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Author : Akumbu Martin Nshom
Supervisor : Stefan Sundgren
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The Association of Exchange rates and Stock returns. (Linear regression Analysis)

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ABSTRACT

The association of exchange rates with stock returns and performance in major trading markets is widely accepted. The world's economy has seen unprecedented growth of interdependent; as such the magnitude of the effect of exchange rates on returns will be even stronger. Since the author perceives the importance of exchange rates on stock returns, the author found it interesting to study the effect of exchange rates on some stocks traded on the Stock exchange.

There has been a renewed interest to investigate the relationship between returns and exchange rates as such; the author has chosen to investigate the present study to focus in the United Kingdom with data from the London Stock exchange .The author carried out his research on 18 companies traded on the London Stock Exchange in the process, using linear regression analysis. Taking into account the fact that the magnitude of exchange rate movements on stock returns is governed by a series of factors, the authors did set up a selection criteria which spread across a series of industries ranging from financial services, manufacturing, aviation, mining, tobacco, fashion and food processing. All selected companies are of the FTSE 100 companies.

The author produced results that to some degree are consistent with predictions in the theoretical framework. The author find significant exposure of stock returns to changes in exchange rates for some companies in the sample of FTSE 100 firms used in the study. The author equally finds out that particular currencies may be of more risk to certain companies than to others by introducing euro values in to his regression equation. This gives the compelling evidence that these companies rely heavily on external sales and revenue.

The author, further employed lagged values of exchange rates in to his regression and found significant evidence of the possibility of mispricing for certain stocks and the impact of the previous days trading figures on present stock prices. The author believes that the weak responds in certain cases was as a result of hedging strategies put in place by these companies and risk management strategies which tend to minimise the effect of exchange rates movements.

TABLE OF CONTENTS

Chapter 1 INTRODUCTION

This chapter starts by presenting a background discussion on the selected topic in this thesis. It further moves to the formulation of the research question, statement of purpose and limitations in the studies.

1.1 Problem background

The evolution of the global economy, has rekindled the interest of investors to understand the association between stock returns and exchange rates. The last three decades has seen the emergence of substantial research on exchange rate exposure and stock returns.

The study of Richard et al (1998) illustrates with convincing evidence the casual relationship between returns and exchange rates. Looking at this from a theoretical point of view, one will conclude that exchange rates have a causal relationship with stock prices. The same underlying factors such as demand and supply, fiscal and monetary policy, affect both factors and their derivation. These factors are triggered by economic indicators such as rising Gross Domestic Product (GDP), low inflation, low interest rates, low unemployment and a budget surplus or deficit which indicate the health of an economy (Education, New York Stock Exchange Inc 2002) with this in mine, one will expect returns and exchange rate movements to exhibit some degree of linear relationship. Nowadays, a firm's value irrespective of it being domestically or internationally oriented is subject to exchange rate values as cited in Shapiro (1997 p.13-17). However, there is little or cloudy empirical evidence backing this point of view. This thesis is an empirical indebt analysis that focuses on the effects of exchange rate fluctuation on firm's value, using 18 stocks traded on the London stock exchange.

With the break down of the Bretton wood fixed parity system in the 1970's, volatility on exchange rate has become a call of concern. There have been investigations on both relatively large and small economies yielding different results. One of such research is that of Nydahl (1998). Nydahl investigated the effects of exchange rate exposure on the value of a sample of 49 Swedish firms. Using the stock prices to reflect the value of the firms, he did a cross sectional analysis and came to the conclusion that the value of the firm is quite sensitive to movements in exchange rates. This result was contrary to some earlier studies. In this study,I carry out a similar

approach as Nydahl making use of His methods and those of Fraser and Pantzalis (2003) in a much more global and pretty long established system such as firms trading on the London Stock exchange and observe the result.

In a world of no taxes as indicated by Miller & Modigliani (1958), where there is no tax no transaction cost and same or relatively the same borrowing cost for both individuals and corporations, corporations cannot change their value by borrowing. Ross et al (2005p 403-416). These Miller and Modigliani equations indicate that firms cannot change their values by merely repackaging their securities under such conditions. This is as replaced equity by increase debts only goes to increase the risky ness of the equity that will intern warrant higher returns. The net effect is that both actions eventually offset each other. Firms are usually exposed to three kinds of exchange rate exposures. These include (1) transaction exposure; which arises from exchange rate gains or losses on foreign currency denominated contractual obligations.
(2) Operating exposure; this stems from fluctuation in currency value which can alter company's future revenue and cost and (3) lastly translation exposure; which comes as a result of assets and liabilities which are exposed to currency fluctuations, usually in a different country from the mother company Shapiro (1996 p 328-411). Looking at these exposures, one begins to ponder how they translate in to firm returns.

1.2 Research question

Do changes in exchange rates affect stock returns of companies traded on the stock exchange? Does a linear relationship exist between stock returns and exchange rates?

1.3 Statement of purpose

In this study, I will examine the association of exchange rate and stock returns on some companies trading on the London stock exchange. In 2005 alone the London Stock exchange carried out trade worth some 5.3 trillion dollars and had over 80 percent of the initial public offering (IPO) in the whole of western Europe (Newsweek January 2005), these factors and the continues growth and influence of the London stock exchange motivated for its choice. I aim at investigating the effect on firms' value as a consequence of exchange rate fluctuations. My findings will be based in England precisely on the some top 18 firms on the London stock exchange. All firms have an active global presence in the international market with at least 40% of revenue from the international market. I will be using stock price to compute returns. It is my

believe that this work will benefit present and potential investors, firm managers, and policy makers while also providing a road map for future research.

We recognise that companies today face exchange rate risk from transactions, balance sheet translation for multinational firm with subsidiaries and from economic exposure that has the potential to create uncertainty on the future stream of cash flows

I will equally run a regression analysis with lagged exchange rate figures to verify the possibility of stock mispricing for my sample companies. Mispricing could arise as a result of the inability of investors to fully comprehend and incorporate previous exchange rate effects in stock prices of subsequent trading days.

1.4 Limitation

This study is limited to 18 companies traded on the London stock exchange were the significance of Beta values of various stocks will be subject to interpretation. These companies were chosen across various industries ranging from food processing, aviation, manufacturing, mining, media and mass communication, banking and financial services. This was the case as it was deemed necessary to get a fair picture across the stock exchange market as a whole. It would have been even more interesting to increase the scope of companies or even focus entirely on a particular industry and focus on other factor affecting returns provided there was time and resources for such a broad study. In selecting the companies factor such as (a) consistency and stability of financial data (b) degree on internationalisation of these companies and (c) their sales volume where taken into consideration. I did not take into consideration the effect on returns by other factors such as interest rates, which is usually a component in most implementation of the multifactor model. This could not be possible due to the complex nature of interest rates in the market and the unavailability of comprehensible data on all usable interest rates.

1.5 Disposition

Chapter 1: *Introduction*

As must have been noticed, chapter one gives a brief introduction, research question, purposed of study and the limitation of this study.

Chapter 2: *Theoretical framework*

Chapter 2 highlights the bulk of literature review existing in this area and previous study. It presents fact that there is an increasing involvement in international marketing both through

foreign direct investment and international portfolio investment. However, because of certain factors like interest rate, inflation rate, these companies are confronted to foreign exchange exposure. Hedging is a good way out, but one need to know if the exposures actually affect the firms' value. I conclude by trying to have a theoretical understanding how Arbitrage pricing theory and the multifactor model of risk and return helps us to get the degree of responsiveness of firms' value to exchange rate fluctuations.

Chapter 3: *Methodology*

In this chapter, I discuss both the theoretical and practical methodology used in writing this thesis. The theoretical methodology discusses the underlying philosophy, scientific approach and research data. The practical methodology on the other hand discusses the actual process I follow in this thesis.

Chapter 4: *Empirical study and Analysis*

In this chapter, I will present data used in the regression analysis, rationale for using the data and respective sources.

Chapter 5: *Conclusion*

This chapter presents my solutions and finding of the various regression analysis .It rounds up with the final conclusion of all the results and gives implication for any prospective study in the field.

Chapter 6

This chapter applies a discussion on the credibility, degree of generalisation and validity criterion

Chapter 2 **THEORETICAL FRAMEWORK**

In this chapter the theories that are considered relevant for this and necessary to facilitate a comprehensive analysis and understanding of the research question are presented. This is followed by a literature review of existing and previous studies in this area.

2.1 Foreign Exchange Exposures

With the advent of globalisation, multinationals as well as domestic firms have been experiencing increasing volatility of both current and future cash flows (Bartov et al. 1996). Such volatility is referred to as foreign exchange rate exposure. (Shapiro 1996) define foreign exchange rate exposure as ``a measure of the potential change in a firm's profitability, net cash flow, and market value because of a change in exchange rates``. There are little or no theoretical arguments that foreign exchange exposures have negative consequences on the organization. It increases the cost of accessing capital markets, resulting to lower level of investment and consequently lower firm value. Minton et al(1999). Three measures of foreign exchange exposure can be broadly classified as follows

Shapiro (1996) broadly divides currency risk or exchange rate exposures in to the following categories

a) Transaction exposure
b) Translation exposure
c) Economic exposure

It is worth noting that these three risk are not discrete exposure but are actually overlapping and interrelated in nature .An individual or any investor in the market place or the society is faced by these principal risks, which could result to an erosion of currency values.(Shapiro 1996)

Transaction Exposure arises as a result of companies or individual dealing with other companies or individual in other countries in which the underlying currencies are different. Say an individual in Leeuwarden ordering a yatch from the United States or Furniture Company in The Hague importing timber from Cameroon.

In either situation, there exist a transactional risk involve in the contract for example if the Euro/CFA exchange rate is say 600 Cameroonian FCFA for a euro and these two parties go into contract to import timber worth 10 million euros in November 2007. The transactional risk here

is the uncertainty of the Euro/FCFA rate at the delivery date of November 2007. If at the date of delivery, the FCFA has appreciated in value to say 1 euro to 300FCFA. The Dutch individual stands to pay almost twice the price for timber, which at the time of negotiation cost less. This is a pretty dangerous situation for such an individual involve in international trade. Such risk could usually be transferred to the derivative traders such paying forward on the Cameroonian FCFA for delivery in November. This is usually a two way trade for the reverse could occur with an appreciation of the euro as regards to the FCFA as such resulting in less euro denominated currency being exchange for the FCFA. In either case hedging is usually the answer here.

Translation exposure arises from the translation of accounting data from branches of multinational companies or subsidiaries to the home company currency. If an individual owns share in such companies, they are therefore subject to translation exposure. Shapiro (1998) and many others writers states that translation exposure should not be managed, as it is purely an accounting matter. A good example of translation exposure could be by looking at the consolidated balance sheet and financial statements of the Dutch Multinational Heineken. Heineken has international subsidiaries scattered all over the globe, at the end of each financial year, the corporate mother body has to present a consolidated balance sheet which will definitely constitute assets of its global subsidiaries. These subsidiaries operate in different currencies and as such their respective assets have to be translated to a single currency value for its asset in the consolidated balance sheet. This definitely gives rise to translation risk, as Heineken will witness foreign currency gains or losses when its assets, liabilities and financial obligations are restated in the mother currency be it the Dollar or the Euro.

Economic exposure looks at how the underlying operations, strategy and company actions of a company affects future cash flows and profit figures. This is very important in the modern day economy of today where companies need to outperform competitors with better corporate deals, good strategies and innovative thinking and creativity.

2.2 Foreign direct investment and portfolio Investment

Some companies have made their presence in the foreign market through models like licensing, strategic alliances, joint ventures, management contracts and exporting. However to benefit from things like, owners specific competitive advantage that cannot easily be transfered, flexibility and diversification effect, many companies are making their presence in the foreign market via international portfolio investment and foreign direct investment (FDI).

Multinational corporations have come into being via international portfolio investment and foreign direct investment. With international portfolio investment, companies diversify their international portfolio by purchasing foreign stocks, bonds and other securities. Firms get into foreign direct investment by acquiring plants and equipment abroad. The firm owns either direct or indirect 10 percent of a foreign firm in a long-term commitment and is responsible for production (Shapiro A., 2003)

There has been a tremendous increase of firms going multinational. The diagram below shows an increase made by U.S. firm in their abroad investment and foreign direct investment from 1960 to 1996.

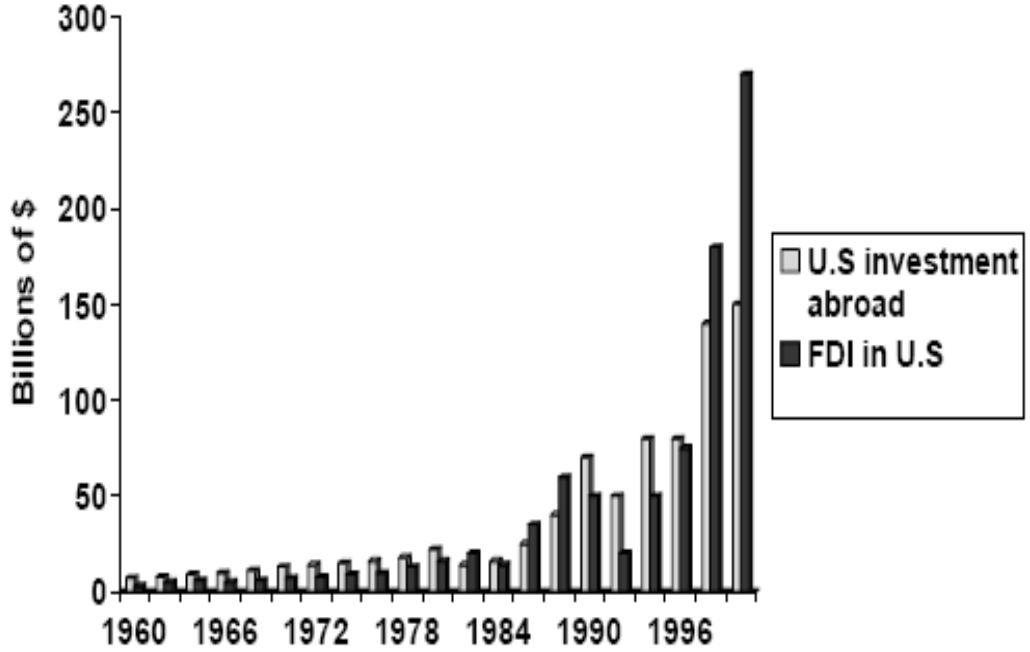

Fig 1: **Foreign direct investment (1960-1996), USA**. (Shapiro A., 2003)

Over the past 50 years, companies have increasingly got into foreign direct investment due to the following reasons (Shapiro A., 2003):

- Market imperfections caused by country differences in market conditions.
- Increases in research and new technologies.
- Growth in information and communication technologies.
- Many deregulation of trade and capital barriers
- Integration of economies and spread of the free market system.

A noticeable trend today is the moving of many companies to China, India and other nations. Multinationals avoid staying national companies only, for some of the reasons below (Shapiro A., 2003):

- Exploit raw materials in foreign countries
- To keep up with competitors. This is a matter of survival. Companies could do this by following their customers abroad, to seek knowledge, to reduce cost or in order to reduce risk like fire and strike.
- Market imperfection. Some companies take advantage of differences in market conditions like trade barriers, transportation cost, cheap labour, to enter some foreign markets.

Whether entering the foreign market through licensing, or strategic alliances, or joint ventures, or management contracts or exporting, or foreign direct investment, the multinational is confronted with risk. Risk ranges from global specific risks, country-specific risk, to firm-specific risks.

Global-specific risks incorporate terrorism and war, epidemic, natural catastrophe, poverty, environmental concerns and anti-globalisation movement.

Country-specific risks on the other hand include economic and political factors. The challenges lies with cultural differences, religious heritage, nepotism and corruption, political instability, fiscal irresponsibility, monetary irresponsibility, command economy, large government deficit compare to Gross National product, inflexible labour market, and expensive social welfare system loaded with high taxes

A firm specific risk includes business risk, governance risks and exchange rate risks. Exchange rate risks will not exist if there is an equilibrium exchange rate. As seen on the diagram below, and equilibrium position is determined by the demand and supply of the dollar and the Euro.

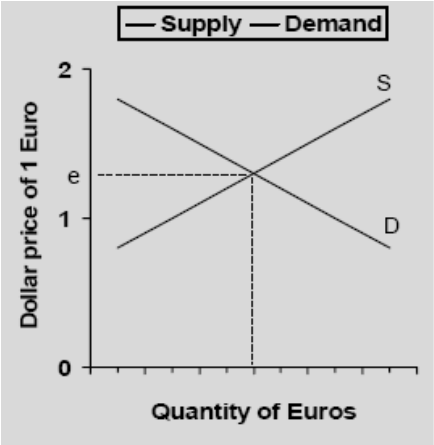

Fig 2: **Supply and Demand curve.**

There is equilibrium when the America demand for European goods, services and financial assets determines the demand for Euro and the European demand for U.S. goods, services and financial assets determines the supply of the Euro. Is this always the case?

2.3 Foreign Exchange Risk Management

As businesses go international the presence of risk become an open day reality. Most firms openly agree and even present evidence of risk management in their daily operations. The commonly agreed exchange rate risk includes translation, transaction and economic exposure risk. However must companies openly agree that risk management for them has to do with transaction exposure.

Research works by Belk and Edelshain (1997), Doungploy et al (1997) indicate that majority of USA firms focus predominantly on transactional exposure. This is quite a logical conclusion since it is the most evident of exchange rate risk especially for firm operating internationally.

Shapiro (1996 p.349) in his book states that translation exposure should not be managed. His argument is based on the fact it basically arises as a result of accounting practices in companies and not purely related to cash flows. Companies seemed to have taken the opposing view in practice with various hedging strategies for translation exposure this is quite evident in the work of Rodriguez (1977) and Collier et el (1992) where they found evidence of this practice in top US and UK firms.

Economic exposure, which is probably, the least managed of all the exposures in practice happens to be of most importance. In takes in to account other aspects of the business such as strategy, which are very fundamental to the business success. In the work of Blin et al (1980) they observed that as few as one in every three companies takes this risk seriously.

Marshall (1999) in his work titled “Foreign exchange risk management in UK USA and Asia Pacific multinational companies” tries to analyse risk management strategies of multinational in this respective geographical regions. Their work highlights the effect of their environment on their respective strategies.

Their research was questionnaire based with companies providing relevant information. The distribution was as follows

200 largest companies in the United Kingdom and United States of America

For the Asian pacific: Australia 20, Hong Kong 30, Japanese 100, 40 from Singapore and 10 from South Korea. Based on the period July to September 1998. Test data characteristics included size, total sales, total asset and profit figures. In a whole there was a 30 % respondent rate.

In their study they came out with a general consensus that companies in all the regions agreed that foreign exchange risk management was very significant and should be taken in to consideration. However, firm in the USA and UK were more unlikely to list this as a serious concern comparative to over 87% respondents in the Asian pacific recognising this as a measure program. This is quite obvious if one where to consider the volatility of the currencies in the Asian pacific during this period. The UK was second inline with a considerable number recognising this as a problem. This is of course obvious taking in to consideration the fact that more than half the number of UK multinational firm relying on about 50 % of their revenue on foreign trades and businesses. The United States tails the list which of course indicate the relative strength of the dollar economy it self. They reveal in their data that only about 17% of US firms rely on more than 50% of their revenue from outside the United States.

In their study transactional exposure recorded the highest most recognised risk in a whole scoring over 59% of the total poll. There was no significant difference between company sizes, region or degree on internationalisation but in a whole over 80% rated it either as 5 or 4 on their list of risky ness. With the US leading with a mean of 4.37 followed by UK with 4.21 and tailed by the Asia Pacific with 4.17.

Translation Exposure had huge disparity in their data with about 63% of US firms giving it a 1 or a 2 in their rating. Asia pacific firm how ever gave it a 4 or a 5 with 48% of its overall respondents. The UK had a similar high figure, which should be a logical think taking in to consideration their reliance on foreign operation for revenue generation. Disparity in the various accounting system requirement could of course be an other factor if one where to take into consideration legal balance sheet reporting requirements in the respective regions finally the failing value of the Asian pacific currencies could also be seen as an influencing factor here with its high rating

Asia Pacific had the highest rating on economic exposure with over 50 % giving it a 5 or 4 while the other almost completely ignored it. This was in accordance to the underlying economic

situation in the Asian pacific region at the time where management had to go beyond translation exposure to build up competitive business strategy to survive in the market place at that time.

In a whole this survey express the need for managing exchange rate exposure with emphases on transactional exposure while not forgetting to stress the need for economic exposure management which has the potential to erode future cash flows if under looked.

Sarah et al (1998) in their paper "Multi-currency Options and Financial Institutions' Hedging: Correlation Does matters" examines financial institutions doing business internationally and their potential currency exchange risk, concluded that financial institutions increasingly are facing exposure to foreign currency. They go further in identifying linearity with future and forwards (p.487) and recommending hedging and financial strategies. This is of course as fluctuations in exchange a rates causes multinational firm to be faced by substantial currency risk.

In a survey carried out by Stephanos et al (2005) they explored the role that random arbitrage opportunities played in hedging financial derivatives. This was carried out in light with the asymptotic pricing theory introduced by Fedotov and Panayides and arrived at the same results as in other empirical studies with large deviations on ratios near at the money.

2.4 Factors that cause Exchange rate fluctuation

A series of factors could directly be attributed as factors, which directly determine changes in exchange, rate figure. These factors reach from economic indicators to international factors.
Exchange rate mechanisms, expresses the parity condition on which one currency say the Swedish Crown exchanges with other currencies or indices denominated in foreign currency. With the collapse of the European monetary system established in 1979, most countries moved on to the free floatation of their currencies. No country in reality practices a completely free system; as such it is always kind of a dirty float. That is to say, a near proxy to the free, currency floating system in which values of commodities are determined by the forces of the market. In this case two conditions are of important consideration to determined exchange rates

(1)The Purchasing Power Parity (PPP); central to this theory is the assumption that commodities will cost the same price regardless of where they are Ross et al (2005) popularly known as the

law of one price. As such ascertaining their exchange rate mechanism becomes a matter of basic mathematics. It could be express as follows

……(I)

$$e_t = e_o * \frac{(1 + i_h)^t}{(1 + i_f)^t}$$

Where e_t = Exchange rate at time t

e_o = Exchange rate at previous time

i_h = Home inflation rate

i_f = Foreign inflation rate

With a constant stream of exchange rate values, meanwhile the rate of inflation differ substantially between two currencies, the country with a higher inflation rate will become less competitive in its exports of goods and services, whereas imports from abroad will become more competitive than domestic products leaving the country with a deficit in its balance of payments. By purchasing power parity, there will be a new exchange rate e_t in such a way that the currency of the higher inflation country depreciate while the other appreciate. Shapiro (2003p.121-124)

For example, A Nokia telephone handset cost 10 pounds in London and 100 Euro in Paris, the pound euro exchange rate will be

1 Pound = 10 Euro

Or

1 Euro = 0.1 Pound

The arbitrage Pricing theory forms the underlying assumptions on which the parity condition holds. It states that, currencies and resources will de diverted by investor to take advantage of any mispricing existing in the market to such an extend that, the system corrects its self.

(2) Balance of trade figures with other foreign countries and partner constitute a measure source of its exchange rate mechanism. A strong Euro is expected with increase demand for French products for example rising Wine prices has to lead to a strong Euro as Wine products are important export commodities

(3) Political and Economic risk

The objective of any operating company is to maximise both shareholders and company value. In other words, this can be called risk management, in this case investor prefer to hold less risky assets or assets in relatively stable conditions. More politically and economically stable nations have their low risk currencies highly valued than currencies from instable countries plagued with pervasive corruption, absence of basic institutions and reliable regulation, ethnic and religious violence, large government deficit, and monetary instability.

(4) Expectations about future exchange rates

If investors have a favourable forecast about future earning stream or potential about an economy there is the tendency for its currency to appreciate relatively. A good expectation from investors about the future value of a currency will trigger their willingness of holding that currency and thus affect the spot rate today.

2.5 The Capital Asset Pricing Model (CAPM)

Determination of the appropriate discount rate for projects and investment has always been of huge importance. This is because the discount rate of any investment is a function to the risk Ross et al (2005.p255-288). Individuals who hold securities use expected return as the measure of security return. CAPM is the formula used to calculate this expected return. Risky projects or investment should eventually have higher returns to compensate for the risk. Expressed as

$Rxp = Rf + \beta*(Rm-Rf)$…….(II)

Where

Rep is the expected return on a security

Rf is the risk free rate

B is the beta of the security

Rm –Rf is the difference between the expected return on the market and the risk free rate. Ross et al (2005)

In effect it tries to describe the relationship between risk and expected return and as such, serves, as am model for pricing risky securities. Its asserts only systematic risk or risk largely regarded by rational investors as not firm specific based on the nation that firm specific risk can be diversified away.

Since its proponent by William Sharpe, the CAPM has become a centrepiece in modern finance. With precise predictions on risk and returns its severs to basic function confronting financial expert of today, Firstly it provides a bench mark for assessing possible future investment Secondly it enables financiers to make an educated guess as to the expected returns on investments. It answers question such as how to be price stocks in an initial public offering, or how a new investment will affect the investors stake in a company and future returns.

One cannot talk about the relationship between risk and return or the merits of the CAPM without mentioning the contributions of Markowitz (1952,), which basically lays down the foundations of the CAPM. The Markowitz selection techniques in portfolio are very much in use today in modern portfolio security Analysis. The CAPM lies on a series of strong assumption, which have always been a strong front of critique against the CAPM. These assumptions are

Firstly is assumes all investors are price takers and in effect act as though their trading does not affect the prices of securities. In this scenario, they all hold small stakes of stocks, which is small comparative to the endorsement of all the investors.

Secondly, investors act in a myopic behaviour by desiring or aiming for the same holding period. As such they ignore all investment outcomes, which could occur after this holding period.

Thirdly, Investors are limited to a basket or universe of public traded financial asset such as stocks and bonds and risk free rate borrowing or lending. This assumption limits investment to traded securities and eliminate nontraded asset such as human capital. It equally assumes that all investor will borrow or lend any amount at the risk free rate.

Fourthly, it Assumes investors pay no tax or transaction cost in trading securities. This is of course very far from the reality, as we know investors spend millions of dollars in tax and transaction cist for investments.

The fifth assumption says that all investors are mean- variance optimisers, that is, they all go by the Markowitz portfolio selection techniques. This is again so not real in our world of to day.

Investor have different preferences for even badly performing stock this argument can even be more enforced with the huge profit potential in the emerging markets.

Finally the CAPM assumes that all investors share the same view in analysing securities and on the global economy. This implies they all arrive at the same list to fit into the Markowitz model. Bodie et al (2005p 282)

Despites its unrealistic assumption, the CAPM has dominated modern finance. Investment projects corporate mergers, acquisitions nowadays must be defended in the light of the capital asset pricing model. This is so useful as it enable managers to calculate the rate that investors want. Any rate of return must be able to above this for adoption. Although the CAPM is complicated it helps investors to take care of some risk such as the boss will unreasonably diversify across industries for personal or unjustifiable reasons. This is as investors are able to calculate with a fair degree of accuracy the returns expected on each project . Bodie et al (2005p 281-303)

Jeremy (1996) in his article " Rational capital budgeting in an Irrational world" published in Journal of Business tries to evaluate the relevance of the CAPM in a modern context. The BETA is probably what makes the CAPM so important Although an investment may well be so risky, diversified investor should care so much only about those risk associated with the market basket. This gives the CAPM such a unique tool for assessing return and risk. The CAPM goes further to translates this in to rate, which is better understood and can be more widely analysed.
Exchange rate exposure can be measured by a simple regression anchoring Beta values or stock sensitivity on the simple factor model and multifactor models developed and tested in the light of the capital Asset Pricing Model (CAPM) and Arbitrage pricing Theory (APT).

In a very much similar way as the CAPM, the single factor model presents a reversal of the CAPM equation where the beta of the single factor is suppose to account for risk discrepancies between the security and the market. As such returns on a particular stock is presented as a sum of the expected return at the start of the period and contribution from the systematic factor in the market.

In an efficient or near efficient system, co variances between security returns tend to be positive because the same economic factor s, which account for systematic risk affect all firms indiscriminately. It is practically assumped that non-systematic risk can be managed properly by diversification or other mitigating strategies based on firm-by-firm bases. Examples of economic factors include, business cycles movements, Interest rates, cost of labour and of course exchange rates, which is of focus in this study.

In this light, unexpected change in these variables causes simultaneous unexpected changes in returns and can be summarized in one macroeconomic indicator or a single factor model
The firms return can be summarised as follows

$$R_{i= E(ri) + \beta iF + si} \quad \text{.....(III)}$$

Where

Ri represent the return on security i

E (ri) is expected return on security i at the beginning of the stated period,

F is the unanticipated macroeconomic factor (which is assumed to capture all systematic risk)

Si is the impact of the unanticipated firm specific characteristic or event (such as a new discovery)

β measures the sensitivity of stock i to the macro economic factor or event Bodie, et al (2005)

However, financial economist have found out that "beta" is not much of use in explaining rate of return on firms' share. Equally there appear to be an other measure which explains this returns quite well and it is the ratio of firm's book value to market value.
Jeremy in his new article say that " If investors are rational, then beta cannot be the only measure of risk so managers should stop using it. Conversely if Investors are irrational then beta is still the right r measure in many cases".

2.6 Arbitrage pricing theory and Multifactor models (APT)

The CAPM model stipulates a linear relationship between the beta of a security and its expected return, contrary to this, the APT model anticipates and interrelationship among returns of various securities. The APT assumes that the returns on securities are generated by a number of industry wide and market factors. The APT specifies the factors, which could be responsible for the

correlation between securities. The APT views risk more generally in contrast to the CAPM, which attributes risk in terms of the beta measure of security and market. Ross et al (2005 p297-315).

Ross (1976) is credited with the work of the Arbitrage Pricing theory in 1976.His APT is very similar to the CAPM in predicting the security market line and linking risk to return. But it takes quite a different path to arrive at the security market line. It relies on three factors

1 Security returns can be arrived at from the factor Model, that is to say there exist a linear relationship between returns and certain factor such as exchange rate, inflation and gross domestic product

2 there exist well enough security for risk diversification

3 in a well-developed and functioning market, arbitrage conditions are quickly wiped out. The usual APT discussion involves multifactor as used in the regressional analysis of this work.

There is a significant difference between arbitrage and risk return dominant arguments on the re-establishment of equilibrium condition. The risk return proponents or as in CAPM says that investors will react to arbitrage situations taking limited amounts in the positions available until it is wiped out whereas the proponents of the arbitrage or APT says just a few enough investors are needed to restore the market equilibrium by taking continues large position until such an opportunity is completely eliminated.

The APT model in contrast to the CAPM states that there is multiple risk factors to take into account when calculating risk return relationships. The APT can be defined as a mathematical theory for explaining security values and it holds that the return on an investment is a function of the investment sensitivity to various common risk factors such as inflation and unemployment.

The multifactor model in the same light as the APT model, modifies the factor model, it stand to reason that more than one factor affects the value of security returns trading in an open economy. It states that a more complete picture of the systematic risk, should allow for other factors as different stocks exhibit different sensitivity to different factors.

For example

$$Ri = E(ri) + {}^{\beta}i_{GDP}GDP + {}^{\beta}{}_{iIR}IR + e_i \quad \text{.....(IV)}$$

Where

Ri is the return on stock i.

E(ri) is the expected return at the start of the holding period

GDP is the gross domestic product

IR ist the interest rate prevailing

β Measures sensitivity to this of stock i to this factors.

The reason behind the multifactor model is that a couple of factor could actually be responsible for a particular stock's return value. The assumption of the factor model that a single macro economic factor could actually capture all of the macro economic effect is not very convincing and could not be applicable in all situations. For example a particular return may be reacting to changes in the business cycle or rising interest rates. This has no clear-cut relationship with labour cost or say exchange rates. The markets values or stock prices reflect both these macro economic changes and firms' sensitivity to them.

Muller et al (2005) in their work carried out a comprehensive research on existing literature and empirical studies on foreign exchange risk exposure. They carry out their research by reciprocally repeating method and techniques used in resent times. They come out with the fine conclusion that characteristics of exchange rate risk exposure have to be taken in to measure consideration when measuring the relationship between stock returns and exchange rate movements, as such they come out with the conclusion that exchange rates affect share holders value or wealth and are worth enough to be taken in to serious consideration. They equally come out with the conclusion that there is no general agreement to the parameters most influential or any model, which captures the entire effect to a satisfactory level of acceptance. This of course shades more light to the mystic surrounding exchange rate movement and shareholders' value as well as emphasized the importance of the firm's cost of capital, operation as well as revenue structure and proportions in an international competitive market.

One fundamental drawback to the multifactor APT is that it offers no guidance or rule for factor selection. As such this is usually done with reference to the relevance of this factors to the subject under investigation. As a general rule one has to look out firstly for factors, which explains

systematic risk and secondly factors relevant to the risk factor. The work of Elton et al ((1994) "Using the APT to Find cost of capital" they make use of concrete industrial relevant factors such as anticipated changes in interest rates, Level of interest rates, Inflation rate, business cycle foreign exchange rate and a summary they devised for measuring other factor expressed as

R_f + .425βterm struc - .51 βint rate - .049 βex rate + 0.41 βbus cycle + .069 βinflation +.530 βother……(V)

In the case of our research in the same light we focus on factors relevant to our factor under investigation. We make use of regression analysis where we examine the correlation between our variables .we try to establish if this relationship in the past still postulates in the future.

2.7 Exchange rate Risk and Stock returns

The theoretical effect of exchange rate on stock returns is along debate that has been analysed from different front with varied considerations. In general terms, the same underlying factors such as demand and supply, fiscal and Monetary policy affect the derivation of both stock prices and exchange rates. In a general trend one will expect these values to respond correspondingly to changes in these values positively or negatively depending on the underlying economic factors and expectation of the markets. Economic models tells us that the demand for a currency takes its value up or leads to an appreciation of that currency visa a vie a basket of currencies or an other specific currency assuming the existence of an efficient system. With the purchasing power parity condition in mine, one expects exchange rate values to have a significant effect on cash flows of companies operating in the global scenario, but this huge theoretical rational thinking leaves yet a vacuum to be fulfilled with empirical finding satisfactory enough to financial information users.

Over the years empirical investigations on this subject has produced mixed results. Nyadahl (1998) in Sweden found a significant enough evidence to support this theory. Jerion (1990) analysing US multinational companies, runs short of a convincing enough evidence Amihud (1994) fines no evidence in this analysis of 32 US exporting firms within the period 1982 to 1988. Bodnar and Gentry (1993) found out that about 20 –30 % of companies in Japan, Canada and the USA are in one way or the other exposed to a fair degree of exchange rate hazards.

Steve and Christos (2003) in the article " Foreign exchange rate exposure of US Multinational corporations" used a slightly different less traditional approach by introducing what they called "

firm specific foreign exchange index" in the regression equation. They argue that firms will tend to be less responsive if a general index such as the MERM which is used in both the works of Jorion (1990) and He and Ng (1998) but rather, more responsive to geographical specific location characteristics. As such the go ahead with the construction of weighted indices of companies based on presentation of their subsidiaries and sales factors. They proceed by carrying out an analysis of these firms' operations in different operational networks, with contrasting characteristics in say Africa, Europe and Asian subsidiaries.

In the light of earlier works such as in Levi (1994) who argues that, the microeconomic factors that determine the exchange rate of a particular country, varies over time as consumer preference changes the dynamics of demand and supply. As such, companies or entities tend to indicate little or no exposure to exchange rates whereas actually are exposed. They structure a new approach based on firm specific characteristics to improve on such biases. Their regression equations where as follow

$$Rit = \beta 0 + \beta 1FXt + e \quad \text{.....(VI)}$$

$$Rit = \beta 0 + \beta 1FXt + \beta 2MKT + e \quad \text{.....(VII)}$$

Where

Rit is the return on individual companies at time-denoted t

FXt represents foreign exchange rate index variables

MKT represents the domestic market weighted market index

A beta value here denoted by β captures sensitivity of returns to exchange rates. They obtain quite a positive result with equation one giving a 35 out of 310 significant foreign exchange variable with firm specific subsidiary weighted indices and a 37 out of 310 with equation 2 or the equally weighted indices.

On the other hand they obtained 91 firms with significant exposure when the foreign exchange is the broad index in equation 1. However with adjustment for market movements with MKT, they

obtained quite a similar with 26 out of 310. And a 27 with equally weighted indices as compared to the 37 above.

To test for the investors degree of responsiveness to changes in prices, and to further appreciate their result they introduced lags in their regression equation. In the works of He and Ng (1998) in Japan little effect was found with the introduction of lags. Their equation was as follows

$Rit = \beta 0 + \beta 1FXt + \beta FXt\text{-}1 + e$……..(VIII)

Where Rit was the firm's returns

FXTt foreign exchange rate index variables
And FXt-1 value of the foreign rate index.

They obtained significant evidence for this with 26 firms with the firm specific weighted index having significant beta value thus indicating that some forms of a lag before the effects of exchange rates are impacted in stock prices. This is quit significant considering the 6 out of 171 obtained by He and Ng (1998) in Japan.
In one work, one will say YES firms tend to show a more significant relationship between returns and exchange rate if firm specific proxies are used instead. " All politics is local"

2.8 Hedging of Foreign Exchange Exposure

Hedging or risk management strategies can be divided in to two, Internal methods and external method
Internal methods includes method in both the short term and long terms as expressed bellow:
In the short run companies employ strategies such as
(1) Leading and Lagging; this has to do with timely management of company cash flows. This is associated with parties in negotiation contracts where there is an interrelationship. In this way date of payment and trade credits are managed to minimise effect on cash flows
(2) Netting; is equally a widely used internal technique in the short term to hedge. Here interrelated companies net out their liabilities. It usually works with a well established inter group settlement system.

(3) Matching technique; is an other method in which receivables and payables are matched in an order such that there is available liquidity for settlement of liabilities as they due arise
(4) Finally Balance sheet hedging and pricing policies are other short-term internal policies used for hedging

In the Long term, internal hedging techniques is usually achieved by international diversification in manufacturing, distribution and financing of business operations
(5) Manufacturing diversification could be achieved by investing in plants across the globe in such away that benefiting situations in an other market can offset unwelcoming circumstances in one market. For example a worker strike in a BMW plant in Germany can be mitigated with non-stop production in its plant in the United States In this way sales figure and demands are hedged. This has be come a very attractive strategy for cost production with must western firms such Philips electronic operating factories out of Holland in Poland or Ericsson building production units in China and South Korea
(6) Financing Diversification is probably the must evident of all with companies listing their stocks in various stock exchange markets around the world to raise finances. This trend is very evident with must European multinationals being listed on the New York stock exchange far away in North America. An other good example is the Chinese trade surplus fuelling companies in Europe and America. With a record surplus of 1 Trillion dollars this year we all expect the Chinese to increase their influence and stake holdings in American and European multinational.

External methods of hedging include

A) Forward contracts
B) Financial derivatives

In a forward contract, a deal is agreed on today for delivery in the future with a price negotiated at the present date. Both parties are obliged to fulfil the obligation. For example A Farmer in the Netherlands negotiate s contract with Wal-Mart in China to deliver flowers during the Olympic games in China at a price initiated today. Forward contracts are not standardized and are usually not traded on recognised exchange market cooperative to options or futures.

Financial derivatives could be broken down in to
Currency futures, Options on currency futures, and currency swaps.

(a) Currency future; are standardised and specific in nature. The future exchange value of the currencies are agreed upon today to be delivered in the future. Future are quite advantages to forwards in many ways. Firstly they can be delivered at any date within the said period. It must not only be at the end of the said time. This of course gives the holder to make second judgement about the profitability of such transaction and could actually get out of it if the future seems not too promising. Secondly they are quite liquid since they are traded on standardized market. This gives the flexibility of to a buyer to net out his position with a sale and seller setting out their positions with a purchase.

Thirdly and most important the mark to market principle on future in which the seller updated his losses as the trading days go by. For example a buyer of a future contract with a broker needs some reserve to manages their position say the price fall on a closing date from 5.1 euro to 5.08euro, the buyer most update their account by .2 euro or 2 cents at the opening date the next day this is known as a margin call. On the contrary the price could rise to 5.14 euro, in this case each buyer receives .04 euros or 4 cent in their account immediately.

(b)Currency options, grant the holders the right but not the obligation to buy or sell at a future date. This is usually in the form of a put or call option. With a call option the older has the right but not the obligation to buy a specified currency or commodity at a certain date. If on the said settled date the price differences in the market does not favour the holder he has a right not to exercise his contract as such make a minimal loss in terms of the price of purchasing the contract. For example a holder buys a call to buy the dollar at 34 euros in two weeks, if at the said settlement date the dollar actually sells for 40 euro then he will exercise his option making a profit of 6 euros this is described as in- the- money. On the contrary if the dollar sells at 30 euros then he will not exercise because he could buy the dollar at a much cheaper price in the market. In this case he looses just the initial cost of the contract or the premium say it was 1 Euro, this is described as out -of -the money. That is the amount he will loose.

It could well be the other way around when he buys a contract to sell dollars or a put option .in this case if the selling price in the market is less than the exercise or strike price, he sells and make a profit. For example say he agrees to sell dollars at 10 euros in two week, and upon the expiration date the piece in the market is 12 euros per dollar, he exercises his put option. This situation is described as in- the –money and gets more dollars for lesser euros. On the contrary upon expiration, the price in the market could be 8 euros as such he does not exercises his option

because he can sell get more dollars by selling at 8euros in the market. This is described as out – of- the Money. In this situation he looses his premium or the amount by which he purchased the option.

Traders of option make a profit which arises as a result of discrepancies in prices in the market .this is described as" the spread". Prices are usually higher for pretty volatile currencies for example one will expect a very high premium charged for an option for the Zimbabwean Dollar due its high volatility.

(c) Currency Swaps are equally used as external hedging strategy in which situation the principal and interest in one currency are being swapped with that of an other currency. This is quite an effective means of getting around exchange rate problems between different companies. For example an American firm owning subsidiaries in London and having pound pending liabilities can swap principal and interest on a loan payment with a British firm in a similar situation. As such it is guaranteed the availability of pounds to meet future obligation. Swaps are also quite effective in getting cheap funds for companies by exchanging their borrowing rate from fix rate to a variable rate depending on their interpretation of capital market and borrowing cost

The use of financial hedge increases as firms increase in size and exposure. (Hagaline & Pramborg, 2005)

Multinationals with large economics of scale and exchange rate exposure, greater growth opportunity are more likely to use currency derivatives.Studies on some US firms revealed that they hedge in response to firm size, investment opportunities, expected cost of financial distress, and degree of foreign exchange exposure . (Graham & Rogers, 2000; Allayannis & Ofek, 2001)

Chapter 3 Scientific Approach

In this chapter the intended approach used in answering the research question and purpose of this study discussed in the introductory chapter and in the literature are mainly discussed. The choice of the subject is first discussed followed by the perception and preconception. Secondly the different approaches that are available for making a scientific research are discussed. In this process, the approaches found to be relevant to this thesis are identified and motivated.

3.1.1 Choice of subject

With the world becoming a global village, and many businesses becoming international, I am concern as a business administration student of the challenges that befalls the corporate world. I believe exchange rate risk is one of such challenges that management of multinational firms seek to properly addressed. With future ambitions in the financial sector, it is my delight to get into studies that relates exchange rate exposure and the value of a firm. It is my hope that, this study will help me in future to maximize firm's value and therefore shareholder's value. It will also be beneficial to corporate managers since it goes beyond theoretical assumptions to empirical evidence as to whether foreign exchange exposure affects the value of the firm.

3.1.2 Perspective

In Science, the direction of a study could be fashion base on the choices of different tradition (Halvorsen, 1992). To get right knowledge in order to understand reality, every researcher must carefully choose a right perspective. Form and well-based opinion of reality influences research, hence the choice of perspective after a research work makes it easier to define reality and therefore higher the level of meaning of the study (Bryman and Bell 2003)

I write this thesis with an investor's perspective. I make use of company's financial data since I believe analysing these financial data will help me empirically conclude if foreign exchange exposure affects the firm value.

3.1.3 Preconception

Practical experiences and the theoretical knowledge of a researcher form his preconceptions (Halvorsen, 1992). Preconceptions are usually subconscious, but with training and experience, researchers adapt to recognizing their preconceptions (Bryman and Bell 2003)

A reader should know the degree of influence the writer's preconception has in a study. Also, the writer should be aware of his preconception so as to ensure it does not influence their study negatively. The author of this thesis is a business administration student in Accounting and Finance. The author did a Bachelors of Science degree in Finance and work for a year after that. Firstly with the First Trust Saving and loan in their operations department then at Akale and Co chartered accountants in the auditing and assurance department. Being a foreign student the author has experience fluctuations in exchange rate when He receives money from home. Coupled with his desire to work with finance and huge interest in financial services and trading of securities, as such working with exchange rates and shareholders value was of profound interest.

The author has studied many profitable courses at the Umeå School of Business; among them are Multinational Finance, Advance Analysis of Financial Data, Investment course and Research Design and Method courses that have left a lasting impression on his views on research. The theoretical framework and the choice of research method use in this thesis have its base on the knowledge he gained from the Advance Analysis of Financial Data, Multinational Finance course and the Research Design and Method courses respectively. My conclusions and remarks are strictly with regards to the out come of my research on the subject matter with statistical backing of the data.

3.1.4 Underlying Philosophy

A good understanding of philosophical issues will help a researcher to recognize which research design will work for a given circumstance, how to create designs outside his experience and how to clarify on a chosen research design (Easterby-Smith et al, 1999).

Epistemology and Ontology are two concepts that are use for the determination of research methodology. Epistemology is the study of knowledge, science, model and testability, what we see as truth, while on the other hand, Ontology is the study of being, the way we view the world (Bryman and Bell 2003). Phenomenology and positivism are two extremes of ontological choices.

Phenomenologist advocates for a holistic view rather than the reduction approach so as to capture the complexities of social science. To them, scientist should only study phenomena and the

related human experiences (Bunge, 1996) so as to understand and explain why people have different experiences and meanings (Easterby-Smith et al, 1999)

On the other hand, positivists see an external social world, whose properties should be measured through objective methods, not inferred subjectively (Easterby-Smith et al, 1999). Positivistic research has as aim to search for regularities and causal relationships through a reductionism process, where the whole is reduce as far as possible into its constituent parts (Muller, 2005). Positivist usually derives hypothesis from existing theories, in the form of causal connections between entities, which are then submitted to empirical testing (Bryman and bell 2003).

Ontology has experience the development of a range of intermediate stances over time. Two of such stances include realist ontology that argue that we can measure things but it can change with time (Bunge and Mario 1996) and the pragmatist ontology that argues that, "The world is out there, but not objective", and that an attempt to articulate situations becomes subjective. Realities are experienced in every day life, yet there is no true objective account of reality (Bunge 1996).

Epistemology is linked with the ontological stance one takes as it identifies the researcher with the data. Phenomenological research attempts to explain human behaviour by answering question like "Why" something happens. On the other hand positivistic research looks for facts and causes as they try to answer the "How" and "what" questions (Muller, 2005).

Since my goal is to determine if there exist a relationship between firms' value and exchange rate fluctuation, I have chosen a predominantly positivistic stance. I intend to look for causal relationships, precisely if firms' value is affected by exchange rate changes. As such, I narrow down to movements in exchange rate values.

3.1.5 Scientific approach

Inductive and deductive researches are two basic scientific approaches often used when conducting a study. With inductive approach, seek to understand new or unknown phenomena. Data is usually collected through methods like interview, observation and diary methods. Inductive researchers' carryout analysis through induction, pattern recognition or development; using a holistic perspective. With inductive approach, theory follows data and it's difficult to replicate. With deductive research on the other hand, hypothesis are developed from existing

theory. Data is being collected through surveys, observation, questionnaire, interviews etc. Deductive researchers usually analyzed their data through statistical methods like multivariate data analysis techniques. Such research aims at developing theories through rejecting or confirming hypothesis. It is possible to replicate deductive research (Muller, 2005).

Our positivistic stance places us to a more deductive research (Bryman and bell 2003). I have a causal research design that aim to establish that, a change in one variable brings about a change in another variable.

3.1.6 Research Data

Qualitative and quantitative data are two types of research data. Qualitative data is collected in order to discover or gain deeper understanding from information on a few characteristics. It has unstructured collection techniques, little concern for representative ness, relatively long interviews, highly skilled active interviewer and the results have subjective interpretation.. Quantitative data on the other hand is used for testing a theory or hypothesis or providing summary information on many characteristics. It includes a more structured collection technique, high representative ness, relatively short interviews, passive interviewer, large samples and an objective interpretation of results (Muller, 2005).

Since our aim to test a linear relationship, I have therefore decided to use quantitative data for my empirical study. To me, qualitative data was inappropriate since I am interested to have a more objective result than subjective.

3.2 Practical Methodology

Since I am investigating the effect of exchange rate on returns as stated in my research question, this has influence over my research process. I developed the theoretical part of this study together with empirical study. However, the theoretical review is to give the reader an understanding of the research question while the empirical study is to test if the conditions stated in the research question hold or not.

My theoretical review was mainly from scientific articles and some relevant books in the field of finance and accounting. I used the Umeå University library search engine ALBUM to get relevant literature. Articles were found by using search words like exchange rate fluctuations, foreign involvement, exchange rate exposure, and firm's value on article databases like Science Direct and Business Source Premier.

Data for this analysis was collected still from Umeå University library data stream. From the Thomson data stream, I got stock prices, exchange rate; market index for 18 companies and domestic market index from London stock exchange.

My selection of the 18 companies was base on their heavy international presence, having at least 40% of revenue from international markets, paid some degree of foreign tax, publicly traded, fairly stable and consistency in financial data. This in my point of view gave the best choice companies for my research question especially as I am working with foreign exchange exposure.

3.3 Source Criticism

When wrong ideals are picked up from previous authors to build up a new research, it affects the authenticity of the work. All researches before using any previous study, should evaluate the materials independence, if it is free from false view, how recent it is and how close to the source the material was collected (Bryman and Bell 2003). I tried to use source information in this thesis. In the case where I used a secondary source, I tried to check that it was correctly cited. All this is to be such that I achieved material independence. I also limited myself to articles published in highly stated journals to ensure that they do not carry a false view.

Chapter 4 Methodology

In this chapter the practical method used to answer the research question and fulfil the purpose of this thesis is presented. Firstly a background information on how data was collected. Secondly motivations and explanations for choices of variables in the equation. It ends up with a practical methodology followed by some possible critic of the work.

4.1 Data collection

In this study, the effects of exchange rates on stock returns will be examined with the aid of linear regression techniques. Where by both returns and exchange rate value will be expressed in an equation and statistical data from the excel software analysed for linearity by beta significance.
Data was collected from Thompson's Data Stream in the USBE Library with close collaboration with Alison Gooch the Client support Executive at Thompson Financial in the United Kingdom (UK). Further theoretical data was collected from the university library resources such as science direct where a good number of articles of related material were made use of. Finally course texts and materials in the courses in Multinational Finance, Advance analysis of Financial Data, Corporate Finance and Investment were all of valuable assistance.

The London stock exchange in the UK was of critical interest and I narrowed down on 18 performing firms based on their degree of internationalisation, consistency in financial data, stability, active trading on the London stock exchange and paid some degree of foreign tax. This was done for the period 1999 to 2004.
Data type RI for total returns, The Bank of England's trade weighted indices of data type TW was used to get exchange rate changes. In this case I made use of the sterling broad index with code BOEGBPB. The pound-euro exchange rate of data type EB and code ECURRSP. Finally the FTSEALL was used for the market portfolio for which the code is FTALLSH.

4.2 Choice of Investigation Objective and Variables

Choosing the research objectives and variables is of primordial importance to the outcome of any research study. The factors selected in this study are inline with a number of previous studies enabling this thesis to accommodate a broader view of existing literature.

The primary objective was to investigate the effects of exchange rates in a fairly well established and open economy. In contrast to the work carried out by Stefan Nydahl in his research " Exchange rate Exposure, Foreign Involvement and currency hedging of Firms" in 47 Swedish

firms. From a theoretical point of view one expect exchange rate changes to be of significant effect on share holders value but this is so far has illustrated very weak relationship in empirical investigations. One will expect this to be more significant in small economies such as Sweden and as such I took to the task of investigating this relationship in a big well-established economy such in the UK. In 2005 the London stock exchange traded an equivalent of 5.3 trillion dollars of stocks and in 2004 it had more than 80% of the total initial Public offering (IPO) market in Western Europe. By all accounts it's the best in the European market (Newsweek January 2005). All this motivates the choice of the London stock exchange.

The time frame of 1999 to 2004 was of significance especially taking in to account the introduction of a single currency that is the Euro forming the world's biggest trading block. The UK is not a member of the euro member states as such; it is of interest to investigate how the London stock exchange reacted to this major global event. I also thought it wise to include a number of years to get a better picture of sensitivity rather than using a single year.

In the regression I make use of daily stock returns rather than monthly or weekly stock prices as utilized by other empirical studies. Daily returns are very much appealing in contrast to weekly returns and have been proven statistically to give a better appreciation in financial research in varied financial investigations as such more relevant. This of course makes data seize bulky but was not an issue considering the fact that this data could be handled fairly easy with a computer program. And looking at the benefits of using daily data, which captures with fair degree of precision market movements.

The motive of my choice of firms moved primarily from a general to more specific characteristics of these companies. Firstly the London stock exchange was of interest as it represents some of must performing stocks in the United Kingdom (UK) and it stands shoulder high as the best performing equity market in Europe. This gives better if not near perfect presentation of the level of competitiveness of the European economy. On a Specific note I took into consideration companies which where more exposed to exchange rates fluctuations that is to very international companies with a lot of global influence. In this regard, the respective Line of business that is products produced, International sales ratio was of obvious consideration. I looked at firms with significant foreign sales out of the UK. Must importantly the presents of consistence in its data was of some consideration, that is to say companies with little or no gaps in its trading record was

taken into consideration as well little variances in the data. Stability of these companies was an other factor and finally they had to in some way be paying some foreign tax. This data was obtain from company financial statements and wedsites.

Finally I used the FTSEALL for the market portfolio, as it is the main market index in the United Kingdom (UK). No other market index can give a finer result and true representation. The sterling broad gives weighted indices in the UK, which is more, compelling basket of currencies in contrast to a single currency value. This was also to be inline with previous works using the common weighted indices In the regression the Euro exchange rate changes where introduced both to capture the euro zone effect on the stock returns and measure effect in case of companies with predominant sales to the euro zone.

One strong critique of the multifactor model is its inability to clearly pinpoint what factor to be used in the regression equation.
Bodie, et al (2005p.358-360) in their masterpiece " Investment" stresses this limitation and gave some general guidelines on choosing factors
Firstly, they state to limit factors to systematic factors which consist of factors whose effect cannot be eliminated by diversification such as Inflation, Exchange rate and gross domestic product to name a few in the unending list. In this light we use exchange rates which is a focal point in this study
Secondly, they should be important risk factors. This equally qualifies exchange rate. This second guideline is actually research specific and actually depends on the relevance of the factor to the research question. In the study of Elton, Gruber and Mei (1994) " Using the APT to find cost of capital" for energy supplies, they exactly used factor relevant to their research question which were tern structure on interest rates, inflation and business cycle movements.

4.3 research Method

Preliminarily, I implement a measure of Beta values that depicts return sensitivity to changes in exchange rate using regression analysis. In this case changes in firm's value or total returns is the dependent variable and exchange rate changes is the regressor or independent variable.

$R_t = \alpha_0 + \beta\Delta st + e_1$.....(1)

The right hand side of the equation R is the dependent variable, which is explained in the regression by the variable **α and βΔst** on the left hand side of equation (1). The value **α** gives the value of the R when the independent variable is zero. The second part on the left hand side **Δst** multiple the sensitivity coefficient beta **(β)** , translates movement in exchange rate **Δst** figure in to the returns R.

The unexplained item on R is represented by the error term e. the error term is assumed to be uncorrelated with the explained term R and has no expectation

.

A second test introduces returns on the market portfolio as a second independent variable. This is in accordance with the multifactor model; in this case the market portfolio takes care of market movements in the economy. It is of practice to introduce returns of recognised market indexes such as the S&P500, which give the stock daily returns of 500 of some of the most performing stocks in New York or the FTSE ALL that is made use of in this case in the United Kingdom. The regression equation could be represented by the following expression.

$$R_t = \alpha_0 + \beta\Delta st + \alpha_1 Rmt + e_1 \text{.....(2)}$$

$$T = 1 \text{..... } T$$

Rt is the rate of return of stocks in local currency (in this case the Pound sterling)

Δst is the rate of change in exchange rate specifically the Sterling broad index

. We control for Market movements by introducing **Rmt**, which is the rate of return on the market Portfolio in this case, the FTSE ALL index.

e represents the error term

In this equation Beta **(β)** measure the degree of responsiveness of returns as a result of changing exchange rates values.

Finally, a last regression is carried out with a single currency in this case the euro was chosen due to the euro regions dominants of UK goods.

$R_t = \alpha_0 + \beta\Delta steuro + \alpha_1 Rmt + e_1$.....(3)

Where

Δsteuro gives the rate of change of the British pound-euro exchange rate within the period December 1999 to December 2004

The introduction of a single currency as the regressor was to capture sensitivity in case a particular company's goods or operations where largely in the euro zone.

To measure the effect when a lagged exchange rate is introduced in the equation, I further introduced the lagged exchange rate in the equation. This is to verify the incorporation of the previous days exchange rates into stock prices of the present day.

$\mathbf{R_t = \alpha_0 + \beta\Delta st + \beta\Delta st\text{-}1 + e_1}$**.....(4)**

Where

Δst-1 represents the exchange rate of the previous day

Rates of return for Stock returns, Exchange rates, and the market indices where calculated as follows

$$R_{t\ =(R1-R0)/RO}$$

or

$$\Delta st = (\text{exchange rate}_{t1} - \text{exchange rate}_{t-1}) / \text{exchange rate}_{t-1}$$

Where R1 is the stock returns of today R0 the stock returns of the previous day.

4.4 List of companies and background information

(1) Anglo American- Anglo American was founded in 1999 with the merger of South African (AACSA) and Minorca. It is principally own by UK institutions with a global presence in Africa, Europe north and south America and Australia. On 21 February 2007 it announce a record earning of 5.5 billion dollars. (Company website)

(2) Associated of British foods- ABF was founded in 1935 by the incorporation of 7 bakery subsidiaries. The associated British Foods is a diversified international food ingredients and retail group. It had a record of 6 million Pounds in 2006 with 75000 employee and

presence in 46 countries. It has a net investment worth 760 million pounds in 2006 with a dividend per share of 18.75p. It equally has a total asset of 6,492 million Pounds and a total liability of 2,310 as at 2006 and it's a FTSE 100 company. (Company website)

(3) Barclay Plc - Barclay was founded in 1690 by the merger of several small banks in the English provinces under the banner Barclay and co. It has head quarters in London with Marcus Agius as chairman and John Varley as CEO. It is a global financial service company with activities principally in Banking, Investment banking and Investment management. It has offices in the UK, USA, Middle East, Latin America Australia and Africa. Barclay is the fourth largest bank in the UK and the 28 largest in the world with market capitalisation of 71.6 billion dollars as at 2006. it made a net income of 4.571 Billion pounds in 2006 with a work force of 118,000 employees.(Wikipedia)

(4) BHP Billiton- the merger of Broken Hill Property Company in Australia and the British Billiton in 2001 gave rise to BHP Billiton the world's largest mining company. It still listed to day as separate companies with the Australian Company owning 60 % and head quarters in Melbourne and the British company owning 40% with head quarters in London. They both have separate shareholders and separate board of director although they share the business in common and the same management structure. Its group CEO is Charles Goodyear with over 100,000 employees. In 2006 it recorded revenue of 10.543 billion dollars. (Company site)

(5) BOOTS group- Founded in 1849 in Nottingham England by John Boot. The BOOTS has seen switch of ownership from British hands to Americans and finally to British hands. In the late 90s it was predominantly a troubled company that saw its merger with Alliance Unichem in October of 2005. it is predominantly the a pharmacy chain in the united Kingdom with recent diversification into photo processing , opticians and household appliances. It earned a net profit of 303.4 million Pounds in 2006 with an earning per share of 44.5p. (Wekipedia)

(6) British petroleum- Founded in 1908 originally known as the Anglo-Persian oil company when William D'acy discovered oil in Iran. Its name was changed to BP in 1954 with Head quarters in London. Fortune Global 500 ranged BP fourth largest company in terms on turnover sales of 268 billion dollars in 2006. In the same year Forbes Global 2000 ranked BP the 8 th largest company in the world BP's products include petroleum and derivative products, Bp service stations am/pm convenience store and Aral service stations. In 2006 it recorded net income of 22.286 billion dollars. It has 96,200 employees

with Lord Browne of Madingley as chief executive officer. BP has a popular slogan which states “Beyond Petroleum” (Wikipedia)

(7) British Airways- the British Airways was founded in 1924 as the Imperial Airways, which lead to the expansion of its services to Australia and Africa. It is the largest airlines in the United Kingdom and third largest in Europe. It has a fleet size of 234 aircrafts with 19 new orders as at 2006. It equally has 222 destinations with a lion’s share of the operations across the Atlantic. British Airways has always come under increased criticism for its mainly Boeing fleet with respect to few carriers from the European Airbus company. Willie Walsh is CEO and it had net profits of 467 million Pounds in 2006 with earning per share of 40.4p.

(8) British Sky- British sky was founded in 1986 as the British Satellite Broad casting by Granada, Pearson, Virgin and Amstad. It is the main operator in television subscription in the United Kingdom and the republic of Ireland. It had 8,176,000 home customers in the UK and Ireland, some 3294,000 indirect customers though its operation with Virgin media and some 604,000 indirect cable customers with NTL Ireland and Chorus in the republic of Ireland. James Murdoch is CEO and Bsky has 16,000 employees with net income of 551 million in 2006.

(9) HSBC HDG- Founded in 1865 by Thomas Sutherland to finance British operations in the Far East. It full names stands for “ the Honkong and Shanghai Banking Corporation” with present head quarters in London. The Forbes 2000 ranks it the fifth largest company in the world and the third largest bank in the world. It is equally the second largest corporation in terms of asset with over 1.861 trillion in net asset as at 2006. It has 312,000 employees and Michael Geoghegan is CEO. Its main products are; personal financial services, commercial banking, Corporate/investment banking and markets and private banking. Its net profit in 2006 was 15.8 billion dollars and its known by the slogan “ the Worlds Local Bank”.

(10) Imperial Tobacco- Imperial Tobacco was created in 1901 by the merger of British tobacco companies in respond to threats of competition from the United States of America. It is the fourth largest tobacco company in the world and the largest tobacco manufacturer in the United Kingdom. It has head quarters in Bristol England. It has a work force of 14,486 employees and Gareth Davis is chief executive officer. On the 30th of September it had a turn over of 11.676 Billion pounds with a profit of 1.168 billion Pounds.

(11) **Lloyds**- Lloyds TSBC is a banking and insurance group in the United Kingdom. It was founded in 1995 by the merger of Lloyds Bank and Trustee Saving bank and its headquarters in London. At the moment it is fifth largest banking group in the UK. At the time of its creation it was the largest bank in Europe and UK. It has manpower of 66,800 workers and Eric Daniel is the chief executive officer. In 2006 it had a net profit of 2.9 billion Pounds. And is known by the slogan " the For the Journey".

(12) **Mark and Spencer**- Founded in 1884 by Michael Mark a Russian born Polish-Jewish immigrant. Head Quarter, London England. It's a huge British retailer with shops outside the UK. Its products include; clothing, household items, coffee shops, furniture and technology. It made a net income of 0.52Billion pound in 2006 and Staut Rose is CEO.

(13) **Morrison**- founded in 1899 by William Morrison. It is the fourth largest chain super market in the United Kingdom with over 369 super stores. It has 118,800 employees and Marc Bolland is CEO. It is head quarters in Bradford, England. In 2006 it record net income of 250.3 million Pounds.

(14) **Reuter Group**- founded in 1851 by Paul Julius reuters. Its products include supplying the financial markets with information and trading products such as market data, stock prices, currency rates research and analysis where in does an analysis of over 40,000 companies. It equally provides information for many newspapers and runs broadcasting it self. Its headquarters in London. In 2006 it made a net income of 305 million Pounds.

(15) **Royal Dutch Shell**- Founded in 1907 when the Dutch company Royal Dutch Petroleum Company and the British transport and trading company merged. It is 60% Dutch and 40 % British with head quarters in Amsterdam. Jeroen Van der Veer is CEO. its main product include Oil, natural gas and petrochemical products. It has 112,000 employees and made a net income of 26.311 Billion dollars. In 2007 to mark it 100 years of existence it lunched a scholarship fund.

(16) **Standard Chartered Bank**- founded in 1969 when the Standard bank of south Africa merged with the Chartered Bank of India, Australia and China. It is present in more than 50 countries with head quarters in London. The UK accounts for only about 10% of its revenue 90% of its revenue comes from Asia Pacific, South Asia Middle east and Africa. Their means areas of operations include; consumer banking, corporate and

institutional banking and treasury services. it has a work force of 60,000 employees with Peter Sands as CEO. It recorded a net income of 2.4 billion dollars in 2006.

(17) **Tesco**- Tesco is a UK based international grocery and general merchandising retail chain. John Cohen in London founded Tesco in 1924. Its main products include; Groceries, consumer goods, financial services and telecom. It has head quarters in London with Sir Terry Leahy as CEO. In 2006 it recorded net income of 2,5500 million dollars. Tesco is largest retailer in the UK and the third largest in the world.

(18) **An Irishman named Federick York Wolseley in Sydney Australia founded wolseley- in 1887**. It is head quarters in Reading in the UK. Claude Hornsby is CEO.wolseley is one of the world's largest suppliers of building equipment. It is known for great expertise in plumbing and heat supplies. It has 65,233 employees and made a net income of 537 million Pounds. It is equally a FTSE 100 company

4.5 Criticism of data

The data used for the regressional analysis and interpretation of this data can be classified as secondary considering the fact that we used stock returns from the Thomson Data stream instituted in the library, we all are quite aware on the infrequent movements of the stock prices and its susceptibility to speculations and non economic or financial information. On the other hand, we will all agree it is the fairest representation on any economy. This is as a stock price captures the true economic value of firms. Its serves as a supplement to the balance sheet value and figures presented in financial reports, which are mostly based on historical and conservative accounting methods. A stock price captures the market value of assets and expectation of investors as such the best possible source of data available. There could not have been no better source than Thompson Financial that is appreciated and respected globally with renown newspapers and financial publication making use of their data source.

A second area of criticism could be the focus of the research on a group of firm rather than to a specific industry in the economy. It is common practice for research work to be focus on a particular industry say IT or banking industry to make better comparism and results more credible. This is not the case here; firstly I am investigating a subject that affects the entire economy to a fair degree. Every company can feel exchange rates values. It is even out of the question today for any company to be labelled as strictly domestic, the world is becoming even more global than ever before. Secondly previous studies carried out by Nydahl (1998) in Sweden

on 47 Swedish firm, also studies by Jerion (1990) on US multinational Steve and Christos (2003) did not take into consideration industry specificity in this vein, of thinking one can conclude the results become even more credible and reliable using a group of firms with the economy focusing on their degree of exposure due to their respective activities

Chapter 5 Empirical Findings and Analysis

In this chapter, the results of the various regression equations are presented. The chapter concludes with an interpretation of the achieved results

5.1 results

This thesis was design to study the association of exchange rates and stock returns. This was done for the period 1999 to 2004 for 18 performing stocks on the London Stock exchange. The approach being by the use of regression analysis to establish linear dependence. The regression analysis can be summarised by the following four equations

$$\mathbf{R_t = \alpha_0 + \beta\Delta st + e_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)}$$

$$\mathbf{R_t = \alpha_0 + \beta\Delta st + \alpha_1 Rmt + e_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)}$$

$$\mathbf{R_t = \alpha_0 + \beta\Delta steuro + \alpha_1 Rmt + e_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)}$$

$$\mathbf{R_t = \alpha_0 + \beta\Delta st + \beta\Delta st\text{-}1 + e_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)}$$

In this process beta values are measured in the regression equation to establish the existence of a linear relationship. This is achieved by analysing the beta values at 95% and 99% significant levels. Panels A, B and C on page 55 to 56 gives data statistic of the variables used and their correlation matrix.

5.2 regressions with Single factor (sterling broad index)

The first regression equation test for linear dependence between returns of the stocks and exchange rates of the sterling broad index. Primarily, I assumed a linear relationship between returns and exchange rate, which I am out to observe if the contrary exist in my regression analysis.

This regression was carried out with exchange rate values as regressor and rates of return as dependent variable. Rates of return were calculated from daily data of stock prices of the 18 firms under investigation. Equation 1(variables defined in previous section Panels A to C presents data statistic and characteristic of both dependent and independent variables)

$$\mathbf{R_t = \alpha_0 + \beta\Delta st + e_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)}$$

This is done with the notion that a single factor could measure return sensitivity of stock prices to a single macroeconomic value, which captures market movements. That is to say in accordance with the single index model the result is as follows

Table 1(a) Regression of changes in the bank of England weighted exchange rate (Sterling broad) and returns at 0.05 levels

Companies	Intercept	β of sterling broad	P- value of sterling broad	Result at 0.05 level
Anglo American	0.0005	-0.31	0.06	Non
Association of British food	0.0008	-0.13	0.29	Non
Barclay group	0.0006	-0.08	0.61	Non
BHP billiton	0.0008	-0.29	0.09	Non
BOOTS Group	0.00041	0.04	0.7	Non
British Petroleum	0.00014	-0.31	0.02	Significant
British Airways	0.00016	-0.37	0.11	Non
British Sky	1.21E-06	-0.32	0.15	Non
HSBC HDG	0.0003	-0.45	0.0002	Significant
Imperial Tobacco	0.0001	0.19	0.14	Non
Lloyds	0.0001	0.00014	0.99	Non
Mark & Spencer	0.0004	-0.04	0.81	Non
Morrison	0.0006	0.05	0.76	Non
Reuters group	0.0001	-0.21	0.42	Non
Royal Dutch shell	0.00019	-0.39	0.004	Significant
Standard Chartered Bank	0.0039	-0.21	0.20	Non
Tesco	0.0006	0.06	0.61	Non
Wolseley	0.0009	-0.35	0.02	Significant

$R_t = \alpha_0 + \beta\Delta st + e_1$.....(1)

4 companies with relevant test statistic,

4 of the firm indicate a linear relationship between exchange rate and stock returns. Analysing the P- values of the sterling broad, which indicates statistical relevance of beta values, 4 stocks have beta values with significant p values. Giving a 22.22 percent prove of linearity in the 18 company sample.

Table 1(b) Regression of changes in the bank of England weighted exchange rate (Sterling broad) and returns at 0.01 levels

Companies	Intercept	β of sterling broad	P- value of sterling broad	Result at 0.01 level
Anglo American	0.0005	-0.31	0.06	Non
Association of British food	0.0008	-0.13	0.29	Non
Barclay group	0.0006	-0.08	0.61	Non
BHP billiton	0.0008	-0.29	0.09	Non
BOOTS Group	0.00041	0.04	0.7	Non
British Petroleum	0.00014	-0.31	0.02	Non
British Airways	0.00016	-0.37	0.11	Non
British Sky	1.21E-06	-0.32	0.15	Non
HSBC HDG	0.0003	-0.45	0.0002	Significant
Imperial Tobacco	0.0001	0.19	0.14	Non
Lloyds	0.0001	0.00014	0.99	Non
Mark & Spencer	0.0004	-0.04	0.81	Non
Morrison	0.0006	0.05	0.76	Non
Reuters group	0.0001	-0.21	0.42	Non
Royal Dutch shell	0.00019	-0.39	0.004	Significant
Standard Chartered Bank	0.0039	-0.21	0.20	Non
Tesco	0.0006	0.06	0.61	Non
Wolseley	0.0009	-0.35	0.02	Non

$\mathbf{R_t = \alpha_0 + \beta \Delta st + e_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)}$

At 0.01 levels I got 2 firms with significant Sterling broad significant values at the 0.01 level

Regression analysis is done at both 0.01 and 0.05 levels to observe if there are any differences in significant beta values at the two standard levels of regression analysis.
The results in both case (at the 5% and 1%) could be liken to the results obtain by Jorion (1990) for US multinational firms were 15 out of 287 firms showed a significant exposure and was interpreted as prove of linearity or sensitivity.

Looking at the work of Fraser and Pantzalis (2003 p 269) on some 310 US multinational, a total of 91 firms give significant results compared to the 35 obtained when the market index was been introduced for the same set of data.

5.3 Regressions with Multifactor (including market portfolio)

The results of the first regression could be disputed in very much the fashion as the single factor model. This is based on the fact that a single factor cannot give a true representation of the returns of all stock trading in the market. This could be true for some stocks but not necessarily for all. Addressing this issue we introduce the market portfolio, I draw inspirations from the work of Lewis (1995), which talks about international diversification and the so-called "home currency Bias". In his work he came out with the obvious result that that investors tend to give a preference to home stock as such we use the FTSEALL the most popularly used market index in our second regression

$$\mathbf{R_t = \alpha_0 + \beta \Delta st + \alpha_1 Rmt + e_1 .....(2)}$$

Research carried out by Nydahl (1998) gives no significant difference in terms of the market index used in the regression as such the FTSEALL is quit suitable for our regression. In this case I have two independent variables Δst and Rmt against the dependent R_t (defined in previous section) or stock rate of return

Table 2 Regression of changes in sterling broad exchange rate and FTSE ALL market index on returns at 0.05 level

Companies	Intercept	β 2 Of market	β 1 Of sterling	p-value of	Result at 0.05

		index	broad exchange rate	sterling broad exchange rate	level
Anglo American	0.0005	1.13	-0.02	0.88	Non
Association of British food	0.0009	0.46	-0.01	0.90	Non
Barclay group	0.0007	1.35	0.26	0.03	
BHP billiton	0.0008	0.96	0.04	0.76	Non
BOOTS Group	0.0004	0.46	0.15	0.22	Non
British Petroleum	0.0002	0.92	-0.06	0.5	Non
British Airways	0.0002	1.48	0.01	0.95	Non
British Sky	7.27E-05	1.46	0.05	0.74	Non
HSBC HDG	0.0004	1.04	-0.18	0.03	Significant
Imperial Tobacco	0.0001	0.39	0.29	0.02	Significant
Lloyds	0.0001	1.28	0.33	0.008	Significant, equally at 0.01
Mark & Spencer	0.0005	0.71	-0.14	0.3	Non
Morrison	0.0006	0.61	0.20	0.16	Non
Reuters group	0.0002	1.92	0.29	0.16	Non
Royal Dutch shell	0.0002	0.96	-0.14	0.19	Non
Standard Chartered Bank	0.0004	1.18	0.09	0.46	Non
Tesco	0.0007	0.65	-0.23	0.05	Significant
Wolseley	0.0009	0.71	-0.17	0.23	Non

$$R_t = \alpha_0 + \beta \Delta st + \alpha_1 Rmt + e_1 \text{.....(2)}$$

From the table above, I have a total of 4 out of 18 stocks giving significant exposure with P values close or equal to zero giving an overall result of 22.22 percent at 0.05 levels. Only a single firm indicates significant exposure at the 0.01 levels. This is quite positive taking in to consideration the result from Jorion (1990) Bodnar and Gentry (1993) with just 11 out of the 39 industries with significant exposure within the period 1979 to 1987. This is of course weaker than the 26% obtain in Sweden by Nydal (1998) with a larger number of companies

A more compelling result is obtained from the work of Fraser and Pantzalis (2003) with just 35 out of 310 American multinational have a significant effect with a BROAD index controlling for market movements.

5.4 Regression with a single currency (Euro- pound exchange rate)

In the previous regression a weighted exchange rate index was used to investigate effects of exchange rate. This was in line with previous studies by Bodnar et al (1994), Gentry (1993). This does not rule out the possibility that a particular firm could be affected basically by a single currency. This will be the case if that economy consumes a considerable amount of good or services provided my that firm that is a considerable sales volume. Currencies significant to UK exports are the Euro, US Dollar, and Japanese yen. It will be of considerable interest to measure sensitivity with the euro, which is undisputedly one the UK's principal export markets. In this regression I use the euro in place of the weighted index the sterling broad

$$R_t = \alpha_0 + \beta\Delta steuro + \alpha_1 Rmt + e_1 .....(3)$$

.

Table 3.Regression of changes in euro-pound exchange rate index and FTSE ALL market index on returns at 0.05 levels

Companies	Intercept	β 2 Of market index	β 1 Of euro-pound exchange rate	p-value of euro-pound exchange rate	Result at 0.05 level
Anglo American	0.0005	1.13	-0.01	0.89	Non
Association of	0.0009	0.46	-0.11	0.21	Non

British food					
Barclay group	0.0007	1.34	0.21	0.03	Significant
BHP billiton	0.0008	0.96	0.0008	0.99	Non
BOOTS Group	0.0004	0.46	0.05	0.5	Non
British Petroleum	0.0002	0.92	-0.06	0.4	Non
British Airways	0.0002	1.48	0.25	0.11	Non
British Sky	7.52E-05	1.46	0.027	0.8	Non
HSBC HDG	0.0004	1.04	0.07	0.26	Non
Imperial Tobacco	0.0001	0.38	0.12	0.21	Non
Lloyds	0.0002	1.27	0.20	0.04	Significant,
Mark & Spencer	0.0005	0.71	0.06	0.5	Non
Morrison	0.0006	0.59	0.17	0.12	Non
Reuters group	0.0002	1.91	0.28	0.08	Non
Royal Dutch shell	0.0002	0.96	-0.02	0.80	Non
Standard Chartered Bank	0.0004	1.18	0.16	0.11	Non
Tesco	0.0007	0.64	0.017	0.85	Non
Wosely	0.0009	0.71	-0.07	0.50	Non

$$\mathbf{R_t = \alpha_0 + \beta\Delta steuro + \alpha_1 Rmt + e_1 .....(3)}$$

2 companies with significant exposure 11.11% success rate

From our table we have 2 stocks with significant beta values relative to the Euro with Barclay scoring the most significant result. We can draw the conclusion that a significant percent of its market in the euro region. It is worth nothing that there was no significant exposure at 0.01 levels

5.5 Introducing lagged exchange rate in regression

In testing the lag hypothesis I introduced a lags in to the basic regression equation in order to observe beta values in the regression. The equation was

$$R_t = \alpha_0 + \beta\Delta st + \beta\Delta st\text{-}1 + e_1 \text{.....(4)}$$

Table 4. Regression of changes in sterling broad index with lagged values on returns at 0.05 level

Companies	Intercept	β 2 Of lagged sterling broad index	β 1 Of sterling broad index	p-value of sterling broad index	Result at 0.05 level
Anglo American	0.0005	0.11	-0.32	0.05	Significant
Association of British food	0.0008	0.12	-0.14	0.27	Non
Barclay group	0.0006	0.11	0.09	0.59	Non
BHP billiton	0.0008	0.11	-0.29	0.09	Non
BOOTS Group	0.0004	0.06	0.04	0.77	Non
British Petroleum	0.0001	0.02	-0.31	0.03	Significant
British Airways	0.0002	0.18	-0.37	0.12	Non
British Sky	1.69E-06	0.10	-0.31	0.15	Non
HSBC HDG	0.0003	0.007	-0.46	0.00027	Significant also significant at 0.01
Imperial Tobacco	0.0012	0.008	0.19	0.14	Non
Lloyds	0.0001	0.02	0.0005	0.99	Non
Mark &	0.0004	0.06	-0.04	0.82	Non

Spencer					
Morrison	0.0005	0.18	0.04	0.80	Non
Reuters group	0.0001	0.14	-0.21	0.42	Non
Royal Dutch shell	0.0002	0.078	-0.39	0.004	Significant also significant at 0.01 level
Standard Chartered Bank	0.0003	0.07	-0.21	0.21	Non
Tesco	0.0006	0.002	0.06	0.6	Non
Wolseley	0.0009	0.006	-0.35	0.02	Significant

Where Rt was return on individual stocks a Δst exchange rate changes Δst-1 the one period lagged value of the exchange rate

Fraser and Pantzalis (2003) found evidence to support the claim of a lagged effect on stock prices. They obtained 24 firms out of 310 with significant beta value with a lag. In this study I obtained 5 out of 18 firm with significant beta value with a one period lagged effect.

Two stocks equally showed significant beta values at the 0.01 levels

5.6 General Conclusion

From the author's findings, there exist a linear relationship between stock returns and exchange rate for some companies in the sample. A positive beta value indicates that, an appreciation of that particular currency be it the pound or the euro leads to stronger returns for that company and a negative beta value indicates a depreciation of a particular currency, favours the returns of that particular company positively.

In a nutshell, the three different regressions show some significant relationship between stock returns and exchange rate. At the 95 percent level, I obtained 22.2 percent success with the sterling broad index, 22.2 percent when a market portfolio is introduced, and 11.11 percent with the euro-pound exchange rate and finally 27.7 percent with the introduction of lagged values in my sample of 18 companies. From a theoretical point of view one will expect the result to be highly significant due to the fact that both exchange rates and return are determined and affected by the same underlying factors such as demand and supply and fiscal and monetary policies

(triggered by economic indicators) in the economy but this is not the case. Leaving one with the conclusion that companies hedging policies some how is effective in taking away exchange rate exposure. A more comprehensive study will be possible if one has access to companies hedging ratios and information, regarding their hedging strategy. But such information is often considered to be company secret and kind of sensitive enough to be disclosed. In the a study by Allayannis and Olek (1996) analysing the ling between exposure and currency derivatives, they found that exchange exposures are considerably affected by currency hedging since there exist a negative relationship between these two values

In the works of Bodnar and Gentry (1993) where they arrived at the conclusion that 20 to 35% of industries in Canada, Japan and the United States are some how subjected to foreign exchange exposure. they gave the following possible explanations

(1) Industry undertake varied number of activities which could eventually offset their exposures

(2) Firm may be reducing their exposure by the use of derivatives and financial instruments

(3) Bodnar (1994) even suggested that mispricing in stock prices as a result of modelling and estimating changes in the value of the dollar could be causing stock prices to take time to adjust or react to exchange rate changes.

To round up I will say empirical evidence is still weak and actually challenging and I will recommend further study in this field

6.1 Validity, Criterion

This last chapter applies the discussion of the credibility of the study including reliability, validity, transferability, and generalisation

6.1 Credibility Criteria

A credibility criterion is quite important for any written document as it gives the reader the opportunity to make a sound judgement if the scientific goals are fulfilled. There are a lot of measures, which can be used to assess the figure of the work as outline below for this thesis

6.1.1 Reliability

Reliability of a study is when a repeat of the study by an other individual will lead to the same result this can be decided by answering the following three questions (Smith, M et al 2002, p 53)

1 wills the measure yield the same result on an other occasion?
2 Will similar observations be obtained by other observers?
3 Is there a clear transparency on how raw material or data have been used to draw the relevant conclusion?

The author believes that the outcome of this study is reliable with careful and well determination of the selection of the firm firstly the choice of a relevant well developed economy such as that of the United Kingdom Secondly by the choice of the London stock exchange and further narrowing down to the sales ratios and characteristics of activities of the various firms. All the firms in the sample are FTSE 100 companies.

The Author equally used a well establish data source such as the Thompson data stream downloadable from the university of Umeå Library

Finally to further make the work reliable all the data used in the work including excel out comes are available at the appendix of the work.

6.1.2 Validity

Validity refers to how well the research suits the research question or objective (Remenyi et al., 1998) in other words; the data collected and used must be relevant and good enough for interpretation of the final results. The author of this work when through a bulk of relevant literature in connection with the subject matter carried out on varied continents ranging from

Asia, to North America and Europe then proceeded in screening of these article and making use of those strictly relevant to the research question and hypothesis. Equally rich inside knowledge came from course work ranging from Advance Analysis of Financial data to Corporate Finance and Investment.

The choice of the multiple regression in excel was in accordance with standard methods used in other previous research work and in the course program masters in Accounting and Finance at the university of Umeå.

With all the facts above one can confidently say it was a valid research.

6.1.3 Generalisation and transferability

For a researcher to be able to generalise his work will largely depend on the sampling technique from the general to the specific, Analysis and interpretation of the data. Also the larger the research data the more relevant the degree of generalisation

In this study the target population was the London stock exchange which is believed, to be a highly performing stock exchange market the author narrowed down to their sales volume, consistency in data , and activities at the international level to select the used set. It would have been a more interesting study to fully analyse every company in this economy but considering the factor under investigation, exchange rate it was not quite relevant and was quite relevant from a few international firms.

Data Statistics

Panel A: sample statistics for dependent and independent variables data 1306

	Mean	**Standard deviation**	**Min**	**Max**	
Euro exchange rate	**1.55**	**0.08**	**1.38**	**1.75**	
Pounds exchange rate	**99.48**	**2.13**	**94.13**	**104.86**	
Market index	**2442.48**	**340.59**	**1634.76**	**3125.89**	

Panel B: sample statistic of stock rates of returns (N= 18) total data =1305

Companies	Mean	Standard deviation	Min	Max
Anglo American	0.00051	0.022	-0.11	0.09
Association of British food	0.00089	0.017	-0.073	0.18
Barclay group	0.00062	0.023	-0.085	0.09
BHP billiton	0.00083	0.024	-0.11	0.18
BOOTS Group	0.00041	0.018	-0.13	0.12
British Petroleum	0.00014	0.018	-0.08	0.09
British Airways	0.00016	0.032	-0.21	0.17
British Sky	4.5E-07	0.029	-0.19	0.19
HSBC HDG	0.00033	0.017	-0.13	0.09
Imperial Tobacco	0.0012	0.017	-0.07	0.12
Lloyds	0.00014	0.022	-0.08	0.13
Mark & Spencer	0.0005	0.022	-0.08	0.19
Morrison	0.00059	0.021	-0.14	0.15
Reuters group	0.00013	0.035	-0.23	0.23
Royal Dutch shell	0.00019	0.018	-0.09	0.08
Standard	0.00039	0.022	-0.15	0.11

Chartered Bank				
Tesco	0.00067	0.017	-0.08	0.12
Wosely	0.00092	0.021	-0.12	0.1

PANEL C: correlation Matrix of dependent and independent variables

	Market index	Euro-pound exchange rate	Sterling broad exchange rate
Sterling broad exchange rate	0.14	0.29	1
Market index	1	0.54	0.14
Euro-pound exchange rate	0.54	1	0.29

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Result with sterling- pound exchange rate

Appendix 1

$R_t = \alpha_0 + \beta\Delta st + e_1$.....(1)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,051898
R Square	0,002693
Adjusted R	0,001928
Standard E	0,022321
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,001753	0,001753	3,519018	0,060892
Residual	1303	0,649163	0,000498		
Total	1304	0,650916			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000512	0,000618	0,829018	0,407246	-0,0007	0,001724	-0,0007	0,001724
X Variable	-0,312817	0,166755	-1,875905	0,060892	-0,639955	0,014321	-0,639955	0,014321

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,029136
R Square	0,000849
Adjusted R	8,21E-05
Standard E	0,017152
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,000326	0,000326	1,107035	0,292922
Residual	1303	0,383321	0,000294		
Total	1304	0,383646			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000895	0,000475	1,885189	0,059627	-3,64E-05	0,001827	-3,64E-05	0,001827
X Variable	-0,134823	0,12814	-1,052157	0,292922	-0,386206	0,116559	-0,386206	0,116559

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,013985
R Square	0,000196
Adjusted R	-0,000572
Standard E	0,022661
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,000131	0,000131	0,254876	0,613748
Residual	1303	0,669141	0,000514		
Total	1304	0,669272			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000623	0,000627	0,99268	0,32105	-0,000608	0,001853	-0,000608	0,001853
X Variable	-0,085472	0,169302	-0,504852	0,613748	-0,417606	0,246661	-0,417606	0,246661

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,046543
R Square	0,002166
Adjusted R	0,0014
Standard E	0,023527
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,001566	0,001566	2,828692	0,092833
Residual	1303	0,72124	0,000554		
Total	1304	0,722805			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,00083	0,000651	1,274151	0,202837	-0,000448	0,002107	-0,000448	0,002107
X Variable	-0,295621	0,175769	-1,681872	0,092833	-0,640442	0,0492	-0,640442	0,0492

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,007341
R Square	5,39E-05
Adjusted R	-0,000714
Standard E	0,01772
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	2,21E-05	2,21E-05	0,070228	0,791047
Residual	1303	0,409145	0,000314		
Total	1304	0,409167			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,00041	0,000491	0,835567	0,403552	-0,000552	0,001372	-0,000552	0,001372
X Variable	0,035083	0,132386	0,265006	0,791047	-0,224629	0,294796	-0,224629	0,294796

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,061909
R Square	0,003833
Adjusted R	0,003068
Standard E	0,018358
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,00169	0,00169	5,013209	0,025323
Residual	1303	0,439126	0,000337		
Total	1304	0,440815			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,00014	0,000508	0,275915	0,782657	-0,000857	0,001137	-0,000857	0,001137
X Variable	-0,307083	0,13715	-2,23902	0,025323	-0,576142	-0,038023	-0,576142	-0,038023

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,043695
R Square	0,001909
Adjusted R	0,001143
Standard E	0,031792
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,002519	0,002519	2,492538	0,11463
Residual	1303	1,316973	0,001011		
Total	1304	1,319492			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000161	0,00088	0,183359	0,854545	-0,001565	0,001888	-0,001565	0,001888
X Variable	-0,374983	0,237515	-1,578778	0,11463	-0,840937	0,09097	-0,840937	0,09097

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,040186
R Square	0,001615
Adjusted R	0,000849
Standard E	0,029423
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,001825	0,001825	2,107661	0,146804
Residual	1303	1,128011	0,000866		
Total	1304	1,129836			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	1,21E-06	0,000814	0,001482	0,998817	-0,001597	0,001599	-0,001597	0,001599
X Variable	-0,319124	0,219816	-1,451779	0,146804	-0,750356	0,112108	-0,750356	0,112108

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,100635
R Square	0,010127
Adjusted R	0,009368
Standard E	0,016698
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,003717	0,003717	13,33114	0,000271
Residual	1303	0,363309	0,000279		
Total	1304	0,367026			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000329	0,000462	0,71273	0,476141	-0,000577	0,001236	-0,000577	0,001236
X Variable	-0,455485	0,12475	-3,651183	0,000271	-0,700218	-0,210753	-0,700218	-0,210753

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,040536
R Square	0,001643
Adjusted R	0,000877
Standard E	0,017503
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,000657	0,000657	2,144546	0,143319
Residual	1303	0,399186	0,000306		
Total	1304	0,399843			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,001227	0,000485	2,532724	0,011435	0,000277	0,002178	0,000277	0,002178
X Variable	0,191495	0,130765	1,464427	0,143319	-0,065037	0,448027	-0,065037	0,448027

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,000233
R Square	5,41E-08
Adjusted R	-0,000767
Standard E	0,022395
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	3,54E-08	3,54E-08	7,05E-05	0,993302
Residual	1303	0,65348	0,000502		
Total	1304	0,65348			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000137	0,00062	0,220404	0,825591	-0,00108	0,001353	-0,00108	0,001353
X Variable	0,001405	0,167309	0,008397	0,993302	-0,326819	0,329629	-0,326819	0,329629

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,006672
R Square	4,45E-05
Adjusted R	-0,000723
Standard E	0,022291
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	2,88E-05	2,88E-05	0,058004	0,809717
Residual	1303	0,647448	0,000497		
Total	1304	0,647477			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000498	0,000617	0,806478	0,420115	-0,000713	0,001708	-0,000713	0,001708
X Variable	-0,040108	0,166535	-0,240841	0,809717	-0,366814	0,286597	-0,366814	0,286597

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,008236
R Square	6,78E-05
Adjusted R	-0,0007
Standard E	0,020527
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	3,72E-05	3,72E-05	0,088395	0,766275
Residual	1303	0,549055	0,000421		
Total	1304	0,549093			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000598	0,000568	1,051663	0,293149	-0,000517	0,001712	-0,000517	0,001712
X Variable	0,045596	0,15336	0,297313	0,766275	-0,255263	0,346454	-0,255263	0,346454

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,022026
R Square	0,000485
Adjusted R	-0,000282
Standard E	0,035094
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,000779	0,000779	0,632462	0,426599
Residual	1303	1,60478	0,001232		
Total	1304	1,605559			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000125	0,000971	0,129052	0,897336	-0,00178	0,002031	-0,00178	0,002031
X Variable	-0,20851	0,262187	-0,795275	0,426599	-0,722864	0,305843	-0,722864	0,305843

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,078859
R Square	0,006219
Adjusted R	0,005456
Standard E	0,018413
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,002764	0,002764	8,153771	0,004365
Residual	1303	0,441766	0,000339		
Total	1304	0,44453			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000199	0,00051	0,390696	0,696086	-0,000801	0,001199	-0,000801	0,001199
X Variable	-0,392806	0,137562	-2,855481	0,004365	-0,662673	-0,122939	-0,662673	-0,122939

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,035433
R Square	0,001255
Adjusted R	0,000489
Standard E	0,022065
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,000797	0,000797	1,637947	0,200835
Residual	1303	0,634399	0,000487		
Total	1304	0,635196			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000391	0,000611	0,64063	0,521876	-0,000807	0,00159	-0,000807	0,00159
X Variable	-0,210976	0,164848	-1,279823	0,200835	-0,534373	0,11242	-0,534373	0,11242

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,01386
R Square	0,000192
Adjusted R	-0,000575
Standard E	0,017816
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	7,95E-05	7,95E-05	0,250353	0,616911
Residual	1303	0,413588	0,000317		
Total	1304	0,413668			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000671	0,000493	1,361439	0,17361	-0,000296	0,001639	-0,000296	0,001639
X Variable	0,066598	0,133103	0,500352	0,616911	-0,194521	0,327717	-0,194521	0,327717

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,063195
R Square	0,003994
Adjusted R	0,003229
Standard E	0,020738
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	0,002247	0,002247	5,224487	0,022431
Residual	1303	0,560375	0,00043		
Total	1304	0,562622			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000918	0,000574	1,599126	0,110035	-0,000208	0,002044	-0,000208	0,002044
X Variable	-0,354131	0,154932	-2,285714	0,022431	-0,658075	-0,050187	-0,658075	-0,050187

With multiregression model

Appendix 2 $\mathbf{R_t = \alpha_0 + \beta\Delta st + \alpha_1 Rmt + e_1}$**.....(2)**

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,580523
R Square	0,337007
Adjusted R	0,335989
Standard E	0,018206
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,219364	0,109682	330,9113	6,3E-117
Residual	1302	0,431553	0,000331		
Total	1304	0,650916			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000568	0,000504	1,126071	0,260343	-0,000421	0,001556	-0,000421	0,001556
X Variable	-0,020024	0,136494	-0,146704	0,883388	-0,287797	0,247748	-0,287797	0,247748
X Variable	1,130701	0,044129	25,6229	1,4E-117	1,04413	1,217271	1,04413	1,217271

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,312047
R Square	0,097373
Adjusted R	0,095987
Standard E	0,016309
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,037357	0,018678	70,2285	1,09E-29
Residual	1302	0,346289	0,000266		
Total	1304	0,383646			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000918	0,000451	2,033166	0,042238	3,22E-05	0,001804	3,22E-05	0,001804
X Variable	-0,01404	0,122269	-0,114832	0,908596	-0,253906	0,225826	-0,253906	0,225826

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,683428
R Square	0,467073
Adjusted R	0,466255
Standard E	0,016551
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,312599	0,1563	570,5564	1,1E-178
Residual	1302	0,356673	0,000274		
Total	1304	0,669272			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000689	0,000458	1,503725	0,132895	-0,00021	0,001588	-0,00021	0,001588
X Variable	0,265379	0,124089	2,138627	0,032651	0,021944	0,508815	0,021944	0,508815
X Variable	1,354911	0,040118	33,77329	4,2E-180	1,276208	1,433614	1,276208	1,433614

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,468323
R Square	0,219326
Adjusted R	0,218127
Standard E	0,020818
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,15853	0,079265	182,8951	9,95E-71
Residual	1302	0,564275	0,000433		
Total	1304	0,722805			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000877	0,000576	1,521417	0,128398	-0,000254	0,002007	-0,000254	0,002007
X Variable	-0,046952	0,156078	-0,300825	0,763596	-0,353145	0,25924	-0,353145	0,25924
X Variable	0,960303	0,05046	19,03096	1,93E-71	0,861311	1,059295	0,861311	1,059295

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,302972
R Square	0,091792
Adjusted R	0,090397
Standard E	0,016894
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,037558	0,018779	65,79599	6,01E-28
Residual	1302	0,371609	0,000285		
Total	1304	0,409167			

	Coefficients	*tandard Erı*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000433	0,000468	0,925504	0,354875	-0,000485	0,00135	-0,000485	0,00135
X Variable	0,156686	0,12666	1,237061	0,216287	-0,091794	0,405167	-0,091794	0,405167
X Variable	0,469605	0,040949	11,46799	4,51E-29	0,389271	0,549939	0,389271	0,549939

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,577236
R Square	0,333201
Adjusted R	0,332177
Standard E	0,015025
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,14688	0,07344	325,3066	2,6E-115
Residual	1302	0,293935	0,000226		
Total	1304	0,440815			

	Coefficients	*tandard Erı*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000185	0,000416	0,445683	0,6559	-0,000631	0,001001	-0,000631	0,001001
X Variable	-0,067922	0,112648	-0,602957	0,546642	-0,288913	0,153069	-0,288913	0,153069
X Variable	0,923586	0,036419	25,36	1,2E-114	0,852139	0,995032	0,852139	0,995032

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,53624
R Square	0,287554
Adjusted R	0,286459
Standard E	0,02687
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,379425	0,189712	262,7529	1,39E-96
Residual	1302	0,940067	0,000722		
Total	1304	1,319492			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000234	0,000744	0,314756	0,752997	-0,001225	0,001693	-0,001225	0,001693
X Variable	0,01035	0,201454	0,051377	0,959033	-0,384861	0,405561	-0,384861	0,405561
X Variable	1,488072	0,06513	22,84768	1,98E-97	1,3603	1,615843	1,3603	1,615843

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,569245
R Square	0,32404
Adjusted R	0,323001
Standard E	0,024219
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,366111	0,183056	312,0741	1,9E-111
Residual	1302	0,763724	0,000587		
Total	1304	1,129836			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	7,27E-05	0,00067	0,108492	0,913622	-0,001243	0,001388	-0,001243	0,001388
X Variable	0,059704	0,181579	0,328805	0,742356	-0,296515	0,415923	-0,296515	0,415923
X Variable	1,46295	0,058704	24,92063	2,1E-112	1,347785	1,578116	1,347785	1,578116

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,717495
R Square	0,514799
Adjusted R	0,514054
Standard E	0,011695
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,188945	0,094472	690,7123	3,4E-205
Residual	1302	0,178081	0,000137		
Total	1304	0,367026			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,00038	0,000324	1,175164	0,240144	-0,000255	0,001016	-0,000255	0,001016
X Variable	-0,185355	0,087681	-2,113968	0,034708	-0,357367	-0,013343	-0,357367	-0,013343
X Variable	1,043183	0,028347	36,80011	8E-204	0,987572	1,098795	0,987572	1,098795

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,259565
R Square	0,067374
Adjusted R	0,065941
Standard E	0,016924
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,026939	0,01347	47,02903	1,9E-20
Residual	1302	0,372904	0,000286		
Total	1304	0,399843			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,001246	0,000468	2,660438	0,0079	0,000327	0,002165	0,000327	0,002165
X Variable	0,293249	0,126881	2,31122	0,020976	0,044336	0,542162	0,044336	0,542162
X Variable	0,39295	0,04102	9,579359	4,73E-21	0,312476	0,473423	0,312476	0,473423

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,655034
R Square	0,42907
Adjusted R	0,428193
Standard E	0,016928
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,280389	0,140194	489,2449	3,4E-159
Residual	1302	0,373092	0,000287		
Total	1304	0,65348			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000199	0,000469	0,425499	0,670543	-0,00072	0,001119	-0,00072	0,001119
X Variable	0,333759	0,126913	2,629834	0,008643	0,084783	0,582735	0,084783	0,582735
X Variable	1,283477	0,041031	31,28082	1,2E-160	1,202983	1,363971	1,202983	1,363971

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,368906
R Square	0,136092
Adjusted R	0,134765
Standard E	0,020727
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,088116	0,044058	102,5524	4,37E-42
Residual	1302	0,559361	0,00043		
Total	1304	0,647477			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000533	0,000574	0,928621	0,353257	-0,000593	0,001658	-0,000593	0,001658
X Variable	0,146177	0,155397	0,940666	0,347051	-0,15868	0,451033	-0,15868	0,451033
X Variable	0,719391	0,05024	14,31914	2,68E-43	0,620831	0,817951	0,620831	0,817951

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,337245
R Square	0,113735
Adjusted R	0,112373
Standard E	0,019333
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,062451	0,031225	83,54287	7,31E-35
Residual	1302	0,486642	0,000374		
Total	1304	0,549093			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000627	0,000535	1,171953	0,24143	-0,000423	0,001677	-0,000423	0,001677
X Variable	0,202401	0,144944	1,396403	0,162831	-0,08195	0,486751	-0,08195	0,486751
X Variable	0,605546	0,046861	12,92231	4,98E-36	0,513616	0,697477	0,513616	0,697477

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,627512
R Square	0,393772
Adjusted R	0,39284
Standard E	0,027342
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,632223	0,316112	422,8525	3,1E-142
Residual	1302	0,973336	0,000748		
Total	1304	1,605559			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,00022	0,000757	0,290068	0,77181	-0,001265	0,001704	-0,001265	0,001704
X Variable	0,290246	0,204988	1,415917	0,157039	-0,111897	0,692389	-0,111897	0,692389
X Variable	1,926085	0,066273	29,06309	1,5E-143	1,796072	2,056097	1,796072	2,056097

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,600027
R Square	0,360033
Adjusted R	0,35905
Standard E	0,014782
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,160045	0,080023	366,2395	6,4E-127
Residual	1302	0,284485	0,000218		
Total	1304	0,44453			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000246	0,000409	0,601534	0,547589	-0,000557	0,001049	-0,000557	0,001049
X Variable	-0,143887	0,110822	-1,298357	0,194395	-0,361296	0,073523	-0,361296	0,073523
X Variable	0,961271	0,035829	26,82959	1,4E-126	0,890983	1,03156	0,890983	1,03156

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,614901
R Square	0,378103
Adjusted R	0,377147
Standard E	0,017418
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,240169	0,120085	395,7966	5,1E-135
Residual	1302	0,395027	0,000303		
Total	1304	0,635196			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000449	0,000482	0,931783	0,351621	-0,000497	0,001395	-0,000497	0,001395
X Variable	0,096108	0,13059	0,735949	0,461894	-0,160083	0,352298	-0,160083	0,352298
X Variable	1,18589	0,04222	28,08852	4,2E-136	1,103064	1,268716	1,103064	1,268716

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,420073
R Square	0,176462
Adjusted R	0,175197
Standard E	0,016176
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,072996	0,036498	139,4913	1,29E-55
Residual	1302	0,340671	0,000262		
Total	1304	0,413668			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000703	0,000448	1,570961	0,116435	-0,000175	0,001582	-0,000175	0,001582
X Variable	0,236085	0,121273	1,946719	0,051783	-0,001828	0,473997	-0,001828	0,473997
X Variable	0,654519	0,039208	16,69368	7,66E-57	0,577602	0,731436	0,577602	0,731436

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,394679
R Square	0,155771
Adjusted R	0,154474
Standard E	0,0191
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,08764	0,04382	120,118	1,34E-48
Residual	1302	0,474981	0,000365		
Total	1304	0,562622			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000953	0,000529	1,801754	0,071815	-8,46E-05	0,00199	-8,46E-05	0,00199
X Variable	-0,170717	0,143197	-1,192179	0,233408	-0,45164	0,110206	-0,45164	0,110206
X Variable	0,708304	0,046296	15,29957	1,02E-48	0,617482	0,799127	0,617482	0,799127

Result with euro in regression

Appendix 3 $R_t = \alpha_0 + \beta\Delta steuro + \alpha_1 Rmt + e_1$.....(3)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,580522
R Square	0,337006
Adjusted R	0,335987
Standard E	0,018206
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,219363	0,109681	330,9089	6,4E-117
Residual	1302	0,431554	0,000331		
Total	1304	0,650916			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000566	0,000504	1,123352	0,261495	-0,000423	0,001555	-0,000423	0,001555
X Variable	-0,014434	0,106507	-0,135525	0,892217	-0,223379	0,19451	-0,223379	0,19451
X Variable	1,131594	0,04405	25,68877	4,5E-118	1,045177	1,218011	1,045177	1,218011

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,313746
R Square	0,098437
Adjusted R	0,097052
Standard E	0,016299
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,037765	0,018882	71,07909	5,04E-30
Residual	1302	0,345882	0,000266		
Total	1304	0,383646			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000908	0,000451	2,011144	0,044516	2,23E-05	0,001793	2,23E-05	0,001793
X Variable	-0,118663	0,095351	-1,244483	0,213546	-0,305721	0,068396	-0,305721	0,068396
X Variable	0,469707	0,039436	11,9106	4,03E-31	0,392342	0,547073	0,392342	0,547073

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,683437
R Square	0,467086
Adjusted R	0,466268
Standard E	0,016551
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,312608	0,156304	570,5865	1,1E-178
Residual	1302	0,356664	0,000274		
Total	1304	0,669272			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000707	0,000458	1,543477	0,122958	-0,000192	0,001606	-0,000192	0,001606
X Variable	0,207801	0,096826	2,146132	0,032047	0,017849	0,397752	0,017849	0,397752
X Variable	1,342665	0,040046	33,52804	3,5E-178	1,264103	1,421227	1,264103	1,421227

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,468265
R Square	0,219272
Adjusted R	0,218073
Standard E	0,020819
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,158491	0,079246	182,8372	1,04E-70
Residual	1302	0,564314	0,000433		
Total	1304	0,722805			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000877	0,000576	1,520897	0,128529	-0,000254	0,002007	-0,000254	0,002007
X Variable	-0,000851	0,121793	-0,006991	0,994423	-0,239783	0,23808	-0,239783	0,23808
X Variable	0,961595	0,050372	19,08982	8E-72	0,862775	1,060414	0,862775	1,060414

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,301559
R Square	0,090938
Adjusted R	0,089541
Standard E	0,016902
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,037209	0,018604	65,12257	1,11E-27
Residual	1302	0,371959	0,000286		
Total	1304	0,409167			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000438	0,000468	0,935403	0,349754	-0,00048	0,001356	-0,00048	0,001356
X Variable	0,05467	0,09888	0,552889	0,580434	-0,139312	0,248651	-0,139312	0,248651
X Variable	0,464032	0,040896	11,34673	1,6E-28	0,383803	0,544261	0,383803	0,544261

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,577308
R Square	0,333284
Adjusted R	0,33226
Standard E	0,015024
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,146917	0,073458	325,4279	2,4E-115
Residual	1302	0,293899	0,000226		
Total	1304	0,440815			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000191	0,000416	0,458777	0,646471	-0,000625	0,001007	-0,000625	0,001007
X Variable	0,06371	0,087894	0,724846	0,468677	-0,10872	0,236139	-0,10872	0,236139
X Variable	0,923872	0,036352	25,41459	4,9E-116	0,852557	0,995187	0,852557	0,995187

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,537568
R Square	0,28898
Adjusted R	0,287888
Standard E	0,026843
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,381307	0,190653	264,5859	3,76E-97
Residual	1302	0,938185	0,000721		
Total	1304	1,319492			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000256	0,000743	0,344717	0,730363	-0,001202	0,001714	-0,001202	0,001714
X Variable	0,253921	0,157038	1,616939	0,106134	-0,054155	0,561997	-0,054155	0,561997
X Variable	1,481605	0,064949	22,81174	3,57E-97	1,354189	1,609022	1,354189	1,609022

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,569212
R Square	0,324002
Adjusted R	0,322964
Standard E	0,02422
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,36607	0,183035	312,0212	2E-111
Residual	1302	0,763766	0,000587		
Total	1304	1,129836			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	7,52E-05	0,000671	0,112075	0,910781	-0,00124	0,001391	-0,00124	0,001391
X Variable	0,027124	0,141691	0,191432	0,848217	-0,250843	0,305091	-0,250843	0,305091
X Variable	1,460673	0,058602	24,92545	1,9E-112	1,345709	1,575638	1,345709	1,575638

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,716671
R Square	0,513617
Adjusted R	0,51287
Standard E	0,011709
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,188511	0,094255	687,4511	1,7E-204
Residual	1302	0,178515	0,000137		
Total	1304	0,367026			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000387	0,000324	1,193835	0,23276	-0,000249	0,001023	-0,000249	0,001023
X Variable	0,077903	0,068501	1,13725	0,255643	-0,056482	0,212288	-0,056482	0,212288
X Variable	1,046302	0,028331	36,93088	7,6E-205	0,990722	1,101882	0,990722	1,101882

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,254325
R Square	0,064681
Adjusted R	0,063244
Standard E	0,016948
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,025862	0,012931	45,01927	1,24E-19
Residual	1302	0,37398	0,000287		
Total	1304	0,399843			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,001257	0,000469	2,679851	0,007458	0,000337	0,002178	0,000337	0,002178
X Variable	0,124535	0,099148	1,256046	0,209324	-0,069973	0,319043	-0,069973	0,319043
X Variable	0,381979	0,041007	9,315041	5,03E-20	0,301532	0,462425	0,301532	0,462425

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,654091
R Square	0,427835
Adjusted R	0,426956
Standard E	0,016946
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,279582	0,139791	486,7844	1,4E-158
Residual	1302	0,373898	0,000287		
Total	1304	0,65348			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000217	0,000469	0,462824	0,643568	-0,000703	0,001138	-0,000703	0,001138
X Variable	0,200531	0,099137	2,022761	0,043302	0,006045	0,395018	0,006045	0,395018
X Variable	1,269558	0,041002	30,9632	3,4E-158	1,18912	1,349995	1,18912	1,349995

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,368359
R Square	0,135688
Adjusted R	0,134361
Standard E	0,020732
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,087855	0,043928	102,2004	5,92E-42
Residual	1302	0,559622	0,00043		
Total	1304	0,647477			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000539	0,000574	0,938156	0,348338	-0,000588	0,001665	-0,000588	0,001665
X Variable	0,063753	0,121285	0,525648	0,599223	-0,174183	0,30169	-0,174183	0,30169
X Variable	0,713882	0,050162	14,23144	7,96E-43	0,615474	0,812289	0,615474	0,812289

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,33771
R Square	0,114048
Adjusted R	0,112687
Standard E	0,01933
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,062623	0,031311	83,80277	5,81E-35
Residual	1302	0,48647	0,000374		
Total	1304	0,549093			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000643	0,000535	1,200854	0,230026	-0,000407	0,001693	-0,000407	0,001693
X Variable	0,175596	0,113081	1,552837	0,120705	-0,046245	0,397437	-0,046245	0,397437
X Variable	0,59579	0,046769	12,739	4,07E-35	0,504039	0,687541	0,504039	0,687541

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,627906
R Square	0,394266
Adjusted R	0,393335
Standard E	0,027331
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,633017	0,316508	423,7288	1,8E-142
Residual	1302	0,972542	0,000747		
Total	1304	1,605559			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000244	0,000757	0,322687	0,746984	-0,00124	0,001729	-0,00124	0,001729
X Variable	0,280094	0,159888	1,751818	0,080041	-0,033572	0,59376	-0,033572	0,59376
X Variable	1,911405	0,066128	28,90471	2,5E-142	1,781676	2,041134	1,781676	2,041134

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,599361
R Square	0,359234
Adjusted R	0,358249
Standard E	0,014791
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,15969	0,079845	364,971	1,5E-126
Residual	1302	0,28484	0,000219		
Total	1304	0,44453			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000244	0,00041	0,596203	0,551143	-0,000559	0,001048	-0,000559	0,001048
X Variable	-0,021202	0,086529	-0,245026	0,806475	-0,190953	0,14855	-0,190953	0,14855
X Variable	0,965682	0,035787	26,98385	9,6E-128	0,895475	1,035889	0,895475	1,035889

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,615664
R Square	0,379042
Adjusted R	0,378089
Standard E	0,017405
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,240766	0,120383	397,3809	1,9E-135
Residual	1302	0,39443	0,000303		
Total	1304	0,635196			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000463	0,000482	0,961635	0,336411	-0,000482	0,001409	-0,000482	0,001409
X Variable	0,161413	0,101823	1,585229	0,113157	-0,038342	0,361168	-0,038342	0,361168
X Variable	1,179356	0,042113	28,00465	1,8E-135	1,09674	1,261973	1,09674	1,261973

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,417236
R Square	0,174086
Adjusted R	0,172817
Standard E	0,016199
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,072014	0,036007	137,2176	8,41E-55
Residual	1302	0,341654	0,000262		
Total	1304	0,413668			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000705	0,000448	1,572341	0,116114	-0,000175	0,001585	-0,000175	0,001585
X Variable	0,017409	0,094766	0,183703	0,854275	-0,168503	0,20332	-0,168503	0,20332
X Variable	0,647705	0,039194	16,52548	7,75E-56	0,570814	0,724596	0,570814	0,724596

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,393881
R Square	0,155143
Adjusted R	0,153845
Standard E	0,019107
Observatio	1305

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,087287	0,043643	119,5442	2,17E-48
Residual	1302	0,475335	0,000365		
Total	1304	0,562622			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000946	0,000529	1,78812	0,073989	-9,19E-05	0,001984	-9,19E-05	0,001984
X Variable	-0,075097	0,111779	-0,67183	0,501811	-0,294384	0,144191	-0,294384	0,144191
X Variable	0,714755	0,046231	15,46063	1,24E-49	0,62406	0,805449	0,62406	0,805449

Result with lagged exchange rates

Appendix 4 $R_t = \alpha_0 + \beta\Delta st + \beta\Delta st\text{-}1 + e_1$.....(4)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,055203
R Square	0,003047
Adjusted R	0,001515
Standard E	0,022334
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,001984	0,000992	1,988385	0,137332
Residual	1301	0,648933	0,000499		
Total	1303	0,650916			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000513	0,000618	0,828877	0,407326	-0,000701	0,001726	-0,000701	0,001726
X Variable	-0,317317	0,166988	-1,900238	0,057623	-0,644912	0,010278	-0,644912	0,010278
X Variable	0,113371	0,166982	0,678942	0,497295	-0,214213	0,440956	-0,214213	0,440956

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,039235
R Square	0,001539
Adjusted R	4,44E-06
Standard E	0,017159
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,000591	0,000295	1,002891	0,367101
Residual	1301	0,383055	0,000294		
Total	1303	0,383646			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000896	0,000475	1,884805	0,059679	-3,66E-05	0,001828	-3,66E-05	0,001828
X Variable	-0,139658	0,128297	-1,088555	0,276552	-0,391349	0,112033	-0,391349	0,112033
X Variable	0,121621	0,128293	0,948	0,343305	-0,130062	0,373304	-0,130062	0,373304

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,022684
R Square	0,000515
Adjusted R	-0,001022
Standard E	0,022675
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,000344	0,000172	0,334884	0,715483
Residual	1301	0,668927	0,000514		
Total	1303	0,669272			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000623	0,000628	0,992196	0,321286	-0,000609	0,001855	-0,000609	0,001855
X Variable	-0,0898	0,169541	-0,529668	0,596433	-0,422404	0,242803	-0,422404	0,242803
X Variable	0,10921	0,169535	0,644171	0,519578	-0,223383	0,441802	-0,223383	0,441802

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,0497
R Square	0,00247
Adjusted R	0,000937
Standard E	0,023542
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,001785	0,000893	1,610792	0,200127
Residual	1301	0,721019	0,000554		
Total	1303	0,722805			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000831	0,000652	1,274602	0,202678	-0,000448	0,00211	-0,000448	0,00211
X Variable	-0,291351	0,176019	-1,655229	0,098119	-0,636663	0,05396	-0,636663	0,05396

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,015503
R Square	0,00024
Adjusted R	-0,001297
Standard E	0,017732
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	9,83E-05	4,92E-05	0,156389	0,855243
Residual	1301	0,409069	0,000314		
Total	1303	0,409167			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,00041	0,000491	0,83555	0,403562	-0,000553	0,001374	-0,000553	0,001374
X Variable	0,037623	0,132582	0,283769	0,776632	-0,222475	0,29772	-0,222475	0,29772
X Variable	-0,065319	0,132577	-0,492686	0,622317	-0,325408	0,19477	-0,325408	0,19477

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,062184
R Square	0,003867
Adjusted R	0,002336
Standard E	0,018372
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,001705	0,000852	2,525187	0,080436
Residual	1301	0,439111	0,000338		
Total	1303	0,440815			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,000141	0,000509	0,276199	0,782439	-0,000858	0,001139	-0,000858	0,001139
X Variable	-0,308243	0,137364	-2,24399	0,025001	-0,577722	-0,038764	-0,577722	-0,038764
X Variable	0,028836	0,137359	0,209934	0,833752	-0,240634	0,298306	-0,240634	0,298306

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,048483
R Square	0,002351
Adjusted R	0,000817
Standard E	0,031809
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,003102	0,001551	1,532692	0,216343
Residual	1301	1,31639	0,001012		
Total	1303	1,319492			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000162	0,000881	0,184127	0,853942	-0,001566	0,00189	-0,001566	0,00189
X Variable	-0,367942	0,237836	-1,547042	0,122096	-0,834527	0,098642	-0,834527	0,098642
X Variable	-0,180385	0,237828	-0,758466	0,448309	-0,646953	0,286184	-0,646953	0,286184

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,042128
R Square	0,001775
Adjusted R	0,00024
Standard E	0,029443
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,002005	0,001003	1,156535	0,314897
Residual	1301	1,127831	0,000867		
Total	1303	1,129836			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	1,69E-06	0,000815	0,002076	0,998344	-0,001598	0,001601	-0,001598	0,001601
X Variable	-0,315206	0,220144	-1,431815	0,152437	-0,747082	0,116671	-0,747082	0,116671
X Variable	-0,100438	0,220137	-0,456252	0,648285	-0,5323	0,331424	-0,5323	0,331424

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,100658
R Square	0,010132
Adjusted R	0,00861
Standard E	0,016711
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,003719	0,001859	6,658343	0,001327
Residual	1301	0,363307	0,000279		
Total	1303	0,367026			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,00033	0,000463	0,713248	0,47582	-0,000578	0,001238	-0,000578	0,001238
X Variable	-0,455841	0,124946	-3,648306	0,000274	-0,700959	-0,210723	-0,700959	-0,210723
X Variable	0,007774	0,124942	0,062222	0,950396	-0,237335	0,252884	-0,237335	0,252884

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,040562
R Square	0,001645
Adjusted R	0,000111
Standard E	0,017517
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,000658	0,000329	1,072008	0,342623
Residual	1301	0,399183	0,000307		
Total	1303	0,399841			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Upper 95,0%*
Intercept	0,001228	0,000485	2,531463	0,011476	0,000276	0,00218	0,000276	0,00218
X Variable	0,191769	0,13097	1,464224	0,143374	-0,065166	0,448705	-0,065166	0,448705
X Variable	-0,008576	0,130966	-0,065482	0,947	-0,265503	0,248351	-0,265503	0,248351

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,003733
R Square	1,39E-05
Adjusted R	-0,001523
Standard E	0,022412
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	9,11E-06	4,55E-06	0,009064	0,990977
Residual	1301	0,653471	0,000502		
Total	1303	0,65348			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000137	0,000621	0,22024	0,825719	-0,001081	0,001354	-0,001081	0,001354
X Variable	0,000513	0,167571	0,003063	0,997557	-0,328226	0,329252	-0,328226	0,329252
X Variable	0,022518	0,167565	0,134385	0,893119	-0,30621	0,351246	-0,30621	0,351246

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,011585
R Square	0,000134
Adjusted R	-0,001403
Standard E	0,022307
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	8,69E-05	4,34E-05	0,087315	0,916394
Residual	1301	0,64739	0,000498		
Total	1303	0,647477			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000498	0,000618	0,806457	0,420127	-0,000714	0,00171	-0,000714	0,00171
X Variable	-0,037907	0,166789	-0,227277	0,820244	-0,365113	0,289298	-0,365113	0,289298
X Variable	-0,056955	0,166784	-0,341493	0,732788	-0,38415	0,270239	-0,38415	0,270239

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,033741
R Square	0,001138
Adjusted R	-0,000397
Standard E	0,020532
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,000625	0,000313	0,741426	0,476635
Residual	1301	0,548467	0,000422		
Total	1303	0,549092			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000598	0,000569	1,051068	0,293422	-0,000518	0,001713	-0,000518	0,001713
X Variable	0,038451	0,153518	0,250462	0,80227	-0,26272	0,339621	-0,26272	0,339621
X Variable	0,181291	0,153513	1,180946	0,23784	-0,11987	0,482452	-0,11987	0,482452

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,02656
R Square	0,000705
Adjusted R	-0,000831
Standard E	0,035117
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,001133	0,000566	0,459201	0,631891
Residual	1301	1,604426	0,001233		
Total	1303	1,605559			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000125	0,000972	0,128886	0,897468	-0,001782	0,002033	-0,001782	0,002033
X Variable	-0,214047	0,26257	-0,815199	0,415108	-0,729154	0,30106	-0,729154	0,30106
X Variable	0,140582	0,262561	0,535427	0,592446	-0,374507	0,655672	-0,374507	0,655672

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,080472
R Square	0,006476
Adjusted R	0,004948
Standard E	0,018425
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,002879	0,001439	4,239957	0,014608
Residual	1301	0,441651	0,000339		
Total	1303	0,44453			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,0002	0,00051	0,39158	0,695433	-0,000801	0,001201	-0,000801	0,001201
X Variable	-0,389715	0,137761	-2,828925	0,004742	-0,659972	-0,119457	-0,659972	-0,119457
X Variable	-0,079792	0,137756	-0,579223	0,562539	-0,35004	0,190457	-0,35004	0,190457

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,037366
R Square	0,001396
Adjusted R	-0,000139
Standard E	0,022081
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,000887	0,000443	0,909502	0,402981
Residual	1301	0,634309	0,000488		
Total	1303	0,635196			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*Jpper 95,0%*
Intercept	0,000392	0,000611	0,640967	0,521657	-0,000808	0,001592	-0,000808	0,001592
X Variable	-0,208245	0,165096	-1,26136	0,207405	-0,532128	0,115638	-0,532128	0,115638
X Variable	-0,070596	0,16509	-0,42762	0,668999	-0,394468	0,253276	-0,394468	0,253276

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,037366
R Square	0,001396
Adjusted R	-0,000139
Standard E	0,022081
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,000887	0,000443	0,909502	0,402981
Residual	1301	0,634309	0,000488		
Total	1303	0,635196			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000392	0,000611	0,640967	0,521657	-0,000808	0,001592	-0,000808	0,001592
X Variable	-0,208245	0,165096	-1,26136	0,207405	-0,532128	0,115638	-0,532128	0,115638
X Variable	-0,070596	0,16509	-0,42762	0,668999	-0,394468	0,253276	-0,394468	0,253276

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,063217
R Square	0,003996
Adjusted R	0,002465
Standard E	0,020754
Observatio	1304

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	2	0,002248	0,001124	2,610114	0,073911
Residual	1301	0,560372	0,000431		
Total	1303	0,562621			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95,0%*	*pper 95,0%*
Intercept	0,000919	0,000575	1,599008	0,110062	-0,000208	0,002046	-0,000208	0,002046
X Variable	-0,354464	0,155176	-2,284277	0,022516	-0,658886	-0,050042	-0,658886	-0,050042
X Variable	0,006454	0,155171	0,041592	0,96683	-0,297958	0,310866	-0,297958	0,310866

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