Determinants of Secondary Market Development of Government Bonds: Case Studies of Kenya and Zambia, 2000-2015.

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ABSTRACT

The main objective of the study was to determine the factors that contribute to and/or hinder the development of the government bonds liquidity in the MEFMI region using Kenya and Zambia as case studies. The study applied the panel data econometric analysis and tested whether the Eichengreen and Luengnaruemitchai (2004) findings are replicated in Zambia. The study revealed that macroeconomic factors, available instruments, and structural factors do matter in the government bonds market development. The budget balance, available instruments namely the repo market development and issuance of benchmark securities, and an open economy have a positive significant impact on bond market liquidity while the interest rate and exchange volatility, as expected, had a negative impact on bond market liquidity. In the final analysis, the Kenyan government bonds market was found to be deep and fairly active while bond trading in the Zambian market was found to be weak. In particular, benchmark bonds and horizontal (interbank) repos were found to play significant roles in building the yield curve and deepening market activity, respectively. Policies aimed at ensuring a stable macroeconomic environment, necessary structures such as infrastructure, developing instruments and institutions that promote bond market liquidity remain key.

Key Words: government bonds, secondary market development, MEFMI region, liquidity.

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LIST OF ACRONYMS

AfDB	African Development Bank
COMESA	Common Market for Eastern and Southern Africa
CSD	Central Securities Depository
GDP	Gross Domestic Product
ISIN	International Securities Identification Number
LCBMs	Local Currency Bond Markets
MEFMI	Macroeconomic and Financial Management Institute for Eastern and Southern Africa
MRA	Master Repurchase Agreement
OECD	Organization for Economic Cooperation and Development
OTC	Over the Counter
SADC	Southern African Development Community
DvP	Delivery versus Payment
VPN	Virtual Private Network
ZIPSS	Zambia Interbank Payment and Settlement System

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CHAPTER ONE

INTRODUCTION

1.1. Introduction

The role of developed financial markets in the overall sustained economic development is well documented. This evidence is documented by (Levine, 2005; Mishkin, 2007; IMF, 2003). Properly functioning developed financial markets allow the efficient allocation of resources and makes the economy resilient to shocks by enabling risks to be managed appropriately. Additionally, numerous studies, including (Arvai and Heenan, 2008; Gray and Talbot, 2006; World Bank and IMF, 2001) have highlighted the benefits associated with developed secondary markets for government securities in the overall financial market development. These studies have highlighted how developed secondary markets for government securities markets contribute to a stable and cost effective financing for governments, effective monetary policy implementation and financial market development and resilience. The significance of these markets has resulted into the development of various frameworks and guidelines with prescriptions on how these markets can be transformed into mature markets. Despite the considerable progress made in developing the primary markets of government securities, secondary markets for government securities, especially government bonds have remained underdeveloped as evidenced by limited trading activity in developing countries including the MEFMI region. For instance, in Zambia, the government bonds average turnover ratio for the period 2010 to 2015 was at 0.02[2] (calculated by author using: Lusaka Stock Exchange and Bank of Zambia data).

[2] Turnover Ratio is calculated as average bond trading volume (data obtained from Lusaka Stock Exchange) divided by total bonds outstanding (data obtained from Bank of Zambia) in that year.

Eichengreen and Luengnaruemitchai (2004) developed a Model to determine and establish the relationship between bond market development and the macroeconomic, structural and institutional factors which they tested for a number of countries. This study aims at testing whether their model can be replicated in the MEFMI region.

1.2. Statement of the Problem

Financial sector development, particularly the government securities secondary market subsector, has been regarded by countries in the MEFMI region as a necessity towards achieving sustainable economic growth. Despite the existence of a well-functioning primary government securities market in the MEFMI region, the secondary market of government bonds has remained underdeveloped. This study attempts to determine which macroeconomic, structural and institutional factors affect the government bonds secondary market development in the MEFMI region using the Eichengreen and Luengnaruemitchai model. The study applies the Eichengreen and Luengnaruemitchai model on Zambia and Kenya as case studies. Eichengreen and Luengnaruemitchai (2004) investigated the importance of a set of fundamental factors linked to bond market development using structural, financial, developmental, institutional and macroeconomic factors and concluded that these factors affect the development of the financial markets. This study also tests whether the available instruments which include the repo market development and the issuance of benchmarks have an impact on the secondary market development of bonds in the MEFMI region.

1.3. Objectives of the Study

The general objective of this study was to identify the main factors that determine development of secondary market for government bonds in the MEFMI region. More specifically,

- To determine whether the macroeconomic factors affect the development of the government bonds secondary markets in the MEFMI region;
- To determine whether the structural factors affect the development of the government bonds secondary markets in the MEFMI region;
- To determine whether available instruments affect the development of the government bonds secondary markets in the MEFMI region; and
- To determine whether the institutional factors affect the development of the government bonds secondary markets in the MEFMI region.

1.4. Hypotheses

The study tested the following hypotheses as per the Eichengreen and Luengnaruemitchai (2004) model findings:

Null Hypothesis: macroeconomic factors affect government bonds secondary market development.

Null Hypothesis: structural factors affect government bonds secondary market development.

Null Hypothesis: institutional factors affect government bonds secondary market development.

Null Hypothesis: Available instruments affect government bonds secondary market development.

1.5. Significance of the Study

A developed government securities secondary market has a number of benefits including effective debt management and monetary policy implementation. Additionally, a developed government securities market is a precursor to the development of other financial market instruments. Therefore, this financial markets sub-sector contributes to the attainment of sustainable economic development. Despite the guidelines developed by the World Bank in 2001 and the framework developed by the IMF in 2008 to develop the secondary market of government bonds, in the MEFMI region, secondary bond markets remain in their nascent stages. This study sought to determine the factors that are important in the development of secondary market of government bonds. The factors that affect the development of this subsector are key in contributing to the effective policy formulation and implementation. In addition, the study contributes to the body of knowledge by extending the Eichengreen and Luengnaruemitchai Model to cover the available instruments namely the repo market and the existence of benchmark securities.

1.6. Scope of the Study

The focus of the study was to assess the impact of macroeconomic, structural and institutional factors on the development of secondary market for government bonds in the MEFMI region using Zambia and Kenya as case studies for the period 2000 to 2015. This period was selected on the basis of data availability as well as taking into account

when the bond market commenced in the two countries. Selected macroeconomic, institutional and structural factors were empirically tested. Since the government securities market is the corner stone to the development of the other financial markets, the study focused on the secondary market of government bonds. Zambia was selected because the writer is resident there, understands the development of that market well, and could easily obtain data. Kenya was chosen because of the level of government bond market development, data availability, and since it is more developed relative to the others, some useful insights could be obtained for the study.

1.7. The structure of the study

The rest of this study is structured as follows. Chapter two presents the Literature Review. The Research Design and Methodology is discussed in Chapter Three before discussing the Data Analysis and Findings in Chapter Four. Finally, the Conclusion and Recommendations and are presented in Chapter Five.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section presents the financial market development theories which highlight the characteristics of a developed financial market, its participants and institutions.

2.1 Theoretical Literature Review

There are a number of financial market development theories that postulate the way a financial market should operate. One of them is the Efficient Market Hypothesis, Asset Pricing Theory, Portfolio Theory, Capital Asset Pricing Theory, Interest Rate Structure Theory, Capital Structure Theory, Agency Theory, Information Asymmetry Theory and the Option Pricing Theory.

2.1.1 Efficient Market Hypothesis

According to Kiami (2004), Fama (1970) financial markets are "informationally efficient". The theory postulates that one cannot consistently achieve returns in excess of average market returns on a risk-adjusted basis.

According to (Kartašova et al, 2014), the main proposition of Efficient Market Hypothesis suggests that all relevant information is known and factored into the current price of stocks. This means that before an investor can learn new information and act on it, the price has already reflected any new information. Further, the EMH has three levels: the weak form, semi-strong form and strong form. Weak form prices of asset reflect all past price information; semi-strong form – prices reflect all information available to the public and instantly change to show new information to public; and strong form claims that prices show hidden and unreachable information for the public.

Neave (2009) argues that, although practitioners and scholars subscribe to a wide range of view-points as to how market efficiency varies across markets, a considerable body of empirical evidence indicates that markets are at least efficient in the weak form. Additionally, the more liquid the market, the more active the trading in it, and the more homogenous the instruments traded, the stronger the form of market efficiency that is likely to prevail. Further Neave (2009) also asserts that the only real difference between instruments traded in efficient markets is in their risk-return characteristics. On average, riskier securities command relatively higher rates of interest than their less risky counterparts. In this regard, larger and more active secondary securities markets are usually regarded as allocative efficient, and indeed can facilitate both small retail trades and large institutional trades at nearly the same market prices.

Neave (2009), further argues that a financial system is said to be operationally efficient if it can perform services at the lowest possible cost, given existing technology and use of

best practices. A perfectly competitive market is operationally efficient as deals can be completed without payment of transactions costs. In addition, agents are willing to deal at a lowest feasible cost or else be driven out of business.

2.1.2 Other Financial Market Development Theories.

In 1952, Markowitz published an article where he argued that the traditional application of the one-dimensional investment criteria such as the Net Present Value (NPV) should be replaced by two dimensions which are expected returns and risk defined as the standard deviation of the return distribution. He further argued that investors should not look at securities individually. This is because it is unrealistic to assume that investors can predict returns of individual stocks. However, based on empirical analysis of covariation of returns of several securities, it is possible to make portfolio decisions, in which the incomplete correlation between securities can be exploited for diversification. The available investment opportunities are represented by an efficient frontier with a slope and shape that reflects the interplay in the financial market between all investors with a varying degree of risk aversion. An individual who wants a higher expected return must take a high level of risk and vice versa.

However, in 1964, William Sharpe supplemented the Markowitz Model with some additional assumptions in his Capital Asset Pricing Model (CAPM). He argued that one of the requirements of the Markowitz Theory is to estimate the variance covariance matrix which is difficult when there are numerous securities. He simplified the Markowitz Model by assuming that the returns of the individual securities are only interrelated through their sensitivity to a common factor which is the return of the broad

market index. Sharpe further assumed that when there are no transaction costs, investors will agree to invest in a risky asset by adding a risk premium to the risk-free return. The market risk in this case would be measured by beta. This model was criticized as it is a single factor model. Other Models such as the Arbitrage Pricing Model (APT) tried to overcome this weakness by introducing a multi factor model which includes other market factors (Balling and Gnan, 2013).

On the other hand, the Interest Rate Structure Theory argues that owners of bond portfolios face different types of risks which include market, credit or default, interest, inflation, currency and political risks. In this regard, the interest rate structure at a given time reflects the overall evaluation of these risks by participants of the market. The Expectations Hypothesis Theory highlights that forward interest rates are determined by the expectations of the short-term interest rates plus a risk premium. The Liquidity Theory argues that investors are attracted to the short-term securities because of the nature of their liquidity. These investors would only invest in long term assets if they are compensated for the risk (ibid).

However, many theorists argued that the interest structure theory ignored the credit risks. However, the interest rates observed in the market reflect the probability of losses in the case of bond issuers' default on their contractual payments of principal and interest. In this regard, many investors rely on the credit ratings such as Moody's investor service, Standard and Poors or Fitch Ratings.

In 1958, Franco Modigliani and Merton H. Miller published an article that displayed the irrelevance of the firm's capital structure in an abstract economy with transaction costs and taxation. These authors argued that the value of a firm is a sum of the market values of its equity and debt and this is independent of the size of the composition of the debt. This theory assumes that financial markets are perfect and are in equilibrium.

In 1976, Jensen and Merkling (1976) developed the Agency Theory of the ownership structure of the firm. This theory focussed on the separation of ownership and control of listed companies and analysed the implications of potential conflict of interests between company managers, shareholders, creditors and other stakeholders of the company. According to this theory, agency relationships arise when persons (principals) engage other persons (agents) to perform some service on their behalf and this involves delegating some decision authority to agents. The two authors argue that the contract between the principal and the agent contains a set of incentives that limit divergencies between their interests. This theory has motivated many contributions in the corporate governance literature and regulation of listed companies.

In 1970, George Akerlof published an article on the market for 'lemons'. He demonstrated the role of asymmetric information using the illustration of how a seller of a bad car is better informed than the buyer of a car and this 'lemons problem' often arises in financial market assets and products. Sellers of financial market products are therefore better informed than the buyers and this creates the problem of adverse selection.

2.2 Empirical Literature Review

The World Bank and the International Monetary Fund developed guidelines for public debt management and government securities development guidelines in 2001 which were revised in 2003 and 2014. These guidelines provided the general preconditions for the development of the secondary markets for government securities. These include among others, a sound and stable macroeconomic environment, a viable balance of payments position and exchange rate regime. These guidelines provide general rather than prescriptive recommendations on how these markets can be developed. This was to ensure that different markets at different levels can customise the general guidelines to specific ones that are based on existing structures and environments.

Eichengreen and Luengnaruemitchai (2004) considered a broad set of determinants of bond market development, using panel data from 1990 to 2001, for a sample of 41 developing and developed countries, with a focus on emerging Asia. They regressed domestic currency bond market capitalization on various macroeconomic, institutional and structural factors. Their results indicate that the GDP at purchasing power parity, exports and open capital accounts have a positive impact on government bonds development. However, Phelps and Mu (2013) found that the GDP at purchasing power parity was insignificant.

Gray and Talbot (2006) identified the key structures that are necessary to the development of secondary markets, such as, the sufficient demand and supply of

government securities, existing instruments, availability of information, existence of market makers and diversified investor base.

In 2007, the World Bank undertook a pilot study of selected countries including Zambia and Kenya that were willing to adopt the guidelines recommended by the World Bank and IMF in 2001. This was to assess the effectiveness of these reforms. The study revealed that secondary markets in the pilot studies are mostly at an early stage of development and that the structure of these markets was key to the development of these markets. The findings also revealed that there is no "one-size-fits-all" solution to developing sound debt markets, given the differing circumstances and institutional capacities in the pilot countries.

In 2008, Arvai and Heenan provided more specific recommendations of developing the secondary markets of government securities and developed a framework for sequencing these reforms in secondary markets. This study used case studies of Mexico, India and Hungary to develop this framework. This study argues that, despite the country differences, there are some commonalities that can be addressed in a stepwise manner. These recommendations are more prescriptive compared to the guidelines developed by the World Bank and the IMF in 2001.

The IMF, World Bank and OECD (2013), in their diagnostic framework, identify the general preconditions, key components and constraints of the development of local currency bond markets. The framework argues that secondary market liquidity and

active trading relies on several microstructure aspects such as concentrated issuance of key benchmark tenors, well-functioning spot and repo markets, ability to short-sell bonds, derivatives markets, automated and electronic market structures and well-functioning clearing and settlement.

In Africa, a few studies have been undertaken in the area of secondary market development. In 2009, AfDB undertook a bond mapping study that focussed on establishing the nature and status of the existing secondary markets initiatives at the national, regional and international level towards bond markets development in SADC and COMESA member countries. This was to consolidate the different initiatives to avoid duplication. In the same year, Adelegan (2009) undertook a study on the determinants of bond market development in Sub-Saharan Africa. The results show a number of institutional and macroeconomic factors that matter in the underdevelopment of this sector. Overall, no single class of variables is wholly responsible for the underdevelopment of the domestic bond markets. Structure, investment profile, law and order, size of the banking sector, and level of economic development measured by per capita income all matter for domestic bond market development in Sub-Saharan Africa. Similarly, macroeconomic factors such as interest rates, exchange rates, the presence or absence of capital controls, and fiscal balances also matter.

In 2013, MEFMI developed guidelines on the government securities issuance procedures to guide the primary market development of government securities. The MEFMI guidelines were developed to guide and assist MEFMI member states to improve their current securities issuance programmes and help those planning to issue government

securities for the first time. These guidelines further state that there is limited secondary market activity of government bonds in the MEFMI region despite the listing of these bonds on the Stock Exchanges. The limited secondary market trading is attributed to the "buy and hold" strategy of domestic banks who hold about 70 percent of the domestic debt.

In 2014, Thotho established the key determinants of government bond market development in the MEFMI region using Tanzania, Mozambique, Kenya, Uganda and Zambia. Thotho' s study identified a combination of structure, policy and institutional variables that matter on government bond market development. The study established that banking size, capital account openness, exchange rate variability, legal origin, size of the economy and development have a positive significant impact on bond market development.

Berensmann et al (2015) undertook an empirical analysis of the factors that may hinder the development of Local Currency Bond Markets (LCBMs). The study established that, country size, a large banking size, higher public financing needs, lower inflation rates and better quality of political institutions support LCBMs. In addition, structural constraints, such as undeveloped secondary markets of government bonds hinder the development of LCBMs.

The studies above conclude that LCBMs are supported by some macroeconomic, institutional and structural factors though the results are mixed. These studies focus on

establishing the factors that matter in the development of bond markets in general, using measures such as bond market capitalization and local currency government debt as the dependant variables to capture the level of LCBMs development.

This study intends to determine the secondary market development of LCBMs using the turnover ratio as the dependant variable. Further, this study adds to the existing knowledge by building on the Eichengreen and Luengnaruemitchai model to incorporate the impact of existing instruments on the secondary market liquidity of LCBMs. This is modelled by including the repo market development, measured by the volumes of repo transactions in the repo market, and the issuance of benchmark issues. This model will be estimated using data from Kenya and Zambia.

2.3 Definitions of Liquidity

Since this study focusses on determinants of secondary market development of government bonds, it is important to define liquidity. Árvai and Heenan (2008) highlight the dimensions of liquidity, namely; tightness, depth, and resiliency. Tightness refers to the cost of executing transactions in the market and is frequently measured by the bid-ask spread. The depth dimension measures the extent to which the market can absorb large volume transactions without affecting the prices prevailing at the time of the transaction. One proxy for market depth is the average turnover for a given period (e.g. daily or weekly). Other candidates are the size of trades that market makers are willing to accept and the volume per trade. On the other hand, resiliency denotes the speed with which price fluctuations resulting from trades are dissipated. This study employed turnover ratio (dependent variable) together with measures of domestic currency bond

market development such as macroeconomic, institutional and structural factors that were modelled and tested by Eichengreen and Luengnaruemitchai (2004). Eichengreen and Luengnaruemitchai regressed several of these factors to measure the secondary market development of government securities.

2.4 Benefits of Secondary Market Development

Numerous studies have expounded the benefits of secondary market development of government securities. For example, (Zsófia and Heenan, 2008; Gray and Talbot, 2006; World Bank and IMF, 2001) highlighted that the secondary market development of governments securities has benefits in the areas of government financing, monetary policy implementation, as well as financial sector development and resiliency. These are explained below.

2.4.1 Government Financing

A deep and liquid secondary market of Government securities contributes to a stable and cheap source of financing and planning for the Government. Governments, especially in developing countries, issue Government securities to raise finance for development projects. This is achieved through the issuance of a broad range of maturities to meet Government domestic demand. Development of the Government securities market normally starts from the short end of the yield curve. As the secondary market of Government securities develops, investors become more confident that they can unwind their securities positions on the secondary market at minimum transaction cost, Zsófia and Heenan (2008). This increases the investor's demand for longer term

Government securities in the primary market, hence minimises the roll-over risk of short-term securities which present uncertainties regarding financing costs of the Government. Further, as the demand of the longer securities increases, the investors are willing to quote lower yields thereby lowering borrowing costs for the Government. Zsófia and Heenan (2008) further assert that, a deep and liquid secondary market of Government securities also contributes to efficiency in pricing of securities in the secondary market. This is because any information or news on the market concerning government policies is quickly conveyed in the secondary market prices. For instance, news and information contained in the budget announcements is reflected in the secondary market prices, thus presenting a constant disciplining device for the Government in terms of policies. Further, in the event that the Ministry of Finance is experiencing an unexpected shortfall in its financing, securities issued in such a developed Government securities market would be quickly absorbed by the market.

2.4.2 Monetary Policy

Deep and liquid secondary markets also contribute to effective monetary policy implementation. A developed Government securities market strengthens the transmission and implementation of monetary policy including the achievement of inflation targets, and can enable the use of market based indirect monetary policy instruments (World Bank and IMF, 2001). The Government securities market enables the use of indirect monetary policy tools such as repos and outright sales and purchases. Further, the IMF and World Bank argue that the existence of a benchmark yield curve strengthens the transmission of monetary policy signals, provides information on the public futuref expectations of interest rates and inflation. The yield curve therefore links expectations

of future short-term rates to current long-term rates. Further, deep and liquid secondary markets also enable the smooth execution of the monetary policy tools such as outright purchases and sales of Government securities without unreasonably affecting the yields on these monetary policy instruments.

2.4.3 Financial Market Development and Resiliency

Zsófia and Heenan (2008) highlight that a deep and liquid secondary markets contribute to financial market development and management of risks. Government securities are considered risk free assets with respect to default and therefore are used as benchmarks for pricing other securities in the market. Further, the institutional infrastructure including securities and settlement systems, legal and regulatory framework developed for this market also acts as leverage for the other instruments in the market. Regarding resiliency, a developed secondary market of government securities results into developed institutions and instruments which enables the financial markets withstand shocks.

2.5 Government Securities Secondary Market Development in the MEFMI region.

MEFMI countries are at different levels of development though they do exhibit common characteristics regarding the secondary market development of Government Securities. This section outlines some of the salient features of the government securities secondary markets structure in the MEFMI region.

2.5.1 Fragmented Government Securities Markets and Benchmark Issues

In the MEFMI region, there still exists in some countries numerous, small bonds that are bunched in maturities and difficult to trade. The heterogeneity in the Government Securities issues with respect to the maturity dates have resulted into fragmented issues that are not fungible[3] (MEFMI, 2013). This also makes it difficult to price other financial products when there are no benchmark securities to form a yield curve.

According to Arvai (2008), issue fragmentation may result from several causes, for example, a multitude of agencies issuing public debt or a substantial stock of nonmarketable debt. It also may result from the issuance of too many different types of instruments, such as securities that are floating-rate, inflation-linked, foreign exchange-linked, and fixed-rate, or simply those that arise from a proliferation of maturity dates resulting from a frequent opening of new issues at primary level.

In this regard, some countries in the MEFMI region have consolidated their debt issuances by issuing benchmark securities. For instance, Zambia, Kenya, Botswana, Swaziland and Namibia issued benchmark securities while Malawi, Mozambique, Lesotho and Tanzania do not issue benchmark securities (Chakufyali, 2013). This in part contributed to increased liquidity as measured by turnover in Zambia and Kenya. A study by Kiama M. (2013) revealed that the adoption of benchmark bonds by the Central Bank of Kenya contributed to increased liquidity in the treasury bonds market. In Zambia, the statistics show that, a year after the issuance of the benchmark bonds, in 2013, the turnover also improved.

[3] Fungibility is a good or asset's interchangeability with other individual goods/assets of the same type. Assets possessing this property simplify the exchange/trade process, as interchangeability assumes that everyone values all goods of that class as the same (Investopedia).

2.5.2 Market Making Arrangements

2.5.2.1 Short Selling

Allowing short-selling[4] of securities in the market makes it possible for the dealers to quote two way prices for the securities that they do not have in their inventories thereby contributing liquidity in the market. However, as highlighted by Lecce S. (2011), short-selling has recently received notoriety over its part in the global financial prices. This is because short-selling is alleged to depress stock prices. The impact of short-selling has therefore concerned regulators in recent times resulting into the ban of short-selling in some countries. In 2008, the United Kingdom banned both naked and covered short-selling. Further, markets such as Australia temporarily banned all forms of short-selling.

In most MEFMI countries, short selling is prohibited by law, either under the Capital Markets Regulations or the act governing securities markets. Some countries do not have any legal provisions on securities lending, making it difficult to deduce whether it is allowed or not (MEFMI, 2013).

In Zambia, the law allows for short-selling under certain conditions*: 'A person who sells securities he does not hold at or through a securities exchange shall be guilty of an offence unless, at the time he sells them, he has or, where he is selling as an agent, his principal has a presently exercisable and unconditional right to vest the securities in the*

[4] Short-selling is the sale of borrowed securities (World Bank and IMF, 2001).

purchaser of them, and has on deposit in the manner prescribed one hundred percent collateral against the short sale.' (Zambia Securities Act Cap 354 of 1993).

In this regard, dealers in most MEFMI countries do not practice short selling and therefore this restrict liquidity in these markets. In the MEFMI region, covered short-selling could be allowed to support market makers but should be accompanied by proper risk management policies.

2.5.2.2 Market Making Arrangements

While a number of countries in the MEFMI region require exchange listing and trading of government securities, in practice most secondary market trading takes place Over-The-Counter (OTC). It is worthwhile to note that most countries in the MEFMI region do not have structures that offer obligations and incentives to dealers for quoting firm two way prices in the secondary market of government securities. This is with the exception of Botswana, and Uganda where Primary Dealers have been given this obligation (MEFMI, 2013).

However, in some countries, discount houses do exist or existed to play the role of market makers in the government securities market. Malawi had discount houses in the past similar to Zimbabwe before this role was given to commercial banks (Reserve Bank of Malawi and Reserve Bank of Zimbabwe, 2015).

Countries such as Kenya and Zambia are considering the introduction of designated dealers to play the role of market makers by quoting two way prices on the government securities.

2.5.2.3 Buy Backs and Exchanges

Bond buybacks and exchanges are liability management tools widely used in government securities markets to manage refinancing and liquidity risks. In addition to their capacity to pursue different objectives, they are closely linked to the implementation of a benchmark issuance policy, which is itself one of the prerequisites for an efficient government securities market (World Bank, 2015). This mechanism assists in retiring illiquid off-the-run bonds from the market and offers additional issuance opportunities which foster a quicker building of benchmark securities. Both Kenya and Zambia have been issuing benchmark bonds and are considering buy backs and exchanges in order to smoothen their redemptions (Bank of Zambia and Central Bank of Kenya, 2015).

2.5.3 Repo market development

To quote selling prices continuously to investors, market-makers often hold inventory from which to sell to investors on demand. But if an investor wishes to buy an issue which market-makers do not hold in their inventory, and if market-makers cannot or do not wish to purchase immediately from someone else in the market, their ability to deliver to the investor depends on being able to borrow that issue in the repo market (http://www.icmagroup.org). In this regard, dealers require a developed repo market to enable them finance and acquire their inventories needed to take positions in their markets.

It is worthwhile to note that the vertical repos[5] are the most common in the region while the interbank or horizontal Repo market is generally inactive, with the exception of Kenya (MEFMI, 2013). In this case while the vertical market is active, the horizontal repo market remains underdeveloped in the region yet it is the one that deepens market liquidity. In order to support this market, adequate regulation regarding the borrowing and lending of these instruments is key. Adoption of customized Master Repurchase Agreements (MRAs), with clear and clauses covering issues such as events of default, insolvency, and substitution is important for this market segment.

2.5.4 Available instruments

Derivative instruments contribute to overall market efficiency and liquidity, through the ability for market participants to hedge positions effectively, the ability to trade in and out of markets at any time, continuous price updates and market intelligence through trading in the derivative asset class and, last but not least, the maintenance of market liquidity (OECD, 2007).

However, it is important to mention that the region still has very limited financial instruments issued. For instance, though the derivatives market has grown overtime, instruments such as forward rate agreements (FRAs) and interest swaps are mainly concentrated on the short tenors in Zambia. These transactions are normally between non-resident banks and resident banks (Bank of Zambia, 2015). Additionally, Zambia

[5] A vertical repo is a repo between a central bank and a commercial bank while a horizontal repo market is a repo between commercial banks.

has one (01) Bond and Derivatives Exchange aimed at providing a similar trading platform to that of the LuSE, but with a primary focus on corporate and government bonds, futures, currency and interest rate derivatives.

2.5.5 Investor Base

Government securities need buyers. Policy makers can do much to develop voluntary demand by financial institutions, non-financial institutions and retail investors. Historically, governments have relied on their taxation and coercion powers to ensure adequate demand for their issues (World Bank and IMF, 2001).

In Zambia and Kenya, the investor base is composed of institutional investors, banks and retail investors. Institutional investors include pension funds, insurance companies, and fund managers. Corporate entities include other institutions but the institutional investors.

While banks prefer investing at the short end of the market to match their liquidity requirements, institutional investors particularly pension funds and life policies prefer the long end of the market (also to match their liabilities). Further, in the two countries of Kenya and Zambia, foreign investors are also allowed to invest in government securities (Bank of Zambia and Central Bank of Kenya, 2015).

It is worthwhile to note that some countries in the MEFMI region including Zambia's demand for the Government Securities is through captive sources. For instance, the Government of the Republic of Zambia requires pension funds to invest 2.5 percent of its fund size in government securities (Pension Scheme Regulation Act (1996). This has contributed to limited secondary market trading as the investors hold these securities to maturity.

2.5.6 Taxation Issues

Appropriate tax policies impact on investment decisions. A well-developed tax policy is therefore key to developing secondary markets. A good tax policy is one that does not result in investors, for instance, to prefer other markets due to a differential tax rate (World Bank, 2001). Most of the countries in the region face complications in pricing due to the existence of taxes on the capital gains and withholding tax. In addition, taxation of non-resident Government Securities holders tends to create gridlocks in the trade of securities. The practice of applying these taxes seems well entrenched in the MEFMI countries capital markets and is a regular feature of the income of most regional revenue authorities (MEFMI, 2013).

2.5.7 Legal and Regulatory Framework

The legal and regulatory environment cuts across various issues in both the primary and secondary markets of government securities. Government debt securities must be supported by a clear legal framework that grants government the authority to issue debt, binds it to meet its repayment obligations, and governs the rights and responsibilities of

those who purchase and trade in government debt securities (World Bank and IMF, 2001). Additionally, in the secondary market, it is important to have clear guidelines that govern the intermediaries, market conduct for the trading practices and surveillance as well as transparency. This should normally be in line with the existing market structure. As already alluded to above, issues such as short-selling, if legal must be clearly covered by the law. Issues such as dematerialisation of securities and the securities settlement systems must be covered by the laws.

2.5.8 Securities and Settlement Systems

A modern, efficient securities settlement system is a principal component of the infrastructure necessary for development of securities markets in general and the government securities market in particular (World Bank and IMF, 2001). This entails that, in addition to low transaction costs, widely available and continuous pricing, investors must have access to safe, robust and efficient securities settlement systems as well as efficient custodial and safekeeping services.

In most countries, government securities are dematerialized and registered in the Central Securities Depository (CSDs) operated by the central banks. Very few countries, notably Mozambique and Swaziland, still do not have CSDs for government securities. In Swaziland, settlement of securities in the secondary market is done through Transfer Secretaries, who are members of the stock exchange (MEFMI, 2013). Zambia and Malawi implemented the CSDs in 2014 in an effort to achieve international best practice. One of the key results is that this system has achieved Delivery Versus Payment (DVP) and straight through processing.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The primary objective of this study is to identify the factors that determine the development of secondary market for government bonds.

3.2 Data Procedure and Administration

The study utilised both econometric and non-econometric analysis using primary and secondary data sources based on Kenya and Zambia. The country selection took into account the availability of the selected indicators which are important in the analysis.

3.3 Data Collection

3.3.1 Questionnaires and interviews

The primary data was obtained from the survey where key central bank officials from Zambia and Kenya were interviewed using a questionnaire (see questionnaire in Appendix 1). This data included the government securities structure, factors that influence the secondary market of government bonds and therefore established the salient features of the Government Securities structure in the two countries.

3.3.2 Desk research

The study used annual data for the period 2000-2015 from secondary sources which mainly include the Bank of Zambia website, Central Bank of Kenya website, World

Bank Development indicators (2015), Organisation of Economic Cooperation and Development Statistical year book publications (2014).

The annual series on the turnover ratio (government securities trading as a proportion of outstanding government securities) which is the dependent variable and interbank repo volumes traded (only horizontal) (one of the explanatory variables) were obtained from Bank of Zambia and Central Bank of Kenya. The study only used the horizontal repo market which is a key ingredient in the bond secondary market development. A strong horizontal repo market could have a positive impact on bond market liquidity. Information on when the benchmark issues were introduced in Kenya and Zambia was obtained from the officials from the respective central banks during the field visits. The benchmark bonds in Zambia are defined by the original term to maturity (3, 5 and 10 years). Zambia therefore seeks to build up volumes around these tenures to create the desired outstanding volumes. On the other hand, in Kenya, benchmark bonds are defined by size and pricing.

Further, the other explanatory variables data such as interest rates, exchange rate, the ratio of exports to GDP, GDP at purchasing power parity, GDP per capita, budget balance and domestic credit provided by the financial sector was obtained from the World Bank Development Indicators.

3.2 Econometric Analysis

3.2.1 Model specification

The study employed a model developed by Eichengreen and Luengnaruemitchai (2004) but extended to incorporate repo market and benchmark bonds. The study estimated the following multiple regression equation:

Model specification

$$y_{it} = a_i + \beta_1 \text{EcSize}_{it} + \beta_2 \text{Open}_{it} + \beta_3 FinactalSize_{it} + \beta_4 \text{Exrate}_{it} + \beta_5 \text{Intrate}_{it} + \beta_6 \text{BB}_{it} + \beta_7 X_{it} + \varepsilon_{it}$$

Where:

Y_{it}, The Dependant variable, secondary market development is measured by Turnover. The explanatory variables include,

(EcSize_{it}), economic size measured as GDP at purchasing power parity.

(Open_{it}), trade openness, measured as a proportion of exports to GDP.

($FinactalSize_{it}$), financial sector size measured as domestic credit provided by the banking sector as a percentage of GDP.

(Exrate_{it}), exchange rate volatility measured as the logarithm of the standard deviation of the exchange rate.

(Intrate_{it}), the interest rate volatility measured as the logarithm of the standard deviation of the 91 day Treasury Bill Interest Rate; and

(BB_{it}) the Budget Balance measured as the budget balance as a proportion of GDP.

The vector X_{it} includes the additional regressors, the developmental stage of the country, the existence of benchmark issues as well as the repo market development. Table 1 below presents the symbols and the proxies for the explanatory variables used in the estimation.

Table 1 Symbols and Proxies for the Dependent and Explanatory Variables

FACTOR CLASSIFICATION	VARIABLE	SYMBOL	DESCRIPTION
Dependant Variable	Turnover Ratio	DLOG(TURN)	Measures the level of secondary market development of government bonds and was calculated by dividing the bonds trading volumes by the total outstanding bonds.
EXPLANATORY VARIABLES			
Available Instruments	Repo Market Development	(DREPO)	Market makers require a developed horizontal repo market in order to finance their inventories required to meet their marketing obligations. In this study, the horizontal repo market development is measured by the volume of repo transactions.
	Existence of Benchmark Securities	BENCHDUMMY	A number of studies postulate that it is important to build a critical mass on selected government securities to avoid fragmentation of securities in the market. Benchmark issues also help in building a market yield which is needed in order to price instruments properly. In this study, a dummy variable is used to capture the period before and after this policy was implemented in Kenya and Zambia.
Macroeconomic factors	Exchange Rate Volatility	D(LOG_STDER_)	Measured the exchange rate volatility using the logarithm of the standard deviation of the exchange rate.
	Interest Rate Volatility	D(LOG_STDIR_)	Measured the interest rate volatility using the logarithm of the standard deviation of the 91 day Treasury Bill Interest Rate.
	Size of Financial Sector	DLOG(DC)	Measured the size of the financial sector using the domestic credit provided by the financial sector as a percentage of GDP.
	Economic Development	DLOG(DEVT)	Economic development was measured by GDP per capita.
	Economic Size	DLOG(SIZE)	Measured by GDP at purchasing power parity.
	Openness of Economy	DLOG(OPEN)	The openness of the economy was measured as a proportion of exports to GDP.
	Budget Balance	D(BB)	Measures the country's Public Financing needs and. It was calculated as the budget balance as a proportion of GDP.
Structural factors	Infrastructure Development	DUMMYINFRA	A dummy variable was included to take in to account the introduction of the automated trading system in Kenya.

Further, these variables were selected on the basis of the existing empirical market evidence and conventional wisdom regarding the researcher's knowledge about Kenya and Zambia, and relevance to policy making. The model was adopted because of its relevance to Kenya and Zambia as developing countries with financial markets still in their infancy stage.

4.2.2 Time Series Characteristics of the Data

4.2.2.1 Stationarity Tests

In order to test for stationarity, unit root tests[6] were undertaken using the Augmented Dickey Fuller (ADF) tests[7]. Gujarati (2004) states that, the ADF is preferred to the Dickey Fuller test because the latter assumes that the error term or white noise is uncorrelated, hence the measure is not appropriate if the error term is serially correlated and could lead to biased estimates.

A non-stationary time series has to be differenced d times to make it stationary. In this case, time series data is said to be integrated of order d and is denoted as $Y_t \sim I(d)$ (Gujarati, 2004). In this regard, if a time series Yt is stationary in its levels, it is said to be integrated of order zero, denoted by $Yt \sim I(0)$.

However, according to (Ross, 2014), the ADF is among others, a type of I(1) hypothesis in which the null hypothesis assumes a unit root. Ross argues that the ADF has the low have low power against I(0) alternatives that are close to being I(1) processes and therefore the power diminishes as deterministic terms are added to the test regression. In this regard, there are other tests which assume that the series is stationary under the null hypothesis and one of these tests is the Kwiatkowski-Phillips-Schmidt-Shin (KPSS)

[6] Use the unit root tests to determine the order of integration of the raw data series: $Y_t = \rho Y_{t-1} + \mu_t$. If $\rho = 1$, then Y has a unit root →Random walk. Random walk is an example of a non-stationary time series. If a time series is differenced once and the differenced series is stationary (white noise), then the original series is **integrated of order 1**, denoted by I(1).

7 The early and pioneering work on testing for a unit root in time series was done by Dickey and Fuller (Dickey and Fuller 1979, Fuller 1976).

Test. In this regard, the study employed both the ADF and the KPSS and in cases where there were differences, the KPSS results were considered.

The stationarity test results are presented in Table 2 below:

Table 2 Stationarity Tests

Variable	ADF	KPSS
Turnover	I(0)*	I(0)*
Budget Balance	I(1)*	I(1)*
Repo Market Development	I(0)***	I(0)*
Exchange Rate	I(0)**	I(1)**
Interest Rate	I(1)***	I(1)**
Domestic Credit	I(1)***	I(1)**
Openness (Exports to GDP)	I(1)**	I(1)**
Economic Size (GDP,PPP)	I(1)**	I(1)**
Economic Development (GDP per Capita)	I(1)*	I(1)**

* Stationary at 5 percent level of significance, intercept

**Stationary at 5 percent level of significance, intercept and trend

*** Stationary at 5 percent level of significance, none

Table 2 above shows that some variables were not stationary except for the turnover, repo market development and interest rates which were stationary in their levels. The model was therefore estimated in a differenced form to avoid the problem of nonsensical results. Since the study uses the 91-day Treasury bill rates as a proxy for interest rates, it would have been useful to capture fiscal pressures normally measured by the government overdraft facility at the central bank (how it behaves), and whether the central bank lowers rates to accommodate government borrowing. The model used did not capture fiscal pressure.

4.2.3 Panel Data Analysis and Presentation of Results

Panel data also known as longitudinal or cross sectional time series data is a dataset in which the behaviour of entities is observed overtime (Reyna, 2007). Multiple cases could be in the form of individuals, firms or countries observed at two or more periods of time. Cross-sectional time-series data possesses two kinds of information, reflected in the differences between subjects, as well as the time-series or within-subject information reflected in the changes within subjects over time. Panel data regression techniques allows one to take advantage of these different types of information and enables the control for variables that cannot be observed such as differences in country practices or variables that change overtime but not across cross sections.

On the other hand, panel data can have some drawbacks such as data collection issues, non-response in the case of micro panels or correlation between countries in the case of macro panels. Further, cross sectional data could have a problem of heteroscedasticity[8] which means a non-constant variance of the error term ($E(u_t^2) = \sigma^2$. Heteroscedasticity is generally found in cross-sectional data and can result into the violation of the following classical linear assumptions:

- E ui \X1i,X2i,…….,Xki
- Uncorrelated errors; Cov $U_i,U_j = 0$
- Homoskedastic errors; Var U_i = Var $Y_i/X_{1i}, X_{2i},……,X_{ki} = \sigma^2$

[8] In order to address the problem of heteroscedasticity, the study employed the Generalized Method of Moments which provides for the correction of heteroscedasticity.

If these assumptions are violated, then the Ordinary Least Squares (OLS) estimates may still be unbiased but inefficient. As a result, confidence interval and hypothesis testing based on t and F distributions[9] are unreliable.

4.2.2.2 Multicollinearity Tests

When the model was tested for multicollinearity, the results indicated that there is no multicollinearity as shown in the correlation matrix below:

[9] The t-statistic and f-statistics are used to test the hypotheses in regression analysis. The t-statistic is computed by dividing the estimated value of the parameter by its standard error and measures the likelihood that the actual value of the parameter is not zero. The larger the absolute value, the less likely that the actual value could be zero. The F-statistics test the overall significance of the regression model, specifically, they test the null hypothesis that all regression coefficients are equal to zero (Gujarati,2004).

Table 3 Correlation Matrix

	C	D(BB)	D(REPO)	BENCHDUMMY	INFRADUMMY	LOG_STDER_	D(LOG_STDIR_)	DLOG(DC)	DLOG(DEVT)	DLOG(SIZE)	DLOG(OPEN)
C	1.00000										
D(BB)	0.00000	1.00000									
D(REPO)	0.00000	0.00000	1.00000								
BENCHDUMMY	-0.00002	0.00000	0.00000	1.00000							
INFRADUMMY	0.00000	0.00000	0.00000	-0.00004	1.00000						
LOG_STDER_	0.00002	0.00000	0.00000	0.00001	-0.00002	1.00000					
D(LOG_STDIR_)	-0.00002	0.00000	0.00000	-0.00003	-0.00002	-0.00004	1.00000				
DLOG(DC)	0.00002	0.00000	0.00000	-0.00002	0.00003	0.00004	-0.00025	1.00000			
DLOG(DEVT)	0.00009	0.00000	0.00000	0.00001	0.00005	0.00009	-0.00039	0.00023	1.00000		
DLOG(SIZE)	-0.00127	-0.00001	0.00000	0.00012	-0.00014	-0.00010	0.00089	-0.00029	-0.00209	1.00000	
DLOG(OPEN)	0.00000	0.00000	0.00000	-0.00001	0.00001	-0.00001	-0.00002	0.00002	0.00001	-0.00009	1.00000

Table 4 Normality Test

Skewness	0.778132
Kurtosis	3.462405
Jarque Bera	3.651007
Probability	0.161136

When tested for normality, it was clear from the Jarque Bera statistic, that the null hypothesis of normality could not be rejected. Regarding the skewness, the distribution was relatively normal.

This study used panel data on two cross sections of countries namely Zambia and Kenya. The study used the Pooled, Fixed and Random effects models (see explanation of the models in the Appendix 3) which are better suited for panel data analysis.

The study then chose the appropriate model between the two case studies using the Hausman Effect test[10]. In order to address the problem of heteroscedasticity, the study employed the Generalized Method of Moments which provides for the correction of heteroscedasticity. Two models were ran, one that excludes the special bonds which are not tradable in the secondary market, and another model which excludes the infrastructure bonds in Kenya. The infrastructure bonds in Kenya accounts for about 125 percent trades in the total tradable bonds in 2015. Additionally, the analysis took into account the following important aspects likely to have an impact on the secondary market trading of bonds in both countries:

[10] The Hausman effect in panel data allows one to choose the appropriate model between the fixed effects and Random Effects models.

1. The introduction of the horizontal repo market trading in Kenya in April 2009. To model the repo market in both countries, data on the horizontal repo for the period 2000-2015 was used to model the repo market development in both countries.
2. The introduction of the benchmark bonds in 2007 and 2012 in Kenya and Zambia, respectively. The reopening of these bonds in the two countries. Kenya commenced with reopening programme in 2009 while Zambia started in 2012 Dummy variables were used to capture these structural changes.
3. The introduction of the automated trading system in Kenya in the year 2009.

CHAPTER FOUR

RESEARCH FINDINGS

Introduction

This chapter presents the results of the panel data analysis and model estimation to determine the factors that determine the secondary market for the bond market development in the MEFMI region using Kenya and Zambia as case studies.

Table 4 below presents the summary of results for Model 1 and 2. Model 1 excludes the special bonds which are non-tradable while model two excludes the special and infrastructure bonds in the analysis. These two models are results of the random effects models which are the best models as revealed by the Hausman Effect tests (see Hausman test results for model 1 in Appendix 4 and 5, respectively).

Table 5 Summary of Results

VARIABLE	SYMBOL	COEFFICIENT	COEFFICIENT
Constant	C	-0.001008 (0.009497)	0.05072* (0.009570)
Budget Balance	D(BB)	0.001672** (0.000723)	0.00618 (0.000631)*
Repo Market Development	D(REPO)	0.003000 (0.000000)	0.00200 (0.000000)*
Infrastructure Development	DUMMYINFRA	0.232900* (0.008612)	0.16447* (0.008951)
Existence of Benchmark Securities	BENCHDUMMY	0.094677* (0.008054)	0.05754* (0.007478)
Exchange Rate Variability	D(LOG_STDER_)	-0.111416)* (0.005356	-0.02300* (0.007366)
Interest Rate Variability	D(LOG_STDIR_)	-0.528094* (0.028540)	-0.51053* (0.030690)
Size of Financial Sector	DLOG(DC)	-0.074581* (0.018810)	0.11947* (0.015499)
Economic Development	DLOG(DEVT)	0.016484* (0.025155)	0.12748* (0.025929)
Economic Size	DLOG(SIZE)	1.783926* (0.150381)	0.99381* (0.147782)
Openness of Economy	DLOG(OPEN)	0.013985 (0.002762)	0.01301* (0.002357)
	R-Squared	0.8534	
	Adjusted R-Squared	0.77277	
	Durbin Watson	2.11211	

Standard errors are reported in parentheses. *,**,*** indicates the significance at 1%,5% and 10% levels, respectively.

MODEL ONE RESULTS

i) Available Instruments

The results show that the issuance of benchmark securities (BENCHDUMMY) and the repo market development DLOG(REPO) have the correct signs as expected and have a positive significant impact on the secondary market development of government securities. This is in line with Talbot (2006) who asserts that existing instruments do matter in the secondary market development of government securities. Therefore, the development of the repo market (horizontal or interbank) and issuance of benchmarks remain key in the development of the secondary market of government securities in Kenya and Zambia.

ii) Structural Factors

The results indicate that the structural factors modelled to capture the infrastructural changes, had a positive and significant impact.

ii) Macroeconomic Factors

The model revealed that the budget balance as expected, has a positive sign which is significant. The openness of the economy (DLOG(OPEN)), the budget balance D(BB), and Economic Size DLOG(SIZE) have correct positive signs in line with a priori expectations and have a significant relationship with bond market liquidity. This is in line with Eichengreen and Luengnaruemitchai (2004), Thotho (2014) and Berensmann (2015).

The interest rate volatility D(LOG_STDIR_) and Exchange Rate Volatility D(LOG_STDER_) have the correct negative signs in line with apriori expectations. This is contrary to Thotho (2014) who found that the Exchange Rate volatility has a positive impact on bond market liquidity.

On the other hand, the model revealed that the domestic credit DLOG(DC) has negative sign contrary to a priori expectations. This is contrary to Thotho (2014) and Berensmann (2015) who established that the size of the financial sector measured by domestic credit has a positive impact on bond market liquidity. The negative relationship could be explained by the fact that while, a large financial sector is important for the government securities, a large financial sector especially the banking sub-sector could be competing for the same liquidity for investments.

iii) Institutional Factors

Further, the model revealed that institutional factors, such as the level of development DLOG(DEVT) has a positive sign as expected and has a significant impact on the secondary market development of government bonds. This study is supported by Adelegan (2009).

MODELTWO RESULTS

As already alluded to above, Model 2 excludes the special and infrastructure bonds in the analysis.

i. AVAILABLE INSTRUMENTS

Similar to the Model 1, the results show that, in line with economic theory, the issuance of benchmark securities (BENCHDUMMY 1) and the repo market development (DREPO) have the correct signs as expected and have a positive significant impact on the secondary market development of government bonds.

ii. STRUCTURAL FACTORS

The infrastructure has a correct positive sign which is similar to Model 1 and in accordance with apriori expectations.

ii) **MACROECONOMIC FACTORS**

The budget balance D(BB), domestic credit (D(LDC)), openness of the economy (DLOG(OPEN)) and Economic Size DLOG(SIZE) have correct positive sign in line with apriori expectations and have a significant relationship with government bond market liquidity. The interest rate volatility D(LOG_STDIR_) and Exchange Rate Volatility D(LOG_STDER_) have the correct negative signs as expected and have a significant relationship with government bond market liquidity. Unlike Model 1, the model 2 revealed that the domestic credit DLOG(DC) has a positive sign in line with a priori expectations. This finding is line with Thotho (2014) and Brensmann (2015).

iii) **INSTITUTIONAL FACTORS**

The model revealed that institutional factors, the level of development DLOG(DEVT) has a correct positive sign as expected and has a significant impact on the secondary market development of government bonds.

Overall, explanatory power for both models was very high with R squared at 85.34 percent and 78.66 percent for Model 1 and Model 2 respectively under the Random Effects Model. The Adjusted R squared were 77.28 percent and 66.93 percent for Model 1 and Model 2, respectively. The Durbin Watson statistic for Model 1 and Model 2 at 2.11 and 2.38 respectively, suggest low autocorrelation for both models.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

As already alluded to, the benefits of developing secondary markets of government securities are well documented. The benefits are in the areas of government financing, monetary policy implementation and financial market development and resiliency. The significance of this sector has led to the development of guidelines, models and frameworks. For instance, in 2001, the IMF and World Bank developed guidelines on the government securities market development and in 2004, Eichengreen and Luengnaruemitchai developed a set of factors that are linked to the bond market development. Further, in 2008, the IMF developed guidelines on how develop the secondary market of government securities. Despite these models and guidelines, this subsector has remained underdeveloped especially the secondary market development of government bonds, especially in the MEFMI region. The objective of this study was to assess whether the findings of Eichengreen and Luengnaruemitchai model are replicated in the MEFMI region using Zambia and Kenya as case studies by employing both the non-econometric and econometric methods.

The non-econometric analysis shows that, Zambia and Kenya are at different levels of development with Kenya showing a highly active secondary market. The secondary markets of government bonds in both countries do not have designated market makers obligated to quote firm two way prices on government securities and have limited

derivative instruments. However, having no designated market makers is not a barrier to developing a vibrant financial market as the case of Kenya demonstrates.

The panel econometric analysis revealed that the Eichengreen and Luengnaruemitchai findings are replicated in the MEFMI region. The macroeconomic factors such as budget balance, economic size, and financial sector size[11] have a significant positive relationship on the secondary market development of bonds. It is important to note that the financial sector size had a negative significant relation in Model 1[12] . The interest rate volatility and exchange rate volatility have negative impact on bond market liquidity. In addition the, institutional factor, development stage of the economy also has a positive impact of the secondary market development of bonds implying that as the economy grows so does the secondary market development of government bonds. Additionally, the study revealed that the variables that were separated in the model namely, the repo market development and the issuance of benchmark bonds have a positive significant impact on the secondary market development of government bonds for Zambia and Kenya.

[12] Model 1 exclude the non- tradable special bonds but included the infrastructure bonds.

5.2. RECOMMENDATIONS

5.2.1 Econometric Analysis

The Central Banks in collaboration with the National Treasuries should continue with their efforts of maintaining macroeconomic stability as this is key in promoting liquidity of the government bonds.

The Central Bank authorities should continue with efforts directed at developing instruments in the two countries. There is need to further development of the repo market development which is required to support the government securities market development. In Zambia, for instance, there is a Master Repurchase Agreement signed between the commercial banks and the central bank which governs the repo transactions. However, the commercial banks have not signed the Global Master Repurchase Agreement (GMRA) amongst themselves. A review of the legal enforceability of the GMRA in consultation with the market in the Zambian market is therefore recommended. Additionally, Zambia could consider reducing the withholding tax to boost bond market liquidity.

5.2.2 Non-Econometric Analysis

The following are the recommendations from the non – econometric analysis:

As indicated in the analysis earlier, both Kenya and Zambia have experienced some improvement in trading turnover of government bonds in recent years. However, in order to further increase trading activity, the two countries especially Zambia should consider

developing policies aimed at developing structures that support the bond market liquidity. Introducing designated market makers obligated to quote firm two way prices and ready to take buy and sell positions in government securities. This structure should have a set of obligations and incentives that will support it in order to motivate the market makers to make the market. In Zambia, in particular, introducing a primary dealership system could provide enough incentives required for the market makers to quote two way prices and therefore boost liquidity in the government bonds markers. A graduated approach is recommended where the market makers should only have this obligation on benchmark bonds. However, it should be noted that introducing a primary dealership is not a panacea for developing/deepening the financial markets. In 2013, an assessment of the Primary Dealership System in Uganda and also the experience from Tanzania showed that designated PDs failed in making the market in those countries. The two countries are currently reviewing the incentives in order to motivate the primary dealers to make the market.

The low levels of trades in Zambia in particular could be reflecting the skills gaps in trading and instrument pricing in the market, particularly the other financial institutions. There is a requirement that dealers should have the ACI dealing qualification but there is still need to enhance the skills and knowledge in this market. There is therefore need to train people in instrument pricing and trading and this can be achieved by encouraging entry into the market by experts from markets that already possess the skills or seconding staff to such markets.

4.2.3.1.4 Future Areas of Study

The limited number of cross-sections in the model could have constrained the robustness of the model. A study based on more countries in the MEFMI region could yield more insights and could be more robust but the resources available and time constraint during this study did not permit such a wider coverage of the study to be undertaken.

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APPENDIX 1 SURVEY QUESTIONNAIRE

I am currently undertaking research on 'determinants of the secondary market development of government securities in the MEFMI region, 2000-2015' using Zambia and Kenya as Case Studies. To this end, I would like to seek your assistance and cooperation in identifying the factors that determine the secondary market development of government securities in the MEFMI region. The survey questionnaire has the following sections;

Introduction

This section entails describing the structure of the primary and secondary market of Government Securities.

Determinants of Secondary Market Development

This section involves highlighting the macroeconomic, structural and institutional factors that have impact on the secondary market development of government securities.

Other Information

This section captures any other information that the respondent views as key to the development of the secondary market of the government securities secondary market.

Please describe:

Access to the Primary Market

Is access to the Primary Market Auctions open to all participants?

Are there Primary Dealers in Place?

What is the frequency for government securities auctions?

Instruments

What are the current Government Securities Instruments available? Please indicate the tenors?

What is the purpose of issuance? Financing or Financial Market Development?

What is the longest maturity tenor for government bonds (outstanding debt)?

Is the Derivatives market very active?

Investor Base

What is the composition of the investor base?

How has the investor base evolved over the last five (05) years?

Is there and equitable treatment of investors?

What is the role of pension funds?

Any captive behaviour?

Secondary Market

Is there an active secondary market?

Are there designated Market Makers obligated to quote two way prices?

Is there an efficient electronic trading platform for government securities?

Is short selling allowed?

Legal and Regulatory Framework

Is there a clear legal and regulatory framework for the primary and secondary market of government securities?

Determinants of secondary market development

Could you please list which macroeconomic factors affect the liquidity government securities?

Could you please list which structural factors affect the liquidity government securities?

Could you please list which institutional factors affect the liquidity government securities?

Available Instruments and Structural Factors

Is there a deliberate policy on domestic debt consolidation? Are there benchmark issues?

Is there a market determined yield curve?

Is there a repo market in place? How developed is the repo market? Is there a Global Master Repurchase Agreement in place? Has it been signed by the market players?

Other Information

Please provide any additional information that is relevant to the study.

APPENDIX 2 RAW DATA

YEAR	COUNTRY	TRADING VOLUMES (TOTAL) EXCLUDING SPECIAL AND INFRASTRUCTURE BONDS	TOTAL OUSTANDING VOLUMES EXCLUDING SPECIAL BONDS	TURNOVER RATIO	DOMESTIC CREDIT PROVIDED BY THE FINANCIAL SECTOR	EXCHANGE RATE	ECONOMIC DEVELOPMENT
2000	Kenya	13,118,048,000.00	30,116,890,000.00	0.435571136	35.74607	76.1755	408.9818683
2001	Kenya	15,000,302,000.00	73,012,702,137.50	0.205447841	36.41356	78.5632	407.5540066
2002	Kenya	33,629,700,000.00	120,880,804,380.00	0.278205462	38.97865	78.7491	402.1703155
2003	Kenya	41,128,200,000.00	172,549,004,380.00	0.238356635	38.97394	75.9356	444.2336311
2004	Kenya	34,133,450,000.00	178,598,744,548.85	0.191118085	39.37959	79.1739	467.3787525
2005	Kenya	13,634,500,000.00	206,333,096,837.00	0.066080043	37.36084	75.5541	530.0821579
2006	Kenya	56,860,300,000.00	234,434,858,135.20	0.242542003	32.00276	72.1008	711.7211637
2007	Kenya	84,135,850,000.00	273,463,740,000.00	0.307667298	31.09305	67.3176	857.9256887
2008	Kenya	95,362,630,817.00	292,838,300,754.00	0.325649447	33.90252	69.1753	938.5717623
2009	Kenya	110,645,360,000.00	380,407,550,421.00	0.290860052	35.57696	77.352	942.7431465
2010	Kenya	483,148,200,000.00	513,309,500,000.30	0.941241493	41.08091	79.2332	991.8505451
2011	Kenya	445,462,176,532.15	618,549,349,998.00	0.720172411	41.67822	88.8108	1012.879773
2012	Kenya	565,674,559,685.10	701,068,293,652.10	0.806875114	42.23917	84.5296	1184.923256
2013	Kenya	452,225,245,347.00	794,289,139,409.30	0.569345875	42.93577	86.1229	1261.092863
2014	Kenya	506,050,222,786.27	944,000,381,123.31	0.536069935	44.25161	87.9222	1368.491132
2015	Kenya	305,099,191,502.01	1,061,319,753,124.81	0.28747151	45.20303	98.1785	1376.712829
2000	Zambia	15,616,300.00	201,705,000.00	0.077421482	63.96245	3.1108	340.1613797
2001	Zambia	29,843,430.00	3,029,725,022.60	0.009850211	44.84043	3.6109	376.9810576
2002	Zambia	68,632,930.00	882,437,787.60	0.077776508	41.39828	4.3986	376.4680395
2003	Zambia	117,670,000.00	3,029,725,100.00	0.038838507	33.89041	4.7333	429.0072779
2004	Zambia	61,338,330.00	3,025,603,619.90	0.020273089	30.67518	4.7789	530.5535841
2005	Zambia	20,026,910.00	3,248,329,361.60	0.006165295	19.43518	4.4635	691.8094586
2006	Zambia	131,174,120.00	3,444,452,897.00	0.038082716	13.97383	3.6031	1030.31536
2007	Zambia	76,163,110.00	4,196,162,398.80	0.018150658	13.45836	4.0025	1103.486577
2008	Zambia	3,055,560.00	4,741,436,046.80	0.000644438	15.40917	3.7457	1365.721205
2009	Zambia	57,315,000.00	3,956,834,902.59	0.014485062	15.48323	5.0461	1134.772998
2010	Zambia	13,339,037.01	4,248,463,467.39	0.003139732	15.10927	4.7971	1456.126526
2011	Zambia	120,000,000.00	5,602,997,464.39	0.021417108	21.08507	4.8607	1635.547304
2012	Zambia	138,270,374.25	3,691,339,026.41	0.037458053	21.93314	5.1473	1724.743564
2013	Zambia	181,903,112.67	7,818,157,432.65	0.023266750	26.26894	5.3959	1839.522481
2014	Zambia	215,375,731.25	10,264,265,855.00	0.020983062	25.82178	6.1528	1725.974549
2015	Zambia	234,348,708.33	11,361,822,398.00	0.020625979	29.44802	8.6324	1307.788611

Source: Central Bank of Kenya, Bank of Zambia, Lusaka Stock Exchange and World Bank Development Indicators

APPENDIX 2 RAW DATA CONTINUED.

YEAR	COUNTRY	INTEREST RATE	BUDGET BALANCE	REPO VOLUMES (USD)	BENCHMARK BONDS	OPENESS OF ECONOMY	ECONOMIC SIZE
2000	Kenya	12.0656	1.975	84,746.69	No	21.59	67,055,109,891.19
2001	Kenya	12.7295	2.002	25,922.79	No	22.93	69,589,730,346.06
2002	Kenya	8.9427	1.993	0	No	24.9	69,970,288,418.35
2003	Kenya	3.7317	-2.197	0	No	24.09	72,022,150,015.82
2004	Kenya	2.9596	-1.465	0	No	26.61	75,698,376,457.53
2005	Kenya	8.4366	1.495	0	No	28.51	80,169,626,784.13
2006	Kenya	6.8132	-2.03	0	No	22.98	85,358,601,306.96
2007	Kenya	6.7989	-2.54	0	Yes	21.92	91,206,288,418.49
2008	Kenya	7.7029	-3.46	0	Yes	22.67	91,418,144,889.45
2009	Kenya	7.3754	-4.392	116,302.20	Yes	20.03	94,441,287,921.25
2010	Kenya	3.6011	-4.728	83,379.44	Yes	20.66	102,376,506,594.92
2011	Kenya	8.7237	-3.648	64,325.03	Yes	21.63	108,633,362,952.27
2012	Kenya	12.5807	-3.845	51,877.02	Yes	19.82	113,581,550,492.60
2013	Kenya	8.9254	-1.912	52,078.31	Yes	18.15	120,048,350,544.56
2014	Kenya	8.9307	-2.062	46,406.07	Yes	16.92	126,449,159,812.21
2015	Kenya	10.9269	-3.612	83,926.81	Yes	15.77	133,592,522,053.10
2000	Zambia	44.2792	-7	0	No	23.92	17,545,421,636.72
2001	Zambia	34.5365	-8	0	No	25.11	18,899,390,483.93
2002	Zambia	29.9748	-6.3	8,727,912,723.71	No	27.13	20,054,202,196.59
2003	Zambia	12.6036	-6.6	0	No	25.68	21,874,625,774.67
2004	Zambia	16.3162	1.729	59,723,031.24	No	33.54	24,056,726,344.71
2005	Zambia	10.3678	-4.009	691,627,865.29	No	30.61	26,627,440,785.45
2006	Zambia	11.9511	1.837	1,611,126,737.38	No	32.59	29,614,715,773.63
2007	Zambia	13.4674	-0.68	2,730,034,108.48	No	33.59	32,942,242,723.32
2008	Zambia	15.3944	-1.106	3,943,443,909.86	No	28.92	36,199,572,309.01
2009	Zambia	6.2786	0.177	2,220,040,597.35	No	29.25	39,837,559,004.68
2010	Zambia	9.5531	-1.195	2,862,005,539.27	No	37.03	44,476,775,124.20
2011	Zambia	10.1274	-3	0.00	No	0.4	47,944,251,956.63
2012	Zambia	11.4448	-2.8	0.00	Yes	0.41	52,524,896,689.39
2013	Zambia	15.356	-6.7	0.00	Yes	0.41	56,120,523,486.71
2014	Zambia	19.0153	-5.5	112,744.71	Yes	0.41	59,908,709,211.21
2015	Zambia	22	-8.1	0.00	Yes	0.34	62,458,409,612.21

Source: Central Bank of Kenya, Bank of Zambia, World Bank Development Indicators

APPENDIX 3 EXPLANATION OF THE POOLED AND FIXED EFFECTS MODELS

Pooled Effects Model

The pooled effects model assumes that there are no unique attributes of individuals within the measurement set, and no universal effects across time. Specifies constant intercept and slope coefficients meaning that there are no significant country or temporal effects. Pooled effects model ignores the panel data altogether. This is the most restrictive model and not widely applied in the literature.

Fixed Effects Model

The fixed effects model assumes that there are unique attributes of individuals that are not a result of random variation and that do not vary across time. This model is used when the individual effects are correlated to the explanatory variables. Further, this regression model is used when one wants to control for omitted variables that differ between cases but are constant over time. It lets one use the changes in the variables over time to estimate the effects of the independent variables on the dependent variable, and is the main technique used for analysis of panel data. This is equivalent to generating dummy variables for each of the cases and including them in a standard linear regression to control for these fixed "case effects". It works best when one has relatively fewer cases and more time periods, as each dummy variable removes one degree of freedom from the model. Hence, this model was more appropriate for our case which had fewer cases.

APPENDIX 4 MODEL 1 POOLED EFFECTS MODEL

Dependent Variable: DLOG(TURN)
Method: Panel Generalized Method of Moments
Date: 05/06/17 Time: 15:54
Sample: 2000 2015
Periods included: 16
Cross-sections included: 2
Total panel (balanced) observations: 32
Cross-section SUR instrument weighting matrix
Instrument specification: C D(BB) D(REPO) BENCHDUMMY
D(LOG_STDER_) D(LOG_STDIR_) DLOG(DC) DLOG(DEVT)
DLOG(SIZE) DLOG(OPEN) DUMMYINFRA
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.248460	0.082487	3.012125	0.0066
D(BB)	0.003765	0.010018	0.375830	0.7108
D(REPO)	1.03E-12	2.52E-12	0.407456	0.6878
BENCHDUMMY	0.037149	0.094485	0.393175	0.6982
D(LOG_STDER_)	-0.080166	0.060819	-1.318096	0.2017
D(LOG_STDIR_)	-0.546262	0.309766	-1.763466	0.0924
DLOG(DC)	0.242456	0.244919	0.989944	0.3335
DLOG(DEVT)	0.790071	0.266546	2.964106	0.0074
DLOG(SIZE)	-3.222648	1.074630	-2.998844	0.0068
DLOG(OPEN)	0.041958	0.037524	1.118154	0.2761
DUMMYINFRA	0.366137	0.097602	3.751340	0.0012

R-squared	0.650713	Mean dependent var	0.214727
Adjusted R-squared	0.484386	S.D. dependent var	0.256835
S.E. of regression	0.184424	Sum squared resid	0.714254
Durbin-Watson stat	1.338022	J-statistic	1.83E-27
Instrument rank	11		

Source: Eviews Output

MODEL 1 FIXED EFFECTS MODEL

Dependent Variable: TURN
Method: Panel Generalized Method of Moments
Date: 05/06/17 Time: 16:08
Sample: 2000 2015
Periods included: 16
Cross-sections included: 2
Total panel (balanced) observations: 32
2SLS instrument weighting matrix
Instrument specification: C D(BB) D(REPO) D(LOG_STDER_) D(LOG_STDIR_) DLOG(DC) DLOG(DEVT) DLOG(SIZE) DLOG(OPEN) DUMMYINFRA BENCHDUMMY
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.013451	0.190527	-0.070597	0.9465
D(BB)	0.004593	0.012562	0.365596	0.7296
D(REPO)	8.87E-12	5.38E-12	1.649362	0.1600
DUMMYINFRA	0.184099	0.119311	1.543013	0.1835
BENCHDUMMY	0.175275	0.137584	1.273951	0.2587
D(LOG_STDER_)	-0.258614	0.125300	-2.063948	0.0940
D(LOG_STDIR_)	-1.219531	0.538704	-2.263826	0.0730
DLOG(DC)	0.079874	0.364026	0.219418	0.8350
DLOG(DEVT)	0.086091	0.509019	0.169131	0.8723
DLOG(SIZE)	1.913302	2.809628	0.680980	0.5261
DLOG(OPEN)	0.125454	0.086460	1.451002	0.2065

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.971938	Mean dependent var	0.214727
Adjusted R-squared	0.826017	S.D. dependent var	0.256835
S.E. of regression	0.107129	Sum squared resid	0.057383
Durbin-Watson stat	2.969733	J-statistic	3.96E-25
Instrument rank	27		

MODEL 1 RANDOM EFFECTS MODEL

Dependent Variable: DLOG(TURN)
Method: Panel GMM EGLS (Period random effects)
Date: 05/06/17 Time: 16:10
Sample: 2000 2015
Periods included: 16
Cross-sections included: 2
Total panel (balanced) observations: 32
Cross-section SUR instrument weighting matrix
Swamy and Arora estimator of component variances
Instrument specification: C D(BB) D(REPO) D(LOG_STDER_) D(LOG_STDIR_) DLOG(DC) DLOG(DEVT) DLOG(SIZE) DLOG(OPEN) DUMMYINFRA BENCHDUMMY
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001008	0.009497	-0.106163	0.9165
D(BB)	0.001672	0.000723	2.314487	0.0314
D(REPO)	3.09E-12	1.70E-13	18.14890	0.0000
DUMMYINFRA	0.232900	0.008612	27.04327	0.0000
BENCHDUMMY	0.094677	0.008054	11.75566	0.0000
D(LOG_STDER_)	-0.111416	0.005356	-20.80255	0.0000
D(LOG_STDIR_)	-0.528094	0.028540	-18.50376	0.0000
DLOG(DC)	-0.074581	0.018810	-3.964932	0.0008
DLOG(DEVT)	0.016484	0.025155	0.655284	0.5198
DLOG(SIZE)	1.783926	0.150381	11.86272	0.0000
DLOG(OPEN)	0.013985	0.002762	5.062951	0.0001

Effects Specification	S.D.	Rho
Cross-section fixed (dummy variables)		
Period random	0.088022	0.4030
Idiosyncratic random	0.107129	0.5970

Weighted Statistics

R-squared	0.853400	Mean dependent var	0.214727
Adjusted R-squared	0.772770	S.D. dependent var	0.239900
S.E. of regression	0.114357	Sum squared resid	0.261551
Durbin-Watson stat	2.11211	J-statistic	5.06E-27
Instrument rank	12		

Unweighted Statistics

R-squared	0.773915	Mean dependent var	0.214727
Sum squared resid	0.462320	Durbin-Watson stat	2.112110

MODEL 1 HAUSMAN TEST

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	19.532310	9	0.0210

APPENDIX 5 MODEL 2: FIXED EFFECTS MODEL

Dependent Variable: TURN
Method: Panel Generalized Method of Moments
Date: 05/06/17 Time: 16:20
Sample: 2000 2015
Periods included: 16
Cross-sections included: 2
Total panel (balanced) observations: 32
Cross-section SUR instrument weighting matrix
Instrument specification: C D(BB) D(REPO) BENCHDUMMY INFRADUMMY (LOG_STDER_) D(LOG_STDIR_) DLOG(DC) DLOG(DEVT) DLOG(SIZE) DLOG(OPEN)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BB)	0.010431	0.008305	1.255947	0.2223
D(REPO)	3.47E-12	8.38E-12	0.413735	0.6831
BENCHDUMMY	0.088110	0.087538	1.006535	0.3251
INFRADUMMY	0.231546	0.108778	2.128616	0.0447
LOG_STDER_	0.152691	0.066382	2.300164	0.0313
D(LOG_STDIR_)	-0.785670	0.342547	-2.293612	0.0317
DLOG(DC)	0.501895	0.193870	2.588827	0.0168
DLOG(DEVT)	0.794501	0.238450	3.331943	0.0030
DLOG(SIZE)	0.716534	0.743013	0.964362	0.3453
DLOG(OPEN)	0.011792	0.032323	0.364829	0.7187

R-squared	0.513780	Mean dependent var	0.195523
Adjusted R-squared	0.314872	S.D. dependent var	0.225302
S.E. of regression	0.186488	Sum squared resid	0.765110
Durbin-Watson stat	1.258848	J-statistic	6.369246
Instrument rank	11	Prob(J-statistic)	0.011611

MODEL 2 FIXED EFFECTS MODEL

Dependent Variable: DLOG(TURN)
Method: Panel Generalized Method of Moments
Date: 05/06/17 Time: 16:22
Sample: 2000 2015
Periods included: 16
Cross-sections included: 2
Total panel (balanced) observations: 32
2SLS instrument weighting matrix
Instrument specification: C D(BB) D(REPO) BENCHDUMMY INFRADUMMY (LOG_STDER_) D(LOG_STDIR_) DLOG(DC) DLOG(DEVT) DLOG(SIZE) DLOG(OPEN)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.088323	0.242911	0.363601	0.7310
D(BB)	0.011251	0.014568	0.772296	0.4748
D(REPO)	-3.64E-12	1.86E-11	-0.195433	0.8527
BENCHDUMMY	0.087402	0.136087	0.642250	0.5490
INFRADUMMY	0.227933	0.107065	2.128913	0.0865
LOG_STDER_	0.009331	0.138286	0.067475	0.9488
D(LOG_STDIR_)	-0.919463	0.691715	-1.329251	0.2412
DLOG(DC)	0.125432	0.485654	0.258275	0.8065
DLOG(DEVT)	0.029756	0.751654	0.039587	0.9700
DLOG(SIZE)	0.292906	3.399593	0.086159	0.9347
DLOG(OPEN)	0.058182	0.095381	0.609996	0.5685

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.957966	Mean dependent var	0.195523
Adjusted R-squared	0.739390	S.D. dependent var	0.225302
S.E. of regression	0.115017	Sum squared resid	0.066144
Durbin-Watson stat	3.098550	J-statistic	4.95E-24
Instrument rank	27		

MODEL 2 RANDOM EFFECTS

Dependent Variable: TURN
Method: Panel GMM EGLS (Period random effects)
Date: 05/06/17 Time: 16:23
Sample: 2000 2015
Periods included: 16
Cross-sections included: 2
Total panel (balanced) observations: 32
Cross-section SUR instrument weighting matrix
Swamy and Arora estimator of component variances
Instrument specification: C D(BB) D(REPO) BENCHDUMMY INFRADUMMY (LOG_STDER_) D(LOG_STDIR_) DLOG(DC) DLOG(DEVT) DLOG(SIZE) DLOG(OPEN)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.050719	0.009570	5.299649	0.0000
D(BB)	0.006183	0.000631	9.806346	0.0000
D(REPO)	5.37E-12	5.73E-13	9.371027	0.0000
BENCHDUMMY	0.057541	0.007478	7.694172	0.0000
INFRADUMMY	0.164468	0.008951	18.37402	0.0000
D(LOG_STDER_)	-0.022998	0.007366	-3.122393	0.0054
D(LOG_STDIR_)	-0.510525	0.030690	-16.63489	0.0000
DLOG(DC)	0.119470	0.015499	7.707998	0.0000
DLOG(DEVT)	0.127483	0.025929	4.916627	0.0001
DLOG(SIZE)	0.993807	0.147782	6.724831	0.0000
DLOG(OPEN)	0.013008	0.002357	5.519136	0.0000

Effects Specification	S.D.	Rho
Cross-section fixed (dummy variables)		
Period random	0.056082	0.1921
Idiosyncratic random	0.115017	0.8079

Weighted Statistics

R-squared	0.786662	Mean dependent var	0.195523
Adjusted R-squared	0.669326	S.D. dependent var	0.217608
S.E. of regression	0.125134	Sum squared resid	0.313171
Durbin-Watson stat	1.384625	J-statistic	6.89E-27
Instrument rank	12		

Unweighted Statistics

R-squared	0.745345	Mean dependent var	0.195523
Sum squared resid	0.400722	Durbin-Watson stat	2.384625

MODEL 2 HAUSMAN TEST

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	0.055864	1	0.8132

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
D(REPO)	0.000000	0.000000	0.000000	0.8132