*EFFICIENCY OF FOREIGN EXCHANGE MARKET IN KENYA: THE RATIONAL EXPECTATIONS APPROACH

BY





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Declaration

This research project report is my original work and has never been presented for a degree in any other university.

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Dedication

I dedicate this research report to my dear husband, loving daughters, my dad and my siblings for being supportive during the time of my studies.

Acknowledgement

I would like to acknowledge the support, advice and tireless efforts of my supervisor Mr. Kisaka Sifunjo in the supervision during my research work and in writing of this research project report.

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Abstract

The aim of this study was to establish the efficiency of foreign exchange markets in Kenya using the rational expectations approach. The study was based on the null hypothesis that the economic agents are rational. Assuming that market participants are rational, the expected change in the exchange rate should differ from the actual change only by a rational expectations forecast error. Historical data for the monthly (average) spot exchange rate and the three-month forward premiums for the Euro, the Sterling Pound, the US Dollar, and the two East African currencies were obtained from the Central Bank of Kenya based on all banking institutions that actively engage in foreign exchange rates were expressed in Kenya Shillings (Kshs) per unit of foreign currency. The US monthly averages for the 91-Day T-BILL rates were used in computing the forward rates for each of the currencies.

The key findings revealed that the forward rates are not unbiased predictors of the future spot rates for the Euro, the Sterling Pound, the US Dollar, the Uganda Shilling, and the Tanzanian Shilling. Secondly, the findings established that the participants in the foreign currency markets in Kenya are not risk-neutral and are not rational; a phenomenon that was reinforced by the presence of auto-correlations. The results of the study were consistent with the hypothesis that the forward exchange rates are not unbiased predictors of the future spot rates. This agreed with previous empirical works (Frankel, 1980; Fama 1984; Bekaert and Hodrick, 1993) which rejected the

efficient markets hypothesis under risk-neutrality on the basis of regressing the applicable model for various currencies.

Under the presence of efficiency in the foreign exchange market, the forward exchange rate should be an unbiased predictor for the future spot rate. The rejection of the efficiency hypothesis implies the presence of unexploited profit opportunities for those who participate in exchange rate transactions in the Kenyan FOREX markets. In other words, the general conclusion emerging from the extensive empirical analysis is that the forward exchange rate is not an unbiased predictor of the future spot and the presence of a risk premium is apparent. The failure of the currency markets to be 'weak form' efficient also indicates that not all price information is fully reflected in currency prices, thus implying that the current price changes cannot be predicted from past prices. As a result, the participants in the FOREX markets in Kenya conduct their transactions on the basis of speculation rather than on prediction of future market behaviour based on the past or current performance of respective currency markets.

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List of Abbreviations and Acronyms

ADF	*	Augmented Dickey-Fuller
СМА	• •	Capital Markets Authority
ЕМН	:	Efficient Market Hypothesis
JCIF	0 0	Japan Center for International Finance
FOREX	0 4	Foreign Exchange
K-S	8 9	Kolmogorov-Smirnov
MMS	8 9	Money Market Services
NSE	•	Nairobi Stock Exchange
SSA	•	Southern Sahara African
UIRP	*	Uncovered Interest Rate Parity
UON	:	University of Nairobi
VAR	*	Vector Auto Regression

CHAPTER ONE

1.0 INTRODUCTION

1.1. Background to the study

1.1.1. Efficient market hypothesis

Using a very broad definition, a market is considered to be efficient if absolute price movements do not alter relative ones and if all markets are in equilibrium at current values. In other words, under efficiency conditions, monetary variables do not affect real ones and the economic system is dichotomous (Canale and Napolitano, 2001). The classic definition of an efficient market is due to Fama (1970), and is a market where prices fully reflect the information available, such that an unusual profit cannot be earned through exploiting this information set. In this case, decisions taken on the basis of these prices will promote the efficient allocation of resources (Levich, 1985).

Fama deduced three forms of market efficiency depending on how much information is used in forming expectations about the future price. They include 'weak form' efficiency; the 'semi-strong form' efficiency; and the 'strong form' efficiency. The 'weak form' efficiency of the EMH asserts that all price information is fully reflected in asset prices, in the sense that current price changes cannot be predicted from past prices (Fama, 1970). Security prices therefore fully reflect the information contained in past price movements hence they do not follow patterns which repeat and it is not possible to trade profitably purely on the basis of historical price information. The semi-strong form efficiency asserts that a market is efficient in the semi-strong form if excess returns from trading rules based on publicly available information. The strong form efficiency asserts that a market is efficient in the strong form if security prices fully reflect all relevant information whether it is publicly available or not. In such case, no investor can earn excess returns using any information (not even using insider information) [Fama, 1970].

If foreign exchange markets are efficient, the spot or forward exchange rates should embody all relevant information, and they should not be able to forecast the spot or forward exchange rate as a function of another. Also the forward rate should be an unbiased predictor of the future spot rate assuming risk neutrality and a covariance stationary risk premium.

The traditional tests of the foreign exchange market efficiency hypothesis, EMH, are therefore based on a linear projection of the forward rate on the future spot exchange rate. To circumvent the non-stationarity problem in this estimation procedure, Froot and Frankel (1989) use the forward premium as the regressor and the exchange rate differential as the regressand. As shown in Liu and Maddala (1992a), this adjustment can lead to inconsistent estimate of the slope coefficient because the forward rate is correlated with the risk premium. Liu and Maddala suggest therefore regressing the forward premium on the exchange rate differential when both series are stationary. However, this approach can exhibit finite sample bias due to the presence of an endogenous regressor. Whether the small sample bias is large enough to result in rejection of the EMH even when it is true remains to our knowledge an open empirical question. In its simplest form, market efficiency in foreign exchange markets can be presented as a joint hypothesis that participants in the foreign exchange market are (1) rational and (2) risk-neutral. Empirical studies of the efficiency of the foreign exchange worldwide shows that it is not efficient (Canale and Napolitano, 2001; Atingi and Kaggwa, 2003). No consensus exists at the moment concerning the actual behaviour of the exchange rate markets. For instance, different markets may be characterized by different statistical distributions. Several reasons have been advanced to explain the failure of the EMH but none has passed the empirical tests (Fama, 1991), including the studies conducted about the efficiency of the foreign exchange market in Kenya. This study used the rational expectations approach to test the efficiency of foreign exchange markets hypothesis in Kenya.

1.1.2. Rational Expectations

The rational expectation assumption, based on Muth (1961), argues that economic agents form expectations about future events. These expectations are rational in the sense that they combine all the available information and therefore do not lead to systematic forecasting errors. The implication of the rational expectations hypothesis is that policies will only be effective when they produce surprises. By definition, this is not possible in the long run since rational economic agents will detect any policy rule and will therefore no longer be surprised. This is also known as the 'irrelevance hypothesis'. This view has been applied to several policy instruments, most of the time - monetary policy; the core arguments are, however, also relevant to fiscal policy and taxation. Normally, rationality is defined in terms of two criteria: (1) whether the expected exchange rate is an unbiased predictor of the future spot exchange rate (unbiasedness); and (2) whether the expected exchange rate fully incorporates all

available information (orthogonality). The tests of rational expectations reported in the literature are also based on these two criteria.

1.1.3. Foreign exchange markets in Kenya

Since the 1970s after the breakdown of the Fixed Exchange Rate Bretton Woods System, the major currencies (the US Dollar, EURO and others) float freely. Encouraged by the Bretton Woods institutions, many countries (Kenya included) adopted transitional systems toward unified, market determined and convertible exchange rates.

Following the repeal of the Exchange Control Act in 1995 and the licensing of foreign exchange bureaus, there has been witnessed some vibrancy in Kenya's foreign exchange market (Kurgat, 1998). In the period prior to 1995, Kenya maintained restrictions on foreign exchange currency transactions. However, Kenya currently pursues a floating exchange rate regime, in which market forces of demand and supply interplay to determine the exchange value of currencies. Indeed, as proposed by Friedman (1953), because speculators buy low and sell high, their activities ensure that exchange rates reflect the fundamental determinants of currency values. The major participants in the foreign exchange market in Kenya are commercial banks and foreign exchange bureaus. Other participants such as corporations, institutional investors, and seldom also individual persons usually have to contact their bank or broker in order to obtain foreign currencies. Efficiency of foreign exchange market in Kenya has not been widely tested. Few studies have been carried out on the efficiency of foreign exchange market in Kenya. The findings have favored the conclusion that the foreign exchange market in Kenya is inefficient due to existence of arbitrage opportunities.

1.2. Problem Statement

The market efficiency hypothesis formulation has two major problems: i) the interpretation associated with the rejection of market efficiency and ii) the ambiguity in constructing alternatives to the null hypothesis of efficiency. These problems arise since failure to find evidence in favour of the null hypothesis may imply either a rejection of the information set (probably on the assumption that agents are rational but have the wrong model) or that the information set has all the relevant information but agents are not using the available information and hence irrational (Atingi and Kaggwa, 2003).

Local studies carried out on efficiency of foreign exchange market in Kenya i.e. Ndunda (2002), Kurgat (1998) and Muhoro (2005) have looked at efficiency from the basis of profitability of simple trading rules. Ndunda (2002) tested whether forward exchange rates are predictors of future spot rates in Kenya. In her study, Ndunda focused on the foreign exchange market under floating exchange rate for the period between October 1993 and December 2002. The data involved comprised of weekly spot exchange rate and the three-month forward exchange premium for the US dollar, the UK sterling pound, the Swiss Franc, the Euro, and the Japanese Yen. Her study was based on the model by Hansen & Hodrick (1980). The hypothesis that the forecast error is uncorrelated with information available at a certain time was tested using ordinary least squares regression. She established that the forward rate is not a good predictor of the future spot rate, which led to the conclusion that the foreign exchange market in Kenya is inefficient as the rate of return to speculation is not equal to zero. Kurgat (1998) carried out an empirical study of the spot markets' efficiency on foreign exchange bureaus in Kenya where he pointed out the inefficiency of the Kenyan foreign exchange market due to the existence of arbitrage opportunities. He showed that there was an opportunity to make instantaneous risk free profits through locational arbitrage. The study established that the foreign exchange markets in Kenya are not efficient.

Seven years later Muhoro (2005) carried out a similar study using locational and triangular arbitrage models. The study involved secondary data in the form of daily closing counter foreign exchange rates of the Kenya shilling against two currencies; the Euro and US dollar for six banks and fifty-seven bureaus for the year 2003. The researcher used the Chi-square as a test of goodness of fit and descriptive statistics in her data analysis. The study established that the FOREX market was inefficient due to many cases that arbitrage opportunities occur in the market. According to Muhoro (2005), higher profits could be made by carrying out a triangular arbitrage transaction rather than carrying out a locational arbitrage transaction in both banks and bureaus. It therefore appeared that currencies are not efficiently priced against one another.

The above local studies considered efficiency of foreign exchange market in Kenya from the arbitrage perspective i.e. profitability of simple trading rules. This is just one of the ways through which efficiency of foreign exchange market can be tested. Presence of risk premium, rationality of participants' behavior, presence of over/under reaction in the market, inefficient information processing can also be used to test EMH. This study will look at efficiency of foreign exchange market in Kenya from the rational expectations approach. The local studies carried out were limited in the sense that the assumptions of normality, stationarity of data, and constant variance were not accounted for in the research models used. These assumptions need to be satisfied so that the estimated value of regression constants can be shown to be accurate. Prior research on efficiency of foreign exchange markets provide evidence that spot rates and forward rates are non-stationary and follow unit root processes. Failure to account for these assumptions may therefore put in doubt the studies' results and hence the conclusions arrived at by the researchers. This study will therefore go further to fill these gaps by testing for constant variance, normality distribution of error terms, as well as the stationarity of the time series data to be used.

The choice of rational expectations approach has also been motivated by the implication irrational participants in foreign exchange markets has on modern businesses. If participants are not rational, the error term will not be equal to zero. This may lead to wrong pricing of derivative products in the market which will in turn affect the cost of hedging and hence cost of doing business will be affected. The study was based on the null hypothesis that the economic agents are rational. Assuming that market participants are rational, the expected change in the exchange rate should differ from the actual change only by a rational expectations forecast error. The following research questions guided the study:

- 1. Is the current expected forward rate an unbiased predictor of the future spot exchange rate?
- 2. Does the expected exchange rate fully incorporate all available information?

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1.3 Objectives of the Study

The aim of this study was to establish:

- Whether the current expected forward rate is an unbiased predictor of the future spot exchange rate and;
- 2. Whether the participants in the foreign currency market in Kenya are rational and hence expected exchange rate fully incorporates all available information.

1.4 Importance of the Study

Since the collapse of the Breton Wood systems, most of the major exchange rates have been allowed to float freely for the longest period of time in recent economic history. Many smaller banks have as a result adopted policies of pegging their exchange rates to major foreign currencies. The findings of the study therefore provide a rationale for examining the exchange rate management systems in Kenya. In particular, the study will benefit the following:

- (i) Investors: The study seeks to inform investors on the rationality of transacting businesses in foreign currency, as opposed to local currencies and further advice on the risks related to either of the approaches.
- (ii) Financial institutions: This study will seek to inform financial institutions in developing of policies to advise their clients against the effects of unstable exchange rates especially in cases where business transactions are conducted in major foreign currencies.

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- (iii) The government, through the Central Bank of Kenya in formulating of guidelines towards the management of foreign exchange rate market and associated currency risks.
- (iv) Researchers and Academicians: The study forms a basis for future researchers and academicians who may be conducting research on efficiency of financial markets and in the development of Efficiency Markets Hypothesis (EMH) considering it has gone through a paradigm shift over the years.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1. Introduction

This chapter reviews the literature on rational expectations in the foreign exchange markets. Empirical tests from the literature are generally unfavourable to the hypothesis that exchange rate expectations are rational in terms of both unbiasedness and orthogonality. Except for certain time periods and horizons, survey expectations are shown to be biased predictors of future exchange rates, and the forecast errors are correlated with some variables that are known to be in the set of information available when the expectations are formed. Given the extraordinary nature of some sample periods, however, the rejection of the rationality hypothesis may be saying more about the peculiarity of actual exchange rate movements than the nature of exchange rate expectations.

The chapter is organized as follows: section 2.1 is the introduction; section 2.2 covers the efficient market hypothesis; section 2.3 is a review on efficiency of foreign exchange markets; section 2.4 covers the relationship between rational expectations and efficient markets; section 2.5 reviews the testing of foreign exchange markets' efficiency; section 2.6 reviews empirical evidence on FOREX market efficiency; section 2.7 reviews empirical evidence on FOREX market efficiency in Kenya; and finally section 2.8 gives the chapter summary.

2.2. Efficient Market Hypothesis (EMH)

Fama (1970) deduced different forms of efficiency of a market (i.e. weak form, semistrong form and strong form efficiency) depending on how much information is used in forming expectations about the future price. The various forms of efficiency are tested using the methodology outlined below.

2.2.1 Weak form Efficiency

Tests for 'weak form' market efficiency have normally been based on the predictive power of the forward rate for the future spot rate (Swarna, 1994). The test is to determine whether the forward rate is an unbiased predictor of the future spot rate in a foreign exchange market. The procedure is specified as follows:

 $Ln S_{i+1} = \alpha + \beta Ln F_{i+1} + \mu_i \qquad (1)$

Where:

 S_{t+1} is the three-month future spot rate

 F_{i+1} is the calculated forward rate at time t for delivery at time (t+1)

 β is the relationship between S_{t+1} and F_{t+1}

The test for efficiency in Equation 1 relates to testing the null hypothesis $\alpha = 0$ and $\beta = 1$

In the cases where the forward market is not very active in the foreign exchange market, the few agents that undertake these transactions base them on the interest rate differentials between the local and foreign interest rates. The forward rate F_t is therefore computed as follows:

$$F_{t} = S_{t} * \frac{1+i_{h}}{1+i_{0}}$$
(2)

Where:

WAYFREENY OF MARKEN

- i_h is the local interest rate
- i_0 is the foreign interest rate
- S_i is the spot rate at time t

2.2.2 Semi- Strong Form Efficiency

The "Semi-strong" form of EMH requires that current price incorporates all publicly available information, including its own past prices (Fama, 1970). Semi-strong form efficiency is perhaps the version of efficiency closest to the rational expectations hypothesis since it is assumed that economic agents know the true model of the economy and use all publicly available information in forming expectations. Geweke and Feige (1979) distinguished two categories within the semi-strong form of market efficiency: (a) single-market efficiency where all publicly available information concerning a single exchange rate is contained in the information set; and (b) multimarket efficiency where information on all other exchange rates and all available economic information is included in the information set.

2.2.3 Strong Form Efficiency

For the 'strong' form of the EMH, the literature suggests that there should be cointegration between future spot and forward rate series. The Engle-Granger (1987) bivariate two-step co-integration regression procedure is applied. The reverse regression from Equation 1 above is specified as in equation (3) below:

 $Ln F_{i+1} = \alpha + \beta Ln S_{i+1} + \mu_{1i}$ (3)

The direct regression specified in Equation 1 and the reverse regression in Equation 3 are conducted to determine whether the foreign exchange market is characterized by strong form efficiency. Co-integration tests involve establishing whether the stochastic trends in future spot and forward rate series have long-run relationship.

This is accomplished by testing whether the residuals of co-integration regressions are stationary by applying the Augmented Dickey-Fuller (ADF) unit root tests (Dickey and Fuller, 1979). The co-integration equations are of the form shown in equations (1) and (3). μ_{μ} and μ_{μ} are the residuals to be tested for stationarity. If the computed ADF are found to be greater than the critical values (5% and/or 1%), the null hypothesis of existence of co-integration between the future spot and forward rate series will be rejected, and accepted otherwise.

2.3. Foreign Exchange Market Efficiency

The classic definition of an efficient market is due to Fama (1970), and is a market where prices fully reflect the information available, such that an unusual profit cannot be earned through exploiting this information set. In this case, decisions taken on the basis of these prices will promote the efficient allocation of resources (Levich, 1985).

More formally, expressing market equilibrium in terms of equilibrium returns, consider the following definition of the excess return Z_{t+1} in the context of foreign exchange markets:

$$Z_{t+1} = \Delta S_{t+1} - E \left(\Delta S_{t+1} / \Psi_t \right) \dots (4)$$

Where ΔS_{t+1} , is the actual one-period percentage change in the spot exchange rate (or more precisely, the change in the log of the exchange rate); and the second term E $(\Delta S_{t+1}/\Psi_t)$ is the expectation at time t, given the market information set Ψ_t , of the equilibrium percentage change in the spot exchange rate. A currency market is said to be efficient, given the information set, when the difference between these two terms in equation (1), or the excess returns series Z_{t+1} , is a "fair game" (or martingale difference - LeRoy, 1989). This implies the series Z_{t+1} has an expected value of zero and is unforecastable given Ψ_t (i.e. the excess returns are independent of any information dated t or earlier in Ψ_t , especially St-i, for $i \ge 0$). Clearly there will be no systematic large profits or losses in such a market. Note that where there are positive information and trading costs, the definition implies that deviations from a fair game in equation (4) will be within transactions and trading costs (Fama, 1991).

2.4. Rational Expectations and Efficient Markets

The crux of the argument in analysis of efficiency of financial markets changed with the incorporation of the theories of rational expectations put forward by Muth (1961) and efficient markets developed by Fama (1970) in the Fisher hypothesis. While Fisher argued that past changes in the price level became embodied in the current rate of interest, Fama (1975) argued that future price changes were reflected in the current rate of interest. This was interpreted by Fama as evidence of an efficient market. This approach rejected Fisher's conclusions of a distributed lag structure in the formation of expectations. Instead, it assumed that rational forecasters would use all available information in forming price expectations.

Using data for one-month Treasury bills to approximate interest rates and the rate of change in the consumer price index to approximate price changes, Fama(1975) tested the joint hypothesis that the U.S Government Treasury bill market was efficient and that the real return on one-to-six month Treasury bill was constant within a rational expectations framework. Fama computed sample autocorrelations of the expected change in purchasing power and real return for lags from 1–12 for the period January 1953 to July 1971. The estimated sample autocorrelations of the real return were

large, indicating that past rates of change in the real return contained information about expected future rates of change. The sample autocorrelations of the real return were insignificantly different from zero, consistent with the hypothesis of a constant real return. Tests were also carried out for longer-term maturities for up to six months. Results for all maturities indicated that the market used all the available information about the rate of inflation in setting nominal rates of interest, thus supporting the efficient market hypothesis.

Fama's findings were subsequently challenged by Hess and Bicksler (1975), Carlson (1977), Joines (1977), and Nelson and Schwert (1977). Carlson (1977), using Livingston data on the CPI for the period 1953–1971, rejected Fama's findings that short-term interest rates were efficient predictors of subsequent rates of inflation. Carlson introduced a business cycle variable to Fama's regression equation, which was represented by the ratio of employment to population, lagged by six months. With the incorporation of this variable, the coefficient on the interest rate in Fama's model was found to deviate significantly, which led Carlson to conclude that information about inflation that was not fully incorporated in interest rates was reflected in this ratio.

Joines (1977) observed a seasonal pattern in the forecast errors of the rate of price inflation used by Fama, which he pointed out, was inconsistent with the concept of market efficiency leading him to question the accuracy of the price data used by Fama. Nelson and Schwert (1977) and Hess and Bicksler (1975) employed a Box-Jenkins approach to construct a time series predictor of inflation, based on past rates of inflation. The regression of the rate of inflation on the rate of interest and the estimated rate of inflation yielded a non-zero coefficient for estimated inflation, indicating that the forecast contained information about the rate of inflation not embodied in the rate of interest.

With the incorporation of rational expectations and efficient markets in the Fisher hypothesis, it was believed that the time series in question should approximate a random walk in an efficient market (Arusha, 2002). The random-walk model requires that changes in past rates of inflation and interest rates be uncorrelated with all prior information. This was is in sharp contrast to the distributed lag effect in expectations formation, which implied that inflation rates were highly and positively correlated. Although the studies of Hess and Bicksler (1975), Carlson (1977), Fama and Gibbons (1984) suggested that when expected real returns were assumed to display a unit root, Treasury bill rates were good predictors of inflation, no explicit tests for unit roots were carried out by them.

Normally, rationality is defined in terms of two criteria: (1) whether the expected exchange rate is an unbiased predictor of the future spot exchange rate (unbiasedness); and (2) whether the expected exchange rate fully incorporates all available information (orthogonality). The tests of rational expectations reported in the literature also correspond to these two types.

2.4.1. Unbiasedness

According to Shinji (1991), unbiasedness is an important aspect of the rationality of exchange rate expectations. The use of survey data allows direct testing of the hypothesis that the expected spot exchange rate for period t + j (formed in period t) is an unbiased predictor of the future spot rate (in period t + j)

 $S_{i+j} = \alpha + \beta E_i S_{i+j} + \mu_t \quad \dots \tag{5}$

Where the survey expectation $E_i S_{i+j}$ is free from the presence of a risk premium, and μ is a random error term. Tests of the unbiasedness of exchange rate expectations would involve tests of the hypothesis of $\alpha = 0$ and $\beta = 1$, when equation (5) is estimated, usually in first-difference form.

Dominguez (1986) and Ito (1990) regressed actual depreciation on expected depreciation using Money Market Services and Japan Center for International Finance, respectively, for different time horizons and for different dollar exchange rates. For the earlier period (1983- 85), Dominguez almost unanimously rejected the joint hypothesis of $\alpha = 0$ and $\beta = 1$ for one-week, one- month, and three-month expectations for all currencies. The negative estimates of b₂ for some exchange rates from Dominguez's findings suggested that the forecasts missed the direction of exchange rate movements. Moreover, the estimate of b₂ was below unity in many cases, implying the tendency of forecasters to over predict the size of future dollar depreciations. For the later period (1985-87), however, Ito (1990) could not reject the joint hypothesis except for the six-month expectation. The difference between the two studies may reflect the extraordinary nature of the effects of the sample period used. The period studied by Dominguez was one in which the U.S. dollar continued to appreciate on a sustained basis despite expectations to the contrary. Given the extremely low values of R² in all of these studies, only a small portion of actual exchange rate changes was predicted in practice. The exact outcome of empirical tests of the unbiasedness hypothesis is thus likely to depend on the sample used.

2.4.2. Orthogonality

Orthogonality is another important aspect of the rationality of exchange rate expectations (Shinji, 1991). If expectations are to be efficient (in the sense that they incorporate all available information), their predictable power cannot be improved by inclusion of any variable that is already in the set of information available at the time when the expectations are formed. That is to say, prediction errors must be uncorrelated with any variable in the set of known information. Running the following regression can formally test this orthogonality condition:

 $E_{i} S_{i+j} - S_{i+j} = \alpha + \beta X_{i} + \nu_{t}$ (6)

Where the left-hand-side variable is a prediction error, X_i is a set of information known in period t, and v is a random error term; popular candidate variables for X_i , have included forward discounts (or nominal interest rate differentials) and lagged exchange rates. The orthogonality hypothesis is that $\alpha = \beta = 0$.

2.5. Testing of foreign exchange market efficiency

Early efficiency studies of the EMH tested for the randomness of exchange rate changes (Sarno and Taylor, 2004). It was established that there exists significant first order serial correlation for many of the exchange rates examined during the 1920s (Poole, 1967). Poole also provided evidence that simple trading rules could potentially yield large profits. If the risk neutral efficient markets hypothesis is true, then the expected foreign exchange gain from holding one currency rather than another must be equal to the interest rate differential between the home and foreign country. This condition is known as the Uncovered Interest Rate Parity (UIRP) condition. It constitutes the basic parity condition for testing the efficiency of the foreign exchange market (Taylor, 1987).

The second method for testing market efficiency is to test for the profitability of simple filter rules. A simple *n*-percent filter rule involves buying a currency whenever it raises *n*-percent above its most recent trough and selling the currency whenever it falls *n*- percent below its most recent peak. If the market is efficient and UIRP holds, the interest rate costs of such as strategy should on average eliminate any profit. A number of studies do indicate the profitability of simple filter rules (Dooley and Shafer, 1984; Levich and Thomas, 1993) although it is usually not clear that the optimal filter rule size could have been chosen *ex ante*. There are significant risks involved since substantial sub-period losses are often generated. Engel and Hamilton (1990) demonstrated that the dollar, from the early 1970s to the late 1980s, displayed largely uninterrupted trends, which were susceptible to trend following trading rules.

The third method of testing market efficiency is through the rational expectations approach. Assuming that market participants are rational, the expected change in the exchange rate should differ from the actual change only by a rational expectations forecast error. Hence assuming covered interest rate parity the uncovered interest rate parity condition can be tested by estimating the regression parameters of equation (7) below (Taylor, 1987).

 $\Delta_k S_{i+k} = \alpha + \beta \left(f_i^{(k)} - S_i \right) + \eta_{i+k} \quad \dots \tag{7}$

Where:

St, denotes the logarithm of the spot exchange rate at time t,

 $\Delta_k S_{i+k} = S_{i+k} - S_i$

 α , β are regression constants

 η_{i+k} is an error term

If market participants are risk-neutral and have rational expectations we should expect β to be equal to unity and η_{t+k} to be uncorrelated with information available at time t.

Empirical work based on the estimation of equation (7) rejects the efficient markets hypothesis under risk-neutrality (Fama, 1984; and Bekaert and Hodrick, 1993). Indeed it is a stylized fact that estimates of β using exchange rates against the dollar, are generally closer to minus unity than plus unity (Froot and Thaler, 1990). Initial studies based on the regression model that test the weak form of the foreign exchange market efficiency usually found an estimated slope coefficient close to unity. It was subsequently realized, however that standard regression analysis was invalid because of the non-stationary data used (Engle and Granger, 1987). Dornbush (1980 and 1988) and Frenkel (1980 and 1981) concluded that the best way to estimate the exchange rate market efficiency is to presume that the behaviour is due to interest rate differentials and any difference between forward and spot exchange rates at time t+1 results from the arrival of new information which agents have not predicted.

2.6. Empirical Evidence on FOREX Market Efficiency

Fama (1965) described an efficient market as consisting of a large number of competitive profit maximizers interacting in a market and utilizing all available information in a rational manner. In an efficient market, prices should fully reflect all the relevant and available information; hence, no profit opportunities are left unexploited. If currency markets are efficient, the spot or forward exchange rates should embody all relevant information, and they should not be able to forecast the spot or forward exchange rate as a function of another. Also, the current forward rate should be an unbiased predictor of the future spot rate if we assume risk neutrality and

a covariance stationary risk premium (i.e. the current forward exchange rate should forecast the future spot rate if the markets are efficient).

This is a long-standing issue in the literature on foreign exchange markets. As Hodrick (1987) argues, '...there is very strong evidence against the hypothesis that forward exchange rates of any maturity from one day, to one week to one or three months are unbiased predictors of future spot rates.'p.17. When the unbiasedness hypothesis does not hold, there is evidence of a risk premium, market inefficiency or both.

While Baillie and Bollerslev(1989), MacDonald and Taylor (1989), and Diebold *et al* (1994) argued that co-integration among exchange rates in different currencies implies failure of market efficiency, Dwyer and Wallace(1992) and Engel (1996) have demonstrated that there is no connection between co-integration of spot rates and market inefficiency. Levin and Lin (1992), Im *et al.* (1995) and Wu and Chen(1998) showed that the improved statistical power of unit root tests derived from using grouped or pooled cross-sectional data other than individual series strongly supports the hypothesis of market efficiency. Alexakis and Apergis (1996) also prove the presence of the efficient foreign exchange market hypothesis by modeling conditional heteroskedasticity through ARCH models.

As is depicted by the survey by Froot and Thaler (1990), the conventional test for efficiency assumes that the forward exchange rate is an unbiased estimate of the ex post spot rate. A broad range of literature has also proposed the use of expectations survey data to improve further the efficiency test, just in case there are any biases that can be observed in this efficiency tests. Consequently, Elliot and Ito (1995) use micro survey data to examine the efficiency of the forward yen/dollar market and find that the survey data is an important source of supplementary information on the behavior of the markets.

Various researchers have used the martingale model to test efficiency of foreign exchange market from rational expectations approach.

This means that all information concerning the past history of prices which affect Z(t+1) is fully reflected in the current price Z(t). The best predictor of $Z_{(t+1)}$ is Z(t).

To test the martingale hypothesis the researchers have examined whether disturbance term u(t+1) n the following equation is a serially uncorrelated term with zero expectation; P(t) is the spot price, $Q_T(t)$ is the forward price at time t for delivery at date T.

P(t+1) - P(t) = u(t+1)....(9) P(t+1) - Qt + I(t) = u(t+1)...(10)

Dooley and Shafer (1976) examined change in the dollar spot rates during the period March 13, 1973 to September 5, 1975 using the martingale model for Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Switzerland and the United States. The results led to rejection of the martingale model for spot exchange rates for four out of the nine countries at the ninety five percent confidence level implying that exchange markets for many currencies may not have been efficient in the use of price information. Cummins et al. (1976) examined the Canadian-U.S. exchange rate using the martingale model in the 1970-74 period. They concluded that the spot market seems to behave efficiently and hence it does a random walk. However, their test indicated that the forward rate on the Canadian dollar does not do a random walk hence the respective forward market did not pass the usual weak form test of efficiency.

Levich (1978) examined equation (9) for nine countries during the period 1967-75. For the three-month horizon, the error u(t+1) was not significantly different from zero in France and Italy; but the errors seemed to be significantly different from zero in Canada, the United Kingdom, Belgium, Germany, the Netherlands, Switzerland and Japan. Only in two out of nine countries was the martingale hypothesis consistent with the data.

Kaserman (1973) examined the U.S.-Canadian dollar during the period July 1955 to March 1961 for the relation between the subsequent spot price P(t+1), where the unit of time is one quarter, and the forward price $Q_{t+1}(t)$ at time t. He studied equation (10) and concluded that the forward rate under-predicted the spot rate in periods when the spot rate was rising and over-predicted it when the spot rate was falling.

2.7. Empirical Evidence on FOREX Market Efficiency in Kenya

Ndunda (2002) tested whether forward exchange rates are predictors of future spot rates in Kenya using the Hansen & Hodrick (1980) model. In her study, Ndunda focused on the foreign exchange market under floating exchange rate for the period between October 1993 and December 2002. The data involved comprised of weekly spot exchange rate and the three-month forward exchange premium for the US dollar, the UK sterling pound, the Swiss Franc, the Euro, and the Japanese Yen. The regression of the forecast errors of the own exchange rate was estimated on a constant two lagged errors using weekly data and a three-month or a 13-week forward rate. The tests of the regression model used were based on the joint hypothesis that all the coefficients in the regression are equal to zero. The findings of the study established strong evidence to support simple efficiency hypothesis for at least four of the five currencies. She established that in the Kenyan market the interest rates have been relatively high while the change in the foreign exchange rates has not been at the same rate. Hence the forward rates quoted had been higher than the future spot rates; an indication that the forward rate is not a good predictor of the future spot rate. She therefore concluded that the foreign exchange market in Kenya is inefficient as the rate of return to speculation is not equal to zero. The study however was limited in the sense that the assumptions of normality and constant variance were not accounted for in the research model used by Ndunda (2002). Available evidence shows that exchange rates are better characterized by ARCH models (Engle, 1982; Hsieh, 1989). Besides using the rational expectations approach, this study will also go further to fill this gap by testing for constant variance, normality distribution of error terms, as well as the stationarity of the time series data to be used.

In the period prior to 1995, Kenya maintained restrictions on foreign exchange currency transactions. However, according to Kurgat (1998) Kenya's foreign exchange market became vibrant after the repeal of the Exchange Control Act in 1995 and the licensing of foreign exchange bureaus. The introduction of foreign exchange bureaus in the country improved the convertibility of the Kenya shilling in relation to other currencies (Kurgat, 1998). Kurgat carried out an empirical study of the spot

markets' efficiency of foreign exchange bureaus in Kenya where he pointed out the inefficiency of the Kenyan foreign exchange market due to the existence of arbitrage opportunities. He showed that there was an opportunity to make instantaneous risk free profits through locational arbitrage. The study established that the foreign exchange markets in Kenya are not efficient.

Seven years later Muhoro (2005) carried out a similar study using locational and triangular arbitrage models. The study involved secondary data in the form of daily closing counter foreign exchange rates for six banks and fifty-seven bureaus for the year 2003. The data was analyzed though chi-square and line graphs. The aim of the study was to find out whether it was possible for an arbitrageur to make profits through locational and triangular arbitrage. The findings established that the FOREX market was inefficient due to many cases that arbitrage opportunities occur in the market. According to Muhoro (2005), higher profits could be made by carrying out a triangular arbitrage transaction rather than carrying out a locational arbitrage transaction in both banks and bureaus. It therefore appeared that currencies are not efficiently priced against one another.

2.8. Chapter Summary

Local studies carried out on efficiency of foreign exchange market in Kenya i.e. Ndunda (2002), Kurgat (1998) and Muhoro (2005) looked at efficiency from the basis of profitability of simple trading rules (arbitrage). This study will instead look at efficiency of the foreign exchange market in Kenya from the rational expectations approach. The results of the above local studies could also be questionable since in all the studies, the assumptions of regression models such as normally distributed errors terms, constant variance, and stationarity of time series data were not tested. Also prior research on the efficiency of the foreign exchange markets provides evidence that spot rates and forward rates are non-stationary and follow unit root processes (Meese and Singleton, 1982; Baillie and Bollerslev, 1989; Hakkio and Rush, 1989; Barnhart and Szakmary, 1991; Liu and Maddala, 1992; Naka and Whitney, 1995; Lin and Chen, 1998; and Lin et al., 2002). This study sought to fill this gap by testing for rational expectations, constant variance, normality distribution of error terms, as well as the stationarity of the time series data to be used.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1. Data and Sample

There were 43 commercial banks as at November 2006 (Appendix I). The data sources were limited to observations from all commercial banks that have relatively active business operations in foreign exchange markets. The research focused on the foreign exchange markets under floating exchange rates beginning November 1993 to June 2006. The start date in this case was dictated by the time when the government shifted its foreign exchange policy from fixed exchange rates to independently floating exchange rates.

The study involved the collection of secondary data. Historical data for the monthly (average) spot exchange rate and the three-month forward premiums for the Euro, the Sterling Pound, the US Dollar, and the two East African currencies were obtained from the Central Bank of Kenya. The premium was added to the spot exchange rates to obtain the three-month or 13-week forward exchange rate. Due to lack of documented weekly data on T-BILL rates, the sample was based on the monthly averages for both the T-BILL and spot rates. The spot rates were therefore the monthly averages, derived from taking the average of the daily rates for each month. All the exchange rates were expressed in Kenya Shillings (Kshs) per unit of foreign currency. The US monthly averages for the 91-Day T-BILL rates were obtained through a search query at the website link to the US treasury department. This assisted

in computing the forward rate as outlined in equation (2) and explained in section 3.2.1 below.

3.2. Research Model

3.2.1. Analytical Model

The analytical model for testing FOREX market efficiency was based on regressing equation (7) below.

 $\Delta_k S_{i+k} = \alpha + \beta \left(f_i^{(k)} - S_i \right) + \eta_{i+k} \tag{7}$

Where:

St, denotes the logarithm of the spot exchange rate at time t,

 $\Delta_k S_{i+k} = S_{i+k} - S_i$

 $f_{l}^{(k)}$ = Level of k-period forward exchange rate determined at time t

 α , β are regression constants

 $\eta_{\iota+k}$ is an error term with $E_t(\eta_{\iota+k}) = 0$

If market participants are risk-neutral and have rational expectations it is expected that β to be equal to unity and η_{t+k} to be uncorrelated with information available at time t. The forward rates were computed by applying equation (2). The monthly averages for the US 91-Day T-BILL rates for November 1993 to June 2006 were applied in equation (2) as the proxy for foreign interest rates.

3.3. Statistical Tests

3.3.1. T-test

The t-test was used to test the hypothesis that the regression coefficients α , and β are equal to 0 and 1, respectively. Equation (7) was estimated for each of the five currencies over the entire study period at both 1% and 5% levels of significance.

3.3.2. Non-Stationarity Tests

To examine the issue surrounding non-stationarity and unit roots associated with spot and forward rates, the study used an Augmented Dickey-Fuller (ADF) test, which allows for serial correlation in the error term η_{i+k} . This was important since unit root tests of spot and forward rates series should take into account any seasonality in the generation of time-series data. The equation used for conducting ADF test has the general structure of equations (11)

Where:

	Δ	=	First Difference Operator
	ΔS_t	=	$S_t - S_{t-1}$
	$\delta_{\textbf{k}}$	=	Coefficients of the lagged differences of the spot rates.
	β_1	=	Coefficients of the time trend for S_t rates
	ρι	=	Coefficients of the lagged 1^{st} difference of S_t
	t	=	Time trend
	ε _t	-	White noise error terms
In equ	ation (1	1), if	(i) $\beta_1=0$ and $ \rho_1 < 1$, the series S_t is stationary;

(ii) $\beta_1 = 0$ and $\rho_1 = 1$ then the series is non-stationary

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(iii) $\beta_{1\neq0}$ and $|\rho_{1}|<1$ then the series is trend-stationary (i.e. stationary around a deterministic linear time trend).

3.3.3. Correlation Tests

Auto-correlation test is a reliable measure for testing of either dependence or independence of random variables in a series. The serial correlation coefficient measures the relationship between the values of a random variable at time t and its value in the previous period. Auto correlation test provides evidence whether the correlation coefficients for residuals are significantly different from zero. A way to test for the presence of autocorrelation is to regress equation (12) and check whether the γ_i 's i =1, 2, 3,....n have values between [-1, 1]. Values of zero for γ_i 's i =1, 2, 3...n suggests no autocorrelation.

$$\Delta E_{t} = E_{t-1} + \gamma_1 \Delta E_{t-1} + \gamma_2 \Delta E_{t-2} + \gamma_3 \Delta E_{t-3} + \dots + \gamma_n \Delta E_{t-n} + \varepsilon_t \dots \dots \dots (12)$$

Where:

Et	=	Residual from the regression
γi	-	Coefficient of the lagged residuals
ΔE_t	=	$E_t - E_{t-1}$

If auto correlation is present, this will imply that participants in the foreign exchange market are not rational. Ljung-Box Q statistics were used to test for autocorrelations. Ljung-Box Q statistic follows the chi-square distribution with m degrees of freedom as shown in equation (13):

$$LB = n(n+2)\sum_{k=1}^{m} (\hat{p}^2 k / n - k) \equiv \chi^2$$
 (13)

Where \hat{p}^{2}_{k} = autocorrelation coefficients at lag k; and n = Sample size

CHAPTER FOUR

4.0 DATA ANALYSIS, DISCUSSION AND CONCLUSION

4.1. Introduction

This chapter presents the data analysis, interpretation, and discussion of the research findings. The chapter is organized as follows: section 4.2 is on unit roots tests for time series properties; Section 4.3 covers tests on efficiency of FOREX markets and tests for rationality; Section 4.4 outlines the results derived from diagnostic tests; and Section 4.5 provides a discussion of the findings.

4.2. Unit Roots Tests for Time series Properties

The first step involved testing for the time series properties of each of the spot rate series. In particular, it involved examining whether the spot rates series are stationary. The Augmented Dickey-Fuller (ADF) unit root test was used (Dickey and Fuller, 1979) and the results are reported in Table 4.1 below. The ADF test allows for serial correlation in the error term η_{t+k} in equation (7). The null hypothesis, H₀ was that the spot rates series is stationary (i.e., from equation 11; H₀: ρ_1 = 1) while the alternative hypothesis was that each of the series was non-stationary. The results also indicate that each of the series was non-stationary at level form and at first difference. It was established that each of the spot series is stationary, if the ADF statistics are greater than the critical values (Dickey and Fuller, 1979). Therefore the second differences were used in testing whether the forward rate is an unbiased predictor of the future spot

exchange rate; and whether the exchange rates fully incorporate all available information.

Spot Rate	ADF	Critical Values (5%)	Critical Values (1%)	Decision
US Dollar				
S,	12.634	-3.45	-3.99	Reject H ₀
1^{st} Difference, S_i	-5.234	-3.45	-3.99	Reject H ₀
2^{nd} Difference, S_i	-3.046	-3.45	-3.99	Accept H ₀
JK POUND				
S_i	16.556	-3.45	-3.99	Reject H ₀
1^{st} Difference, S_i	-6.236	-3.45	-3.99	Reject H ₀
2^{nd} Difference, S_i	-2.896	-3.45	-3.99	Accept H ₀
THE EURO				
S_{i}	11.446	-3.45	-3.99	Reject H ₀
1 st Difference, S_i	-4.473	-3.45	-3.99	Reject H ₀
2^{nd} Difference, S_i	-2.774	-3.45	-3.99	Accept H ₀
JGANDA SHILLING		All Contracts		
S,	8.446	-3.45	-3.99	Reject H ₀
1^{st} Difference, S_t	-6.341	-3.45	-3.99	Reject H ₀
2^{nd} Difference, S_i	-2.456	-3.45	-3.99	Accept H ₀
FANZANIA SHILLING				
S_{i}	12.362	-3.45	-3.99	Reject H ₀
1^{st} Difference, S_t	-5.220	-3.45	-3.99	Reject H ₀
2^{nd} Difference, S_i	-3.116	-3.45	-3.99	Accept H ₀
		and the second s		1

Table 4.1: Unit Root Test for the spot rates series

H₀: the series is stationary

4.3. Efficiency of FOREX markets and Tests for Rationality

Tests for unbiasedness and orthogonality were carried out to test the foreign exchange market efficiency from the rational expectations approach.

4.3.1. Test for 'unbiasedness' hypothesis

The test for 'unbiasedness' was performed to determine whether the forward rate is an unbiased predictor of the future spot rate in a foreign exchange market. The findings are indicated in Table 4.2. The test for 'weak form' efficiency was based on testing the null hypothesis $\alpha = 0$ and $\beta = 1$ for each of the five currencies.

Equation (1): $Ln S_{t+3} = \alpha + \beta Ln F_{t+3} + \mu_t$									
Spot rate	$\alpha = 0$	$\beta = 0$	T statistic for $H_0:\beta = 1$	Decision					
US Dollar	0.780 (3.122)**	0.793 (13.693)**	-15.683**	$H_0:\beta = 1: \text{ Reject } H_0$ $H_0:\alpha = 0: \text{ Reject } H_0$					
UK Pound	0.373 (1.318)	0.898 (15.195)**	-7.639**	$H_0:\beta = 1: \text{ Reject } H_0$ $H_0:\alpha = 0: \text{ Reject } H_0$					
The Euro	-0.719 (-3.999)**	1.154 (28.365)**	11.488**	$H_0:\beta = 1: \text{ Reject } H_0$ $H_0:\alpha = 0: \text{ Reject } H_0$					
Uganda Shilling	-0.957 (-3.090)**	1.282 (13.037)**	45.274**	$H_0:\beta = 1:$ Reject H_0 $H_0:\alpha = 0:$ Reject H_0					
Tanzania Shilling	-0.574 (-3.124)**	1.199 (16.524)**	23.514**	$H_0:\beta = 1: \text{ Reject } H_0$ $H_0:\alpha = 0: \text{ Reject } H_0$					

Table 4.2: Testing Market Efficiency Using Forward Rates

* Significant at 5% level (P-values < 0.05); Critical values = 1.96 (at 5%) and 2.57 (at 1%) ** Significant at 1% level (P-values < 0.01); the t-statistics for the coefficients are in brackets The T statistics for $\beta = 1$ were computed as follows:

 $\left(\frac{\beta-1}{s/\sqrt{n}}\right)$ Where β is the computed value of β and s is the standard deviation. The decision

rule was to reject the null where the computed T statistic for H_0 : $\beta = 1$ was greater than 1.96

As per the results of Table 4.2, the null hypotheses for the forward rates being unbiased predictors of the future spot rates were rejected at both 95% and 99% levels of confidence since $\alpha \neq 0$ and $\beta \neq 1$ for each of the spot rates. The fact that the unbiasedness hypothesis does not hold in the five foreign exchange markets is evident of either existence of a risk premium and/or that the markets are not 'weak form' efficient.

The above findings are in agreement with previous study carried out by Ndunda (2002) which stated that forward exchange rates were biased predictors of future spot rates in Kenya.

4.3.2. Tests for Orthogonality

The orthogonality condition was tested by regression of equation (7). From equation (7), if market participants are risk-neutral and have rational expectations it was expected that β to be equal to unity and η_{t+k} to be uncorrelated with information available at time *t*. Equation (7) was regressed and the findings are as indicated in Table 4.3. The t-statistics for H₀: $\beta = 1$ were computed using a similar procedure as specified in section 4.3.1. The decision rule was based on rejecting H₀ if the obtained values of t-statistics were greater than 1.96, when the tests are performed at 95% level of confidence.

Equation (7): $\Delta S_{i+3} = \alpha + \beta (f_i^{(3)} - S_i) + \eta_{i+3}$									
Spot rate	$\alpha = 0$	$\beta = 0$	T statistic for $H_0:\beta = 1$	Decision					
US Dollar	0.015 (1.374)	-0.006 (-0.092)	-105.464**	$H_0:\beta = 1:$ Reject H_0					
UK Pound	0.024 (2.255)*	-0.047 (-0.709)	-109.774**	$H_0:\beta = 1: Reject H_0$					
The Euro	0.0323 (4.564)**	-0.490 (-4.014)**	-293.578**	$H_0:\beta = 1: Reject H_0$					
Uganda Shilling	-0.010 (-1.313)	0.221 (2.875)**	-118.781**	$H_0:\beta = 1:$ Reject H_0					
Tanzania Shilling	0.005 (0.609)	0.069 (0.875)	-142.099**	$H_0:\beta = 1: Reject H_0$					

 Table 4.3: Tests for Rational Expectations

* Significant at 5% level (P-values < 0.05); Critical values = 1.96 (at 5%)

** Significant at 1% level (P-values < 0.01); Critical values = 2.57 (at 1%)

The findings of Table 4.3 indicate that the null hypothesis $H_0:\beta = 1$ was rejected for all the five currency markets at both 95% and 99% levels of confidence which indicates that the participants in the currency markets are not risk-neutral and lack rational expectations.

4.4. Diagnostic Tests Results

4.4.1. Assumptions of Normality of Error Terms

A one-sample Kolmogorov-Smirnov (K-S) test was applied in establishing whether the error terms fitted a normal distribution. The One-Sample Kolmogorov-Smirnov Test procedure is a non-parametric test procedure that compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, Poisson, or exponential. The Kolmogorov-Smirnov Z is computed from the largest difference (in absolute value) between the observed and theoretical cumulative distribution functions. This goodness-of-fit test tests whether the observations could reasonably have come from the specified distribution, in this case a normal distribution. Table 4.4 indicates the tests for normality of error terms arising from the regression of equation (7). The null hypothesis for the test was that error terms do not assume a normal distribution. The decision rule was to reject the null hypothesis if the computed K-S Z-statistics are greater than the critical values at 95% level of confidence. The findings indicate that the null hypothesis was rejected for all the five currencies thus indication that the error terms were log normally distributed. Based on the properties of a normal distribution, the findings also imply that the respective residual terms were characterized by constant variances.

Table 4.4: One-Sam	nle Kolmogorov	-Smirnov test f	or normality of	error terms
I ADIC 4.4. UIIC-SAIII	ole Konnosoro	v-Smirnov lest id	ог погшаниу ог	error terms

Spot rate	Kolmogorov- Smirnov Z statistics	Critical Values (5%)	Critical Values (1%)	Decision
US Dollar	2.493	0.113	0.135	Reject H ₀
UK Pound	2.350	0.113	0.135	Reject H ₀
The Euro	0.455	0.158	0.189	Reject H ₀
Uganda Shilling	0.873	0.133	0.159	Reject H ₀
Tanzania Shilling	0.779	0.133	0.159	Reject H ₀

H₀: The error terms do not assume a normal distribution

4.4.2. Auto-correlation Tests

Auto correlation test provided evidence on whether or not the correlation coefficients for residuals were significantly different from zero. The presence of autocorrelation was checked by regressing equation (12) and checking whether or not the γ_i 's i =1, 2, 3,....n have values between [-1, 1]. Values of zero for $\gamma_{i's}$ i =1, 2, 3...n suggests no autocorrelation. Ljung-Box Q statistics were used to test for autocorrelations. Ljung-Box Q statistic follows the chi-square distribution with m degrees of freedom as shown in equation (13). The null hypothesis for the tests was that there was absence of auto-correlations in the residual terms. The findings presented in Table 4.5 indicate Ljung-Box Q statistics obtained up to the fifth order. The auto-correlation functions for each currency residuals are presented in figures 1, 2, 3, 4, and 5 in Appendix II.

Spot rate residuals	Ljung-Box Q statistics	P-values	Decision
	obtained		
US Dollar	1^{st} Order = 91.352	0.000	Reject H ₀
	2^{nd} Order = 120.492	0.000	Reject H ₀
	3^{rd} Order = 125.581	0.000	Reject H ₀
	4^{th} Order = 127.990	0.000	Reject H ₀
	5^{th} Order = 129.684	0.000	Reject H ₀
	6^{th} Order = 129.854	0.000	Reject H ₀
	7^{th} Order = 130.596	0.000	Reject H ₀
	8^{th} Order = 132.900	0.000	Reject H ₀
	9^{th} Order = 135.964	0.000	Reject H ₀
	$10^{\text{th}} \text{ Order} = 140.633$	0.000	Reject H ₀
UK Pound	1^{st} Order = 86.962	0.000	Reject H ₀
	2^{nd} Order = 110.717	0.000	Reject H ₀
	3^{rd} Order = 113.563	0.000	Reject H ₀
	4^{th} Order = 115.036	0.000	Reject H ₀
	5^{th} Order = 115.850	0.000	Reject H ₀
	6^{th} Order = 115.855	0.000	Reject H ₀
	7^{th} Order = 116.806	0.000	Reject H ₀
	8^{th} Order = 118.416	0.000	Reject H ₀
	9^{th} Order = 120.111	0.000	Reject H ₀
	$10^{\text{th}} \text{ Order} = 122.815$	0.000	Reject H ₀

Table 4.5: The results for Auto-co	rrelation Te	sts
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The Euro	151 0 1 20 (00	0.000	Data at II
Inc Euro	1^{st} Order = 32.633	0.000	Reject H ₀
	2^{nd} Order = 34.868	0.000	Reject H ₀
	3^{rd} Order = 38.846	0.000	Reject H ₀
	4^{th} Order = 44.327	0.000	Reject H ₀
	5^{th} Order = 48.475	0.000	Reject H ₀
	6^{th} Order = 49.132	0.000	Reject H ₀
	7^{th} Order = 49.694	0.000	Reject H ₀
	8^{th} Order = 54.739	0.000	Reject H ₀
	9^{th} Order = 62.373	0.000	Reject H ₀
	$10^{\text{th}} \text{ Order} = 65.352$	0.000	Reject H ₀
Uganda Shilling	$1^{\text{st}} \text{ Order} = 49.139$	0.000	Reject H ₀
o Banda Shining	2^{nd} Order = 59.094	0.000	Reject H_0
	3^{rd} Order = 59.131	0.000	
	$4^{\text{th}} \text{ Order} = 59.297$	0.000	Reject H ₀
	$5^{\text{th}} \text{ Order} = 59.712$	0.000	Reject H ₀
	$6^{\text{th}} \text{ Order} = 60.274$	0.000	Reject H ₀
	$7^{\text{th}} \text{ Order} = 60.406$	1	Reject H ₀
	$8^{\text{th}} \text{ Order} = 60.400$	0.000	Reject H ₀
	$9^{\text{th}} \text{ Order} = 60.495$	0.000	Reject H ₀
	$10^{\text{th}} \text{ Order} = 61.941$	0.000	Reject H ₀
	10 Order – 61.941	0.000	Reject H ₀
Tanzania Shilling	$1^{\text{st}} \text{ Order} = 51.931$	0.000	Reject H ₀
	2^{nd} Order = 60.094	0.000	Reject H ₀
	3^{rd} Order = 60.764	0.000	Reject H ₀
	4^{th} Order = 63.245	0.000	Reject H ₀
	$5^{\text{th}} \text{ Order} = 69.257$	0.000	Reject H ₀
	$6^{\text{th}} \text{ Order} = 79.406$	0.000	Reject H ₀
	7^{th} Order = 88.456	0.000	Reject H ₀
	8^{th} Order = 91.088	0.000	Reject H ₀
	9^{th} Order = 91.119	0.000	Reject H ₀
	$10^{\text{th}} \text{ Order} = 91.196$	0.000	Reject H ₀

H₀: There is no auto-correlation (up to the 10th Lag)

Auto-Correlation Functions

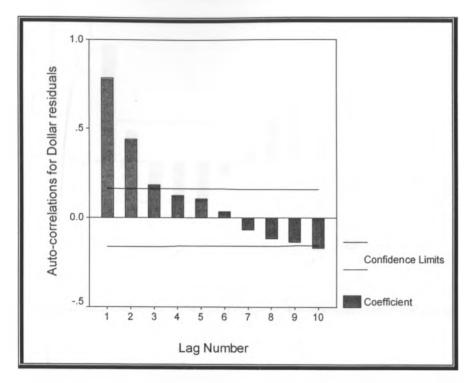
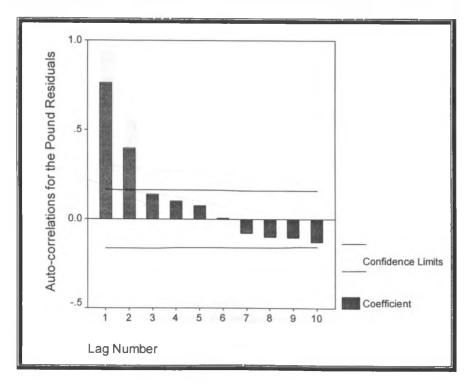


Figure 1: Auto-correlation function for the dollar rates residuals

Figure 2: Auto-correlation function for the Pound rates residuals



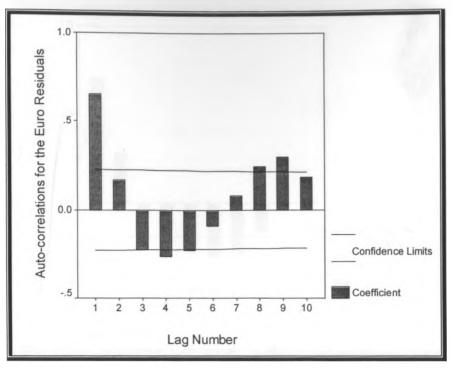
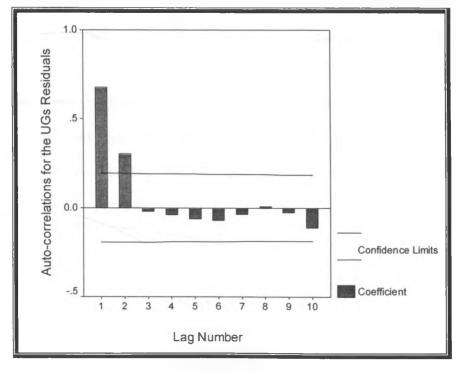


Figure 3: Auto-correlation function for the Euro rates residuals





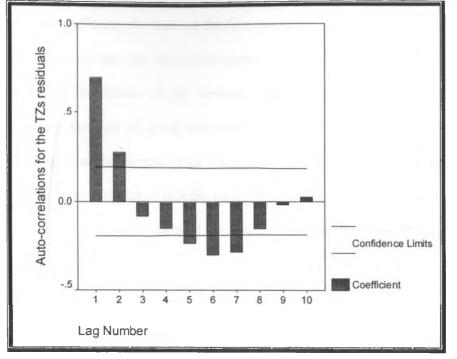


Figure 5: Auto-correlation function for the Tanzanian Shilling residuals

The results from the Table 4.5 and the above graphs confirmed that there is significant autocorrelation in each of the residual terms for the entire sample period. The order of auto-correlation was found to increase with the increase in the number of lags. The nonzero auto-correlation of the series associated with Ljung -Box Q statistics, which are jointly significant at 1% level, suggested that all the spot rate series do not follow random walk model behaviour. The presence of auto-correlations further reinforced the findings of Table 4.3 that the participants in the foreign exchange markets are not rational.

4.5. Discussion of Findings

The study was based on the null hypothesis that the economic agents are rational. Assuming that market participants are rational, the expected change in the exchange rate should differ from the actual change only by a rational expectations forecast error. The findings of the study established that the null hypotheses for the forward rates being unbiased predictors of the future spot rates were rejected at 95 percent level of confidence for each of the five currencies. This indicated existence of a risk premium and that the respective currency markets are not 'weak form' efficient. Secondly, the failure of the currency markets to be 'weak form' efficient also indicated that not all price information is fully reflected in currency prices, thus implying that the current price changes cannot be predicted from past prices. The findings also established that the participants in the foreign currency markets are not risk-neutral and are not rational. This was further reinforced by the presence of autocorrelations.

The findings further revealed that the residual series derived from each of the currency spot rates assumed a normal distribution with constant variance. Augmented Dickey-Fuller (ADF) unit root tests also revealed that the spot rate series were stationary at the second lag difference. Auto-correlation tests confirmed that there was significant autocorrelation in each of the residual terms for the entire sample period. The order of auto-correlation was found to increase with the increase in the number of lags. The nonzero auto-correlation of the series associated with Ljung -Box Q statistics, which are jointly significant at 1% level, suggested that all the spot rate series do not follow random walk model behaviour.

The findings of the study are in agreement with previous empirical works (Frankel, 1980; Fama 1984; Bekaert and Hodrick, 1993) which rejected the efficient markets hypothesis under risk-neutrality on the basis of estimating equation (7) for various currencies. Initial studies based on the regression model that test the weak form of the foreign exchange market efficiency usually found an estimated slope coefficient close

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to unity. It was subsequently realized, however that standard regression analysis was invalid because of the non-stationary data used (Engle and Granger, 1987). Since the previous works confounded the regressions of equation (7) by the non-stationary behaviour of spot exchange rates, the rationality tests and unit root tests performed in this study helped to address this phenomenon.

CHAPTER FIVE

5.0 SUMMARY AND CONCLUSIONS

5.1. Introduction

This chapter presents the summary, conclusions and recommendations derived from the findings of the study. The chapter also presents the limitations that were encountered in the process of gathering findings.

5.2. Summary

The aim of this study was to establish the efficiency of foreign exchange markets in Kenya using the rational expectations approach. The following research questions guided the study: Is the current expected forward rate an unbiased predictor of the future spot exchange rate? Does the expected exchange rate fully incorporate all available information? In answering these two questions, the study applied historical data for the monthly (average) spot exchange rate and the three-month forward premiums for the Euro, the Sterling Pound, the US Dollar, and the two East African currencies (Uganda shilling and Tanzanian shilling) which were obtained from the Central Bank of Kenya.

The key findings revealed that the forward rates are not unbiased predictors of the future spot rates for the Euro, the Sterling Pound, the US Dollar, the Uganda Shilling, and the Tanzanian Shilling. Secondly, the findings established that the participants in

the foreign currency markets in Kenya are not risk-neutral and are not rational; a phenomenon that was reinforced by the presence of auto-correlations.

5.3. Conclusions

The results of the study were consistent with the hypothesis that the forward exchange rates are not unbiased predictors of the future spot rates. Under the presence of efficiency in the foreign exchange market, the forward exchange rate should be an unbiased predictor for the future spot rate. The rejection of the efficiency hypothesis implies the presence of unexploited profit opportunities for those who participate in exchange rate transactions in the Kenyan FOREX markets. The failure of the currency markets to be 'weak form' efficient also indicates that not all price information is fully reflected in currency prices, thus implying that the current price changes cannot be predicted from past prices. In other words, the general conclusion emerging from the extensive empirical analysis is that the forward exchange rate is a biased predictor of the future spot and the presence of a risk premium is apparent. As a result, the participants in the FOREX markets in Kenya conduct their transactions on the basis of speculation rather than on prediction of future markets behaviour based on the past or current performance of respective currency markets.

Based on the rational expectations approach, the Foreign Exchange Market in Kenya is therefore inefficient.

5.4. Limitations of the Study

The study applied monthly observations, as opposed to daily or weekly observations. This was occasioned by lack of documented time series data on the weekly closing values of the T-BILL rates from the Central Bank of Kenya. These were relatively few especially considering that finer results could be obtained by using weekly rates. In addition, the forward rates were computed on the basis of the US 91-day T-BILL rate as a proxy for the foreign interest rates (equation 2). This was attributed to failure to obtain the 91-day T-BILL rate for each of the country whose currency was under study.

5.5. Recommendations

In the research, the monthly observations of foreign exchange rates to the Kenyan Shilling between November 1993 and June 2006 were used. To examine further the significance of the results achieved, empirical investigation on the efficiency of foreign exchange markets can be done by applying weekly data. The use of more frequent observations may better capture the dynamics of currency markets. In addition, the forward rate was computed on the basis of the US 91-day T-BILL rate as a proxy for the foreign interest rates (equation 2). Therefore, further research can be performed with the US 91-day T-BILL rate replaced by the respective currency country's local interest rates.

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Appendix I: List of Commercial Banks in Kenya

- 1. African Banking Corporation
- 2. African Development Bank
- 3. Akiba Bank
- 4. Bank of Baroda
- 5. Bank of India
- 6. Bank of Africa
- 7. Barclays Bank of Kenya
- 8. Biashara Bank of Kenya
- 9. Charterhouse Bank
- 10. Consolidated Bank of Kenya
- 11. Credit Bank Ltd
- 12. CFC Bank
- 13. Citibank N.A. Kenya
- 14. City Finance Bank
- 15. Commercial Bank of Africa
- 16. Cooperative Bank of Kenya
- 17. Development Bank of Kenya
- 18. Diamond Trust Bank
- 19. East African Development Bank
- 20. Fidelity Commercial Bank
- 21. Fina Bank K. Ltd
- 22. Giro Commercial Bank Ltd
- 23. Guardian Bank Ltd
- 24. Habib Bank
- 25. Habib Bank A.G. Zurich
- 26. Housing Finance Ltd
- 27. Industrial Development Bank
- 28. Imperial Bank Ltd
- 29. Kenya Commercial Bank, Nairobi
- 30. K-Rep Bank(Microfinance)
- 31. Middle East Bank
- 32. National Bank of Kenya
- 33. National Industrial Credit Bank
- 34. Oriental Commercial Bank Ltd
- 35. Prudential Bank
- 36. Paramount Universal Bank Ltd
- 37. Stanbic Bank
- 38. Standard Chartered Bank
- 39. Southern Credit Banking Corp. Ltd
- 40. Prime Bank
- 41. Equity Bank
- 42. Victoria Commercial Bank
- 43. Transnational Bank of Kenya

S DOLLA	RS DATA				APPENDIX I				The second secon		
t		C 412					4.11077011.1				
36.2298	Ln_St 3 589882951	S_t+3 3 94892305	D S t+3 0.35904	KE_TBILL 17.870	1+KETBILL 1.179		1+USTBILL 1.0485	F/H 1.124177	S_t(F/H) 40.73	Ln_Ft	LNFt - Ln S
36.5566	3.598862155	4.12972082	0.530859	17.860	1.179				40.73	3.706935 3.717929	
43.1207	3.764002317	4.16126447	0.397262	25.070	1.251	4 · · · · · · · · · · · · · · · · · · ·		1.192563	51.42	3.940107	
51.8795	3.948923047			45.790	1.458		1.0481		72.16	4.278941	0.3300180
62.1606	4.129720822	4.18084977		68.040				1.602518	99.61	4.601297	
64.1526	4.161264472	4.18656291		84.290	1.843		1.0471		112.91	4.72658	
65.3333	4,179502069		0.039617	84.670	1.847	4.78	1.0478	1.762455	115.15	4.74621	
65.4214	4.180849769		0.05299	79.510	1.795	4.74	1.0474	1.713863	112.12	4.7196	
65.7963	4.186562915			75.690	1.757		1.0485	1.675632	110.25	4.702753	0.5161903
67.9736	4.219119007			70.880	1.709		1.0472	1.63178	110.92	4.70879	0.4896714
68.9816	4.233839407			55 260	1.553		1.0483		102.17	4.626601	0.3927611
68 4129	4.225561403			43.520	1.435		1.0486		93.64	4.53941	0.3138482
67.9275		4.13959514		33.550	1.336	-	1.0518		86.25	4.457244	
67.4054 66.0492	4.210725801			23.870	1.239		1.0521	1.17736	79.36	4.374	
62.7774	4.190399299			27.620	1.276			1.213579	80.16	4.383973	
58.0455	4 139595136			30.850	1.309			1.247438	78.31	4.360687	
56.1744	4.061227432			31.240	1.312			1.250798	72.60	4.285009	
55.9687	4 02040173	3.94470587	-0.083756	32.380	1.324			1.259023	70.72	4.258798	
55.5319	4 024793031 4 016957865			29.740	1.297			1.236443	69.20	4.237032	
51.6611	3.944705872			24.130	1.241	4.93	The second secon	1.182979	65.69	4.184994	
42.3823	3.746731319			17.390	1.174			1.118586	57.79	4.056771	0.1120653
42.3823	3.772738054			16.950	1.170			1.112379	47.15	3.853233	0.1065012
45.1845	3.810753176			17.220	1.172			1.116966	48.59	3.883354	0.1106161
45.1845	3.794998539			17.490	1.175			1.117144	50.48	3.921528	0.1107751
44.4782	3.794884107			16.740	1.167			1.110171	49.38	3.899512	0.1045137
44.1384	3.787329068			17.630	1.176		1.0494		49.85	3.909039	0.1141553
43.9856	3.783862939			16.840	1.168			1.113186	49.13	3.894555	0.107226
51.8867	3.949063371			15.160	1.152		1.05095	1.09577	48.20	3.875321	0.0914577
53.6207	3.981936076			15.090	1.151		1.0497	1.096408	56.89	4.041103	
56.5916	4.035860648	4.01516589	0.03323	16.390	1.164		1.0507	1.107738	59.40	4.084256	
55.6994	4.019969375			18.480	1.185		1.0494		63.89	4.157216	
55.4325	4.015165893			19.650	1.197			1.139849	63.49	4.150866	0.1308962
55.5147	4.016648301		and a second	21.160	1.212		1.05035	1.15352	63.94	4.157984	
55.5360	4.017032114			24.070	1.241	4.955	1.04955		65.63	4.183963	0.1673142
55.8011	4.021793085			24.870	1.249		1.0492	1.190145	66.10	4.191107	0.1740750
56.7145		4.06686956	0.045736	21.670	1.217		1.04925	1.15959	64.71	4.16986	0.1480666
58.2945	4.065507578			21.250	1.213		1.0494		65.53	4.182496	0.1444657
58.4125	4.067529256	4.06020324	-0.000993	25.960	1.260		1.0487		70.02	4.24875	0.1832429
58.3739	4_066869557	4.04850206	0.019367	26.680	1.267		1.04755	1.209298	70.64	4.257569	0.1900399
58.2366	4.064514491	4.0429058		24.160	1.242		1.0483		69.14	4.236101	0.1692310
57.9861	4.06020324			21.960	1.220		1.04585		67.91	4.218207	0.1536929
57.3115		4.02277536		21.850	1.219		1.0481	1.16258	67.41	4.210845	0.1506415
56.9917	4.042905803			21.780	1.218		1.0475	1.162387	66.62	4.198977	0.1504753
56.4276	4.032958569	4.01008213	-0.023237	23.100	1.216		1.04795	1.160647	66.15	4.191883	
55.8559	4.022775356				1.231	4.75	1.0475	1.175179	66.31	4.194379	
55.6237	4.018608941			24.080	1.241			1.186914	66.30	4.194132	
55.1514	4.010082131			21.530	1.221	4.63		1.166874	64.91	4.172937	0.154328
54.7382	4.002561654			21.610	1.215		1.04905		63.89	4.157188	
54.9301	4.006060893	3 98433126	-0.02173	21.440			1.0479	1.160511	63.52	4.151423	0.1488608
54.8896	4.005324279	3,99332996	-0.011994	21.440	1.214			1.154647	63.42	4.149856	0.1437946
54.3774	3.995949044		0.05339	21.420	1.214	4.805	1.04805		63.59	4.152478	0.147154
53.7493	3.984331264			20.350	1.204	4.005	1.04665	1.15626	62.87	4.14114	0.1451910
54.2352	3.99332996	4.15522306	0.161893	19.440	1.194	4.915		1.147119	61.66	4.121585	0.1372530
57.3595	4.049338783	4.13732598	0.087987	18.450	1.185	4.77	1.0515		61.61	4.120756	0.1274262
37.1196	4.206475819	4.15780039	-0.048675	19.690	1.103	4.77	1.0477	1.130572	64.85	4.172062	0.1227234
3.7662	4.155223056	4.14394674	-0.011276	26.200	1.262	4.04	1.0484		76.63	4.338946	0_1324696
82.6351	4.137325976			27.150	1.272	4.905	1.04905	1.202993	76.71	4.340036	0.1848123
3.9307	4.157800388	4.1029282		26.780	1.268	5.09	1.0516	1.20911	75.73	4.32721	0.189884
3.0512	4.143946742			26.360	1.264	4.955		1.206395	77.13	4.345437	0.187636
1.1642	4.113562378			26.282	1.263	4.935	1.04955		75.91	4.32955	0.1856032
0.5172	4.102928201			26.326	1.263	4.965	1.04945	1.203318	73.60	4.298645	0.1850830
0.1251		4.10296232		26.736	1.267	5.065	1.05065		72.83	4.288169	0.1852408
9.6117	4.08785136	4.08322668	-0.004625	26.981	1.270	4.96	1.0496		72.53	4.283953	0.1875253
2.6035	4,136820628	4.08385608	-0.052965	26.381	1.264	4.975	1.0496		72.12	4.27831	0.1904581
0.5193	4.102962322	4.09448486	-0.008477	25.475	1.255	5.065	1.05065		75.37	4.3224	0.185578
9.3366	4.083226683			24.672	1.247	5.015	1.05015	1.194263	72.28	4.280491	0.1775289
59.3740	4.083856083			23.741	1.237	4.975		1.187183	70.44	4.25481	0.1715830
30.0084	4.094484855			22.474	1.225	4.975	1.04975	1 178763	69.99	4.248321	0.1644652
59.8708	4.092189543	4.12393981	0.03175	20 587	1.225	5.1Z 4.97	1.0512		69.92	4.247281	0.1527962
6296	4.088152175			17.662	1.177		1.0497	1.148771	68.78	4.230882	0.1386927
31.8164	4.124168187			12.565	1.126	4.965	1.04965	1.120968	66.84	4.202345	0.1141925
31.8023	4.123939814		0.06041	12.565	1.120	4.965	1.04965	1.0724	66.29	4.194068	0.0698994
62.4960	4.135103035			8.950	1.107	5.1	1.051	1.053311	65.10	4.175878	0 0519386
		1.6.0170200	0.000019	0.500	1.090	4.89	1.0489	1.038707	64.92	4.17308	0 0379768

65.6508	4.18434933	4.29180735	0 107458	9 028	1 090	5.05	1.0505	1.03787	68.14	4.22152	0.037170596
68.8192	4.231482361	4.30964593	0.078164	9.626	1.096	4.955	1.04955	1.044507	71.88	4.275027	
73.6046	4.298707977	4.32652251									0.04354471
				11.442	1.114	5.075	1.05075	1.060597	78.06	4.35754	0.058832139
73.0985	4.291807349	4.32507512	0.033268	14.472	1.145	4.835	1.04835	1.091923	79.82	4.379748	0.087940382
74.4141	4.309645929	4.31466443	0.005019	14.842	1.148	4.91	1.0491	1.094675	81.46	4.400104	0.090457914
75.6807	4.326522514	4.30329933		15.778	1.158	4.79	1.0479	1.104853	83.62	4.426234	0.099711898
75.5712	4.325075119					a second s					
	4.323073119	4.2001/130	-0.066904	17.628	1.176	5.1	1.051	1.119196	84.58	4.437686	0.112610574
74.7885	4.314664434	4.29345872	-0.021206	18.135	1.181	4.94	1.0494	1.125742	84.19	4.433107	0.118442666
73.9434	4.303299327	4.30986721	0.006568	19.975	1.200	5.075	1.05075	1.141799	84.43	4.435904	0.132604839
70.6806	4.25817136	4.30896217	0.050791	20.295	1.203	4.7	1.047	1.148949	81.21	4.397019	0.138847941
73.2193	4.293458722		0.036878			4.89	1.0489				
74.4306				14.844	1.148				80.17	4.384121	0.090662504
and the second se	4.309867206		0.040997	11.278	1.113	5.09	1.0509	1.058885	78.81	4.367084	0.057216696
74.3633	4.308962167	4.33606328	0.027101	12.442	1.124	4.765	1.04765	1.073281	79.81	4.379682	0.07072001
75,9699	4.33033685	4.33660912	0.006272	11.222	1.112	5.03	1.0503	1.058956	80.45	4.387621	0.057283979
77.5454	4.350863756	4.35922519	0.008361	10.474	1.105	4.82	1.0482	1.05394	81.73	4.403399	0.052535606
76,4062	4.336063284									the second se	
		4.37269019	0.036627	9.904	1.099	4.585	1.04585	1.050862	80.29	4.385674	0.049610759
76.4479	4.336609122	4.36763574	0.031027	9.245	1.092	4.63	1.0463	1.04411	79.82	4.379774	0.043165037
78.1965	4.359225194	4.366065	0.00684	10.360	1.104	4.905	1.04905	1.052002	82.26	4.40992	0.050694836
79.2566	4.372690185	4.36444242	-0.008248	10.654	1.107	4.78	1.0478	1.056056	83.70	4.427232	0.054541687
78.8570	4.36763574	4.35991317	and the second s	and the second s						or one of the local division of the local di	
				11.167	1.112	4.8	1.048	1.060756	83.65	4.426618	0.058982052
78.7332	4.366064996	4.3535307		12.901	1.129	4.675	1.04675	1.078586	84.92	4 441716	0.075651017
78.6056	4_364442423	4.35027108	-0.014171	14.756	1.148	4.7	1.047	1.096042	86.15	4.456148	0.091705532
78.2503	4.359913174	4.36360487	0.003692	15.297	1.153	4.86	1.0486	1.099535	86.04	4.454801	0.094887449
77.7525	4.353530705,			14.972	1.150	4.845	1.04845	1.096588	85.26	4.445734	
77.4995	4.350271077	4.36968079	the second se						the second second second second		0.092203377
	the second	The second se	0.01941	12.899	1.129	4.62	1.0462	1.079136	83.63	4.426432	0.076160647
78.5398	4.363604866	4.36835694	the subscription of the su	10.517	1.105	4.82	1.0482	1.054348	82.81	4.416527	0.0529225
78.6201	4.36462682	4.36876344	0.004137	12.070	1.121	4.715	1.04715	1.070233	84.14	4.432504	0.06787684
79.0184	4_369680794	4.369024	-0.000657	12.873	1.129	4.635	1.04635	1.078733	85.24	4.445468	0.075786961
78.9139	4.368356944	4.36893259		12.839	1.128	4.695	1.04695	1.077785			a
and the second s						The second secon			85.05	4.443265	0.074908447
78.9460	4.368763441	4.36547152		12.393	1.124	4.8	1.048	1.072455	84.67	4.438714	0.06995011
78.9665	4.369024	4.36433249	-0.004692	11.629	1.116	4.725	1.04725	1.065921	84.17	4.432863	0.063839423
78.9593	4.368932587	4.3599126	-0.00902	11.498	1.115	4.805	1.04805	1.063857	84.00	4.430833	0.061900688
78.6865	4.365471524	4 35744541	-0.008026	11.012	1.110	4.65	1.0465	1.060797	83.47		The second secon
78.596918		4.36021403				The second				4.424492	0.059020458
				10.855	1.109	4.72	1.0472	1.058582	83.20	4.421263	0.056930664
78.250295	4 359912599		0.000824	10.611	1.106	4.61	1.0461	1.057365	82.74	4.415693	0.055780392
78.057475	4.357445414	4.36517202	0.007727	10.144	1.101	4.81	1.0481	1.050892	82.03	4.407085	0.049639413
78.273886	4.360214032	4.36687708	0.006663	10.010	1.100	4.57	1.0457	1.052023	82.35	4.410929	
78.314777	4.360736312			9.040			And a second sec				0.050714567
and the second se		the second se			1.090	4.67	1.0467	1.041748	81.58	4.401636	0.040899951
78.66293	4.365172015	NAME AND ADDRESS OF TAXABLE PARTY.	0.001831	7.338	1.073	4.76	1.0476	1.024609	80.60	4.389483	0.024310715
78.79717	4.366877077	4.37354109	0.006664	8.634	1.086	4.63	1.0463	1.038264	81.81	4.404428	0.037550435
78.57355	4.364035129	4.37658046	0.012545	8.340	1.083	4.725	1.04725	1.034514	81.29	4.397967	0.033931948
78.80711	4.367003215	4.37618357	0.00918	7.601	1.076	4.53				and the second s	
79.324029	4.373541091	4.35308078		and the second se			1.0453	1.029377	81.12	4.395957	0.028953971
the second	and the second sec	the second se	-0.02046	8.065	1.081	4.445	1.04445	1.034662	82.07	4.407616	0.034074594
79.56549	4.376580462	4.34173783		8.299	1.083	4.73	1.0473	1.034073	82.28	4.410086	0.033505694
79.533918	4.376183568	4.33837033	-0.037813	8.378	1.084	4.585	1.04585	1.036263	82.42	4.411805	0.035621288
77.717525	4.353080776	4.32620197	-0.026879	8.384	1.084	4.7	1.047	1.035186	80.45	4.387662	
76.84096	4.341737831	4.27119809	-0.07054								0.034581359
and the second s	a substitution and a substances and			7.774	1.078	4.555	1.04555	1.030785	79.21	4.372059	0.030320874
76.582633	4.338370332	4.30030479	And a state of the	6.239	1.062	4.68	1.0468	1.014897	77.72	4.353157	0.01478696
75.656395	4.326201971	4.31411268		6.254	1.063	4.525	1.04525	1.016539	76.91	4.342606	0.016403824
71.607376	4.271198088			5.843	1.058	4.675	1.04675	1.011161	72.41	4.282297	0.011098914
73.72226	4.300304789			2.998	1.030	4.67			The second se		
74.74727	4.314112684	4.35369244						0.984028	72.54	4.284204	
				1.537	1.015	4.65	1.0465	0.970253	72.52	4.283914	-0.030198185
75.960152	4.330208892			1.181	1.012	4.545	1.04545	0.96782	73.52	4.2975	-0.032709079
77.904168	4.355479458			0.830	1.008	4.51	1.0451	0.964784	75.16	4.319629	
77.765076	4.353692438	4.33460141	-0.019091	1.003	1.010	4.67	1.0467		75.04	4.318025	and the second sec
76.737542	4.340391055			1.280	the second						
76.019415	4.330988768				1.013	4.615		0.968121	74.29	4.307993	-0.032397986
				1.458	1.015	4.585	1.04585	0.970103	73.75	4.300636	-0.030353247
76.294543	4.334601414			1.580	1.016	4.48	1.0448	0.972243	74.18	4.306452	-0.028149
76_38972	4.335848132	4.37251319	0.036665	1.571	1.016	4.53	1.0453		74.23	4.307135	-0.028713589
77.261917	4.347201174			1.592	1.016	4.6					
77.90988	4.355552774							0.971239	75.04	4.318018	and the second s
79.242533				2.110	1.021	4.57	1.0457		76.08	4.331747	-0.02380604
	4.372513192			2.870	1.029	4.63	1.0463	0.983181	77.91	4.355551	-0.016962318
79.270343	4.372864072			2.015	1.020	4.5	1.045	0.976218	77.39	4.348794	
79.990536	4.381908332	4.39693502	0.015027	1.707	1.017	4.38	1.0438		77.94	4.355961	
80.825727	4.392295322			2.267	1.023						-0.025946872
	4.390992627				and the second s	4.38	1.0438		79.19	4.371846	-0.02044909
80 720505	T.000002021			2.749	1.027	4.49	1.0449		79.38	4.374186	-0.016807118
80.720505			-0.041125	3.950	1.040	4.59	1.0459	0.993881	80.70	4.390797	-0.00613793
81.201605	4.396935016				1.00.1	4.36	1.0436				
81.201605 81.204443	4.396935016 4.396969961	4.34300127	-0.053969	5.061	1.051	······································		1.000771	81 /5		U UUEECO NO 4
81.201605	4.396935016 4.396969961	4.34300127	-0.053969				the second se		81.75	4.403668	0.006698481
81.201605 81.204443 79.774438	4.396935016 4.396969961 4.379203129	4.34300127 4.31485544	-0.053969 -0.064348	8.043	1.080	4.37	1.0437	1.035195	82.58	4.413793	0.034590103
81.201605 81.204443 79.774438 77.929895	4.396935016 4.396969961 4.379203129 4.355809644	4.34300127 4.31485544 4.33265812	-0.053969 -0.064348 -0.023152	8.043 8.259	1.080 1.083	4.37 4.43	1.0437 1.0443	1.035195 1.036666			
81.201605 81.204443 79.774438 77.929895 76.938105	4.396935016 4.396969961 4.379203129 4.355809644 4.343001267	4.34300127 4.31485544 4.33265812	-0.053969 -0.064348 -0.023152	8.043 8.259 8.587	1.080 1.083 1.086	4.37	1.0437 1.0443	1.035195	82.58	4.413793	0.034590103
81.201605 81.204443 79.774438 77.929895 76.938105 74.80281	4.396935016 4.3969699961 4.379203129 4.355809644 4.343001267 4.314855445	4.34300127 4.31485544 4.33265812	-0.053969 -0.064348 -0.023152	8.043 8.259	1.080 1.083	4.37 4.43	1.0437 1.0443 1.0438	1.035195 1.036666 1.040305	82.58 80.79 80.04	4.413793 4.391819 4.382515	0.034590103 0.036009514 0.039513609
81.201605 81.204443 79.774438 77.929895 76.938105	4.396935016 4.396969961 4.379203129 4.355809644 4.343001267	4.34300127 4.31485544 4.33265812	-0.053969 -0.064348 -0.023152	8.043 8.259 8.587 8.630	1.080 1.083 1.086 1.086	4.37 4.43 4.38 4.49	1.0437 1.0443 1.0438 1.0449	1.035195 1.036666 1.040305 1.039621	82.58 80.79 80.04 77.77	4.413793 4.391819 4.382515 4.353712	0.034590103 0.036009514 0.039513609 0.038856239
81.201605 81.204443 79.774438 77.929895 76.938105 74.80281	4.396935016 4.3969699961 4.379203129 4.355809644 4.343001267 4.314855445	4.34300127 4.31485544 4.33265812	-0.053969 -0.064348 -0.023152	8.043 8.259 8.587	1.080 1.083 1.086	4.37 4.43 4.38	1.0437 1.0443 1.0438 1.0449 1.04565	1.035195 1.036666 1.040305 1.039621	82.58 80.79 80.04	4.413793 4.391819 4.382515	0.034590103 0.036009514 0.039513609

K POUNE	S DATA										
t	Ln_St	S_t+3	D_S_t+3	KE TBILL	1+KETBILL	US_TBILL	1+USTBILL	F/H	S_t(F/H)	Ln Ft	LNFt - Ln_8
55.6225	4.018588425	4.38621884		17.87	1.1787	4.85	1.0485	1.124177	62.53	4.13564	0.1170515
52.675085	3 964142573			17.860	1.1786	4.63	1.0463	1.126446	59.34	4 08321	0.1190671
80.33608	4.141842478 4.386218835	4.57436418		25.070	1.2507	4.875	1.04875	1.192563	75.03	4.317947	0.1761044
96.377	4.568262495	4.58434553 4.58227676		45.790	1.4579	4.81	1.0481	1.390993	111.75	4 716237	0.3300180
96.966	4 574364183	4.60839738	0.01401426	68.040	1.6804	4 86	1.0486	1.602518	154.45	5.039838	0.4715759
7.939068	4.584345532	4 62615792		84 290 84.670	1 8429	4.71	1.0471	1.760004	170.66	5.13968	0.5653159
7.736664	4 582276756	4.6265241		79.510	1.7951	4.74	1.0474	1.713863	172.61 167.51	5.151053 5.121027	0.5667075
00.32324	4 608397382	4.62436063		75.690	1.7569	4.85	1.0485	1.675632	168.10	5.124588	0.5161903
02.12095	4 626157921	4 61836043	-0.0077975	70.880	1.7088	4.72	1.0472	1,63178	166.64	5.115829	
02.15835	4 626524105	4.60268746	-0.0238366	55.260	1.5526	4.83	1.0483	1.481065	151.30	5.019285	0.3927611
01.93758	4 624360628	4 59083623	-0.0335244	43.520	1.4352	4.86	1.0486	1.368682	139.52	4.938209	0.3138482
101.3278 19.752035	4 61836043	4.53335048	-0.0850099	33.55	1.3355	5.18	1.0518	1.269728	128.66	4 857163	0.2388027
8.576829	4 602687457 4 590836232	4.46949669	-0.1331908	23.870	1.2387	5.21	1.0521	1.17736	117.44	4.765962	0.1632742
3.069868	4.533350484	4.46011755	-0.1403891 -0.0732329	27.620	1.2762	5.16	1.0516	1.213579	119.63	4.78441	0.193574
87_313	4.469496691	4.45084922	-0.0186475	30.850 31.240	1.3085	4.895	1.04895	1.247438	116.10	4.754442	0 2210917
85.665	4.45044712	4.38944068	-0.0610064	32.380	1.3238	4.925	1.04925	1.250798	109.21	4.693279	0.223781
6.497676	4.460117549	4_21937372	-0.2407438	29.740	1.2974	4.93	1.05145	1.259023	107.85	4.680783	0 2303362
5.699691	4.450849224	4.23351839	-0.2173308	24.130	1.2413	4.93	1.0493	1.236443	106.95 101.38	4.672357	0.2122389
0.595328	4 389440685	4.25546966	-0.133971	17.390	1.1739	4.945	1.0493	1.118586	90.15	4.618885	0.1680359
7.990889	4 219373718	4.24896887	0.02959515	16.950	1.1695	5.135	1.05135	1.112379	75.63	4.325875	0.1065012
8.959432	4 233518387	4.24765603	0.01413765	17.220	1.1722	4.945	1.04945	1.116966	77.03	4.344134	0.1106161
0.489916	4.255469661	4.25729621	0.00182655	17.490	1.1749	5.17	1.0517	1.117144	78.75	4.366245	0.1107751
70.0332	4 248968871	4.25977088		16.74	1.1674	5.155	1.05155	1.110171	77.75	4.353483	
69.94128	4.247656033	4.40922824	0.1615722	17.630	1.1763	4.94	1.0494	1.120926	78.40	4.361811	
0.618787	4 257296213	4.44911703		16.840	1.1684	4.96	1.0496	1.113186	78.61	4.364522	0.1072261
0.793761 82 206	4 259770877	4.50257911	0.24280824	15.160	1.1516	5.095	1.05095	1.09577	77.57	4.351229	0.0914577
85.551	4 409228237 4 449117031	4 47078909 4 45844013		15.090	1.1509	4.97	1.0497	1.096408	90,13	4.501268	0.0920398
0.249595	4.502579112	4.4735768	0.0093231	16.390	1.1639	5.07	1.0507	1.107738	94.77	4.551437	0.1023198
7.425683	4.470789091	4.46475353	-0.0060356	18.480 19.650	1.1848	4.94	1.0494	1.129026	101.89	4.623935	0.1213554
6.352705	4.458440127	4.45395465	-0.0044855	21.160	1.1965	4.97	1.0497	1.139849	99.65	4.601685	0.13089622
87.66974	4 4735768	4_46350387	-0.0100729	24.070	1.2407	5.035	1.05035	1.15352	99.61	4.601258	0.14281836
6.899609	4 464753534	4.49498645	0.03023291	24.870	1.2487	4.92	1.04935	1.182126	103.64	4.640891	0.16731424
35.966239	4 453954648	4.49149019	0.03753554	21.670	1.2167	4.925	1.04925	1.15959	99.69	4.638829	0.17407504
86.7911	4.463503872	4 48288356		21.25	1.2125	4.94	1.0494	1.155422	100.28	4.602021	0.1480666
9.566955	4.494986446	4.47938595	-0.0156005	25.960	1.2596	4.87	1.0487	1.201106	107.58	4.678229	0.1832429
9.254352	4.491490186	4.49338105	0.00189087	26.680	1.2668	4.755	1.04755	1.209298	107.94	4.68153	0.19003993
88.48947	4_482883562	4.48953333	0.00664977	24.160	1.2416	4.83	1.0483	1.184394	104.81	4.652115	0.1692310
88.181	4 479385953	4.48141675	0.0020308	21.960	1.2196	4.585	1.04585	1.166133	102.83	4.633079	0.1536929
89.423	4_493381051	4.47755616		21.850	1.2185	4.81	1.0481	1.16258	103.96	4.644023	0.1506415
9.079865 8.359768	4.489533329	4.48350659	-0.0060267	21.760	1.2176	4.75	1.0475	1.162387	103.55	4.640009	0.15047534
8.019305	4.481416755	4.52660465	0.0451879	21.630	1.2163	4.795	1.04795	1.160647	102.55	4.630394	0.14897758
8.544619	4.483506595	4.51987233 4.51180881	0.04231616	23.100	1.231	4.75	1.0475	1.175179	103.44	4.638977	0.16142047
2.444148	4 526604653		0.02830221	24.080	1.2408	4.54	1.0454	1.186914	105.09		0.17135675
1.823874	4.519872326	4.47993803	-0.0399343	22.090	1.2209	4.63	1.0463	1.166874	107.87	4.680933	0.15432816
91.0864	4.511808806	4.48505263	-0.0267562	21.530	1.2153	4,905	1.04905	1.158477	106.38	4.666978	0.14710597
9.312826	4.492145109	4.47493295		21.440	1.2144	5.175	1.0479	1.160511	105.71	4.66067	0.14886086
8.229205	4 479938034	4.49107071	0 01113267	21.420	1.2142	4.805	1.04805	1.154647	103.12	4.63594	0.14379468
8.681618	4.485052632	4.56374407	0.07869144	21.020	1.2102	4.665	1.04665	1.15626	102.22	4.630244	0.1451910
87.789	4.474932953	4.67954004	0.20460709	20.350	1.2035	4.915	1.04915	1.147119	100.70	4.612187	0.1372536
89.217	4.491070708	4.626084	0.1350133	19.440	1.1944	5.15	1.0515	1.135901	101.34	4.618497	0.1274262
5.942022	4.563744069	4.62713085		18.450	1.1845	4 77	1.0477	1.130572	108.47	4.686468	0 1227234
07.72051	4.679540042	4.68106001	0.00151996	19.690	1.1969	4.84	1.0484	1.141644	122.98	4.81201	0.1324696
02.22036	4.626084005	4.65165977	0.02557576	26.200	1.262	4.905	1.04905	1.202993	122.84	4.810897	0 1848127
07.88437	4.681060005	4.60596007 4.59765728	-0.0211708	27.150	1.2715	5.16	1.0516	1.20911	123.60	4.817015	0_1898844
04.75872	4.651659769	4.60377995	-0.0834027 -0.0478798	26.780	1.2678	5.09	1.0509	1.206395	130.15	4.868696	0.1876361
00.0790	4.605960074	4.60260375	-0.0033563	26.360 26.28225	1.2636	4.955	1.04955	1.203945	126.12	4.837263	0 1856032
9.251525	4.597657285	4.63010423		26.326	1.2632625	4.945	1.04945	1.203318	120.43	4.791043	0.1850830
9.861073	4.603779947	4.60318321	-0.0005967	26.736	1.267358	4.965	1.04965	1.203508	119.45	4.782898	0 1852408
9.743685	4 602603745	4.58138667	-0.0212171	26.981	1.26981	4.96	1_05065	1.206261	120.46	4.791305	0.1875254
102.525	4 630104233	4.5749592	-0.055145	26.381	1.26381	4.90	1.0496	1.209804	120.67	4.793062	0.19045814
99.802		4.61361137		25.475	1.254752	5.065	1.04975	1.194263	123.43	4.815683	0.1855789
7.649709	4.581386674		0.03799195	24.672	1 24672	5.015	1.05015	1.194263	119.19	4.780712	0.1775289
97.02408	4.574959195	4.59643313		23.741	1.237406	4.975	1.04975	1.178763	115.93 114.37	4 75297	0 1715830
00.84769	4.613611368	4.63654019		22.474	1.22474	5.12	1.04975	1.165088	114.37	4.739424	0 1644652
01.43099	4.619378624		0.00552525	20.587	1.205865	4.97	1.0497	1.148771	116.52	4.758071	0.13869274
99.1301	4 596433129	4.62329715	0.02686402	17.662	1.176624	4.965	1.04965	1.120968	111.12	4.738071	0.11419255
03 18672	4.636540189	4.64250379	0.0059636	12.565	1.125645	4.965	1.04965	1.0724	110.66	4.70644	0.06989943
	4 00 4000074	4 66470044	0.03687857	10.703	1.10703	5.1	1.051	1.053311	107.43	4.676843	0.00000004

117.659 4.786.00270 8.05677 0.0577 1.05677 1.427 1.4427 1.4427 1.4427 1.4427 1.4427 1.4427 1.4427 1.4447 1.4447 1.4447 1.4447 1.4447 1.4447 1.4447 1.4447 1.4447 1.4447 1.4444 4.01 1.04457 1.056 4.7526 0.05675 1.4447 1.4444 4.01 1.04447 1.04447 1.04447 1.044411												
0.9.09.09 4.492.03794 7.0001 0.00240 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0025 0.0031 0.0031 0.0025 0.0031 <t< td=""><td>101.82923</td><td>4.623297145</td><td>4,7108848</td><td>0.08758765</td><td>8 950</td><td>1 0905</td><td>4.80</td><td>1 0489</td><td>1.038707</td><td>105.77</td><td>4 661274</td><td>0.03797688</td></t<>	101.82923	4.623297145	4,7108848	0.08758765	8 950	1 0905	4.80	1 0489	1.038707	105.77	4 661274	0.03797688
108.9544 4.86778244 4.78480131 0.028797 0.0287 100021 0.0267 100021 0.0267 100021 0.0267 100021 0.0267 100021 0.02687 0.066847 1010 4.72640 0.066847 11110 4.70660127 4.20164710 0.0248347 4.427 1.4477 4.4477 1.4477 4.4477 1.4477 4.4477 1.4477 4.4477 1.4477 4.4477 1.4477 4.4477 1.4477 4.4477 1.4477 1.4477 4.4477 1.4477 4.4477 1.44777 1.44777 1.44777 </td <td>103 80393</td> <td></td> <td></td> <td></td> <td>the second se</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	103 80393				the second se							
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11.5 diss 4.76800127 4.8000716 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4805071 0.4905071	111.150	4.710884796	4.78376773	0.07288294	9,626	1.096262	4.955	1.04955	1_044507	116.10	4.75443	0.04354471
115 0880 4.74665 308 4.83060 10 0.44370 1442 4.8356 10 0.44370 10 0.44370 10 0.44370 10 0.44370 10 0.4457 10 0.4455 10 0.45070 10 0.4457 10 0.4455 10 0.45070 10 0.45170 10 0.4457 10 0.45170 10 </td <td>117.519</td> <td>4.766601279</td> <td>4.81056716</td> <td>0.04396588</td> <td></td> <td></td> <td></td> <td>1 05075</td> <td>1.060597</td> <td>124.64</td> <td>4.825433</td> <td>0.05883214</td>	117.519	4.766601279	4.81056716	0.04396588				1 05075	1.060597	124.64	4.825433	0.05883214
118 4.780777.4 7.00 1.4842 1.4842 1.4842 1.4847 </td <td>115.08389</td> <td></td>	115.08389											
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19.2056 4.758087 7.0597 1.00776 1.00776 1.00776 1.04708 0.22 4.614294 0.12205 4.71 0.077 1.44708 0.30 3.4222 4.614294 0.12205 0.32676 0.327676 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.3276776 0.32767776 0.3277776 0.3277776 0.3277776 0.3277776 0.3277776 0.3277776 0.3277776 0.32777776 0.3277776 0.32777777777777777777777777777777777777	125.26119	4.830401073	4.75371691	-0.0766842	17.628	1.176275	5.1	1.051	1.119196	140.19	4.943012	0.11261057
19.3056 4,761087,7714687,47071337 0.014654 19.075 1.19746 5.075 1.00776 1.147769 133.0 4.2526 0.132004 17.4520 4,7573618 4,7423268 0.023977 46.44 1.1484 4.89 1.0468 1.0468 1.04898 133.0 4.2526 0.132004 17.4520 4,7573618 4,7423268 0.023977 46.44 1.1484 4.89 1.0468 1.0488 1.0489 1.0498 17.252 4,7573618 4,7423268 0.02597 12.46 1.14222 1.14222 0.03 1.0476 1.0476 1.0489 1.0489 1.0498 1.0498 0.07220 11.701 4,74232654 4,7383788 0.005847 1.222 1.14222 0.03 1.0455 1.05685 1.0534 1.223 4.47981 0.07283 11.5344 4,7699538 4,723648 0.02598 2.246 1.0462 1.0474 4.555 1.0465 1.05344 1.223 4.7777 0.046617 11.9307 4,7529788 4,7357868 0.021297 2.04421 1.0474 4.555 1.0465 1.05344 1.223 4.77770 0.046617 11.9307 4,74237588 4,7439548 0.012285 2.245 0.04252 4.40 1.0455 1.05344 1.223 4.77770 0.046617 11.9307 4,742375788 4,723248 0.01334 0.02129 1.0474 1.0474 4.55 1.0465 1.0465 1.05282 1.128 4.78172 0.046617 11.9307 4,7435720 4,713495 0.014550 1.1167 1.11775 4.46 1.0465 1.05282 1.128 4.78172 0.046617 11.9474 4.74190534 4,722379 0.04321 1.11767 1.11775 4.460 1.04655 1.05282 1.128 4.78172 0.045664 11.9474 4.74190524 4.722379 0.014908 1.1167 1.11767 4.465 1.0465 1.00576 1.128 4.78172 0.05664 11.9474 4.74190524 4.722379 1.01480 1.015481 1.1675 1.17656 4.7 1.047 1.00776 1.0421 0.07766 1.128 4.78112 0.07765 11.7244 4.722976 4.7213968 0.014958 1.12871 1.15272 4.46 1.0461 1.06953 1.22 4.441962 0.0275510 11.94251 4.7222075 4.731988 0.044492 1.0425 1.01585 4.4601 0.09233 11.2204 4.71514 0.05252 11.2204 4.71514 0.05252 11.2204 4.722379 0.045694 0.019361 1.1297 4.4556 4.10461 1.069558 1.22 4.441960 0.02559 11.2544 1.25474 4.7229796 0.015364 1.2279 0.045694 1.25474 4.725297 0.045694 0.01937 0.05595 1.4274 1.4451 1.4251 4.722279 0.045694 0.01937 0.05595 1.4272 1.445 1.046 1.046 1.046 1.046 1.046 1.046 1.046 1.046 1.046 1.046	121.425	4.799296751	4.76572619	-0.0335706	18 135		4 94	1.0494	1.125742	136.69	4.917739	0.11844267
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114.8473 4.742210444 4.72532713 -0.0168833 11.626 4.725 10.85927 122.25 4.80865 0.0983947 113.45649 4.72549716 4.71025021 0.0187261 11.0121 4.655 10.4655 10.4657 1.066397 120.71 4.728280 0.0589004 112.76738 4.72520103 4.72555254 0.028444 10.641 1.10641 4.65 1.0465 1.06677 12.012 4.788518 0.0587803 111.0581 4.710050302 4.7389754 0.0286444 10.641 1.10614 4.61 1.0461 1.05062 116.756 117.75 4.789705 0.0486324 112.90564 4.73809753 0.0280444 1.0010 1.0101 4.57 1.0467 1.04714 119.44 4.780297 0.048939 114.596 4.73997733 4.8047832 7.338 1.0761 1.0476 1.04726 1.03284 1.23287 0.042199 1.04259 1.04260 1.9444 4.783027 0.048939 0.042310 0.232871 0.2284001 0.243107 1.04726 1.03284 1.04174 1.03284 1.04174	113.36572	4.730619068	4.73149875	0.00087968	12.839	1.1283875	4.695	1.04695	1.077785	122.18	4.805528	0.07490845
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146.77058 4.988870716 4.98710064 -0.0017701 3.950 1.0395 4.59 1.0459 0.993881 145.87 4.982733 -0.006137 150.84926 5.016281073 4.97770179 -0.0385793 5.061 1.050614 4.36 1.0436 1.006721 151.86 5.02298 0.0066984 153.93602 5.036537086 4.96079164 -0.0757454 8.043 1.08043333 4.37 1.0437 1.035195 159.35 5.071127 0.034590 146.51102 4.987100641 4.97189582 -0.0152048 8.259 1.08259 4.43 1.0443 1.036666 151.88 5.02311 0.0360095 145.14044 4.977701791 4.95374958 -0.0239522 8.587 1.08259 4.43 1.04438 1.04305 150.99 5.017215 0.0360095 145.14044 4.977701791 4.95374958 -0.0239522 8.587 1.08687 4.38 1.04305 150.99 5.017215 0.0396136 142.70672 4.960791642 8.630 1					2.749	1.027485	4.49	1.0449	0.983333	142.34	4.958227	-0.0168071
150.84926 5.016281073 4.97770179 -0.0385793 5.061 1.050614 4.36 1.0436 1.006721 151.86 5.02298 0.0066984 153.93602 5.036537086 4.96079164 -0.0757454 8.043 1.08043333 4.37 1.0437 1.035195 159.35 5.071127 0.034590 146.51102 4.987100641 4.97189582 -0.0152048 8.259 1.08259 4.43 1.0443 1.036666 151.88 5.02311 0.0360095 145.14044 4.977701791 4.95374958 -0.0239522 8.587 1.08587 4.38 1.0438 1.040305 150.99 5.017215 0.0385622 142.70672 4.960791642 8.630 1.0863 4.49 1.0449 1.039621 148.36 4.999648 0.0386682 144.3002 4.971895819 8.681 1.086805 4.565 1.04565 1.039358 149.98 5.010499 0.038603	146.77058	4.988870716	4.98710064	-0.0017701	3.950	1.0395	4.59					
153.93602 5.036537086 4.96079164 -0.0757454 8.043 1.08043333 4.37 1.0437 1.035195 159.35 5.07127 0.034590 146.51102 4.987100641 4.97189582 -0.0152048 8.259 1.08259 4.43 1.04437 1.035195 159.35 5.071127 0.034690 145.14044 4.977701791 4.95374958 -0.0239522 8.587 1.08587 4.38 1.0438 1.040305 150.99 5.017215 0.0395136 142.70672 4.960791642 8.630 1.0863 4.49 1.0449 1.039621 148.36 4.999648 0.0388562 144.3002 4.971895819 8.681 1.086805 4.565 1.039358 149.98 5.010499 0.038603	1											
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142.70672 4.960791642 8.630 1.0863 4.49 1.0449 1.039621 148.36 4.999648 0.0388562 144.3002 4.971895819 8.681 1.086805 4.565 1.04565 1.039358 149.98 5.010499 0.038603	153.93602 146.51102	4.987100641	4.97189582								0.02011	
<u>144.3002 4.971895819</u> 8.681 1.086805 4.565 1.04565 1.039358 149.98 5.010499 0.038603	153.93602 146.51102 145.14044	4.987100641 4.977701791	4.97189582		8 587	1.08587						
140.50 0.010405 0.000000	153.93602 146.51102 145.14044	4.987100641 4.977701791	4.97189582		8 587	1.08587	4.38	1.0438	1.040305	150.99	5.017215	0.03951361
	153.93602 146.51102 145.14044 142.70672	4.987100641 4.977701791 4.960791642	4.97189582		8 587 8.630	1.08587 1.0863	4.38 4.49	1.0438 1.0449	1.040305 1.039621	150.99 148.36	5.017215 4.999648	0.03951361
	153.93602 146.51102 145.14044 142.70672 144.3002	4.987100641 4.977701791 4.960791642 4.971895819	4.97189582 4.95374958		8 587 8.630 8.681	1.08587 1.0863 1.086805	4.38 4.49 4.565	1.0438 1.0449 1.04565	1.040305 1.039621 1.039358	150.99 148.36 149.98	5.017215 4.999648 5.010499	0.03951361 0.03885624 0.0386035

	ATA										
t	Ln_St	5_t+3	D_S_t+3	KE_TBILL	1+KETBILL			F/H	5_t(F/H)	Ln Ft	LNFt - Ln_S
				17.870		4.85		1.124177			
			_	17.860 25.070	1.179	4.875	1.049				
				45.790	1.458	4.81		1.390993			
				68.040		4.86	1.049	1.602518			
				84.290		4.71	1.047				
_				84_670		4.78	1.048				
				79.510		4.74	1.047				
			-	70.880		4.03	1.047	1.63178			
				55.260		4.83	1.048	1 481085			
				43.520		4.86	1.049				
				33 550	1.336	5.18	1.052			_	
				23.870	-	5.21	1.052	1.17736			
				27.620			1.032				
				31.240				1.250798			
				32.380			1.051	1.259023			
				29.740		4.93			[
				24.130		4.93		1.182979	+	_	
				17.390					-		
				16.950					-		
				17.490				1.117144			
				16.740				1.110171	1		
				17.630							
				16.840					4		
				15.160							
				15.090							
				18.480							
				19.650							
				21.160				1.15352	2		
				24.070	1.24						
				24.870							
				21.670							
				21.250						-	
				26.680				-			
				24.160							
				21.960	and the second s	0 4.58	5 1.046	1.16613	3		
				21.85	-			1			
				21.76				-			
				21.63							
				23.10							
				22.09							
				21.53				1.15847			
				21.61				3 1.16051			
				21.44							
				21.42				3 1.15853			
_				21.02							
				19.44							
				18.45							
				19.69	0 1.19	7 4.8	4 1.04	B 1.14164	4		
				26.20							
				27.15							
				26.78						_	
				26.36							
				26.32				1.20350			
				26.73				1 1.20626			
				26 98	1 1.27	C 4.9	6 1.05	0 1.20980	4		
				26.38				0 1.20391			
				25.47				1 1.19426			
				24.67							
				23.74				-			
				20.58							
				17.66	and the second se	and the second s					
				12.56		4.96				-	

69.722983 70.27677 73.1782 76.410857 75.674686 78.94655 79.475677 80.979895 77.435164 74.8584 71.827737 72.031457	4 249516649 4.24453 4.252441303 4.292897562 4.336124795 4.32644371	4.29289756 4.3361248 4.32644371 4.36877104	0.043381 0.091595 0.074002	8.950 8.845 9.028	1.090	4.89 4.95	1.049 1.050	1.038707 1.037111	72.783809 72.310473	4.287494 4.280969	0.037976879
70.27677 4 73.1782 4 76.410857 4 75.674686 7 78.94655 4 79.979895 4 77.435164 4 74.8584 7 71.827737 7 72.031457 7	4.252441303 4.292897562 4.336124795	4 32644371 4.36877104	0.074002						72.310473		0.036438968
73.1782 4 76.410857 4 75.674686 7 78.94655 4 79.979895 4 77.435164 7 74.8584 7 72.031457 7 71.833678 4	4.292897562 4.336124795	4.36877104		9029	4 000		1				
76.410857 75.674686 78.94655 79.475677 80.979895 77.435164 77.435164 71.827737 71.827737 72.031457 71.833678 71.833678	4.336124795				1.090	5.05	1.051	1.03787	72.938156	4.289612	0.037170596
76.410857 75.674686 78.94655 79.475677 80.979895 77.435164 77.435164 71.827737 71.827737 72.031457 71.833678 71.833678	4.336124795		0.075873	9.626	1.096	4.955	1.050	1.044507	76.43512	4.336442	0.04354471
75.674686 78.94655 79.475677 80.979895 77.435164 74.8584 71.827737 72.031457 71.833678		4.37545103	0.039326	11.442	1.114	5.075	1.051	1.060597	81.041141	4.394957	0.058832139
78 94655 4 79.475677 4 80.979895 4 77.435164 4 74.8584 4 71.827737 4 72.031457 4 71.833678 4	4.020440711	4.39420091	0.067757			4.835	1.048	1.091923	82.630932	4.414384	
79.475677 80.979895 77.435164 74.8584 71.827737 72.031457 71.833678	4 309774044			14.472	1.145				86 420849	4.459229	0.090457914
80.979895 77.435164 74.8584 71.827737 72.031457 71.833678	4.368771041	4 34944099	-0.01933	14 842	1.148	4.91	1.049	1.094675			
77.435164 74.8584 71.827737 72.031457 71.833678	4.375451029		-0.059853	15.778	1.158	4.79	1.048	1.104853	87.808906	4.475163	0.099711898
74.8584 71.827737 72.031457 71.833678	4.394200911	4.27427071	-0.11993	17.628	1.176	5.1	1.051	1.119196	90 632375	4.506811	0.112610574
71.827737 72.031457 71.833678	4.349440988		-0.072338	18.135	1.181	4.94	1.049	1.125742	87.172041	4.467884	0.118442666
72.031457 71.833678	4.315598329	4.27435342	-0.041245	19.975	1.200	5.075	1.051	1.141799	85.473225	4.448203	
71.833678	4.274270708	4.25619733	-0.018073	20.295	1.203	4.7	1.047	1.148949	82.526434	4.413119	0.138847941
	4.277102928	4.23290816	-0.044195	14.844	1.148	4.89	1.049	1.094899	78.867201	4.367765	0.090662504
	4.274353423	4.29963632	0.025283	11.278	1.113	5.09	1.051	1.058885	76.063622	4.33157	0.057216696
	4.25619733	4.27537613	0.019179	12.442	1.124	4.765	1.048	1.073281	75.710537	4.326917	0.07072001
	4.232908158	4.2378676	0.004959	11.222	1.112	5.03	1.050	1.058956	72.980489	4.290192	0.057283979
	4 299636317	4.22084232	-0.078794	10.474	1.105	4.82	1.048	1.05394	77.646923	4.352172	0.052535606
		4.2163801	-0.058996	9.904	1.099	4.585	1.046	1.050862	75.564522	4.324987	0.049610759
	4.275376134									4.281033	0.043165037
	4.237867602	4.21142122	-0.026446	9.245	1.092	4.63	1.046	1.04411	72.315077		
	4.220842318	4.25496269	0.03412	10.360	1.104	4.905	1.049	1.052002	71.63166		0.050694836
67.787655	4.216380099	4.30155383	0.085174	10.654	1.107	4.78	1.048	1.056056	71.587594	4 270922	0.054541687
67.452336	4.211421221	4.27889994	0.067479	11.167	1.112	4.8	1.048	1.060756	71.550484	4.270403	0.058982052
70.454188	4.254962686	4.25995472	0.004992	12.901	1.129	4.675	1.047	1.078586	75.990908	4.330614	0.075651017
	4.301553835	4.23677867	-0.064775	14.756	1.148	4.7	1.047	1.096042	80,903684	4.393259	0.091705532
	4.278899942		-0.047337	15.297	1.153	4.86	1.049	1.099535	79.343568	4.373787	0 094887449
70.806777	4.25995472	4.20695625	-0.052998	14.972	1.150	4.845	1.048	1.096588	77.64585	4.352158	
	4.236778675	4.21698266	-0.019796	12.899	1.129	4.62	1.046	1.079136	74.659615		
	4.231562626	4.26328068	0.031718	10.517	1.105	4.82	1.048	1.054348	72.565175	4 284485	
		4.20328008	0.068264	12.070	1.103	4.715	1.040	1.070233	71.868143	4.274833	0.06787684
	4.206956249										
	4.216982662	4.27085831	0.053876	12.873	1.129	4.635	1.046	1.078733	73.168838	4.29277	
and the second s	4 263280676	4.2504587	-0.012822	12.839	1.128	4.695	1.047	1.077785	76.568757	4.338189	
71.89594	4.275219796	4.25188316	-0.023337	12.393	1.124	4.8	1.048	1.072455	77.105137	4.34517	0.06995011
71.58305	4.270858314	4.24189239	-0.028966	11.629	1.116	4.725	1.047	1.065921	76.301892		
70.137577	4.250458703	4.22060637	-0.029852	11.498	1.115	4.805	1.048	1.063857	74.616331	4.312359	0.061900688
70.237556	4.251883157	4 22591171	-0.025971	11.012	1.110	4.65	1.047	1.060797	74.507785	4.310904	0.059020458
69.539323	4.241892387	4.23899248	-0.0029	10.855	1.109	4.72	1.047	1.058582	73.613104	4.298823	0.056930664
	4.220606366	4.27413552	0.053529	10.611	1.106	4.61	1.046	1.057365	71.979889		
	4.225911714	4.31880711	0.092895	10.144	1.101	4.81	1.048	1.050892	71.919765		
	4.238992478	4.36021349	0.121221	10.010	1.100	4.57	1.046	1.052023	72.945096		
				9.040						+	
	4.274135521	4.34186943	0.067734		1.090	4.67	1.047	1.041748	74.816277	4.315035	
75.09899	4.31880711	4.34732895	0.028522	7.338	1.073	4.76	1.048	1.024609	76.947073		
	4.360213492	4.35477246	-0.005441	8.634	1.086	4.63	1.046	1.038264	81.268942		-
76.851073	4.341869429	4.37801186	0.036142	8,340	1.083	4.725	1.047	1.034514	79.503526	4.375801	0.033931948
77.27179	4.347328953	4.39428008	0.046951	7.601	1.076	4.53	1.045	1.029377	79.54182	4.376283	0.028953971
77.84911	4.35477246	4.41404934	0.059277	8.065	1.081	4.445	1.044	1.034662	80.547499	4.388847	0.034074594
79.679462	4.37801186	4.41615423	0.038142	8.299	1.083	4.73	1.047	1.034073	82.394407	4.411518	0.033505694
	4.394280077	4.41481577	0.020536	8.378	1.084	4.585	1.046	1.036263	83.923139		-
	4,414049343	4,40893009	-0.005119	8.384	1.084	4.7	1.047	1.035186	85.509775		
	4.416154232	4.41663928	0.000485	7.774	1.078	4.555		1.030785	85.325649		
							1.046				
	4.414815766	4.45523307	0.040417	6.239	1.062	4.68	1.047	1.014897	83.89808		
82.18149	4.408930094	4.44316407	0.034234	6.254	1.063	4.525	1.045	1.016539		-	
	4.416639277		0.022481	5.843	1.058	4.675	1.047	1.011161			
	4.455233067	4.47136062		2.998	1.030	4.67	1 047	0.984028			
85.0436	4.443164066		0.067864	1.537	1,015	4.65		0.970253		4.412966	-0.03019818
84.700433	4.439120718	4.49731299	0.058192	1.181	1.012	4.545	1.045	0.96782	81.97478	4.406412	-0.03270908
87.475664	4.471360625	4.53563569	0.064275	0.830	1.008	4.51		0.964784			
91.015381	4.511028514			1.003	1.010	4.67	1.047	0.964961	87.826321		-
89.775579	4.497312989	4.5701303		1.280	1.013	4.615		0.968121	86.913642		
93.282795	4.535635686			1.458				0.970103			
96.220495	4.566642383			1.580							
96.55669	4.570130297	4.55519692									
				1.571	1.016	-	-				
94.848165	4.552277352	4.56628362		1.592							
93.410305	4.537001671	4.58687748		2.110		4.57		0.976475			
95.125486	4.555196922			2.870		4.63		0.983181			
96.185981	4.566283619	4.59119056	0.024907	2.015	1.020	4.5	1.045	0.976218	93.898457	4.542214	-0.0240696
98.187359	4.586877481	4.61937965	0.032502	1.707	1.017	4.38	1.044	0.974387	95.672472	4.560931	-0.0259468
98.496259	4.590018569	4.65741533		2.267	1.023	4 38		0.979759			
98.611764	4.591190561	4.67170992		2.749		4.49		0.983333		+	
101.43109	4.619379646			3.950		4.59					
105.3634	4.657415327	4.60658523	-	5.061	1.040	4.36					
								1.006721			
106.88034	4.671709918			8.043		+		1.035195			
102.33428	4.628244719			8.259				1.036666			
100 14161	4 606585234		-0.032144	8.587				1.040305			
100.14161	4.593123486			8.630				1.039621			
98.802557	4.590559347			8.681				1.039358	102.42828	4.629163	0.03860349
	4.574440888			8,660	1.087	4.435	1.044	1.040454	100.89677	4 614000	0.03965703

01110110	HILLINGS DAT	4									
							1.11070111		0.4150.0		
t	Ln_St	S_t+3	D_S_t+3	KE_TBILL	1+KETBILL		1+USTBILL	F/H	S_t(F/H)	Ln_Ft	LNFt - Ln_S
				17.870	1.179	4.85	1.049				
				17.860	1.179	4.875	1.040				
				25.070 45.790	1.458	4.873	1.048				
				68.040	1.680	4.86	1.049				
				84 290	1.843	4.71	1.047	1.760004			
				84.670	1.847	4.78	1.048				
				79.510	1.795	4.74	1.047	1.713863			
				75.690	1.757	4.85	1.049				
				70.880	1.709	4.72	1.047	1.63178			
				55.260	1.553	4.83	1.048				
				43.520	1.435	4.86	1_049				
				33.550	1.336	5.18	1.052	1.269728			
				23.870 27.620	1.239		1.052				
				30.850	1.309	4.895	1.049				
				31.240	1.303	4.925	1.049				
				32.380	1.324	5.145					
				29.740	1.297	4.93					
				24.130	1.241	4,93					
				17.390	1.174	4.945	1.049	1.118586			
				16.950	1.170	5.135	1.051	-			
				17.220							
				17.490							
				16.740							
				17.630			1				
				16.840							
				15.090		4.97		-			
		1		16.390							
				18.480	4		4	-			
				19.650							
				21.160							
				24.070							1
				24.870				1.190145			
				21.670	1.217	4.925	1.049	1.15959			
				21.250		4.94	1.049	1.155422			
		1	ļ	25.960							
				26.680				and the second s	-		
		<u> </u>		24.160							
				21.960			+				1
0.000040	0.04440400	0.00.00.00	0.0705.40	21.850		-		-	-		
8.383643 8.710805										3.061937	
9.035438						-	-			3.1078079	
9.766814	2.984004485						-			3.155361	
9.574133				the second se							
9.083758					the second se			1.158477			
9.010095					the second se			1.160511			-
8.881921	-										
8.745558					and the second s						
9.073664					1.210	4.665					
9,819681									the second second	4	
9.681925									and the second s		
8.601765					-						
6.264429			the second se								
7.449914											
18.17151 17.93271											
8.139181				+							and the second design of the s
18.75904							-				-
9.045685			-								
9.162236			the second se								
19.46798					the second se						
19.297585											
20.32859											-
20.800757											
20.9206											
21.258036		3 3.0953367						and the second s			
21.851557		4 3.0952882	1 0.01101	3 20.58	7 1.20	4.9	7 1.050				the second secon
22.599633	3 11793368	2 3.0911301	B -0.026804	17.66	2 1.17	7 4.96	5 1.05				
22.094677	3.09533673	2 3.0712417	8 -0.02409	5 12.56	5 1.12			1.0724	1 23 694339	3.165236	0.06989
	3.09528821	0 0000000	3 -0.00890								

[
22.00193	3.091130177	3.10127199	0.010142	8.950	1.090	4.89	1.049	1.038707	22.853563	2400407	0.00707000
21.56867	3.071241779	2.97735734	-0.093884	8.845	1.088	4.95					0.03797688
21.89781	3.086386632							1.037111	22.369105	3 107681	0.03643897
				9.028	1.090	5.05	1.051	1.03787	22.727081	3.123557	0.0371706
22.226205	3.101271987	2.97821034		9.626	1.096	4.955	1.050	1.044507	23.21542	3.144817	0.04354471
19,635857	2.977357341	2.97832297	0.000966	11.442	1.114	5.075	1.051	1.060597	20.825735		0.05883214
19.894836	2.990460219	2,99533009	0.00487	14.472	1.145	4.835	1.048	1.091923			
19.652614	2.978210339			14.842					21.72363		0.08794038
19.654827					1.148	4.91	1.049	1.094675	21.513233	3.068668	0.09045791
	2.978322971	3.01114587		15.778	1.158	4.79	1.048	1.104853	21.715686	3.078035	0.0997119
19 991958	2.995330087	3.0588573	0.063527	17.628	1.176	5.1	1.051	1.119196	22.374919		0.11261057
20.110391	3.001236642	3.03318976	0.031953	18.135	1.181	4.94	1.049	1.125742	22.639118		
20.31066	3.011145871			19 975	1.200	5.075				3.119679	0.11844267
21.3032	3.058857296						1.051	1.141799	23.190685	3.143751	0.13260484
				20.295	1.203	4.7	1.047	1.148949	24.476298	3.197705	0.13884794
20.763357	3.033189757			14.844	1.148	4.89	1.049	1.094899	22.733788	3.123852	0.0906625
20.315417	3.011380075	3.01167944	0.000299	11.278	1.113	5.09	1.051	1.058885	21.511696	3.068597	0.0572167
20.459228	3.018434017	3.04587957	0.027446	12.442	1.124	4.765	1.048	1.073281	21.958494	3.089154	
20.474695	3.019189756			11.222	1.112	5.03					0.07072001
20.3215							1.050	1.058956	21.681812	3.076474	0.05728398
	3.011679439			10.474	1.105	4.82	1.048	1.05394	21.417643	3.064215	0.05253561
21.028519	3.045879566		0.093435	9.904	1.099	4.585	1.046	1.050862	22.098071	3.09549	0.04961076
21.98743	3.090470946	3.15420425	0.063733	9.245	1.092	4.63	1.046	1.04411	22.9573		0.04316504
22.675724	3.121294917	3.11142869	-0.009866	10.360	1.104	4.905	1.049	1.052002			
23.088045	3.139314951			10.654					23.854903	3.17199	0.05069484
					1.107	4.78	1.048	1.056056	24.38228		0.05454169
23.434382	3.154204252	3.0971255		11.167	1.112	4.8	1.048	1.060756	24.858166	3.213186	0.05898205
22.4531	3.111428689	3.11218412		12.901	1.129	4.675	1.047	1 078586	24 217602	3.18708	0.07565102
23.191177	3.143771916	3 12970587	-0.014066	14.756	1.148	4.7	1.047	1,096042	25.418505		0.09170553
22.134235	3.097125505			15.297	1.153	4.86	1.049				
22.470068	3.112184121		0.006458					1 099535	24.337368	3.192013	0.09488745
				14.972	1.150	4.845	1.048	1.096588	24_640403	3.204387	0.09220338
22.867253	3.129705871			12.899	1.129	4.62	1.046	1.079136	24.676874	3.205867	0.07616065
22.802091	3.126852238	3.09883729	-0.028015	10.517	1.105	4.82	1.048	1.054348	24.041337	3.179775	0.0529225
22.615655	3.118642366	3.09972037	-0.018922	12.070	1.121	4.715	1.047	1.070233	24.204031	3.186519	
21.925768	3.087662574	3.0934742		12.873	1.129						0.06787684
22.172157						4.635	1.046	1.078733	23.652044	3.16345	0.07578696
the second secon	3.098837291			12.839	1.128	4.695	1.047	1.077785	23.896828	3.173746	0.07490845
22 191745	3.099720373	3.08450093	-0.015219	12.393	1.124	4.8	1.048	1.072455	23.799641	3.16967	0.06995011
22.053564	3.093474205	3.10090502	0.007431	11.629	1.116	4.725	1.047	1.065921	23.507362	3.157314	0.06383942
22.001405	3.091106294			11.498	1.115	4.805					and the second se
21.856556	3.084500934						1.048	1.063857	23.406341	3.153007	0.06190069
the second secon			0.038578	11.012	1.110	4.65	1.047	1.060797	23.185368	3.143521	0.05902046
22.21805	3.100905022			10.855	1.109	4.72	1.047	1.058582	23.519637	3.157836	0.05693066
22.364565	3.107477787	3.13374446	0.026267	10.611	1.106	4.61	1.046	1.057365	23.647518	3.163258	0.05578039
22.71622	3.123079207	3.12935191	0.006273	10.144	1.101	4.81	1.048	1.050892	23.872296		
22.902119	3.131229441	3.1311128		10.010	1.100	4.57				3.172719	0.04963941
22.959791	3.133744465						1.046	1.052023	24.093546	3.181944	0.05071457
			0.00108	9.040	1.090	4.67	1.047	1.041748	23.918313	3.174644	0.04089995
22.85916	3.129351912			7.338	1.073	4.76	1.048	1.024609	23.421693	3.153663	0.02431071
22.899448	3.131112798	3.13722626	0.006113	8.634	1.086	4.63	1.046	1.038264	23,775681	3.168663	0.03755043
22.984605	3.134824624	3.13675657	0.001932	8.340	1.083	4.725	1_047	1.034514		h	
22.938543	3.13281859	-	0.011676	7.601					23.7779	3.168757	0.03393195
23.039871					1.076	4.53	1.045	1.029377	23.612413	3.161773	0.02895397
	3.137226255			8.065	1.081	4.445	1.044	1.034662	23.838474	3.171301	0.03407459
23.029052	3.136756566			8.299	1.083	4.73	1.047	1.034073	23.813729	3.170262	0.03350569
23.207947	3.144494766	3 23453262	0.090038	8.378	1.084	4.585	1.046	1.036263	24.049544	3.180116	0.03562129
24.079352	3.181354726	3.26361685	0.082262	8.384	1.084	4.7	1.047	1.035186			
24.544485	3.200487185	3.32999459	0.129507	7.774					24.926614	3.215936	0.03458136
25.3945	3.234532615				1.078	4.555	1.046	1.030785	25.300093	3.230808	0.03032087
the second secon		3.30024362		6.239	1.062	4.68	1.047	1.014897	25.772798	3.24932	0.01478696
26.143925	3.26361685			6.254	1.063	4.525	1.045	1.016539	26.576322	3.280021	0.01640382
27.93819	3.329994587		-0.059525	5.843	1.058	4.675	1.047	1.011161			
27.119245	3.300243623	3.24204124	-0.058202	2.998	1.030	4.67	1.047	0.984028	26.686094	3.284143	
26.700509	3.284682617			1.537	1.015	4.65					-0.01610103
26.32369	3.270469312						1.047	0.970253	25.906255	3.254484	-0.03019818
				1.181	1.012	4.545	1.045	0.96782	25.476596	3.23776	-0.03270908
25.585895	3.242041241	3.23845451		0.830	1.008	4.51	1.045	0.964784	24.684868	3.20619	-0.0358508
25.59549	3.242416183	3.23435446	-0 008062	1.003	1.010	4.67	1.047	0.964961	24.698658	3.206749	-0.03566727
25.715684	3.247101086	3.1951336	-0 051967	1.280	1.013	4.615	1.046	0.968121	24.895899	3.214703	
25 49429	3.238454506	3.2172033		1.458	1.015	And the second se					-0.03239799
25.389976	3.234354458					4.585	1.046	0.970103	24.732082	3.208101	-0.03035325
				1.580	1.016	4.48	1.045	0.972243	24.685239	3.206205	-0.028149
24.413435	3.195133596			1.571	1.016	4.53	1.045	0.971695	23.722406	3.16642	-0.02871359
24.958222	3.217203297	3.13434967	-0.082854	1.592	1.016	4.6	1.046	0.971239	24.240398		-0.0291827
24.620315	3.203571915	3.08445739	-0.119115	2.110	1.021	4.57	1.046	0.976475	24.041124	the second se	
23.395471	3.152542475			2.870	1.029					3.179766	
22.97369	3.134349669					4.63	1.046	0.983181	23.001977	3.13558	
the second secon				2.015	1.020	4.5	1.045	0.976218	22.427323	3.11028	-0.02406966
21.855605	3.08445739			1.707	1.017	4.38	1.044	0.974387	21.295814	3.058511	-0.02594687
21.393132	3.063069927	3.05984459	-0.003225	2.267	1.023	4,38	1.044	0.979759	20.960104		-0.02044909
21.326114	3.059932314	3 08145508		2.749	1.027	4.49	1.045	0.983333			
21.364874	3.061748157	3.10066291	0.038915						20.970678	3.043125	-0.01680712
21.324243				3.950	1.040	4.59	1.046	0.993881	21.234139	3.05561	-0.00613793
and the second sec	3.059844588		0.043218	5.061	1.051	4.36	1.044	1.006721	21.467562		0.00669848
21.790086	3.081455083			8.043	1.080	4.37	1.044	1.035195	22.556994	3.116045	0.0345901
22.212671	3.100662911	3 15070466	0.050042	8.259	1.083	4.43	1.044	1.036666	23.027115	3.136672	0.03600951
22.266045	3.103062872		0.042963	8.587	1.086	4.38					0.03951361
	3.129537379		0.012000				1.044	1.040305	23.16347	3.142576	the second se
/ 2 HK (Z				8.630	1.086	4.49	1.045	1.039621	23.769271	3,168394	0 03885624
22.8634											0.0000000
23.352514	3.150704657			8.681	1.087	4.565	1.046	1.039358	24.271629		0.0386035
				8.681 8.660	1.087	4.565	1.046	1.039358			0.0386035

ANZAN	AN SHILLINGS	DATA									
t	Ln_St	S_t+3	D S t+3	KE TBILL	1+KETBILL		1+USTBILL	F/H	S_t(F/H)	Ln_Ft	LNFt - Ln_S
	EII_D(5_113	0 5 11 5	17.870	18.870	and the second s		3.225641	S ((F/H)	LIL_FL	LNPT - LIL 3
		_		17.860	18.860			3.349911			
				25.070	26.070	4.875	5.875	4.437447			
				45.790	46.790			8.053356			
				68.040	69.040			11.78157			
				84.290	85.290						
				84.670 79.510	85.670		1	14.8218			
				75.690	76.690			-			
				70.880	71.880			12.56643			
				55.260	56.260		-	9.650086			
				43.520	44.520	4.86	5.86	7.59727	1		
				33.550	34.550	5.18	6.18	5.590615			
				23.870	-			4.004831			
	_			27.620				4.646104			
				30.850				5.402884		-	
				31.240 32.380		-		5.44135 5.432059		+	
				29.740	-			5.183811			
				24.130			-	4.237774			
				17.390				3.093356			
				16.950				2.925835			
				17.220							
				17.490				2.996759	-		
				16.740							
				17.630					-		
	_			15.160		-					
				15.090		-					·
				16,390							
				18.480			-			1	
				19.650	20.650	4.97	5.97	3.458961			
				21.160				3.671914			
				24.070					-		
				24.870							
				21.670					·		
				21.250							
				26.680		1			-		
				24.160		-					
				21.960							
				21.850	22.850		+				1
0.4886			85 0.00956							3.726099	1.3758047
10.39								3.905091			1.3622809
0.4681		96 2.379429						4.191304			1.4330119
0.5894			18 0.029242						47.939081		
0.7987									44 059013		
0.9036											
0.8988						-					
0.9202	21 2.3906162					-					
1.0196			98 -0.01064	4 21.020	22.020	4.665	5.665	3.887026			1.3576442
1.3432									40.943117	3.712184	1.2835602
1.5160					-						
10.9											
9.2681	the second se										
83016											
9.5835					-						
87903											1
0.305											
.6560											
1.1416				3 26.736							
1.1433									52.31562	2 3.957295	
10.623											
1.9596											
1.2521											
1.2615											
1.1530 1.2648											
11.329											
0.9768											
1.0292		55 2.356689									
			22 -0.04952								0.524316

10 55565 255688208 23441973 0.00840 0.029 6.051 0.051 0.0274 0.0720 0.0711101 0.07200 <th></th>												
19.39944 (2.3310927) 2.285132 (2.07204 (1.442) (2.442) 5.75 (0.77 2.071 (1.92447) 2.29120 (0.77604) (2.7774) (1.92447) 2.29120 (0.77604) (2.7774) (1.92447) 2.29120 (0.77604) (0.77604) (1.942747) (2.91276) (0.77604) (1.942747) (2.91276) (0.77604) (1.942747) (2.91276) (0.77604) (1.942747) (2.91276) (0.77644) (1.942747) (2.91276) (0.77644) (1.942747) (2.91276) (0.77644) (1.942747) (2.91276) (0.77644) (1.942747) (2.91276) (0.77644) (1.9776) (1.97744) (1.97744) (1.97774) (1.97744) (1.97774) (1.97744) (1.97774) (1.97744) (1.97774) (1.97744) (1.97774) (1.97744) (1.97774) (1.97744) (1.97774) (1.97744) (1.97	10.804304	2.379944605		-0.104663	8.845	9.845	4.95	5.95	1.654588	17.876675	2.883497	0.503552177
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12.806743 2.549971818 2.62001066 0.070039 8.384 9.384 4.7 6.7 1.846318 21.083943 3.048512 0.4985399 13.284385 2.56858825 2.67631969 0.08973 7.774 8.774 4.555 5.555 1.579433 20.981795 3.043655 0.4570658 13.549144 2.60832039 2.645614 0.03929 6.239 7.239 4.65 5.655 1.312896 18.033768 2.892246 0.2722353 14.531514 2.67631692 2.61857177 0.056748 5.843 6.843 4.675 5.675 1.205859 17.522958 2.883512 0.1871922 14.92005 2.645614002 2.59789166 0.047722 2.998 3.996 4.67 5.675 1.070515 9.370368 2.896261 0.3323246 0.339344 0.8302177 1.830427 5.8651 0.449027 6.256857 1.830678 0.8006732 13.439342 2.598304069 2.65204272 0.053739 1.003 2.003 4.67 5.67 0.353175 4.769929 1.557511 1.0407927 1.3670416 2.61523406	12.389705	2.516865867	2.58658929	0.069723	8.299	9.299	4.73	5.73	1.622775	20.105702	3.001003	0.484137566
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13.284385 2.586589285 2.67631969 0.08973 7.774 8.774 4.555 5.555 1.579433 20.981795 3.043655 0.4570656 13.549146 2.60632639 2.645614 0.03929 6.239 7.239 4.66 5.68 1.274542 17.268661 2.84911 0.2425870 13.73587 2.620010659 2.63435124 0.014341 6.254 7.254 4.525 5.525 1.312961 8.03768 2.82246 0.2722353 14.092095 2.645614002 2.59789166 -0.047722 2.998 3.998 4.67 5.675 1.205859 17.522658 2.883512 0.1871922 13.93427 2.53830407 -0.036047 1.537 2.557 4.455 5.545 0.332262 5.3997033 1.686344 0.932277 13.45382 2.597891661 2.63223626 0.034345 0.830 1.830 4.51 5.51 0.332051 4.4612961 1.495424 1.1024672 13.436382 2.597891661 2.63223626 0.034345 0.830 1.830 4.51 5.61 0.332051 4.4615 5.615	12.806743	2 549971818	2.62001066	0.070039	8.384	9.384	4.7	5.7	1.646316	21.083943	3.048512	0.498539937
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