0.067	3.1674
Mauritius	0.263	1.9502	-0.326	5.0745	-0.348	8.7960*	-0.351	12.764*
Mozambique	-		-		-		-	
Nigeria	-		-		-		-	
Tanzania	-		-		-		-	
Uganda	-		-		-		-	
Zambia	-		-		-		-	

Country	<u>GEX</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.378	4.8681*	0.075	5.0684	-0.031	5.1027	-0.020	5.1181
Ghana	0.432	6.3670*	-0.110	6.7977*	-0.407	12.849**	-0.377	18.227**
Kenya	0.558	10.631**	0.083	10.874**	-0.256	13.263**	-0.359	18.141**
Mauritius	0.187	1.1905	-0.387	6.4626*	-0.054	6.5674	0.003	6.5678
Mozambique	0.226	1.7465	-0.126	2.3032	-0.326	6.1853	-0.284	9.2462
Nigeria	0.448	6.8346**	0.178	7.9562*	0.015	7.9646*	-0.196	9.4203
Tanzania	0.494	6.8680**	0.311	9.7102	-0.095	9.9851	-0.200	11.273
Uganda	0.286	2.7837	-0.168	3.7793	0.006	3.7804	-0.127	4.3900
Zambia	-	-	-		-		-	

Cross-correlation

The effect of fiscal policy on the business cycles of countries, whether it dampens or exacerbates fluctuations, depends on the timing. For government spending to have a stabilising effect, it should be countercyclical to the business cycle, and conversely, government revenues should be countercyclical (R. L. Male, 2009). The contemporaneous correlations between government expenditure and government revenue with domestic output is captured in Tables 13 and 14 respectively.

Indications of procyclical expenditure, as reported in Table 13, is found for Botswana, Ghana, Kenya, Tanzania, and Uganda, with only Uganda displaying a marginally weak contemporaneous correlation. Government expenditure is observed to lag the fluctuations in output in each of the above-mentioned countries except for Tanzania, where government expenditure is seen to lead the business cycle by one lag. From the available data, government expenditure does not have a contemporaneous correlation with domestic output in Mozambique, Nigeria and Mauritius. Similar to the findings of (Rand & Tarp, 2002) and (Male, 2009), it could be argued that there is a need for the reform of fiscal policy in the FMEs that do not implement countercyclical government expenditure, before it will have the desired stabilising effect.

Table 13: Cross-Correlations: domestic output, government expenditure

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.0756	-0.2356	-0.1156	-0.1482	0.3338*	0.4078	0.2912	-0.0111	0.2550	1.9067
GHA	0.0751	-0.2144	-0.2807	-0.1580	0.2812*	0.5795	0.3581	-0.0294	-0.0018	1.5777
KEN	0.2910	-0.2030	0.3226	0.3648	0.4445*	0.2106	-0.0805	-0.4701	-0.4701	2.6720
MOZ	0.0163	0.2834	-0.2834	-0.5810	-0.0048	0.0093	0.1270	0.1106	-0.0951	-0.0258
MUS	0.0514	-0.0304	-0.3274	-0.4243	-0.0255	0.3971	0.4681	0.0159	-0.1775	-0.1372
NGA	0.4185	-0.3722	-0.3783	-0.3192	-0.1090	0.0259	0.2660	0.5812	-0.2296	-0.5906
TZA	-0.5032	0.2182	0.5506	0.6345	0.6176*	0.4516	0.3010	-0.4346	-0.3055	3.7660
UGA	-0.1965	0.1957	-0.1707	-0.0964	0.2168	0.2793	0.0255	-0.0428	-0.0373	1.1958
ZMB	-	-	-	-	-	-	-	-	-	-

It is observed in the contemporaneous correlations reported in Table 14, that government revenues are strongly procyclical in Mauritius which, according to (Agenor et al., 2000), suggests that this outcome is likely to result from positive effects of increases in tax revenues. This is further supported by the t-statistic which infers a significant relationship between the two variables. The results for Kenya, on the other hand, indicate that although a procyclical relationship exists, it is

weaker than that of Mauritius. No consistent relationship between domestic output and government expenditure or government revenues could be established for the FME countries.

Table 13. Cross-correlations: domestic output, government revenue

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	-	-	-	-	-	-	-	-	-	-
GHA	-	-	-	-	-	-	-	-	-	-
KEN	0.0523	-0.1958	-0.0649	-0.0135	0.1288	0.0683	-0.4653	0.3318	0.0307	0.6091
MOZ	-	-	-	-	-	-	-	-	-	-
MUS	0.0653	-0.2336	-0.3616	0.0685	0.3801*	0.3675	0.3473	-0.2185	0.0904	1.9705
NGA	-	-	-	-	-	-	-	-	-	-
TZA	-	-	-	-	-	-	-	-	-	-
UGA	-	-	-	-	-	-	-	-	-	-
ZMB	-	-	-	-	-	-	-	-	-	-

As defined in Chapter 3, the fiscal impulse is a “ratio of government spending to government revenue, and is used to examine the net effect of government expenditure and revenue on the domestic business cycle” (Agenor et al., 2000, p.26). As a result of the limited data available for government revenues, the fiscal indicator could only be constructed for Kenya and Mauritius. The result of the contemporaneous correlation between the fiscal impulse and domestic output, as reported in Table 15, indicates a countercyclical relationship between these variables. Mauritius is observed to have a strong negative and significant contemporaneous relationship between these two variables, which infers that the public-sector variables could play a role in short-run macroeconomic stabilisation in this country.

Table 14. Cross-correlation: domestic output, fiscal indicator

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	-	-	-	-	-	-	-	-	-	-
GHA	-	-	-	-	-	-	-	-	-	-
KEN	0.2189	0.1964	0.1336	-0.0985	-0.1079	-0.1586	0.3421	-0.4109	0.0339	-0.5089
MOZ	-	-	-	-	-	-	-	-	-	-
MUS	0.1241	0.3587	0.2370	-0.2638	0.5803*	-0.3958	-0.1805	0.2188	0.2532	-3.4170
NGA	-	-	-	-	-	-	-	-	-	-
TZA	-	-	-	-	-	-	-	-	-	-
UGA	-	-	-	-	-	-	-	-	-	-
ZMB	-	-	-	-	-	-	-	-	-	-

In summary, the correlations examined in this subsection suggest that government expenditure and revenue play a significant role in exacerbating domestic fluctuations in Botswana, Ghana, Kenya Tanzania, and Uganda. From the present data, only Mauritius is observed to implement effective fiscal policy, through countercyclical expenditure and procyclical revenue collection. Although

the results for Kenya also indicate that they implement procyclical revenue, the significance of this policy is relatively low.

4.3.4. Prices and inflation (CPI and CCPI)

Volatility

The empirical results for the relative volatility of prices and inflation for the FMEs, as reported in Table 7, indicate that both prices and inflation (measured as the change in the CPI) are significantly more volatile than domestic output. The sample average infers that prices and inflation are respectively 20.8 and 105 times more volatile than domestic output. (Kabundi, 2012) asserts that external factors such as the rise in world food prices and world energy prices contribute towards sudden rises in inflation in developing countries, as these economies are generally “small open economies with a large agricultural sector” (p.6). Developing countries continue to be net importers of food which also makes up the largest proportion of the basket of average household goods, making them particularly vulnerable to these external shocks. This essentially results in “any increase in domestic food prices leading to a general increase in prices” (Kabundi, 2012, p.6). As discussed in Chapter 3, the FME countries are developing countries which are generally classified by the World Bank as low or lower-middle income countries, making them more susceptible to the external food and energy price shocks that impact price levels. The sample volatility of inflation is exacerbated by Uganda, whose inflation volatility is 680 times that of output. This staggering result is due to a period of hyperinflation which was experienced in the last half of the 1980’s, with average rates of well in excess of 70 percent (World Bank Group, 1993). Another contributing factor to the excessive volatility in inflation in the FMEs is the surge in inflation in east Africa in 2011, with inflation that reached an average of 20 percent, with Uganda’s inflation reaching over 30 percent, followed by Kenya and Tanzania with inflation rates of 18.9 percent and 17.9 percent respectively (Kabundi, 2012). These findings are generally in line with those of (Male, 2009).

Turning to the volatility of prices in the FMEs, as reported in Table 7, the prices in Mozambique are the most volatile in the sample, with it being 39 times more volatile than domestic output. This can be attributed to high prices in the period between 1986-1989, with the growth in CPI peaking at 163.3 percent during this period (World Bank Group, 1992). This is followed by Kenya, Ghana, Tanzania and Uganda which respectively record price volatilities of 29, 26, 22 and 21 times higher than output. These findings depart from the stylised facts for the volatility in developing countries, which indicate that price volatility in developing countries is approximately the same as in developed countries. These results are also contrary to the findings of (Male, 2009), who found

that price volatility in African countries is on average lower than the output. The difference in the findings could be as a result of the sample of countries examined in the studies.

Persistence

Table 15. Persistence: price, inflation

Country	<u>CPI</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.053	0.0972	0.018	0.1083	0.324	3.9451	-0.157	4.8808
Ghana	-0.079	0.2133	-0.129	0.7990	-0.025	0.8214	0.026	0.8475
Kenya	0.039	0.0510	-0.258	2.4038	0.071	2.5886	-0.028	2.6194
Mauritius	0.185	1.1640	-0.441	8.0186*	-0.384	13.400**	-0.006	13.401**
Mozambique	0.378	4.3023*	-0.066	4.4394	-0.333	8.0676*	-0.342	12.041*
Nigeria	0.347	4.1013*	-0.321	7.7458*	-0.310	11.264*	-0.153	12.151*
Tanzania	0.409	5.7015*	0.033	5.7405	0.212	7.3900	0.041	7.4539
Uganda	-0.079	0.2133	-0.129	0.7990	-0.025	0.8214	0.026	0.8475
Zambia	0.429	5.8983*	-0.059	6.0134*	-0.063	6.1498	-0.183	7.3539

Country	<u>CCPI</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	-0.496	7.9019**	-0.123	8.4018*	0.428	14.744**	-0.282	17.595**
Ghana	-0.505	8.1885**	-0.160	9.0388*	0.458	16.297**	-0.290	19.331**
Kenya	-0.313	3.1498	-0.301	6.1753*	0.151	6.9643	-0.045	7.0373
Mauritius	-0.225	1.6271	-0.277	4.1853	-0.043	4.2485	-0.020	4.2629
Mozambique	-0.186	1.0103	-0.100	1.3124	-0.188	2.4339	-0.022	2.4494
Nigeria	-0.090	0.2591	-0.542	10.054**	0.036	10.098*	0.260	12.531*
Tanzania	-0.208	1.3865	-0.365	5.8201	0.237	7.7627	-0.016	7.7721
Uganda	-0.112	0.4019	-0.084	0.6382	-0.060	0.7619	-0.393	6.3047
Zambia	-0.177	0.9745	-0.472	8.1779*	0.260	10.451*	0.137	11.108*

Contrary to the findings of persistence in prices in both developed and developing countries, no clear pattern of price persistence emerges from the examination of the autocorrelation coefficients of the prices for the FMEs. As reported in Table 16, price shocks are not persistent in Botswana, Ghana, Kenya, Mauritius and Uganda. There is, however, significant price persistence in Mozambique, Nigeria, Tanzania and Zambia, with Zambia experiencing the largest magnitude of persistence in lag one. The persistence is particularly sticky in Nigeria, where it continues past lag four. Inflation is also only persistent in Botswana and Ghana; however, the inflation rates revert back to the trend after lag two.

Cross-correlation

It has been well established in the literature that prices in industrialised countries are countercyclical to aggregate output, and it is generally argued that supply driven interpretations

of the business cycle, including real business cycle models, are justified by this negative relationship (Agenor et al., 2000). This is not, however the case for developing countries where no consistent negative pattern of cyclicity can be established, particularly in SSA countries (Agenor et al., 2000) and (Rand & Tarp, 2002). The analysis of FMEs is consistent with the findings of these authors, with no consistent negative relationship being observed for FMEs. The results of the contemporaneous correlations between price and domestic output are reported in Table 17, and it is observed that 6 of the countries have a procyclical relationship, with a particularly strong procyclical relationship being observed for Botswana and Uganda. From the current data, prices are observed to be countercyclical in three of the countries, with a particularly strong countercyclicity reported for Mozambique. The impact of prices on GDP is not found to be significant in any of the sample countries.

Table 16. Cross-correlations: domestic output, prices (CPI)

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.0532	-0.1155	0.0252	-0.1429	0.3091*	0.2830	0.2112	0.0837	-0.3091	0.3090
GHA	0.0736	0.0345	0.0474	0.0067	0.1107	-0.1483	-0.1772	0.0188	-0.0362	0.5995
KEN	0.1017	-0.1196	-0.0040	-0.1212	-0.0372	0.3433	0.4415	0.0213	-0.1768	-0.2003
MOZ	-0.0964	0.1648	0.0666	-0.2726	-0.5711*	-0.5799	-0.2923	0.5010	-0.1600	-0.5711
MUS	0.0803	0.0506	0.0113	-0.2922	-0.2119	0.2315	0.4051	-0.1298	0.0491	-1.1674
NGA	-0.0829	-0.2268	0.3447	0.3888	0.0435	0.0271	0.1593	0.0468	0.0468	0.2345
TZA	-0.0695	-0.5536	-0.1296	-0.0261	0.1871	0.5181	0.5306	0.6481	-0.3558	1.0254
UGA	0.1910	-0.2372	-0.3071	-0.1611	0.0652	0.2768	0.1709	0.2716	-0.2668	1.7194
ZMB	0.1442	0.0477	-0.4104	-0.0496	0.2291	0.0986	0.2495	0.2429	-0.1756	1.2231

The relationship between domestic output and inflation, as reported in Table 18, is generally procyclical for the FMEs, with a countercyclical relationship only being observed for 3 of the countries. (Male, 2009) went on to observe a relationship between the price correlations and the inflation correlations for developing countries, stating that countries that have countercyclical prices also have countercyclical inflation, however, no such relationship was observed for the FMEs. Therefore, the patterns observed in the remainder of the FMEs are similar to the stylised facts for industrialised countries, where they have procyclical inflation and countercyclical prices.

According to (Chadha & Prasad, 1994), the relationship between the correlations of prices and inflation are critical for the correct classification of shocks in terms of demand-side or supply-side shocks to domestic output: demand-side shocks to domestic output result in procyclical fluctuations in prices and inflation whereas supply-side shocks to domestic output result in countercyclical prices and inflation. From the available data it is difficult to determine whether supply- or demand-side shocks drive fluctuations in domestic output, with only Botswana and

Uganda exhibiting weakly procyclical prices and inflation, where it is plausible that these business cycles are attributable to demand shocks. Therefore, similarly to the finding of (Rand & Tarp, 2002), “demand driven models cannot be ruled out for all African countries, and the importance of paying attention to country specific circumstances” (p.17). The stylised fact that “prices are not consistently countercyclical and inflation is not consistently procyclical” (Male, 2009, p.50) can be inferred for the FMEs.

Table 17. Cross-correlation: domestic output, inflation (CCPI)

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.0300	-0.0916	-0.0706	0.4259	0.0128	-0.0746	0.0651	-0.1804	0.1131	0.0663
GHA	0.0043	0.0887	-0.1361	0.2029	-0.1998	-0.1088	0.1041	-0.0523	0.0151	-1.0596
KEN	-0.0732	0.1790	-0.0630	0.0041	0.0612	-0.2172	-0.2613	0.1387	-0.0694	0.3185
MOZ	0.0681	-0.0632	-0.1533	-0.1649	0.1602	0.2550	0.3753	-0.2820	0.1164	0.7949
MUS	-0.1251	-0.0532	-0.0981	0.2141	0.3459*	-0.1058	-0.4662	0.0132	-0.0027	1.9153
NGA	-0.1711	0.1936	0.0706	-0.2225	-0.1534	0.0969	0.0928	-0.0952	-0.0199	-0.8066
TZA	-0.1764	0.1084	0.0876	0.2064	0.2776*	0.0268	0.1120	-0.1648	-0.1205	1.5016
UGA	-0.2216	0.0493	-0.0063	0.1600	0.1468	-0.0378	0.1903	0.0100	0.0630	0.7711
ZMB	0.1707	-0.2385	0.3446	0.1601	-0.0735	0.0847	0.1559	-0.0989	0.0141	-0.3760

4.3.5. Money and credit (LR, BM, DCR)

Volatility

(Agenor et al., 2000) explain that the monetary mechanism can play a potentially important stabilising role in developing countries, therefore it is important to include monetary variables when analysing business cycles. As such, this analysis of FME business cycles also examines interest rates, broad money and private sector credit as key money and credit variables. In their examination of the role of interest rates in the business cycles of developing countries, (Neumeyer & Perri, 2005), find that interest rates are more volatile than in developed countries. In this study, as reported in Table 8, the analysis on the interest rate could only be conducted for Botswana, Kenya, Mauritius and Tanzania due to data availability. On average the volatility of interest rates, measured by the lending rate, is 32 percent less than output, which is in contrast to the finding of (Male, 2009) and (Rand & Tarp, 2002) who found that interest rates are more volatile than output. This could, however, be as a result of the analysis only being conducted on four countries.

Turning to broad money, as reported in Table 7, it is on average 12 times more volatile than output, this result is, however, skewed by Zambia, whose broad money is 76 times more volatile than domestic output. When removing Zambia from the sample, the average volatility of broad money is 4 times higher than that of domestic output, which is significantly lower than the findings of (Rand & Tarp, 2002). According to (Zgambo & Chileshe, 2014), the volatility of Zambia’s broad

money could be as a result of the monetary policy implemented prior to 1996 which had multiple objectives, including the provision of cheap credit particularly to state owned companies, and the promotion of economic growth through various initiatives and incentives. (Zgambo & Chileshe, 2014) go on to highlight that during this period, the central bank had limited control over money supply since the banking sector was dominated by foreign banks that tended to issue loans to mostly foreign owned companies without regard to prevailing economic and financial conditions. In addition, the state dominated the economic paradigm during this period, with the government's budget deficit being financed through borrowings from the central bank (Zgambo & Chileshe, 2014). The central bank generally relied on the use of direct instruments such as interest rate controls, directed credit allocation as well as core liquid assets, that caused excessive volatility in the circulation of money in the economy, with this situation only being brought under control after 1996, when the monetary policy was narrowed to focus on price and financial stability.

The consideration of private sector credit is also important when analysing the business cycles of developing countries, as the private sector has a significant influence on economic activity due to the weakly capitalised equity markets (Agenor et al., 2000). The volatility of private sector credit, as reported in Table 8, is significantly higher than domestic output, with the volatility being on average 8.36 times higher. This result is skewed by the results of Tanzania, with domestic credit being 36 times more volatile than output which could be due to changes in the policy positions of the Tanzanian government during the period under review. As discussed by (Moshi & Kilindo, 1999), prior to 1990, the government actively discouraged the development of the private sector through legislation that not only prohibited the private ownership of small enterprises in villages, but also legalised nationalisation. This was further entrenched by only allowing state owned banks to operate in the financial sector. These factors limited both the demand and supply of private sector credit. Only in 1990 did government significantly change its policy stance by enacting legislation that not only promoted investment, but also liberalised the financial sector and allowed private banks to operate. The findings of FMEs are significantly different from (Male, 2009), who reports lower volatility in the African countries included in her sample. The existing stylised fact is also not suitable to African countries.

Persistence

The examination of persistence in interest rates in FMEs, as reported in Table 19, indicates that interest rates are persistent for all four countries examined, with the persistence for Botswana, Kenya and Mauritius, being highly significant. Botswana experienced the highest magnitude of persistence in lag one, which remained significant over four lags. Similarly, the persistence remained significant for Kenya over four lags, with the persistence decreasing after the first lag for Mauritius. , Similarly, the persistence of changes to broad money, as reported in Table 19, was only significant for five out of the nine countries in the sample, the magnitude of the persistence being the highest in Tanzania. Private sector credit was significantly persistent in only four of the sample countries, with Mozambique experiencing the highest magnitude of persistence.

Table 18. Persistence: lending rate, broad money, domestic credit rate

Country	<u>LR</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.637	13.828**	0.082	14.067**	-0.376	19.240**	-0.529	29.861**
Ghana	-	-	-	-	-	-	-	-
Kenya	0.544	10.087**	0.326	13.841**	0.130	14.456**	0.005	14.457**
Mauritius	0.451	6.9360**	-0.062	7.0696*	-0.295	10.242*	-0.296	13.562**
Mozambique	-	-	-	-	-	-	-	-
Nigeria	0.337	3.8646*	0.009	3.8678	0.069	4.0412	-0.380	9.5101*
Tanzania	-	-	-	-	-	-	-	-
Uganda	-	-	-	-	-	-	-	-
Zambia	-	-	-	-	-	-	-	-

Country	<u>DCR</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.585	11.662**	0.122	12.185**	-0.314	15.781**	-0.625	30.573**
Ghana	0.190	1.2326	-0.181	2.3827	0.094	2.7037	-0.034	2.7475
Kenya	0.053	0.0953	-0.157	0.9679	0.194	2.3480	-0.078	2.5779
Mauritius	0.057	0.1126	-0.416	6.2103*	-0.378	11.434*	-0.043	11.504*
Mozambique	0.615	10.996**	0.213	12.373**	-0.140	12.993**	-0.572	23.836**
Nigeria	0.475	7.7082**	-0.067	7.8663*	-0.521	17.796**	-0.416	24.339**
Tanzania	0.203	1.2390	0.061	1.3573	-0.078	1.5543	-0.043	1.6160
Uganda	-0.202	1.0690	-0.134	1.5572	0.034	1.5914	-0.103	1.6160
Zambia	0.392	3.8680*	-0.266	5.7388	-0.145	6.3268	0.137	6.8812

Country	<u>BM</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.287	2.8161	0.198	4.1969	-0.091	4.4973	-0.121	5.0510
Ghana	0.326	3.6166	-0.012	3.6219	-0.044	3.6935	-0.400	9.7450*
Kenya	0.254	2.2051	0.116	2.6814	-0.044	2.7522	-0.339	7.1172
Mauritius	0.410	5.7334*	-0.051	5.8252	-0.270	8.4792*	-0.141	9.2374
Mozambique	0.211	1.2932	-0.207	2.5951	-0.173	3.5379	-0.247	5.5644
Nigeria	0.487	8.0724**	-0.103	8.4445*	-0.451	15.873**	-0.480	24.609**
Tanzania	0.734	16.215**	0.290	18.842**	-0.208	20.254**	-0.544	30.336**
Uganda	0.473	7.6150**	0.078	7.8273*	-0.162	8.7890*	-0.339	13.132*
Zambia	0.340	2.9087*	-0.304	5.3432	-0.278	7.4910	-0.217	8.8694

Cross-correlation

The examination of Table 20 reveals that broad money is procyclical for six of the FMEs and that this relationship is robust in four of these countries. A negative contemporaneous coefficient is observed for three of the FMEs, namely Kenya, Mozambique and Zambia, of which Mozambique exhibits a strongly countercyclical relationship between broad money and domestic output. From the analysis of the correlation between the business cycle and the leads and lags of broad money, money appears to be synchronous with the business cycle in Botswana, Mauritius and Tanzania while money appears to lag the business cycle in Kenya, Mozambique, Nigeria and Zambia, which suggests that money is led by output. Lastly, money appears to lead the business cycle in Ghana and Uganda, and innovations in money take quite some time to be transmitted, only in lag five for Ghana and lag six for Uganda. The role of money in output seems to be significant in Botswana, Mauritius, Kenya and Tanzania.

Table 19. Cross-correlations: domestic output, broad money

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	-0.0199	0.0809	0.1099	0.1649	0.3675*	0.1330	0.1770	-0.5063	0.0333	2.1282
GHA	0.0608	-0.2110	0.0557	0.3135	0.3262*	0.1655	0.0450	-0.0113	-0.0889	1.8580
KEN	-0.1871	0.1497	0.1668	0.0379	-0.0327	-0.1964	-0.2831	0.4736	-0.1140	4.1296
MOZ	0.0441	0.1561	-0.3149	-0.2284	-0.3311*	0.1025	0.2218	0.5633	-0.3316	-1.7187
MUS	-0.1143	-0.0360	-0.1195	0.2074	0.4210*	0.1573	-0.0719	0.0604	-0.2122	2.4996
NGA	-0.2769	0.1780	0.1750	0.0653	0.0437	0.0914	0.1512	0.2287	-0.4141	0.2353
TZA	-0.3986	-0.2546	0.3520	0.5809	0.6366*	0.5104	0.3779	-0.0596	-0.3006	4.1273
UGA	-0.0353	0.0002	0.0984	0.0889	0.1206	0.1162	0.3138	-0.0031	-0.1341	0.6541
ZMB	-	-	-	-	-	-	-	-	-	-

There is a clear pattern of cyclicity of private sector credit in the FMEs, with the results of the analysis, as captured in Table 21, exhibiting a strong positive contemporaneous correlation between real private sector credit and domestic output for all FMEs, except for Tanzania which exhibits a weaker positive correlation. In establishing whether private sector credit influences output, it is firstly necessary to examine whether credit leads or lags the business cycle. There were mixed results in this analysis, with private sector credit lagging output in four of the countries suggesting that fluctuations in output influence credit. Credit is procyclical and is seen to lead the business cycle of three countries, namely Ghana, Kenya and Tanzania and peak between 2 and 7 lags, indicating that although changes to private sector credit do not affect domestic output rapidly, it does still influence output. The significance of private sector credit in output is also inconsistent between the sample countries.

Table 20. Cross-correlations: domestic output, domestic credit

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.0944	-0.2645	-0.4967	-0.2185	0.2921*	0.6215	0.6441	-0.0045	-0.2500	1.6448
GHA	-0.1267	0.0464	-0.0761	0.0021	0.1145	0.1381	0.0491	-0.0719	0.0327	0.6208
KEN	-0.1960	-0.1960	-0.0137	0.0815	0.1711	0.0821	-0.1771	0.0396	0.2037	0.9351
MOZ	0.1300	-0.3047	-0.0829	0.2166	0.4002*	0.6306	0.3718	-0.1625	-0.1980	2.1394
MUS	-0.0620	-0.0559	-0.1525	-0.0662	0.2724*	0.0446	-0.0499	-0.0567	-0.1500	1.5244
NGA	-0.0671	0.0503	0.0213	-0.0108	0.0065	0.1206	0.2013	0.3275	-0.5882	0.0348
TZA	-0.5389	0.0621	0.5186	0.5568	0.4496*	0.2653	0.1285	-0.1886	-0.1584	2.5167
UGA	0.0349	-0.1474	-0.0216	0.1163	0.4836*	0.2240	-0.0004	-0.2503	-0.0615	2.5316
ZMB	-0.2470	-0.0748	0.0679	0.2293	0.0013	-0.1796	0.0234	0.2530	0.2054	0.0058

Although no evidence of a robust unidirectional causal relationship could be established, the strong positive association between private sector credit and the domestic output in FMEs, stills holds important implications for the design of stabilisation programmes (Agenor et al., 2000). (Agenor et al., 2000) went on to state that “ignoring this link may exacerbate the output costs of a restrictive monetary policy aimed at targeting inflation” (p.16).

Table 22 reports the results of the contemporaneous correlations between domestic output and the real lending rate. On average, the interest rates in FMEs are found to be generally weakly countercyclical, except for Nigeria which is observed to have a strong positive contemporaneous correlation. The trend of countercyclical interest rates could be because of the utilisation of interest rates to implement inflation targeting monetary policies. These findings are supported by (Neumeyer & Perri, 2005) and (Uribe & Yue, 2006) as they also found that business cycles of developing countries are characterised by countercyclical interest rates. No clear pattern emerges when examining whether interest rates lead or lag output, with Mauritius exhibiting a synchronous cycle, and interest rates leading output in Botswana and Nigeria. Therefore, similar to the finding of (Male, 2009), interest rates do not appear to be an important source of business cycle movements in the FMEs.

Table 21. Cross-correlation: domestic output, lending rate

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.0049	0.0143	0.6088	0.6040	-0.1601	0.2258	0.5234	0.2583	-0.2105	-0.8731
GHA	-	-	-	-	-	-	-	-	-	-
KEN	-0.2712	0.0199	0.0001	0.1226	-0.2369	-0.1526	0.0458	0.3186	0.1227	-1.3133
MOZ	-	-	-	-	-	-	-	-	-	-
MUS	-0.0131	0.1657	0.0737	0.0742	-0.3397*	-0.3165	-0.0724	0.1472	-0.1004	-1.9447
NGA	-0.5056	0.1150	0.3904	0.3629	0.1899	-0.0908	-0.0837	-0.1198	0.0550	1.0417
TZA	-	-	-	-	-	-	-	-	-	-
UGA	-	-	-	-	-	-	-	-	-	-
ZMB	-	-	-	-	-	-	-	-	-	-

4.3.6. Trade variables (IMP, EXP, TB, TOT)

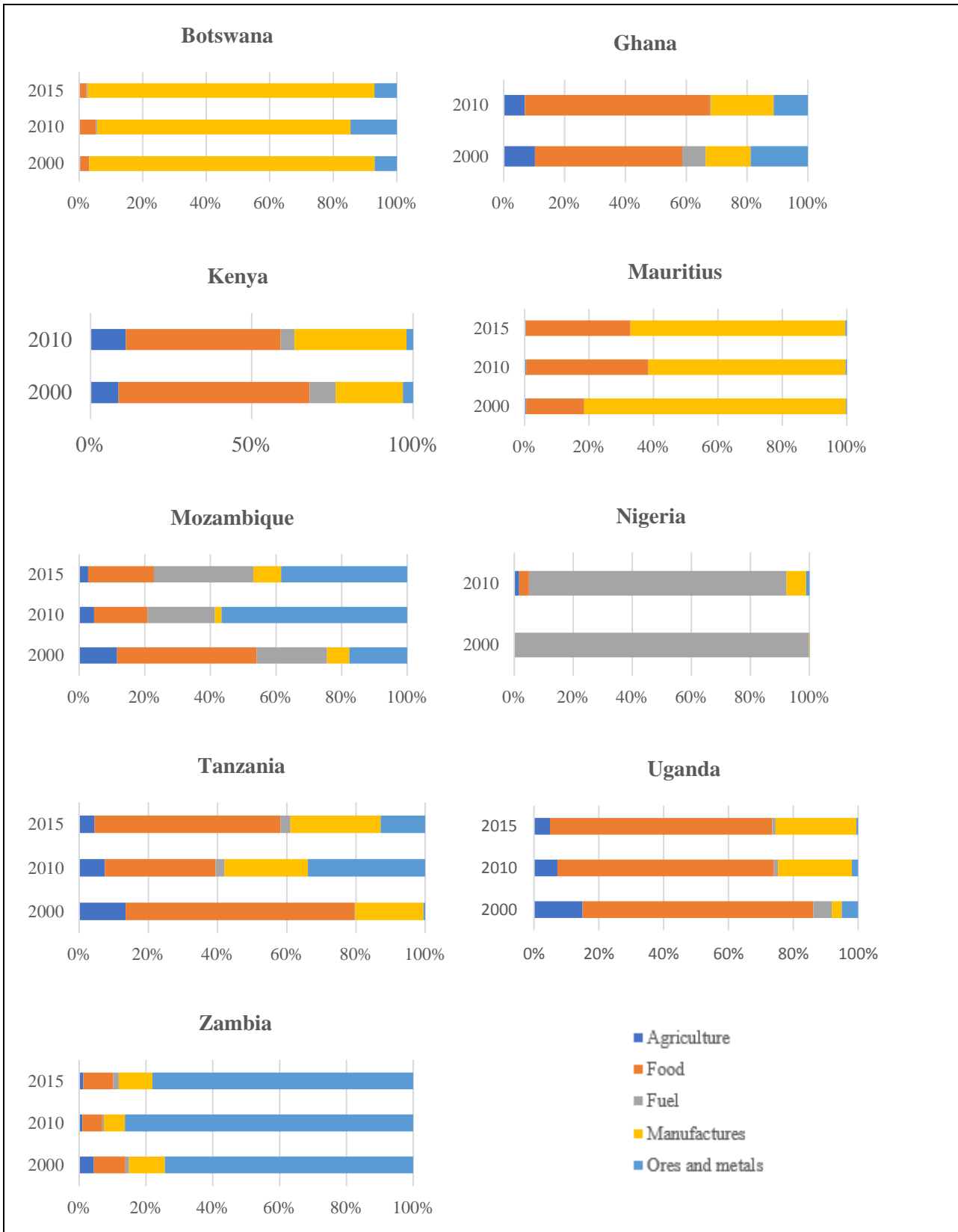
Volatility

As discussed in Chapter 1, commodity exports, particularly food, fuel, ores and metal continue to dominate exports (as a percentage of merchandise exports), as can be seen in Figure 3. It has also been observed that in developing countries, these exports are concentrated on a relatively small number of primary commodities, for which world prices are volatile, which holds true for the FMEs as well. Table 23 provides a breakdown of the top five agricultural and non-agricultural exports of each of the FMEs and there is a distinct concentration of exports in a few products. The volatility of world prices continues to be a challenge to developing countries, and the FMEs on three fronts: firstly, much of the variation in unit values in developing countries can be explained by fluctuations in the world price of the underlying commodity (Deaton & Miller, 1995); secondly, these countries are also generally price takers in the global market, due to their relatively small contribution to world trade (Page & Hewitt, 2001); and thirdly they induce fluctuations in real national incomes posing serious challenges for effective macroeconomic management (Deaton & Miller, 1995). The fluctuations in the prices of tradeable goods are also found by (Blattman, Hwang, & Williamson, 2003) and (Deaton & Miller, 1995) to account for approximately 50 percent of the fluctuations in aggregate domestic output and aggregate investment decreases. In his analysis, (Mendoza, 1995) found that “shocks in terms of trade explain 37 percent of the volatility in the aggregate domestic output at import prices, and 37 percent at domestic prices, implying that domestic shocks play an important role in explaining business cycles” (p.135).

Due to challenges with the availability of data, the analysis on the exports, imports and trade balance could not be performed for Zambia. The results of the analysis of relative volatility, as reported in Table 7 shows that the trade balance for the FMEs are on average 4.8 times more volatile than that of domestic output.

The relative volatility in the FMEs is significantly higher than what was expected from the stylised facts that the trade balance is approximately 3 times more volatile than domestic output. The volatility of exports for the FMEs is, however, on average 6 times higher than domestic output, which is twice what was anticipated from the stylised facts. The export volatility is led by Tanzania and Ghana which respectively have export volatilities of 14 and 10 times higher than domestic output. As alluded to previously, this export volatility in FMEs could be as a result of their continued dependence on the export of commodities, and their specialisation in one or a few commodities for which they are generally price takers.

Figure 3. Composition of manufacturing exports



Source: World Bank World Development Indicators

Imports are found to be about 5 times more volatile than output while the volatility of the terms of trade is approximately twice as volatile as output. According to (Blattman et al., 2003), this trade volatility can be particularly damaging for developing countries as they have a higher sensitivity towards volatility in the terms of trade, and that it can be particularly damaging to countries that concentrate on primary commodity production.

Table 22. Breakdown of FMEs manufacturing exports

Botswana			
Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Bovine meat, fresh, Chilled	52	Diamonds	6453
Bovine meat, frozen	52	Nickel matters, nickel oxide sinters	235
Vegetable saps and extracts	3	Insulated electric conductors	117
Cereal groats, meal and pellets	2	Carbonates, peroxcarbonates	40
Dried leguminous vegetables	2	Gold	39
Ghana			
Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Cocoa beans, whole or broken	1381	Gold	5365
Coconuts, Brazil nuts, cashew nuts	481	Petroleum oils, crude	3015
Coconut (copra), or palm kernel oil	117	Preparations care of the skin	239
Cocoa butter, fat and oil	66	Wood sawn or chipped lengthwise	231
Other oil seeds, oleaginous fruit	59	Sheets for veneering	154
Kenya			
Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Tea	1218	Petroleum oils, other than crude	204
Cut flowers and flower buds	480	Carbonates, peroxcarbonates	108
Coffee	191	Portland cement, aluminous cement	104
Leguminous vegetables	127	Conveyance of good's articles	91
Cigars, cheroots, cigarillos	103	Gold	89
Mauritius			
Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Cane or beet sugar	230	Prepared or preserved fish	263
Vanilla	49	T-shirts. Singlets and other vests	156
Other live animals	20	Men's or boy's shirts	154
Other animal products	16	Men's or boys' suits	110
Flours, meals and pellets	15	Fish, frozen, excluding fish fillet	99
Mozambique			
Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Unmanufactured tobacco	293	Aluminium bars, rods and profiles	911
Cane or beet sugar	118	Coke and semi-coke of coal	387
Bananas, including plantains	32	Electrical energy	317
Cotton, not carded or combed	29	Petroleum gases	231
Other oil seeds, oleaginous fruits	23	Unwrought aluminium	143

Nigeria

Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Cocoa beans, broken or whole	627	Petroleum oils, crude	75033
Other oil seeds, oleaginous fruits	557	Petroleum gases	12179
Cotton, not carded or combed	182	Petroleum oils, other than crude	6257
Cocoa butter, fat and oil	146	Pyrophoric alloys in all forms	1899
Cigars, cheroots, cigarillos	138	Vessels not mainly for navigability	1553

Tanzania

Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Unmanufactured tobacco	360	Gold	1655
Coconuts, Brazil nuts, cashew nuts	348	Precious metal ores and concentrate	322
Solid residuals from other oil	171	Carboys, bottles, flasks, jars	197
Dried leguminous vegetables	159	Fish fillets and other fish meat	114
Coffee	152	Other furniture and parts thereof	42

Uganda

Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Coffee	403	Petroleum oils, other than crude	131
Tea	70	Portland cement, aluminous cement	80
Maize (corn)	63	Fish fillets and other fish meat	79
Dried leguminous vegetables	61	Flat-rolled products of iron +600	44
Unmanufactured tobacco	58	Tanned/crusted bovine hides, skins	41

Zambia

Agricultural product	Value 2016	Non -Agricultural products	Value 2016
Maize (corn)	201	Refined copper and copper alloys	4446
Cane or beet sugar	115	Unrefined copper	643
Unmanufactured tobacco	88	Electrical energy	100
Cotton, not carded or combed	47	Gold	91
Other manufactured tobacco	18	Products of cobalt metallurgy	75

Source: (World Trade Organisation, 2017). Note: value is in US 'millions

Persistence

As reported in Table 24, the examination of the autocorrelations of imports, exports, the trade balance and the terms of trade reveals that there is no defined pattern of persistence in the FMEs for any of these variables. Exports are significantly persistent for Ghana, Kenya, Mauritius and Tanzania, and remains significant over four lags. Imports, on the other hand are significantly persistent for Botswana, Ghana, Mauritius, and Tanzania in the first lag, and remain significant in Botswana and Mauritius over four lags. The trade balance is significantly persistent for Botswana, Mauritius, Tanzania and Uganda while the terms of trade are significantly persistent for Botswana, Kenya, Nigeria, Uganda.

Table 23. Persistence: exports, trade balance, imports, terms of trade, imports

Country	<u>EXP</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.310	3.2848	-0.075	3.4850	-0.234	5.4869	-0.517	15.623**
Ghana	0.552	10.379**	0.133	11.004**	-0.142	11.742**	-0.276	14.629**
Kenya	0.574	11.237**	0.190	12.510**	-0.154	13.378**	-0.400	19.428**
Mauritius	0.445	6.7408**	-0.022	6.7577*	-0.275	9.5115*	-0.274	12.357*
Mozambique	0.310	3.2757	-0.260	5.6662	-0.174	6.7775	-0.110	7.2381
Nigeria	0.087	0.2587	0.096	0.5826	-0.156	1.4761	-0.133	2.1483
Tanzania	0.613	10.576**	0.025	10.593**	-0.438	16.482**	-0.626	29.085**
Uganda	0.296	2.9853	0.097	3.3145	-0.081	3.5532	-0.194	4.9764
Zambia	0.373	3.3661	0.022	3.3778	-0.190	4.3496	-0.385	8.5528

Country	<u>TOT</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.568	10.990**	0.052	11.087**	-0.204	12.609**	-0.483	21.449**
Ghana	0.068	0.1590	-0.147	0.9232	0.093	1.2411	-0.303	4.7305
Kenya	0.507	8.7623**	0.069	8.9307*	-0.173	10.020*	-0.276	12.903*
Mauritius	-0.038	0.0498	-0.186	1.2675	-0.127	1.8580	-0.171	2.9703
Mozambique	0.038	0.0504	-0.368	4.8282	-0.205	6.3693	-0.011	6.3741
Nigeria	-0.467	7.4527**	0.259	9.8235**	-0.372	14.879**	0.048	14.968**
Tanzania	0.015	0.0078	0.006	0.0092	-0.238	2.0823	-0.261	4.6640
Uganda	0.447	6.7994**	0.167	7.7820*	-0.030	7.8157*	-0.137	8.5223
Zambia	-0.019	0.0119	-0.072	0.1953	0.159	1.1220	-0.256	3.5989

Country	<u>TB</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.384	5.0294*	-0.173	6.0866*	-0.214	7.7545	-0.313	11.476*
Ghana	0.204	1.4187	0.124	1.9648	-0.225	3.8165	-0.193	5.2241
Kenya	0.225	1.7193	-0.295	4.7949	-0.354	9.3714*	-0.071	9.5635*
Mauritius	0.369	4.6497*	-0.074	4.8429	-0.145	5.6084	-0.143	6.3808
Mozambique	0.300	3.0629	-0.110	3.4882	-0.056	3.6030	-0.047	3.6861
Nigeria	-0.029	0.0297	-0.136	0.6814	-0.454	8.2126*	0.063	8.3641
Tanzania	0.462	6.0129*	-0.118	6.4184*	-0.517	14.606**	-0.457	21.305**
Uganda	0.421	6.0349*	0.129	6.6228*	-0.054	6.7300	-0.209	8.3812
Zambia	-	-	-	-	-	-	-	-

Country	<u>IMP</u>							
	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.366	4.5751*	-0.147	5.3376	-0.311	8.8670*	-0.246	11.156*
Ghana	0.396	5.3379*	-0.186	6.5623*	-0.092	6.8690	-0.059	7.0013
Kenya	0.222	1.6834	-0.300	4.8553	-0.344	9.1850*	-0.073	9.3858
Mauritius	0.516	9.0906**	0.005	9.0914*	-0.400	14.929**	-0.477	23.554**
Mozambique	0.306	3.2023	-0.207	4.7161	-0.114	5.1943	-0.124	5.7728
Nigeria	0.089	0.2704	-0.102	0.6364	-0.527	10.799*	-0.051	10.895*
Tanzania	0.550	8.5065**	0.050	8.5801*	-0.043	8.6380*	-0.141	9.2774
Uganda	0.123	0.5191	-0.417	6.6672*	-0.152	7.5116	0.171	8.6207
Zambia	0.394	3.7489	-0.050	3.8120	-0.010	3.8148	-0.278	6.0098

Cross-correlation

The contemporaneous correlation between imports and domestic output, the results of which are reported in Table 25, show a generally positive relationship between these two variables, with it being particularly robust for Botswana, Ghana, Mauritius, Tanzania and Uganda. Only two countries, Mozambique and Zambia, exhibit a countercyclical relationship, however it is weak in nature. Imports are found to be synchronous with the business cycle in four of the sample countries,

namely Botswana, Ghana, Mauritius and Uganda, and to lead the business cycle in the remaining countries. Imports is of particular significance in the output of Botswana, Ghana, Mauritius and Tanzania.

Table 24. Cross-correlations: domestic output, imports

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.1113	-0.2396	-0.0728	0.1276	0.5450*	0.3988	0.0304	-0.3438	0.3836	3.5003
GHA	0.0176	-0.2797	0.0777	0.3823	0.4657*	0.2221	-0.0195	-0.0660	0.0305	2.8339
KEN	-0.2772	-0.1570	0.1074	0.2041	0.1529	-0.0621	-0.2600	0.2379	-0.1741	0.8334
MOZ	0.1280	-0.1680	-0.0971	-0.1658	-0.0527	-0.2654	-0.2829	0.3069	-0.1085	-0.2839
MUS	-0.2058	-0.1104	0.2130	0.3132	0.4911*	0.3837	0.0863	-0.3481	0.1543	3.0359
NGA	-0.1540	-0.1926	0.0620	0.3253	0.2331	0.2157	-0.0600	0.1226	-0.3635	1.2906
TZA	-0.2256	-0.3382	-0.0670	0.2903	0.5456*	0.5684	0.6224	0.2789	-0.3151	3.1224
UGA	-0.0413	0.0719	-0.0241	-0.1028	0.2879*	0.2021	-0.0190	-0.2409	0.1468	1.6186
ZMB	-	-	-	-	-	-	-	-	-	-

The relationship between exports and domestic output, as reported in Table 26, is even more robust than that of imports with all FMEs, with the exception of Kenya, displaying procyclical exports. Table 27 presents the correlation between the trade balance and domestic output. For Botswana, Nigeria and Tanzania, the contemporaneous correlations are negative. However, the contemporaneous correlations are positive for Kenya, Mozambique, Mauritius and Uganda, with it being particularly strongly positive for Mozambique. According to (Agenor et al., 2000) the result for Mozambique could reflect a strong link between changes in output and exports of manufactured goods, or the fact that merchandise imports are not highly sensitive to fluctuations in domestic demand. Exports are found to lag output in four of the countries namely Ghana, Nigeria, Tanzania and Zambia, and to lead output in another four countries namely Botswana, Kenya, Mozambique and Uganda, with only Mauritius exhibiting a synchronous pattern. These results are in contrast to the stylised fact that states that “the ratio of net exports to output is generally countercyclical” (Male, 2009).

Table 26. Cross-correlation: domestic output, exports

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.0449	-0.0925	0.3060	0.3613	0.4258*	-0.2189	-0.4460	-0.3365	0.3426	2.5341
GHA	-0.0820	-0.2978	0.2176	0.4270	0.4514*	0.2374	-0.0422	-0.1022	0.0298	2.7245
KEN	-0.2166	0.0884	0.0868	-0.1213	-0.2232	-0.2132	-0.0767	0.4961	-0.4033	-1.2330
MOZ	0.0607	-0.2735	0.0138	0.0568	0.1673	-0.2634	-0.3709	0.3766	0.0214	0.9139
MUS	-0.1513	-0.2271	0.2989	0.4356	0.5501*	0.2370	-0.1477	-0.2720	0.1222	3.5474
NGA	-0.3114	-0.0258	0.3213	0.3915	0.2058	0.1268	0.0301	-0.0120	-0.2064	1.1322
TZA	-0.0803	-0.3156	0.0525	0.2512	0.3328*	0.3382	0.3094	0.1031	-0.1716	1.6926
UGA	-0.3989	0.0729	0.1189	0.1257	0.4320*	0.4698	0.2121	-0.3325	-0.1576	2.5797
ZMB	-	-	-	-	-	-	-	-	-	-

Table 27. Cross-correlation: domestic output, trade balance

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	-0.0448	0.0994	0.2793	0.1797	-0.0655	-0.4435	-0.3539	-0.0093	-0.0141	-0.3536
GHA	0.1910	-0.2372	-0.3071	-0.1611	0.0652	0.2768	0.1709	0.2716	-0.2668	0.4675
KEN	0.1729	-0.0019	-0.0707	0.1447	0.1811	-0.0991	-0.0202	-0.0489	0.0042	0.8238
MOZ	-0.0969	-0.1221	0.1505	0.2997	0.2872*	0.0240	-0.0904	0.0648	0.1758	1.6143
MUS	0.0759	-0.1389	0.0964	0.1371	0.0515	-0.1969	-0.2915	0.1084	-0.0461	0.2778
NGA	-0.1305	0.1446	0.2184	0.0502	-0.0273	-0.0791	0.0774	-0.1162	0.1396	-0.1472
TZA	-0.0542	0.1844	0.2298	0.1107	-0.0089	-0.0140	-0.2814	-0.0986	0.1758	-0.9110
UGA	-0.3846	0.0374	0.1332	0.1802	0.2925	0.3747	0.2253	-0.2152	-0.2351	1.6473
ZMB	-	-	-	-	-	-	-	-	-	-

Examining the results of the analysis of the contemporaneous correlation between the terms of trade and the output, as reported in Table 28, reveals that terms of trade is procyclical in five of the FMEs and strongly so for Kenya, Tanzania and Uganda. According to (Aiolfi, Catao, & Timmermann, 2006) it is not surprising that terms of trade emerges as an important source of volatility in these countries, particularly as their exports were commodity-based for the period under review, however the magnitude of the volatility of terms of trade has important welfare implications and is associated with poorer long-term growth performance. (Agenor et al., 2000) suggest that because these countries are unlikely to influence world prices, the procyclical relationship may reflect shifts in global demand that yield increases in world prices and demand for the country's exports at the same time. Ghana, Mauritius and Zambia, on the other hand, exhibit countercyclical terms of trade. These findings are similar to the findings of (Mendoza, 1995) (Agenor et al., 2000), (Rand & Tarp, 2002) and (Male, 2009) who all found that approximately 50 percent of the fluctuations in output in developing countries could be explained by fluctuations in terms of trade. No clear pattern is observed when examining whether terms of trade leads or lags output; the terms of trade is found to be synchronous with output for Kenya and Tanzania, and to lead the cycle in Botswana and Mozambique.

Table 28. Cross-correlation: domestic output, terms of trade

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	-0.0258	0.0589	0.5035	0.4039	0.2493	-0.1033	-0.3906	-0.2899	0.2079	1.3861
GHA	0.0737	0.1158	-0.0683	-0.3082	-0.3716*	-0.1587	0.0060	0.0801	0.1044	-2.1555
KEN	0.1100	-0.2776	0.3064	0.5739	0.7122*	0.4884	-0.0739	-0.3001	0.2548	5.4630
MOZ	0.0494	0.0211	-0.0518	-0.0110	0.1550	-0.0521	-0.1264	-0.2169	0.4089	0.8450
MUS	0.2975	-0.0670	0.0720	-0.1508	-0.1902	-0.1520	0.1475	0.1573	-0.0409	-1.0432
NGA	0.1379	-0.1770	0.0153	0.0354	-0.0644	0.0961	-0.1841	0.1118	-0.0502	-0.3475
TZA	0.0084	-0.1253	0.2013	0.1184	0.3270*	0.1628	0.1549	-0.0957	-0.2514	1.8635
UGA	-0.3577	0.1499	0.3012	0.3422	0.4470*	0.3034	0.0033	-0.3683	-0.1128	2.6911
ZMB	0.1912	0.0428	0.4557	0.2270	-0.0063	-0.1489	-0.0462	-0.3318	0.2068	-0.0338

4.3.7. Exchange rates (RER)

Volatility

(Aghion, Bacchetta, Ranciere, & Rogoff, 2006) find that real exchange rate volatility can reduce the levels of long-term growth in countries with relatively low levels of financial development. (César Calderón & Kubota, 2009) go further stating that “the negative impact of RER volatility on growth can be transmitted through declining investment and by lower foreign trade” (p.4). Within the African context the FMEs have made great strides in improving their financial development, however when compared to levels of financial development of the developed or EMs, a great deal of progress is yet to be made. The exchange rate volatility in the FMEs is on average 5.12 times more volatile than output, as reported in Table 7, which is substantially higher than the finding of (Male, 2009) that the exchange rate is on average 1.4 times more volatile than output in developing countries and is similar to that of developed countries.

Persistence

The examination of the autocorrelations of the real exchange rate of the FMEs, as reported in Table 29, reveals that, with the sole exception of Nigeria, all the FMEs exhibit significant real exchange rate persistence, with the persistence reverting to the mean by the third lag for Mauritius. The lack of persistence in the case of Nigeria could be as a result of the following: firstly, Nigeria is an oil exporting country and generally has more access to US dollars placing them in a better position to build foreign reserves and cushion against severe fluctuations in the real exchange rate; secondly, as articulated by (Fawenhimi, 2015), the Nigerian government has been actively intervening in the exchange rate regime of the country since 1986.

Table 29. Persistence: real exchange rate

	Lag 1	Q	Lag 2	Q	Lag 3	Q	Lag 4	Q
Botswana	0.416	5.8985*	0.080	6.1229*	-0.014	6.1305	-0.152	7.0042
Ghana	0.494	8.3208**	0.177	9.4265**	-0.011	9.4306*	-0.225	11.344*
Kenya	0.444	6.7272**	-0.042	6.7900*	-0.232	8.7515*	-0.467	17.004**
Mauritius	0.369	4.6331*	0.131	5.2369	0.061	5.3746	0.055	5.4898
Mozambique	0.511	8.8906**	-0.116	9.3671**	-0.257	11.788**	-0.209	13.436**
Nigeria	0.160	0.8694	0.283	3.6956	-0.087	3.9699	-0.044	4.0442
Tanzania	0.557	10.569**	0.124	11.108**	-0.137	11.797**	-0.134	12.475*
Uganda	0.684	15.974**	0.109	16.391**	-0.404	22.366**	-0.711	41.535**
Zambia	0.449	6.8736**	0.055	6.9787*	-0.333	11.021*	-0.216	12.790*

Cross-correlation

The results of the correlation analysis between exchange rates and output for FMEs are reported in Table 30. There is some evidence of a positive relationship between the two variables in Botswana, Kenya, Mozambique, Mauritius, Uganda and Zambia, however the strength of this relationship varies from being strong for the first four countries listed to being weak in the latter two countries. Exchange rates are countercyclical in Ghana, Nigeria and Tanzania and the strength of the relationship varies substantially between these countries. Thus, no clear pattern could be identified for the relationship between exchange rates and output, which is supported by the findings of (Agenor et al., 2000) and (Male, 2009). Moreover, this finding is consistent with the exchange rate disconnect puzzle, which has been well reported in the literature, which refers to the relatively weak impact that fluctuations in the exchange rate have on macroeconomic variables in the short-run (Obstfeld & Rogoff, 2000) and (Rose, 2011). (Agenor et al., 2000) also highlight that the interpretation of this relationship is complicated as the short-run relationship is dependent on sources of macroeconomic fluctuations, but highlights that the sign and magnitude of these correlations could provide insight into the types of the shocks that have had the largest impact over a period of time.

Table 30. Cross-correlations: domestic output, real exchange rate

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.1007	-0.3610	0.3535	0.3831	0.4589*	0.2778	0.0081	0.0236	-0.1719	2.7811
GHA	0.1614	0.2207	0.0259	-0.0322	-0.1150	-0.2956	-0.1971	-0.0050	0.0063	-0.6233
KEN	0.1740	-0.0805	0.1204	0.3924	0.5212*	0.3825	-0.0108	-0.6580	0.3812	3.2890
MOZ	-0.0922	0.0129	0.0876	0.2397	0.3824*	0.4718	0.3119	-0.5986	0.0688	2.2289
MUS	0.0267	0.0920	-0.1365	0.0373	0.2979*	0.0402	-0.0303	0.2478	-0.1142	1.6803
NGA	0.2332	-0.3201	-0.3930	-0.3872	-0.1719	-0.0336	-0.0786	0.3027	0.3430	-0.9395
TZA	0.5213	-0.2718	-0.6133	-0.5993	-0.4756*	-0.2663	-0.1251	0.2908	0.2398	-2.9113
UGA	-0.0956	-0.2213	0.3100	0.3362	0.0962	-0.0278	-0.0592	0.1277	-0.1983	0.5203
ZMB	-0.0895	0.0332	-0.0001	0.0036	0.1058	0.2595	0.2353	0.0459	0.1419	0.5728

4.3.8. Correlations with industrial country variables (WGDP, WIR)

As discussed in Chapter 3, the FMEs are small open economies, which still rely heavily on their primary sectors, particularly agriculture as part of their economy. These countries also continue to rely heavily on commodity exports, which are generally undiversified, and typically make up the largest portion of their export basket (as shown in Figure 3 and Table 23). An additional consideration, is that due to their limited contribution to global production in their commodities, these countries are price takers, and not price setters. Therefore, the relationship between domestic business cycles and the global business cycle, could be particularly important for these countries.

The magnitude of the links between macroeconomic fluctuations in the world and FMEs and the channels through which the shocks propagate are of considerable interest.

Cross-correlation

The results of the correlations between domestic output and world GDP are reported in Table 31. The contemporaneous correlations are positive for all FMEs apart from Ghana (-0.0601) and Uganda (-0.1780) indicating that business cycle fluctuations in the FMEs tend to be correlated with global fluctuations in GDP. The contemporaneous correlation peaks at lag zero for Botswana, Kenya and Zambia, suggesting that international output fluctuations are transmitted fairly quickly to these countries. The correlations for the rest of the countries peak between lags three and seven, indicating a lagged effect of world output on domestic output in these countries.

The relationship between domestic output and world interest rates is also explored, as an additional channel through which global economic conditions can influence the economies of the FMEs. (Neumeyer & Perri, 2005) highlight that economic activity in developing countries is likely to be impacted by fluctuations in the world interest rate because of two key facts: firstly, it affects domestic interest rates, and secondly it is reflection of credit conditions in international capital markets. The international capital markets could be of great importance to the FMEs that do not have well developed/ deep domestic capital markets, as a source of capital.

The results of the contemporaneous correlation analysis between domestic output and world interest rates are reported in Table 32. World interest rates are procyclical for most of the countries, which could reflect the fact that real interest rates in industrial economies tends to be procyclical and changes in industrial country output, through trade links, have positive spill over effects on output in the FMEs. Ghana, Nigeria and Tanzania are the only countries for which the world interest rate is countercyclical, indicating a lagged effect of the world interest rate on domestic output. An interesting case is Kenya, where the correlation peaks at lag zero, indicating that the effects of changes to the world interest rate are transmitted to the Kenyan economy very rapidly.

Table 31. Cross-correlation: domestic output, world output

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.1142	-0.2287	0.3284	0.5541	0.5813*	0.0712	-0.3907	-0.4329	0.2532	3.8475
GHA	0.0582	0.1227	-0.4476	-0.1592	-0.0601	-0.0820	0.0867	-0.0926	0.0707	-0.3239
KEN	0.1585	-0.2658	-0.0083	0.3716	0.6832*	0.5332	0.5332	-0.5603	0.0790	5.0381
MOZ	0.2812	-0.5056	-0.0400	0.2101	0.2064	0.2623	0.1042	0.0046	0.2553	1.1358
MUS	-0.0862	0.0380	0.2062	0.3334	0.3611*	0.0543	-0.0493	-0.2124	0.1087	2.0852
NGA	-0.1597	0.2089	0.2972	0.1575	0.1778	0.1289	0.1573	-0.0023	-0.1826	0.9729
TZA	-0.1347	0.2759	0.1912	0.1992	0.1876	0.0770	-0.0316	-0.0969	-0.2550	1.0284
UGA	0.0024	0.1986	0.0926	0.0253	-0.1780	-0.2075	-0.2133	-0.1133	0.0457	-0.9738
ZMB	-0.0742	0.0751	0.2604	0.2875	0.3112*	0.2706	0.0482	-0.1889	0.0219	1.7631

Table 32. Cross-correlations: domestic output, world interest rates

	-8	-4	-2	-1	0	1	2	4	8	T
BTW	0.2206	-0.3342	0.2639	0.4969	0.4074*	-0.0888	-0.5210	-0.2301	0.2641	1.9428
GHA	-0.1681	0.1616	-0.3158	-0.2363	-0.0968	0.0575	0.1097	-0.0603	0.0753	-0.8172
KEN	0.0856	-0.4061	-0.0488	0.4872	0.6294*	0.3498	-0.1398	-0.4369	0.2218	2.8457
MOZ	0.2108	-0.3442	0.2850	0.4506	0.3723*	0.2663	-0.0201	-0.3158	0.3202	1.4051
MUS	-0.1883	0.1351	0.3469	0.2787	0.0905	-0.1893	-0.1824	-0.3370	0.2596	0.0282
NGA	0.2394	0.0290	-0.0660	-0.1950	-0.2137	-0.1093	0.0668	0.2532	-0.0594	-0.9141
TZA	0.2485	-0.0069	-0.1683	-0.2087	-0.1577	-0.0403	0.1084	0.1836	-0.1215	0.0786
UGA	-0.2371	0.0627	0.1209	0.2022	0.1712	0.0418	-0.1306	-0.0896	-0.0936	0.3045
ZMB	-0.0579	0.0807	0.2174	0.1383	0.0499	0.0401	-0.0399	-0.2135	0.2057	-0.2538

Overall, the results suggest that the level of economic activity in industrial countries has significant positive influences on the domestic output in the FMEs in the sample, and these findings are consistent with those of (Agenor et al., 2000) and (R. L. Male, 2009) for developing countries.

4.4 Summary

This chapter presented the results of the study and the analysis of the relative volatility, persistence and cross-correlation for the FMEs. Preliminary tests were conducted on the data to test for stationarity, namely the ADF test, after which the cyclical components were attained from the data series through that application of the HP filter. The relative volatility, the persistence and the contemporaneous correlation analysis were then conducted on the cyclical components of the data series. The results of these analysis were compared to the established stylised facts for developing countries. The conclusions on the research questions, objectives and hypothesis will be discussed in Chapter 5.

CHAPTER 5: RESEARCH CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

5.1 Introduction

This chapter will build on the research findings and analysis presented in Chapter 4 by providing conclusions to the research questions and objectives to conclude upon the research hypothesis. It will go on to discuss the impact of the conclusions and to provide recommendations for further research.

The construction and validation of theoretical business cycle models relies on the identification of the characteristics and statistical properties (or stylised facts) of business cycles. Policy makers and market participants require a clear understanding of cyclical economic patterns, and their causes. Although there is a growing body of literature focussed on the business cycles of developing countries, (Agenor et al., 2000), (Rand & Tarp, 2002), (Neumeyer & Perri, 2005), (Aguiar & Gopinath, 2007) and (Male, 2009), these studies focus on developing countries from South America, Africa and Asia, and there has been limited focus on African countries. In addition, to the best of my knowledge, the business cycles of Africa's FMEs have not been explicitly analysed. The FMEs on the continent are considered to be the anchors of Africa's economic growth and development in the future, therefore they have a critical role to play in elevating Africa out of its perpetual state of poverty. Therefore, this study makes an important contribution to existing literature by analysing the business cycles of the FMEs and assessing whether the existing stylised facts for developing countries, as established by the aforementioned authors, are applicable to African countries.

This study also sought to determine whether the FMEs are vulnerable to exogenous shocks, particularly fluctuations in commodity prices, fluctuations in world output as well as fluctuations in world interest rates. These channels were identified due to the continued reliance of African countries and the FMEs on commodity exports, which in turn is reliant on the prices of those commodities as well as the global demand for those goods. In addition, the world interest rates could have a role to play as the FMEs have shallow domestic capital markets and would therefore fulfil their capital requirements through the international capital markets. In addition, as the FMEs become more integrated in the global financial system, they are also viewed as high yield investment destinations, which attract capital in times when global interest rates are low. This does, however, place the FMEs in a vulnerable position as they are likely to experience excessive capital outflows as interest rates in developed countries increase.

5.2 Research conclusions

The empirical analysis of the business cycles of the FMEs reveal that although some of the stylised facts for developing countries are applicable to the FMEs there are a number of these facts that are not suitable. Table 33 provides a summary of the comparisons between the established stylised facts and the findings for FME business cycles.

Table 33. - Comparison of stylised facts and empirical findings for FMEs

	Stylised fact	FME results
GDP	Output is more volatile than for developed countries, but there is a similar degree of persistence in fluctuations.	Aggregate output is not found to be more volatile in FMEs than in developed countries. The fluctuations in output are found to be significantly persistent.
CON	Consumption is more volatile than output, and generally weakly procyclical	Consumption is on average twice as volatile as output, and no clear pattern of persistence was observed.
INV	Investment is two to three times more volatile than output, and is generally weakly procyclical	Investment is found to be less volatile than domestic output, and no clear pattern of cyclicity could be established.
GEX	There is no clear relationship between output and government expenditure	No clear relationship between GEX and GDP could be observed for FMEs
CPI	Prices are not consistently countercyclical	No consistent negative relationship observed between GDP and CPI for FMEs
CCPI	Inflation is not consistently procyclical and has a volatility similar to developed countries	Inflation is highly volatile in FMEs, and no clear relationship was observed regarding its cyclicity.
LR	Real interest rates are significantly more volatile than for developed countries, are countercyclical and lead the cycle.	Interest rates are found to be less volatile than output in FMEs, and were observed to be generally weakly countercyclical. No clear pattern observed regarding the lead/lag relationship.
BM	Broad money is generally weakly procyclical to output.	No clear pattern of procyclicity was observed for FMEs
DCR	Private sector credit is on average less volatile than in developed countries, and is generally weakly procyclical.	Private sector credit is observed to be significantly more volatile than output in FMEs, and is also found to be strongly procyclical.
EXP	Net exports are about three times more volatile than output.	The volatility of net exports is on average six times more volatile than output in FMEs.
TOT	There is no clear relationship between terms of trade and output.	No clear relationship between TOT and output was observed.
RER	Real exchange rate volatility is similar to that for developed countries, and no clear relationship observed between real effective exchange rates and output	Real exchange rate is observed to be highly volatile in FMEs, and no clear relationship between this variable and output was observed.
WGDP and WIR	Activity in developed countries, as measured by world output and world interest rate, has a significantly positive influence on output in most developed countries.	FME business cycles are observed to be correlated with the global business cycles. World interest rates are found to be generally procyclical for the FMEs.

Contrary to expectations, the volatility of aggregate domestic output in FMEs is lower than anticipated in the stylised facts. Consumption is found to be on average twice as volatile as output, which is higher than expected from the stylised facts. In contrast, investment is found to be less volatile than output which is also a departure from findings in other developing countries.

There is a general expectation that government plays a stabilising role in the economy, however, this depends on the government implementing a counter-fiscal policy, otherwise it runs the risk of aggravating output volatility. Government expenditure is on average 5.53 times more volatile than domestic output, with five of the FMEs being observed to implement pro-cyclical government expenditure, which could be contributing to the volatility of domestic output.

Prices and inflation are significantly more volatile in the FME's than anticipated from the stylised facts, with the sample average inferring that prices and inflation are respectively 20.8 and 105 times more volatile than output. These findings could be inflated by periods of hyperinflation experienced by countries included in the sample during the period under review. No clear pattern of persistence for either prices or inflation could be observed, however, these levels of volatility could hold significant welfare and long-term growth implications for these countries.

The examination of interest rates reveals that they are less volatile than output, which is in stark contrast to the stylised facts for developing countries. In addition, interest rates are also generally found to be weakly countercyclical in the FMEs, as expected from the stylised facts. The analysis of the circulation of money did not reveal a clear pattern of procyclicality with output, as expected from the stylised facts, and in addition the volatility of the circulation of money in the FMEs is lower than expected from existing literature, with a sample average being four times more volatile than output (if Zambia is excluded from the sample average). Private sector credit is also found to be on average 8.36 times more volatile than output, which is substantially higher than that found in existing literature, and is also found to be strongly procyclical.

The real effective exchange rates are also identified to be highly volatile in these countries with a sample average of 5.12 times more volatile than output. These levels of volatility can have severe implications for the long-term growth prospects of these countries, through declining investment and lower foreign trade. This can be further exacerbated by their relatively low levels of financial development.

FMEs are severely impacted by commodity prices through both the export and import channels. Considering exports, commodity prices continue to play a significant role in the FMEs particularly because the exports in these economies continue to be limited to a few, generally primary sector products. This contributes substantially to their vulnerability to exogenous shocks in the prices of these goods and this is further exacerbated by the fact that FMEs are price-takers in the global market, therefore having limited influence in the setting of prices. The revenue generated from these exports contributes significantly to the real national income of these countries, as well as

their ability to build up adequate foreign reserves, therefore the volatility in commodity prices poses challenges for effective macroeconomic management. Turning to imports, FMEs, like most developing countries, continue to rely on food imports, and as reported in section 4.3.6 imports are on average 5.37 times more volatile than domestic production. Food also generally makes up the largest portion of the ‘average household goods’ in these countries, therefore an increase in food prices directly impacts the levels of inflation in countries, and poses welfare challenges. From the analysis in section 4.3.6, the terms of trade are procyclical for five of the FMEs and emerges as an important source of volatility which has implications for the long-term growth in these countries as well as important welfare implications.

The world interest rates are found to have a procyclical relationship with domestic output in six of the FMEs. This relationship could reflect the generally procyclical interest rates in developed economies, which lead to changes in output in developed countries creating positive spill-over effects for FMEs through trade links. Generally, the impact of fluctuations in world interest rates takes time to reach the FMEs. The remaining three countries exhibit a negative correlation between world interest rates and output, which could also be as a result of their high level of exposure to international debt markets, with world interest rates leading the business cycle in Nigeria and Zambia.

The fluctuations in domestic output in the FMEs are generally positively correlated with the economic activity in developed countries, as proxied by the world gross domestic product. The business cycles of Botswana, Kenya and Zambia are found to be synchronous with that of the world, therefore, fluctuations in global economic activity is transmitted fairly rapidly to these countries.

5.3 Policy implications

The results of the study provide insights into the possible growth implications that the volatility of domestic output can hold for long-term sustainable economic development. FME’s are exposed to greater volatility which is indicative of large shocks as well as the lack of mechanisms available to dampen the effects of the shocks, particularly the lack of economic diversification and financial sector development (Melina & Portillo, 2018).

5.3.1 Economic Diversification: To ensure that the FMEs achieve their respective developmental objectives, policy makers should pursue policies that stabilise domestic output. This is particularly relevant when considering the procyclical nature of the relationship between exports and domestic output, as well as its excessive volatility in FMEs. In a bid to lessen the volatility of output, and contribute to long-term economic growth and stability, policy makers, particularly in those

countries where exports are observed to lead the business cycle, should consider measures to diversify their exports. The need for economic diversification is particularly prevalent as agriculture continues to make a significant contribution towards total GDP in most FME's making them vulnerable to agricultural shocks related to both commodity price fluctuations and environmental disasters. Economic diversification will not only contribute to creating a more predictable macroeconomic environment and national income flows, but will also reduce the risks posed by commodity price fluctuations.

5.3.2 Fiscal Policy: Given the vulnerabilities of the FMEs to exogenous shocks, and the potential impact that government expenditure can have on increasing the volatility of output and economic growth, the governments of the FMEs should ensure that government expenditure is used as an effective policy tool to support macroeconomic stability in the respective countries. Policy makers should implement a counter-cyclical fiscal policy, maintaining conservative fiscal positions during economic upturns to preserve the fiscal space that might be required in the aftermath of a potential shock. "The output patterns observed through the up and downturns of the business cycles of FME's should be incorporated into fiscal policy decisions and the design of fiscal rules"(Cerra & Saxena, 2017,p.19).

5.3.3 Access to financial markets and financial regulations: Considering the procyclical relationship between world interest rates and domestic output in the FMEs the governments should consider taking measures to deepen the local credit markets in these countries, so as to lessen their dependence on the foreign capital markets. "The lack of financial sector development would limit opportunities for smoothing sector specific shocks and could result in more volatile and less-synchronised spending decisions" (Melina & Portillo, 2018, p.26). Financial sector regulation also plays a critical role in supporting the intermediation role that the financial sector plays between savers and investors, making funds available for investment, particularly for risk-taking in projects (Cerra & Saxena, 2017). Financial liberalisation can play a role in improving the long-term growth of countries, however if financial regulation is too limited it can misalign incentives towards too much financial risk-taking. On the other hand, if financial regulation is too limited it can incentivise financial institutions to create off-balance sheet entities to avoid prudential rules. Therefore, "Regulation needs to weigh the benefits of innovation and prudent risk-taking against externalities of excessive risk-taking with the latter including the high costs borne by many bystanders" Regulation should not be so excessive that wipes out all innovation and risk-taking. If regulation is too limited, it can misalign incentives toward too much financial risk-taking" (Cerra & Saxena, 2017, p.17).

The empirical analysis in the study provides the policy makers of other African countries with a high-level overview of the challenges that are faced by the FMEs as they integrate into the global economy and would support the identification of key policy areas that need to be considered as they too integrate into the global economy.

5.4 Recommendations for future research

- This research should be expanded to more African countries. This would contribute towards a better understanding of how the business cycles of other African countries, which are less developed than those included in this sample, compare to the stylised facts for developing countries and how they react to exogenous shocks. This would contribute towards the identification of the key drivers of business cycle fluctuations, enabling policy makers to develop effective stabilisation programmes to cushion the respective economies against exogenous shocks.
- In many African countries government expenditure is a significant contributor towards the aggregate domestic output and national income. Further research is required on the relationship between government expenditure and the volatility of domestic output, and the possible implications that it holds for the long-term economic growth of African countries.

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APPENDICES

Table 25 Unit root test results

Country	GDP				CON				INV			
	Logged values		HP values		Logged values		HP values		Logged values		HP values	
	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob
BTW	5.663058	1.0000	-3.173038	0.0025	6.418211	1.0000	-3.305308	0.0018	2.121868	0.9900	-3.981854	0.0003
GHA	3.008413	0.9988	-3.571519	0.0009	4.022065	0.9999	-4.692619	0.0000	1.583037	0.9691	-3.127550	0.0029
KYA	2.866998	0.9983	-3.990172	0.0003	5.462851	1.0000	-4.056830	0.0002	1.287973	0.9462	-2.967048	0.0044
MUS	12.72903	1.0000	-3.734462	0.0005	2.658550	0.9972	-4.746867	0.0000	26.08589	0.9999	-3.399583	0.0014
MOZ	6.335313	1.0000	-3.936662	0.0003	3.971450	0.9999	-3.733355	0.0006	2.034742	0.9879	-4.077510	0.0002
NGA	3.152428	0.9992	-2.467385	0.0155	3.178367	0.9992	-5.684993	0.0000	2.564784	0.9965	-3.284172	0.0019
TZA	2.102129	0.9895	-2.401183	0.0181	5.566360	1.0000	-3.433913	0.0012	1.979313	0.9864	-3.615235	0.0008
UGA	14.84925	1.0000	-3.912758	0.0003	7.250950	1.0000	-4.522053	0.0001	2.453110	0.9954	-3.665731	0.0007
ZMB	5.740662	1.0000	-3.625193	0.0007	1.664978	0.9739	-3.744468	0.0005	2.898712	0.9984	-3.780820	0.0005

Country	GEX				GRV				FI			
	Logged values		HP values		Logged values		HP values		Logged values		HP values	
	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob
BTW	3.256676	0.9994	-3.443877	0.0012	-	-	-	-	-	-	-	-
GHA	2.983452	0.9988	-3.337707	0.0016	-	-	-	-	-	-	-	-
KYA	2.739554	0.9977	-3.615889	0.0008	1.614297	0.9697	-5.687115	0.0000	-1.029779	0.2633	-6.122354	0.0000
MUS	4.841758	1.0000	-5.439126	0.0000	3.540087	0.9995	-4.397519	0.0001	-0.899413	0.3164	-3.397165	0.0016
MOZ	2.437327	0.9953	-4.515969	0.0001	-	-	-	-	-	-	-	-
NGA	0.457445	0.8073	-4.894410	0.0000	-	-	-	-	-	-	-	-
TZA	1.269622	0.9434	-2.755413	0.0080	-	-	-	-	-	-	-	-
UGA	1.012441	0.9128	-2.961120	0.0047	-	-	-	-	-	-	-	-

Country	CPI				CCPI				LR			
	Logged values		HP values		Logged values		HP values		Logged values		HP values	
	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob
BTW	-0.694203	0.4074	-4.862338	0.0000	-7.749929	0.0000	-7.503502	0.0000	-0.824761	0.3489	-4.286665	0.0001
GHA	-0.632624	0.4345	-9.613177	0.0000	-7.804550	0.0000	-8.236384	0.0000	-	-	-	-
KYA	-1.725501	0.0799	-5.186562	0.0000	-6.135555	0.0000	-6.603444	0.0000	-5.475863	0.0000	-5.267138	0.0000
MUS	-0.748939	0.3829	-5.922484	0.0000	-3.760738	0.0005	-6.749409	0.0000	-4.161707	0.0002	-3.188378	0.0024
MOZ	-1.801845	0.0685	-3.332000	0.0018	-5.371027	0.0000	-5.882871	0.0000	-	-	-	-
NGA	-1.707111	0.0828	-5.317932	0.0000	-4.472704	0.0001	-6.283824	0.0000	-4.966797	0.0000	-3.790588	0.0005
TZA	-1.870517	0.0594	-3.172033	0.0025	-5.286303	0.0000	-5.902579	0.0000	-	-	-	-
UGA	-1.680928	0.0871	-3.895164	0.0013	-5.246828	0.0000	-5.814925	0.0000	-	-	-	-
ZMB	-1.001134	0.2759	-3.840761	0.0004	-4.664370	0.0000	-7.178738	0.0000	-	-	-	-

Country	BM				DCR				IMP			
	Logged values		HP values		Logged values		HP values		Logged values		HP values	
	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob
BTW	2.273998	0.9930	-3.999806	0.0002	2.482067	0.9957	-3.845422	0.0004	2.472349	0.9956	-3.629764	0.0007
GHA	4.117079	0.9999	-3.788638	0.0005	3.309398	0.9995	-4.504989	0.0001	3.162548	0.9992	-2.361515	0.0201
KYA	4.146435	0.9999	-4.116438	0.0002	3.405121	0.9996	-4.984152	0.0000	2.051256	0.9884	-4.755066	0.0000
MUS	6.985907	1.0000	-4.121022	0.0002	6.430952	1.0000	-5.807051	0.0000	3.961024	0.9999	-4.029812	0.0002
MOZ	4.115822	0.9999	-4.087515	0.0002	2.831460	0.9980	-4.545138	0.0001	2.343353	0.9941	-3.870925	0.0004
NGA	0.869398	0.8921	-4.236432	0.0001	0.937868	0.9030	-5.382954	0.0000	1.386132	0.9550	-5.557800	0.0000
TZA	2.384721	0.9940	-4.308911	0.0001	0.942155	0.9027	-4.168080	0.0002	1.475677	0.9611	-2.560317	0.0129
UGA	2.325024	0.9937	-3.221879	0.0022	4.493877	1.0000	-5.513234	0.0000	4.210835	1.0000	-5.405693	0.0000
ZMB	-0.411798	0.5258	-4.080967	0.0003	1.727279	0.9767	-4.161418	0.0003	-	-	-	-

Country	EXP				TB				TOT			
	Logged values		HP values		Logged values		HP values		Logged values		HP values	
	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob	Statistic	Prob
BTW	2.328788	0.9939	-4.751501	0.0000	-1.829766	0.0647	-4.213928	0.0001	-2.756013	0.0076	-5.488835	0.0000
GHA	3.118572	0.9991	-3.057584	0.0034	-0.518317	0.4833	-4.337020	0.0001	-1.222246	0.1982	-5.022126	0.0000
KYA	1.119259	0.9279	-2.784350	0.0070	2.044829	0.9883	-4.284794	0.0001	-2.102207	0.0361	-3.829095	0.0004
MUS	3.600819	0.9998	-3.779529	0.0005	-0.953851	0.2959	-3.645696	0.0007	-1.150773	0.2219	-5.553150	0.0000
MOZ	2.814482	0.9981	-5.087800	0.0000	-1.019030	0.2701	-3.898237	0.0003	-2.318934	0.0220	-5.233183	0.0000
NGA	1.406263	0.9566	-4.890648	0.0000	-2.153462	0.0322	-5.737736	0.0000	-0.880971	0.3259	-8.945714	0.0000
TZA	2.176340	0.9907	-3.165254	0.0032	-1.866490	0.0602	-4.041908	0.0003	-1.180093	0.2120	-5.252100	0.0000
UGA	2.327324	0.9938	-3.914815	0.0003	-0.493580	0.4935	-3.478645	0.0011	-1.231281	0.1953	-4.911551	0.0000
ZMB	2.586664	0.9959	-2.990156	0.0049	-	-	-	-	-1.585442	0.1048	-5.814675	0.0000

Country	RER			
	Logged values		HP values	
	Statistic	Prob	Statistic	Prob
BTW	-1.354436	0.1591	-3.399751	0.0014
GHA	-0.693269	0.4081	-2.751457	0.0076
KYA	-1.095753	0.2413	-3.360681	0.0015
MUS	-3.097724	0.0031	-5.091727	0.0000
MOZ	-0.188501	0.6099	-3.702137	0.0006
NGA	-1.108694	0.2367	-4.523836	0.0001
TZA	-0.814409	0.3547	-3.247594	0.0021
UGA	-0.281136	0.5762	-5.317840	0.0000
ZMB	-1.016802	0.2710	-4.288824	0.0001

