

TERM STRUCTURE OF INTEREST RATES IN KENYA: A Review of Evidence

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DECLARATION

This independent study paper report is my original work and has not been presented for a degree in any other University

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DEDICATION

To my wonderful parents Masani Musyoki and Agnes Wayua Their support and encouragement has seen me this far in pursuit of knowledge

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ABSTRACT

The term structure of interest rates refers to the relationship between interest and maturity period. This study examines the properties of term structure of interest rates. The subject of interest rates has dominated much of economic and business thinking in recent years both for academicians and practitioners. The term structure of interest rates is an important mechanism for transmission of macroeconomic policies in any country.

Through extensive review of theoretical and empirical literature, the study mainly examines the research findings validity of the expectations hypothesis. Attempt to review the premium preference theory, market segmented theory and the preferred habitat theory is also done. In conclusion the evidence from the literature supports expectations hypothesis that the forward rates have power to forecast future rates on the short run while studies surveyed strongly reject the expectations theory especially when the theory is tested in the long run.

LIST OF ABBREVIATION

TB	- Treasury Bill
CBK	- Central Bank of Kenya
EH	- Expectations Hypothesis
USA	- United States of America
UK	- United Kingdom

CHAPTER ONE

INTRODUCTION

1.0 TERM STRUCTURE OF INTEREST RATES

An interest rate is a price established by the interaction of the supply of, and the demand for future claims on resources (Apps R 1996). Interest rate is the price of using someone else's money. It is the price one pays for getting a service from money or the price one receives for providing a money service usually expressed as a percentage of the money per annum. Alternatively, interest rates can also be considered as the cost of borrowing or the price paid for the rental of funds.

Donald E. F. and Ronald J. J., (1996), describe the term structure of interest rates referred to as the yield curve as the difference in interest rates that correspond solely to differences in terms of maturity. As a first approximation, we can determine the term structure by measuring the relationship between the yields to maturity on government debt instruments and their terms-to maturity. Fredric S. M. and Stanley G. E., (1998) state that a bond's term to maturity also affects its interest rate and the relationship among interest rates on bonds with different terms to maturity is the term structure of interest rates. According to Friedman B. M. and Hahn F. H. (1998), the term structure of interest rates at any time is the function relating interest rates to term

Gardner M. J. Dixie L. M., and Elizabeth S. C., (2000), propose that the term structure of interest rates, often called the yield curve all else equal is the relationship, at a specific time, between yields of securities and their maturities. For example, yields on 182-day treasury bills (T-Bills) almost always differ from those on 25-year treasury bonds (T-Bonds). *All else equal* is an important qualifying phrase. In this manner it is noticed that, in the study of term structure of interest rates, to isolate the effects of maturity on yield, one must remove the potential effects of other factors.

Therefore, from the above descriptions the researcher of this paper proposes that the term structure of interest rates can be defined, as the relationship between the interest rates on financial instruments and the maturities of those instruments. Financial instruments refer in this case, to treasury bonds, treasury bills, certificate of deposit (fixed and short-term), options, futures, forwards and others.

This paper is organized in four chapters and the description of each of them is as follows. Chapter one presents the definition and the role of term structure of interest rates in economic development, statement of

the problem, research questions, objectives and hypothesis. Chapter two discusses the relevant theoretical general literature while chapter three presents the empirical literature. Chapter four discusses the findings from the empirical literature, the knowledge gap identified and points the direction for further research and finally draws the conclusions of the independent study paper.

1.1 Term structure of interest rates and economic development

It is related to the notion of informational efficiency of the bond and money markets dealing with the following questions. First, are there profitable arbitrage possibilities to be exploited in these markets? Second, is the relationship between short and long interest rates important for the transmission mechanism of monetary policy? The monetary authorities control the short rate and only if there is a stable relation between short and long rates, will the authorities also be able to control long rates and thereby influence real economic activity? Third, can the spread between long and short rates contain useful information about future interest rates, inflation, and real economic activity. For example, the monetary authorities and policy makers may be able to use the yield spread as an indicator of the inflationary pressures in the economy. Finally, is the term structure of interest rates important for mortgage financing? If the slope of the yield curve is on average positive, real estate owners may find it optimal to finance their houses using short-term bonds instead of long-term bonds (Engsted T., 1996).

Bacon, Peter W. and Richard E. W. (1976), state that, "term-structure management is planning and controlling the maturity structure of assets and liabilities". It is important to manage the term structure so that the financial intermediary can survive and benefit both present and future economic conditions. Managers cannot commit themselves to short-term or long-term positions and cannot be confident that adverse interest rates and flows of funds will not occur unexpectedly.

Recent experience shows that banks borrow substantial amounts of short-term funds to finance long-term commitments and will find themselves paying far more for deposits than they receive from loans and investments. Savings and loans can suffer major decreases in the market value of their mortgage portfolios during periods of high interest rates while the cost of deposits soars. On the other hand, interest-rate changes are extremely beneficial and profitable to those in the right position.

Although some intermediaries attempt to take advantage of increasing short term rates by financing with long-term liabilities. Most banks and many savings and loans financial institutions match the term structure of assets

and liabilities, immunizing themselves from the risk of rising and falling interest rates

Term structure is a fundamental policy decision of all financial intermediaries, and a policy which is made in concert with marketing, credit liquidity, capital, and other policies. Life insurance companies market a long-term liability and cannot shorten the term structure of liabilities without simultaneously destroying their major product - whole life insurance. Long term mortgages are not well matched with short-term deposits of the savings and loan association, but both mortgages and deposits are difficult to alter without upsetting the marketing mix. Likewise, credit liquidity, capital, and other policies and programs influence the term structure and explain why banks, savings and loan associations, credit unions, insurance companies, investment bankers, mortgage bankers, and savings bankers make different term-structure decisions. Thus, term structures are influenced by various structures such as regulatory structure, market demand, and stockholder preference of each intermediary (Bacon et al. 1976)

1.2 Statement of the Problem

The term structure of interest rates is an important mechanism for transmission of macroeconomic policy. Monetary policy conducted through the transaction of short-term assets has effects, via the term structure, on long term interest rates which in turn influence the rate of investment and the growth rate of the economy. Yet to date, there has been relatively little attention devoted to analyzing the effects of term structure on the macroeconomic policy.

This paper is a study of the properties of the term structure of interest rates. It reviews and examines statistical test evidence as to what extent the forward interest rates that are implicit in the term structure can be used as a forecast of future interest rates, that is, it reviews empirical and theoretical literature on what is known as the Expectations Hypothesis (EH) of the term structure of interest rates.

This hypothesis has been tested and reviewed through research conducted by some of the authors: Modigliani and Shiller (1973), Shiller (1979), Shiller, Campbell and Schoenholtz (1983), Friedman (1979), Fama (1984), Mankiw (1986) and Campbell and Shiller (1987), for United Kingdom (UK) and United States of America (USA) financial markets.

This study therefore attempts to review the literature and empirical evidence available in an effort to try and establish how these empirical findings have addressed this problem. This will be achieved by answering the

following research questions

1.3 Research questions.

- 1 What is the difference and relationship between long term and short-term interest rates?
- 2 To what extent does monetary policy affect and determine the term structure of interest rates?
- 3 To what extent does market participants affect and determine the term structure of interest rates?
- 4 To what extent the forward interest rates that are implicit in the term structure of interest rates can be used as a forecast of the future interest rates?

1.4 Research objectives.

The objectives of this study are to establish the

- 1 Difference and relationship if any, between long term and short term interest rates
- 2 Extent to which monetary policy affect and determine the term structure of interest rates
- 3 Extent to which market participants affect and determine the term structure of interest rates
- 4 Extent to which the forward interest rates that are implicit in the term structure of interest rates can be used as a forecast of the future interest rates

1.5 Hypothesis

- H_0 There is no difference and no relationship between long and short term interest rates
- H_1 There is significant difference and relationship between long and short term interest rates
- H_0 Monetary policy has no effect on the term structure of interest rates
- H_1 There is significant effect of monetary policy on the term structure of interest rates
- H_0 Market participants have no effect on the term structure of interest rates
- H_1 There is significant effect of market participants on the term structure of interest rates
- H_0 There is no effect on the forward interest rates that are implicit in the term structure interest rates that can be used as forecast of future interest rates
- H_1 There is significant effect on the forward interest rates that are implicit in the term structure interest rates that can be used as forecast of future interest rates

CHAPTER TWO

THEORETICAL LITERATURE REVIEW

2.0 INTRODUCTION

This chapter presents relevant theoretical literature. The literature is presented in two sections. Section 1 explains what a yield curve is. Section 2 underscores the influence of term structure theories.

2.1 Yield Curve

A yield curve is a chart that graphically depicts the yields of different maturity bonds of the same credit quality and type. Yield is depicted on the vertical axis and maturity duration on the horizontal axis. The yield curve is also called the "Term Structure of Interest Rates." A normal yield curve is upward sloping, with short-term rates lower than long-term rates. An inverted yield curve is downward sloping, with short-term rates higher than long-term rates. A flat yield curve occurs when short-term rates are the same as long-term rates (Gardner M. J. et al. 2000).

Yield curves are generally upward sloping. Given the greater uncertainty investors face when investing over longer time horizons, long-term rates are generally higher than short-term rates. There are a number of different theories that try to explain the shape of the yield curve. The two major theories are the expectations theory and the market segmentation theory. The expectations theory basically states that the yield curve is determined by investor expectations of future short-term rates. An upward sloping yield curve implies that short-term interest rates will be higher in the future. The market segmentation theory basically states that the yield curve is determined by supply and demand for different maturity securities. The market is divided into different maturity segments (Gardner M. J. et al. 2000).

The most common yield curve is the Treasury bill yield curve. The Treasury bill yield curve is used as a base rate because of its high liquidity and riskless nature. The interest rates that cash flows of non-Treasury securities will be discounted at will include a risk premium over the Treasury bill yield for that maturity. The risk premium will incorporate such factors as the issuer's perceived credit quality, the issuer's expected liquidity, and taxability of income (Gardner M. J. et al. 2000).

2.2 Expectations Theory

Historical patterns and the reasons for their existence provide clues about when to expect shifts in the term structure, but they are no substitute for a theoretical understanding of the yield curve. Understanding how the term structure is determined is complicated by economists' lack of agreement on any single explanation.

The existence of several theories should not be discouraging, as each provides insights which the others lack. The body of knowledge is valuable for managers who make decisions involving assets and liabilities of different maturities. Perhaps the most influential of the term structure theories is the unbiased expectations theory, hereafter referred to as the pure expectations theory, which holds that observable long-term yields are the average of expected return, but not necessarily offered at short-term equivalents (Hicks J.R. 1946). For example, this theory argues that the spot rate on 20-year T-bonds is the average of expected annual yields on short-term Treasury securities over the next 20 years, but the offer would not be made for less than 20 years.

Theoretically, there is no best definition of "short term" or "long term" investments. For simplicity, most of the following examples define short term as one year, and long term as five years or more. However, the pure expectations theory also holds that the observed yield on one-year securities is the average of expected rates on shorter-maturity securities during the year. Short- and long-term can therefore be used on the decision maker's desires.

2.2.1 Assumptions of the Expectations Theory

The expectations theory rests on the following important assumptions about investors (lenders or demanders of securities) and markets:

1. All else equal, investors are indifferent between owning a single long-term security or a series of short-term securities over the same time period. Maturity alone does not affect investors' choice of investments.
2. All investors hold common expectations about the course of short-term rates.
3. On average, investors are able to predict rates accurately. Their expectations about future rates are unbiased in the statistical sense, i.e., they are neither consistently low nor consistently high.
4. There are no taxes, information costs, or transaction costs in the financial markets. Investors are free to exchange securities of varying maturities quickly and without penalty.

The main implication of the expectations theory follows directly from these assumptions. For a given holding period, the average expected annual yields on all combinations of maturities will be equal (Cox et al. 1981). For example, the theory holds that the average annual yield on a series of one-year investments over a specific

five-year period will be the same as the average annual yield on a single three-year investment followed by two one-year investments and the same as the average annual yield on a single five-year security. Because investors are assumed to be indifferent about the maturity of their holdings and because they have common and accurate predictions about future rates, they will demand securities at prices that equalize average annual yields over the period. Investors simply have no incentive to prefer one combination of maturities over another. Annual yields currently available on long-term securities will be the average of expected annual yields on shorter-term instruments (Cox et al, 1981)

2.2.2 Modifications of the Expectations Theory

The unbiased expectations theory succinctly explains the shape of any term structure. Lenders' expectations of rising short-term rates produce an observable upward sloping yield curve, expectations of falling short-term rates produce a downward-sloping term structure, and expectations of unchanging rates produce a flat yield curve. Changes in the shape of the curve over time can easily be explained by changes in expectations. Also, the theory appeals to researchers because its mathematical form provides testable hypotheses as well as the opportunity to develop models for predicting interest rates.

2.2.3 Criticisms of the Expectations Theory

The expectations theory is not without its critics, who focus on its restrictive assumptions as serious shortcomings. In particular, investors' assumed indifference between short- and long-term securities ignore the fact that a long term investment may be riskier than a series of short-term investments. Risk brought about by the passage of time alone is rarely a matter of indifference. Even for two securities of the same issuer with equal initial default risk, the probability of default may increase on the long-term security over time. Furthermore, investors are never certain that personal circumstances will allow them to follow initial investment strategies throughout the holding period. If emergencies arise, they may have to sell long-term securities at a loss.

A second assumption that troubles critics is that, according to the theory, issuers of securities have no influence on the term structure once it is issued. This appears to contradict the negotiation process with central bank that actually occurs between borrowers and lenders in many financial markets. It is important to remember that no theory should be judged on the realism of its assumptions. The test of a theory is how well it explains "real world" relationships, and the theory enjoys some qualified empirical support. However, these criticisms have led to some theoretical modifications.

2.3 The Liquidity Premium Hypothesis

The belief that most investors find long-term securities to be riskier than short-term securities has led to the liquidity premium hypothesis. According to this theory, today's long-term rates reflect the geometric average of intervening expected short-term rates plus a premium that investors demand for holding long-term securities instead of a series of short-term, less risky investments. The liquidity premium hypothesis does not rule out the possibility of downward sloping yield curves, although some economists believe that it explains why they are less common (Hicks 1945, and Kessel 1965). If investors expect future short term rates to fall sharply, the expectations theory hold that a steeply downward sloping curve should be observed in the spot market. If investors also demand a premium for investing long term, the observed yield curve might still be inverted, but it would be more gently sloped than if determined by expectations alone.

2.3.1 Incorporating the Role of Lenders

Other theories of the term structure are distinguished from the pure expectations approach because they include a role for lenders in the determination of spot rates, and they discard the assumption of indifference between maturities.

The Modified Expectations reflect support for the idea that expectations of future rates do, in fact, determine today's yields (Smith 1960). As this argument goes, if interest rates are expected to rise in the future, lenders may wish to lend short-term to avoid locking in today's lower spot rates. Such a long-term commitment would not only prevent reinvestment of principal at the expected higher rates, but it also would subject lenders to capital losses, should they sell their investments before maturity. However, borrowers will wish to borrow long-term to avoid expected higher interest costs.

According to the theory, the common expectations of borrowers and lenders and their conflicting maturity preferences put pressure on long-term rates, producing an upward-sloping curve. Conversely, when all parties expect interest rates to fall, lenders wish to lend long, but borrowers prefer to roll over a series of short-term loans at progressively lower expected rates. This places upward pressure on short-term rates, resulting in an inverted term structure. Thus, the conclusions of the modified expectations theory are the same as those for the expectations theory. Expectations of rising rates produce an upward-sloping curve, whereas expectations of falling rates produce a downward-sloping relationship. The main difference between the theories is the motivations that determine spot rates.

2.4 The Segmented Markets Theory

Relying heavily on the existence of market imperfections, the segmented markets theory argues that there really is no term structure. The segmentation theory has gained especially strong support among market participants (Culbertson 1957). It suggests that different spot rates on long and short term securities are explained not by any common set of market expectations, or by a liquidity premium to induce lenders to switch from short to long term securities, but rather by separate demand/supply interactions in the financial markets. According to this theory, short term yields result from interactions of individuals and institutions in the short term market segment; the same is true of yields on long-term securities. Because laws, regulations or institutional objectives prevent many market participants from borrowing or lending in every segment, some maturities are of little concern.

One justification for the segmented markets theory is that it reflects the preference of financial institutions to match the maturities of their assets and liabilities. Commercial banks, for example, have traditionally concentrated on lending in the short-term markets while obtaining funds from depositors in that same segment of the market. Similar segmented demand/supply factors may affect long-term rates. Life insurance firms expect long-term payment inflows from customers and invest those funds heavily in instruments with long maturities.

2.5 The Preferred Habitat Theory

Closely related to the segmented markets theory is the preferred habitat theory. (Modigliani and Sutch 1966). It assumes that although investors may strongly prefer particular segments of the market, they are not necessarily locked into those segments. These strong preferences for certain maturities arise not from legal or regulatory reasons but rather, from consumption preferences. In other words, investors' time preferences for spending versus saving influence their choice among securities. They will lend in markets other than their preferred one, but only if a premium exists to induce them to switch. This argument differs from the liquidity premium theory in that it does not assume that all lenders prefer short-term securities to long term ones. There may well be lenders who prefer to lend for long duration but who can be induced to lend for short duration along with a yield premium, or vice versa.

CHAPTER THREE

EMPIRICAL LITERATURE REVIEW

3.0 INTRODUCTION

The chapter presents review of Empirical literature on the term structure of interest which continues to attract considerable research effort among academicians and although a lot has already been done, there are still glaring gaps in knowledge that ought to be addressed. A fact that necessitates this study. In about half of cases (including Sweden) they could not reject the expectations hypothesis data. USA and Australia are two countries where the expectations hypothesis could not hold for the data. On UK data, Macdonald and Macmillan (1994) do not find support for the expectations hypothesis. In the data from the US it is found that forward rates are worse predictors of future interest rates than the naive martingale method- that the future interest rates is the same as the interest rate today. The null hypothesis in most tests of the expectations theory is a joint hypothesis- that the expectations are rational, and that the interest rates differentials between different maturities depend on expected interest rate changes.

3.1 Studies on Liquidity Premium Hypothesis

Many researchers have concluded that investors also demand liquidity premiums, although they do not agree on the nature of these premiums (Gardner M.J. et al, 2000). The disagreement centers on whether the premium demanded by investors is affected by the general level of interest rates (i.e., whether the premium increases or decreases when rates are considered to be relatively high or low) and whether it is stable or rises monotonically with maturity. There is considerable evidence that the liquidity premium does vary with the general level of interest rates, but there is no agreement on whether the relationship is positive or negative (Nelson, 1972, Van Home 1965, Friedman 1979, and Dua 1991).

In other words, some research indicates that when rates are higher than normal, the liquidity premium required by investors is smaller than usual, whereas other results suggest that it is larger. The debate over the nature of the liquidity premium has implications for tests of the expectations hypothesis and for its usefulness as a forecasting model. Because it is difficult to determine the size and pattern of liquidity premiums, it is difficult to isolate an expected "pure" interest rate from a premium attached to it (Nelson 1972, Van Horne 1965, Friedman 1979, and Dua 1991).

Some research has suggested that liquidity premiums range from 0.54 percent to 1.56 percent but other studies have concluded that premiums are less than 0.50 percent even for long maturities. Researchers have even concluded that liquidity premiums decrease, rather than increase, with maturity (McCulloch (1975); Lee, Maness and Tuttle (1980) and Throop (1981))

3.2 Studies on Segmented Markets and Preferred Habitat

Research on the segmented markets theory and preferred habitat theory is extremely contradictory. Some researchers have reported findings of discontinuities in the yield curve, supporting the market segmentation theory; some have concluded that preferred habitat theory exist (Modigliani and Sutch (1966), Dobson, Sutch and Vanderford (1975), Echols and Elliot (1976); Roley (1981); and Heuson (1988))

In contrast, other studies, including those supporting the expectations theory and liquidity premium theory, argue that the financial markets function more efficiently than the segmented markets theory or preferred habitat theory recognizes. Investors are more willing to move funds back and forth between maturities to maximize returns than either of these theories implied (Modigliani and Sutch, 1966, Dobson, Sutch and Vanderford 1976, Echols and Elliot, 1976, Roley 1981, and Heuson, 1988)

Campbell and Shiller (1987) use their methodology to assess the empirical merit of the expectations theory of the term structure, an example of a present value model. In particular, they compare the evolutions of actual and theoretical long/short yield spreads. Under the expectations theory the long/short spread is a function of expected future one-period changes in the short rate, and Campbell and Shiller (1987) construct theoretical long/short yield spreads from VAR-based forecasts of future changes in short rates. Because actual and theoretical spreads move closely together over time for a sample that ends in 1978, Campbell and Shiller (1987) conclude that there is an important element of truth to the expectations theory as a model of US long-term interest rates.

Other research, however, has reported results less favourable to the expectations theory of the term structure. Hardouvelis (1984) employs the Campbell-Shiller (1987) methodology to study the relationship between short- and long-term US government yields from the mid-1950s to mid-1992. He concludes that there are large deviations of long rates from levels predicted by the expectations theory.

3.3 Studies in U.S.A

A large number of studies have tested the implications of the expectations theory of the term structure with long term interest rate data from the United States (Schiller et al 1983, Campbell and Shiller, 1984, 1991, and Fama and Bliss 1987). These studies report statistical rejections of the model. However, a more meaningful assessment of the merit of the theory might be based on an informal evaluation of the "fit" of the model. This is the approach taken by Campbell and Shiller (1987) in their study of monthly government bond yields. They find that although they are able to reject the implications of the expectations theory at a high level of statistical significance, the theory explains a very large proportion of the variance of 20-year/one-month interest rate spreads.

In a study, Hardouvelis (1984) employs the Campbell-Shiller (1987) methodology and finds the data less supportive of the expectations theory. He examined quarterly interest rate series and concludes that there are large deviations of 10-year/three-month yield spreads from their theoretical counterparts under the expectations theory.

A potential explanation of the different conclusions reached by Campbell and Shiller (1987) and Hardouvelis (1984) are that the studies examine different time periods. Campbell and Shiller (1987) examine the period 1959-78 while Hardouvelis studies the longer sample 1954Q3-1992Q2. Thus, anomalous behavior of interest rates outside the Campbell-Shiller sample might be responsible for the discrepancies between the two studies.

However, these attempts to reconcile the behavior of long rates with the predictions of the expectations theory of the term structure for samples that include the period of non-borrowed reserve targeting have been less than completely successful. Driffill (1992) shows that there are relatively large discrepancies between actual long rates and those predicted by the expectations theory, conditional on Hamilton's model for the evolution of short rates. Fuhrer's (1996) model also delivers theoretical long rates that differ substantially from the values predicted by the expectations theory. Thus, whether the behaviour of US long rates can be reconciled with the expectations theory of the term structure for samples that include the period of non-borrowed reserve targeting remains an open question.

The expectations theory of the term structure is perhaps the most popular model of fluctuations of the yield curve. Some may find this surprising, because numerous studies have rejected the model with formal statistical tests. However, as shown by Campbell and Shiller (1987), it is possible for the expectations theory to explain a large proportion of the variance of interest rate spreads, even if the model is rejected at standard levels of statistical significance. Indeed, Campbell and Shiller (1987) find that at least up to 1978, fluctuations of US long/short

interest rate spreads are in strong agreement with the predictions of the expectations theory, which suggests that reported rejections of the theory may not have much economic significance

Studies, which have examined the behaviour of US interest rates have had greater difficulty reconciling the behaviour of US long rates with the predictions of the expectations theory of the term structure. These studies find relatively large discrepancies between actual long rates and the levels predicted by the expectations theory (Hardouvelis 1984)

3.3.1 The relationship between forward and future interest rates in the Long term period

Fama and Bliss (1987) found that the yield curve from one to five years had substantial forecasting power for the change in rates over the following three or four years. For example they found that the difference between the forward rate on a one-year Treasury security (four years in the future calculated from the current four- and five-year rates) and the current one-year rate explains 48 percent of the variance of the 4-year change in the one-year rate. The finding and result of McCulloch (1987) are generally similar to those reported by Fama and Bliss (1987), although the explanatory power of the four-year rate change regression is smaller

Campbell and Shiller (1989) use the McCulloch (1987) data to test a different specification of the expectations theory in which the current spread between an n -period maturity rate (such as a five-year rate) and a shorter m -period maturity (one-year) rate forecasts a weighted average change of the m -period rate over the next $n - 1$ periods (4 years). They regress the weighted average change of the m -period rate on the current spread and get results similar to those of Fama and Bliss (1987). Specifically they found that the spread between the 4-year and 1-year rates and the spread between the 5-year and 1-year rates have significant forecasting power for the weighted average change in the one-year rate over the next 3 or 4 years. The studies surveyed above strongly reject the expectations theory, especially when the theory is tested with the standard regression using three and six month or six and twelve month rates

3.3.2 Factors that determine the relationship between yield and maturity (the yield curve) in the money market.

What determines the relationship between yield and maturity (the yield curve) in the capital market? A resurgence of interest in this question in recent years has resulted in a substantial body of new research. The focus of much of the research has been on tests of the 'expectations theory'. According to the theory, changes in the slope of the yield curve should depend on interest rate expectations. The more market participants expect

rates to rise, the more positive should be the slope of the current yield curve (Cook, Timothy and Thomas Hahn 1988)

The expectations theory suggests that variation in the slope of the yield curve should be systematically related to the subsequent movement in interest rates. Much of the recent research has focused on whether this prediction of the theory is supported by the data. A surprising finding is that parts of the yield curve have been useful in forecasting interest rates while other parts have not (Cook et al, 1988).

A novel and interesting aspect of some of the recent literature is its emphasis on the possible role of monetary policy in explaining the behavior of the yield curve. A key paper in this area Mankiw and Miron (1986) for example, argues that the persistence of changes in the federal funds rate engineered by the Federal Reserve (Fed) helps explain why the yield curve from three to six months has had negligible forecasting power in the U.S.

3.3.3 Monetary Policy Effect on the term structure of interest rates

While the Mankiw-Miron (1986) hypothesis can help explain the absence of forecasting power of the yield curve from three to twelve months, it is inconsistent with the evidence that the yield curve up to three months and from one to five years had forecasting power. One can pose a more general version of the monetary policy explanation that is consistent with this evidence, and, we believe, more in line with the way market participants actually view monetary policy.

The Mankiw-Miron (1986) hypothesis assumes that the Federal reacts continuously to new information affecting its policy decisions, whereas in practice Federal policy changes are of a more discontinuous nature. That is, changes in the Fed's target for the funds rate typically occur infrequently after they are triggered by the cumulative weight of new information on economic activity and inflation. Consequently, at times there is a gap between the release of new information influencing policy expectations and when policy actually changes. This information could take the form of a policy announcement—such as a discount rate announcement—which signals an upcoming change in the funds rate target. It could alternatively take the form of news on an economic variable—such as the money supply or employment—that is viewed by market participants as likely to influence the Fed's target for the funds rate.

If policy and news announcements affect expectations of changes in the funds rate over a relatively short term, then the slope of the bill yield curve out to three months will vary more in response to changing interest rate

expectations than will the slope from three to twelve months. In this case the reaction of market participants to such announcements could generate a pattern of funds rate expectations that is consistent with the regression results.

Hegde and McDonald (1986) found that Treasury bill futures rates have substantially outperformed a no-change forecast from one to four weeks prior to delivery even though they have not been superior to a no-change forecast from five to thirteen weeks prior to delivery. This evidence is consistent with the hypothesis that market participants are at times able to forecast rate changes over the near-term and build these expectations into the yield curve.

3.3.4 Effect of Market participants on the term structure of interest rates.

A second modification one could make to the Mankiw-Miron (1986) hypothesis notes that funds rate target changes are persistent (i.e., not quickly reversed) but not permanent. If that is the case, and market participants expected this type of funds rate behavior, then increases in the funds rate target would be associated with decreases in the slope of yield curve between short-term rates and rates on longer maturities of five to ten years, and changes in this slope would have some forecasting accuracy. Of course, the evidence from the survey data that market participants expected large declines in interest rates three and six months in the future in these episodes is inconsistent with the Mankiw-Miron (1986) hypothesis that market participants always forecast small changes in rates at the three- and six-month horizons. These episodes constitute a relatively small part of the period covered by the survey data, however, they may be unique to this era. It may be that over the longer period studied by Mankiw and Miron (1986) the generalization, that expected changes in interest rates at the three- and six-month horizons are generally small, is an accurate one.

3.3.5 The difference and relationship between long and short term interest rates.

One type of explanation for the positive average premium in the bill market focuses on the preferences of individual investors. Hicks (1945) argued that investors have a preference for shorter-term securities because of the greater price volatility of long-term securities when interest rates change. In contrast, he reasons that many borrowers have a preference for long-term borrowing. Hence, there is a framework on the long term investments market such that in equilibrium investors have to be offered a premium to invest in longer-term securities. In a similar vein, Kessel (1965) argued that the market has a preference for shorter-term securities because of their greater liquidity. "The shorter the term to maturity of a security, the smaller is its vulnerability to capital loss, and hence the greater its liquidity and the smaller the yield differential between that security and

money' (Kessel 1965)

3.4 Conclusion on Empirical Studies

Since the mid-1980s, several new formulations models of the term structure have emerged. Although still in their formative stages and yielding conflicting results in empirical tests, these models are gaining support in some circles at the expense of the expectations theory and its modifications. The models have by no means supplanted the more traditional theories, however. Best known of the new models is the work of Cox, Ingersoll, and Ross (1985). Their model bears some similarity to the expectations theory in that it, too, recognizes the influence of interest rate expectations. The newer approach, however, focuses on the factors determining those expectations, such as inflation, uncertainty, and productivity.

Researchers continue to explore adjustments, applications of, and empirical verification of the new models, although their complexity has made empirical testing difficult. Experts agree that investigation of these term structure theories will continue to be a fertile area of research. A fact that necessitated this study. Research on the expectations theory increasingly reflects globalization of financial markets. Scholars have noted that investor's expectations may be directed not only toward rates in their home country but also toward rates in other financial markets in which they customarily interact. Thus, some recent studies have tested the expectations theory on contemporaneous data from several countries. Although the evidence by no means supports a definite conclusion that long-term rates in one country reflect expectations of short-term rates in other countries, this avenue of term structure research will undoubtedly be continued in the next decade (Belongia and Koedik 1988; and Kool and Tantom 1988).

CHAPTER FOUR

FINDINGS, DISCUSSIONS AND CONCLUSION

4.0 INTRODUCTION

The objective of this study was to establish the difference and relationship between long term and short term interest rates, the effects of monetary policy and market participants on the term structure of interest rate and to what extent the forward interest rates that are implicit in the term structure can be used as a forecast of the future interest rates. This chapter discusses the finding from the empirical literature, highlights the knowledge gap identified and points the direction for further research and finally draw the conclusions of the Independent Study Paper.

4.1 Findings and Discussions.

The primary objective of this study was to review systematic evidence as to what extent forward interest rates that are implicit in the term structure can be used as a forecast of the future interest rates that is, it tests what is known as the expectations hypothesis of the term structure of interest rates (EH). It is noticed that the findings of Modigliani and Shiller (1973), Shiller (1979), Shiller, Campbell and Schoenholtz (1983), Friedman (1979), Fama (1984), Mankiw (1986) and Campbell and Shiller (1987), do not support EH, for the US market. Gerlach and Smets (1997) tested the EH for 17 countries at the short end of the maturity structure and found that in majority of cases they could not reject the EH. The countries where EH was accepted include Belgium, France, Germany, Italy, Spain, Sweden, Netherlands, Japan, Canada, Turkey, Ireland, Denmark and South Korea. While countries where EH was rejected included USA, UK, Australia and Switzerland.

The great diversity and differences in EH findings from different countries data is explained by different monetary and exchange policies adopted by different countries, the disparity and deviation of tested country data and the statistical test methodology for analyzing the data differed across the countries. Gerlach and Smets (1995) revealed that the acceptance or rejection of the EH depended on the government monetary and exchange rate policies, as well as the prevailing economic environment.

United States of America and Austria are two countries where the EH does not hold. On UK data, MacDonald and Macmillan (1994) do not find support for the EH. In data from the USA, it is often found that forward rates are worse predictors of future interest rates than the naive martingale method - that the future interest rate is the same as the interest today. The null hypothesis in most tests of the expectations theory is a joint hypothesis - that the

expectations are rational, and that the interest rate differentials between different maturities depend on expected interest rate changes

Part of the recommendation of this paper is that a detailed study of the reasons of the differences in findings of EH results would be the subject of the Ph D research proposal, which the researcher intends to develop from this independent study paper

The limited research evidence available in Kenya on the term structure indicates that there is great concern by stakeholders in the issue of interest rates determination, volatility and forecast. Ngugi (1998) undertook an analysis of the interest rate spread in Kenya. Her findings were that interest rates spread increased in the post liberalization period because of high intermediation cost implying presence of inefficiency in the banking sector. The increase in spread stemmed from the failure to meet the prerequisites for successful financial reform. Another study by Ndung'u and Ngugi (2000) used Ngugi's (1998) findings in deriving the optimum interest spread. The study analysed factors behind the widening interest spread following interest rate liberalization in Kenya. Their findings show that market fundamentals and institutional impediments influenced interest rate spread. However, no attempt has been made to determine the question of the term structure based on the above variables.

It is in this spirit that one must view a wide spread attempt to verify with new data the Meiselman (1962) hypothesis that interest rate expectations are subject to error learning. Meiselman tried to show that the implicit forward rates that can be calculated from the empirical term structures really are anticipated future interest rates. To accomplish this, he postulated an error learning mechanism that described how expected rates would change systematically with the receipt of new information. Since the implicit rates of the empirical yield curves changed overtime in a manner consistent with this theory, Meiselman interpreted his results as confirming the expectation theory. As the first study to provide firm empirical support for the expectations theory, his work was greeted with both awe and skepticism.

One of the modifications of the expectations hypothesis was proposed by Hicks (1945) and is known as the liquidity preference or liquidity premium theory. The theory asserts that investors are influenced by expectations of future interest rates, but that they are risk averse with respect to changes in these rates. Hence, they prefer to hold short term 'liquid' assets unless a premium is included in the return on long term securities. Consequently, even if future interest rates are expected to be equal to those in the present, investors would not hold long-term securities. Therefore, the price of long-term securities would fall (their yields would rise) until investors are prepared to hold bonds of all maturities.

Of course, it is possible to simply define the term premium as the difference between expected future rates and current forward rates. However, a testable theory requires that a priori restrictions are imposed on the pattern of term premia. Hick's (1946) theory postulates that term premiums are positively related to the length of the term to maturity: the return on long-term bonds includes a larger premium than the return on medium-term bonds.

The preferred habitat theory by Modigliani and Sutch (1966) is a refinement of the liquidity preference theory that allows for differing preferences of lenders and borrowers with respect to the maturity of the bonds they hold or issue. Some investors, (e.g. pension funds), may be less influenced by liquidity considerations and prefer to hold long-term securities. The theory was proposed in Modigliani and Sutch (1966) and further developed in Modigliani and Shiller (1973). The main implication of the theory is that the stocks of bonds, and the demands to hold them, also influence the term structure of interest rates. If the differentials in bond prices are large enough then investors may choose maturities different from those which they most prefer, but they have to be offered an incentive to do so. An extreme version of the theory - the segmented market hypothesis by Culbertson (1957) asserts that there is no relation between long and short term interest rates because the demands and supplies in one market are independent of interest rates in the other. This extreme version appears to be one that is clearly rejected by the empirical evidence.

4.2 Knowledge Gaps Identified in the Study.

The empirical studies mentioned above show that there is great diversity and differences in findings from different countries' data. The reasons for such variations and differences have not yet been established and no serious attempts have been made in previous research works to identify them. In addition it will be interesting to find out whether this variation in findings across countries can be reflected in their monetary policy decisions. There is ample theoretical support from the literature review so far regarding the support of the expectation hypothesis. However this has not been confirmed empirically. Further study is clearly needed to provide the empirical evidence on the term structure of interest rates. Although some studies found that the expectation hypothesis holds other studies find no support for the same. Clearly more evidence is required to assess the impact of the expectation hypothesis of the term structure of the interest rates, which motivated the current study. In addition, although Meiselman (1962) hypothesized that interest rate expectations are subject to error learning, Meiselman tried to prove that the implicit forward rates that can be calculated from empirical term structures really are anticipated future interest rates. Meiselman interpreted his results as confirming the expectation theory. This being the first study to provide firm empirical support for the expectation theory, the findings need to be verified with new data. It is necessary therefore to examine and verify with new data the Meiselman (1962) hypothesis that interest rate expectations are subject to error learning, from Kenyan financial markets.

4.3 Conclusion

As reviewed through the theoretical and empirical literature it is evident that we have mixed result findings of the studies on the term structure of interest rates both in UK US and other European countries. The scanty evidence available in Kenya on interest rates is also not specifically related to the term structure of interest rates.

It is from the foregoing that the researcher intends to develop this independent study paper to a Ph D research proposal and carry out an **EMPIRICAL STUDY OF THE TERM STRUCTURE OF INTEREST RATES IN KENYA (1989 -2006)**

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