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The Impact of Interest Rate and Exchange Rate Exposure on U.K. Firms

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Abstract

Title The Impact of Interest Rate and Exchange Rate Exposure on U.K. Firms

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Research questions Are there a significant exchange rate exposure and/or interest exposure on firms in the U.K. market? And if so, will the result confirm the Dual-Effect hypothesis used by Pritmani, Shome and Singal (2003)?
Is there a significant exchange rate and/or interest rate exposure for domestic firms, due to the indirect connection between domestic firms and global competitors (with global costs)?
Will the results differ from Pritmani, Shome and Singal (2003) study, and will the interest rate exposure bring another dimension in order to explain the effect of macroeconomic factors on firms share price?

Purpose The purpose of this paper is to apply the Dual-Effect hypothesis in Pritmani, Shome and Singal paper (2003), in order to analyze the exchange rate exposure on firms listed on the U.K. market. The study will examine if the foreign involvement of the firm will affect the share price of the firm. In addition to evaluating the Dual-Effect hypothesis in Pritmani et. al. (2003), we will evaluate the effect of foreign interest rates impact on U.K. firms. By evaluating the interest rate exposure this study will try to test the second variable proposed by Oxelheims and Wihlborgs MUST-analysis.

Methodology To evaluate the purpose of this thesis, the FTSE All Share index was chosen as the basis for data collection. Data for 660 firms were collected and evaluated. Firms were then eliminated following our selection criteria;

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excluding international commodities trading firms, investment companies and banks, holding companies and trusts, and companies in strongly regulated industries. Portfolios were then constructed which mainly were divided into categories such as exporters, importers, MNCs and domestic. These portfolios were also divided into subcategories high/low D/A ratio and durables/non durables, forming 16 portfolios with a total of 238 firms. A regression analysis was performed with interest rate and exchange rate as the independent variables.

Conclusions

The most significant results were found in the exporting and domestic firm portfolios. For importing and MNCs, this thesis found only sporadic significance. The results for MNCs and exporting firms are, in general, in line with earlier research within this field. The significant results for the domestic firms are interesting in the way that conventional wisdom states that domestic firms should not be exposed towards foreign macroeconomic factors. This study showed that in fact they are exposed to the macro economic variables indirectly through competition from abroad. In addition to adding some new knowledge regarding exchange rate exposure for domestic companies, this study also found evidence for the importance of interest rate as one variable in any company valuation.

Key words

Exchange rate, interest rate, stock performance, macroeconomic exposure

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INTRODUCTION

The objective with this chapter is to provide the reader with a background review of why this thesis is written. This chapter will also provide the reader with the limitations and outline of this thesis.

Background

The increasing globalization the recent decades has spurred the interest in the effects of macroeconomic exposure on firm value. The first obvious thought is that multinational firms (MNCs), exporting and importing firms are the ones with the highest exposure of macroeconomic factors, since they are directly depending on foreign trades. Studies have at best found weak significant relationship of the effect of changes in exchange rates on share price, examples include Jorion (1990), Amihud (1993), Bartov and Bodnar (1994), Allayannis (1996). Jorion (1990) found that only 15 of 287 U.S. MNCs (1971-87) had significant exchange rate exposure and Amihud (1993) found no evidence for significant exchange rate exposure for 32 of U.S. largest exporting firms (1982-88). Doidge, Griffin and Williamson (2000) found that exchange rates do have an impact on share price, but it varies a lot among different countries and the relation is not linear.

This could, according to Oxelheim and Wihlborg (2005), be due to the inability of including the effects of hedging and financial decisions, when measuring stock market value with macroeconomic variables. However there are studies (Doukas, Hall and Lang (2003) and Pritmani, Shome and Singal (2003)) that have found significant exchange rate exposures for firms. The latter is introducing a Dual-Effect hypothesis which intends to explain the insignificant exchange rate exposure on MNCs and exporting firms' and significant exposure for importing firms'. The Dual-Effect hypothesis represents an interesting approach that, with the help of the monetary theory, explains exporters offsetting exposure and importers additive exposure caused by the domestic markets GDP and the exchange rates effect on business.

According to Pritmani, Shome and Singal (2003) importing firms are more exposed to exchange rate changes than exporting firms, ceteris paribus, since when the GDP increases in the

domestic market, the exchange rate increases and then can importing firms import cheaper and simultaneously enjoy a higher domestic demand. Of course the opposite is also true, thus, importing firms will therefore feel the effects twice. While exporters receive less for their exported products, but this effect is simultaneously weighed up by the increased demand in the domestic market.

This study intends to scrutinize the Dual-Effect hypothesis effect on firms based in the U.K., and in addition to the exchange rate factor, this study will also evaluate the interest rates effect on firms' stock value.

Problem Discussion

Are there a significant exchange rate exposure and/or interest exposure on firms in the U.K. market? And if so, will the result confirm the Dual-Effect hypothesis used by Pritmani, Shome and Singal (2003)?

Is there a significant exchange rate and/or interest rate exposure for domestic firms, due to the indirect connection between domestic firms and global competitors (with global costs)?

Will the results differ from Pritmani, Shome and Singal (2003) study, and will the interest rate exposure bring another dimension in order to explain the effect of macroeconomic factors on firms share price?

Purpose

The purpose of this paper is to apply the Dual-Effect hypothesis in Pritmani, Shome and Singal paper (2003), in order to analyze the exchange rate exposure on firms listed on the U.K. market. The study will examine if the foreign involvement of the firm will affect the share price of the firm. In addition to evaluating the Dual-Effect hypothesis in Pritmani et. al. (2003), we will evaluate the effect of foreign interest rates impact on U.K. firms. By evaluating the interest rate exposure this study will try to test the second variable proposed by Oxelheims and Wihlborgs MUST-analysis.

Delimitations

Because of the availability of data, the data begins on May, 2001. In order to include only whole years in the regression the last date will be May 2006. The reliability of the results will increase with the number of stocks included in the regression, although taking into consideration the characteristics of the firms' and their time listed the data sample is narrowed down to 238 firms.

Target Audience

There are two target groups for this thesis. The first group is students and teachers at Lund School of Economics and Management and other Universities. The second group is individuals with an interest in the financial field discussed in this thesis.

Outline of the thesis

In the next chapter the thesis will continue with a discussion of the theory which aims to introduce the reader to necessary theories in order to follow the empirical and analytical studies. In the theory chapter the study will go through a number of different theories presented in relevant literature and earlier studies. The empirical part of this thesis is included in chapter three. In this chapter the collection of the data and its features is described. Information will be given about how this data has been applied in the regression. In the two final chapters the results will be discussed and interpreted followed by the conclusions.

THEORY

This chapter will provide the reader with knowledge about; why the macroeconomic firm exposure is an important aspect to investigate, the Dual-Effect hypothesis and its implications and lastly a review of previous studies made within this area.

Macroeconomic Exposure – A MUST Approach

The macroeconomic uncertainty strategy (MUST) is covered in Oxelheim and Whilborg book Corporate Performance and the Exposure to Macroeconomic Fluctuations (2005). It is an important tool in order to fully understand the importance of macroeconomic exposure on firms' performance and hence firms' value. Oxelheim and Whilborg mention three variables affecting the firms' operations; exchange rate, interest rate and inflation. The MUST-analysis emphasizes the importance of that the interdependence between the variables must be taken into consideration when evaluating the macroeconomic exposure.¹

Regarding the exchange rate, the transaction exposure forces the firm to hedge its foreign cash flows in order to minimize this exposure. The transaction exposure is the risk that the exchange rate will move in an unfavorable direction during the maturity of the contract ending up in the buying or selling firm pays more or receives less than the spot exchange rate. Another aspect is the overall decrease in sales for an importing or exporting firm having a lower or higher valued exchange rate than its competitors. This affects the firms' cash flow and hence the value and share price of the firm. Hence the exchange rate exposure depends on both price and quantity effects and valuation effects. Theory presents several different hedging solutions for this exposure, but hedging costs could be mitigated by using the MUST analysis. The MUST-analysis evaluates which risk are evident, how large they are and how sensitive the cash flow are to different macroeconomic variables. By comparing different interest rates, exchange rates and inflation rates, in reality, larger parts of the exposure are mitigated through correlation with each other.²

1 Oxelheim, Lars and Whilborg, Clas, 2005

2 Ibid.

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Regarding the interest rate exposure, it is rarely treated when analyzing macroeconomic exposure on firm value, which is, as Oxelheim and Whilborg mentions, curious, since clearly the correlation between interest rates and stock market behavior is well-known. Also the fact that interest rates are correlated with exchange rates makes interest rates an interesting variable to evaluate. Interest rate affects the firms' cost of capital and hence the discount rate when discounting the firms' cash flows, as well as the cost of credit.

Another point is the demand side of the equation. The demand for the firms' products is influenced by the interest rate since it affects the aggregate demand for the companies' products in the market. Especially the durable goods demand is sensitive to interest rate changes, because of the concept called sticky prices³, i.e. the firms are stuck with the prices they have communicated to the markets for longer periods of time.

However, there is no direct effect on book values (i.e. no direct effect on operational cash flows) from interest rate changes. Interest rate exposure is primarily used towards the measurement of the exposure of financial assets and liabilities. Few firms go beyond financial exposure when measuring interest rate exposure. Traditional risk measures applied to financial assets and liabilities are: Maturity gap, duration, modified duration (duration discounted with interest rate i.e. the interest rate sensitivity) and value at risk. However the interest rate exposure can also be applied to measure commercial cash flows. Cash flow at risk can be estimated with the information about interest rate sensitivity of commercial cash flows and the probability distribution for the interest rate. Since the interest rate and the exchange rate are correlated the cash flow at risk in this case cannot be regarded independently and that is one of the key issues with the MUST analysis, it takes this interdependence into consideration.⁴

The MUST analysis evaluates a broader macroeconomic approach where sensitivity coefficients are emphasized as exposure variables in a multivariate framework in order to capture the interdependence of different macro price variables and mitigating problems like;

- Not capturing the exchange rate effects on domestic cash flows, neglecting commercial interest rate exposure.

3 Mankiw and Reis (2001)

4 Oxelheim, Lars and Whilborg, Clas, 2005

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- Not capturing the dynamics of cash flows arising from exchange and interest rate effects on price and quantity e.g. the competitive implications of these changes.
- Not taking into consideration the effects on sustainable profits and competitiveness due to an increased cost of capital.

Altogether the MUST analysis provides a vital tool for risk management decisions and the overall competitive analysis of the firm.⁵

$$\begin{aligned}
 X_t^{DC} - E_{t-1}[X_t^{DC}] = & \beta_0 + \beta_1 \left(\pi_t^{DC} - E_{t-1}[\pi_t^{DC}] \right) \\
 & + \beta_2 \left(\pi_t^{FC} - E_{t-1}[\pi_t^{FC}] \right) \\
 & + \beta_3 \left(S_t^{DC/FC} - E_{t-1}[S_t^{DC/FC}] \right) \\
 & + \beta_4 \left(i_t^{DC} - E_{t-1}[i_t^{DC}] \right) \\
 & + \beta_5 \left(i_t^{FC} - E_{t-1}[i_t^{FC}] \right) \\
 & + \beta_6 \left(P_t^{DC} - E_{t-1}[P_t^{DC}] \right) \\
 & + \varepsilon_t
 \end{aligned}$$

X_t^{DC} = Total cash flow in DC

E_{t-1} = Expectations operator in period t-1

π = Inflation

$S_t^{DC/FC}$ = Spot exchange rate in DC/FC

i = Interest rate

P = Market price of relevance to corporate profitability

E_{t-1} = The expectations operator in period t-1

ε = Measures cash flow changes in period t independent of macroeconomic and market variables

5 Oxelheim, Lars and Whilborg, Clas, 2005

The Dual-Effect Hypothesis

The Dual-Effect hypothesis is a test on how the exchange rate changes affect stock returns for domestically as well as internationally operating firms. It is based on the monetary theory about exchange rates that is if the GDP decreases/increases the exchange rate depreciates/appreciates, *ceteris paribus*. The Dual-Effect hypothesis states that if the GDP decreases and henceforth the exchange rate also decreases the importing firms suffers from higher importing costs as well as a weaker demand in the home market, while exporting firms receive more for their exported goods but the gain is, at least partially, offset by a declining demand for their products in the home market.

The Dual-Effect hypothesis assumes that neither the exporting firms nor the importing firms are 100% exporters/importers. Hence the Dual-Effect theory states a natural hedge situation for exporting firms, decrease/increase in GDP offset by increasing/decreasing exporting gains, while importing firms is exposed in an additive way, since a decrease/increase in GDP is positive correlated with a decrease/increase in exchange rate → higher/lower cost of imports and lower/higher demand for their products.

Hence the Dual-Effect implies that changes in the exchange rate caused by changes in the GDP should to a greater extent affect the share price of importing firms than exporting, *ceteris paribus*.

Pritmani, Shome and Singal (2003) use the following hypothesis in their regression to test for the significance of the Dual-Effect hypothesis.

H₁ : The total exposure coefficient for exporting firms is expected to be insignificant, on average.

H₂ : The total exposure coefficient for importing firms is expected to be significant and positive, on average.

The results in their study⁶ find evidence for that the exposure estimates are significant for importers and negative and insignificant for exporters, as predicted by the Dual-Effect

6 Pritamani, Mahesh, Shome, Dilip and Singal, Vijay, 2003

hypothesis.⁷

Review of Previous Studies within this Field

The research within this field is vast. The selected studies are a sample of the most relevant ones for this paper. Di Iorio and Faff (2001) assess the contemporaneous and lagged effect of the exchange rate changes in USD and JPY against the AUD, on firms on the Australian stock exchange. The study finds out that six industry portfolios exhibit significant contemporaneous exchange rate exposure and eleven shows significant lagged exposure. The study confirms Bartov and Bodnar's (1994) study which finds no relationship between contemporaneous changes in the USD and firms' stock returns, but finds it in a lagged relationship. Bartov and Bodnar suggest that one explanation to this lagged relationship is that the exchange risk is priced in equity markets but the market is not fully efficient with regards to exchange rate changes and hence takes time to incorporate all the implications of these movements.

Amihud (1994) does not find any significant contemporaneous relationship between the stock returns of thirty larger exporters in the U.S. and exchange rate changes. Nevertheless Amihud reports that fluctuations in the exchange rate affect the stock returns when it is lagged up to two quarters. He and Ng (1998) and Krishnamoorthy (2001) contradict this result when they find no effect of lagged changes in exchange rate in different industries on the Japanese respectively the U.S. market. Donnelly and Sheehy (1996) find a weak lagged and contemporaneous relationship between changes in the exchange rate and large U.K. exporters. They also find that the large U.K. exporters are being more exposed to foreign exchange risk than their U.S. counterparts.

Joseph (2002) studies the exchange rate and interest rate effect on different industries in the U.K. from 1988-2000. He finds that industry returns are more negatively affected by interest rate changes (significant for up to 34% of all firms'), than by foreign exchange rate changes (significant for 28.3% of all firms'). The results are similar on a portfolio level except for the

7 Pritamani, Mahesh, Shome, Dilip and Singal, Vijay, 2003

short-term foreign exchange rate impact, which is very weak. Joseph explains this as a loss or gain in international competitiveness due to exchange rate changes affect firms' financial performance with a certain delay i.e. a lagged relationship. Chang (2002) examine the exchange rate risk for Taiwan's stock market on an industry level. The study finds, among other things, that the exchange risk is less for larger firms than for smaller firms. This finding is consistent with Nance, Smith and Smithson (1993) and Chow, Lee and Solt (1997).

Jorion (1991) studies exchange rate effects on MNCs, where the sales in majority rely on exporting activities, and importing firms. Jorion finds that the MNCs are affected negatively by an appreciation of the USD and the importing firms are affected positively by this. However none of the results are statistically significant at any accepted level. Bodnar and Gentry (1993) investigates the relationship between exchange rate changes and industry portfolio returns for U.S., Canada and Japan 1979-1988. Less than half of the industries display significant exchange rate exposure at the 10% level. Fang and Loo (1994) studies the effect of changes in a U.S. trade-weighted exchange rate on 20 U.S. industries stock returns from 1981-1990. For industries with a known reliance on exporting activities (mining, petroleum, chemical) the stock returns increase when the USD depreciates. Furthermore industries with a known reliance on importing activities (textile and apparel, department stores, retail trade) showed decreased stock returns when the USD depreciated.

The vast area of studies within this field is in general contributing with contradictory and ambiguous results. Most studies focuses on the exchange rate effect on different firm or industry portfolios within a certain market. The firms' returns are in most cases also structured after an equally weighted method and not a value weighted method. Most studies show upon that exchange rate changes has an impact on share price, but has a hard time of receiving significant results. It varies across firm types, regions, lagged data, industry sectors and so forth.

Concluding this chapter about the previews studies within this field, no distinct direction or widely confirmed outcomes regarding the significance of the exchange rates impact on share price have been found. A very large and indicative study by Doidge, Griffin and Williamson (2000) gives a representative picture of this. They used individual firm data from 27,000 stocks in 21 developed and 29 emerging markets, concluding that the exchange rate has an impact on

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share performance, but it varies widely across countries and industries, and the relation is non-linear.

EMPIRICAL PART

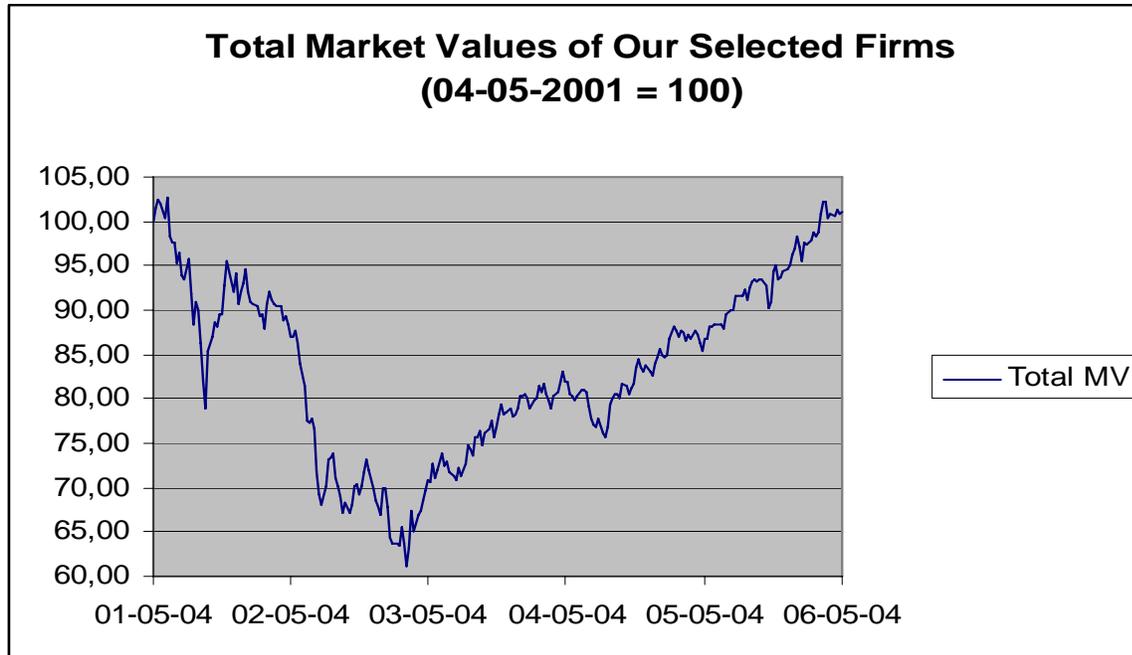
In this chapter the collection and processing of the data is described, as well as the fundamentals of the regression.

Data Collection

This study focuses on firms listed on the London Stock Exchange, on the FTSE All Share Index. This index was chosen so that our sample can include a large number of firms, as well as including a diversified portfolio of firms. All firms were listed and in business on the 10th of May, 2006.

In this study, weekly prices were used instead of the more widely used monthly prices. By using weekly prices, we did get more frequent data which makes the analysis less reliant on larger, more short-term movements in the market. Another important point is the testing of the rate of adjustment in the market. New information about interest and exchange rates hits the market many times a day, the question was then; how fast would the market react to the new information?

The FTSE All Share Index includes 660 companies, of which we chose to start our analysis with. All quantitative and qualitative data needed for our analysis were found using Reuters and DataStream, looking at a time span of 5 years.



Graph 1.

Within the chosen time period, this study captured both a downturn in the economy and an upturns (See graph 1). These effects allows this study to include the whole business cycle, allowing our analysis to evaluate if the share prices responds equally to macroeconomic variables during ups- and downturns.

Firm Selection

From the beginning the index included 660 companies, the selection then began with excluding companies within the following industries:

- Companies directly involved in the sale of internationally priced commodities traded on a few number of large exchanges worldwide. Examples include oil, gas, metals and other mining products. These companies were eliminated because of their reliance on international markets, not on domestic markets, thus they would not be affected by nation-to-nation differences in exchange and interest rates to a large degree.
- Investment companies and banks. There are many reasons to not to include banks and investment companies. Some of them are; their opposite reaction to interest rate increases, the degree of regulations in the industry and thereby the barriers to entry in the industry, the internationalisation of their asset bases.

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- Trusts and holding companies not directly affected by companies' performance.
- Companies in strongly regulated industries, such as the power industry.

Another factor important to our analysis is the access to share prices. This led to our second elimination step; the exclusion of all companies not being listed for the full 5 years. This included companies with shorter periods of not being traded (such as suspensions, stops in trading). For these companies (only two), closing prices for their last day of trading were then used to fill in the blanks.

Data Classification

All firms in our sample were then divided into four categories: Exporters, Importers, MNCs and Domestic companies. Each category had the following characteristics:

- **Exporters:** Exporting firms were firms with at least 50 % of their total sales in foreign countries and/or 50% of their assets abroad. Foreign sales included all sales (both services and goods) and also to some degree goods and services produced overseas. The latter part made the distinction between Exporters' and MNCs small.
- **Importers:** Importers are firms that do import a large part of their sales. Because of problems in accessing data on the amount of imports these companies have in relations to their domestic inputs, we had to rely to large degree on qualitative information from the companies. Companies in industries which for most part is known of their imports is therefore characterised as importers. These industries included mostly retailing and to some degree distribution companies. Companies included in this category were among others: Kingfisher and Travis Perkins.
- **MNCs:** Larger enterprises with typically both sales functions and production functions in multiple countries. The general difference between these companies and exporting is that they have their main businesses in several countries, often more than 10, as well as having characteristics from importers.
- **Domestic:** These companies exhibit features such as less than 10 % foreign sales and little or no foreign competition. Examples include restaurant and pub chains, newspapers, transport companies.

Further the firms' were classified in high vs. low debt/assets ratio and if the firms' were trading with durable goods or not. The grouping of firms' into high vs. low debt/assets ratio was foremost done since the firms' with high debt/assets ratio should be more exposed towards the interest rate than the ones with low debt/equity ratio, due to the higher sensitivity towards the cost of credit. The difficult point was to exactly pinpoint what were high or low debt levels, so this study focused on sorting the companies after their D/A level, and then dividing this list into two parts, a low D/A part and high one. The classification of high D/A ratio firms began at a D/A level of 0,248 (See appendix 1).

The grouping of firms into durable goods trading vs. non-durable goods trading was conducted in order to evaluate if the interest rate and/or exchange rate changes should impact the firms' trading with durable goods vs. non-durable goods differently. The classification of a durable vs. non-durable goods trading firm was undertaken in a qualitative way, reading about the firms' business using Reuters.

The share returns were computed using a value-weighted measure. This meant that the share return of a firm was put in relation to the market capitalization of the firm. This created a lower variance of the share returns for not so market dominating firms which on the one hand, reduced firm variance, but on the other hand gave the weighting for the firms a more real effect on the portfolios. However, to be more in line with other similar studies, tests were also conducted with portfolio weightings in this study. By using this method, each portfolio will be relatively equal to each other, making smaller firms attribute more to the variance in the portfolio. (See table 2 and 3 for details).

The Data Material

The Exchange Rate

In this study, this study used the Official Sterling ERI, also called the Effective Exchange Rate Index. This index is available from the Bank of England, calculated by weighing together unilateral exchange rates. It is designed to measure changes in the price competitiveness of traded goods and services, the weights will then reflect trade flows in manufactured good and services.

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Thus this index will stand as one of our independent variables, explaining exchange rates for all British firms exposed to this.

This index is set up using the latest trade flow data available, comparing these with the different exchange rates. Weights and country sets are changing every year, so that the index will always show the real exchange rate movements. An example would be the sterling against one of the countries included in the index, USA, where the weights would be based on:

- Competition in the U.K. domestic market from imports from the USA
- Competition between U.K. exports and U.S. products in the USA
- Competition between the U.K. and the U.S. exports in the third country markets

This index will therefore show the "real" exposure for U.K. firms from the U.S. companies.

The Interest Rate

The effective interest rate in this study uses much of the methodology as for the effective interest rate. The different weights for each country⁸ are used to create an effective interest rate since no such variable is available from any institution. The three top countries according to their weights are then used to form a portfolio of exchange rates.

Country/Region	Weights According to BoE	Weights with only the three regions/countries.
Euro Zone	54,5 % - 55,5 %	77,58 % - 80,79 %
USA	18,8 % - 20,3 %	15,53 % - 17,84 %
Japan	4,9 % - 5,7 %	3,68 % - 4,58 %

The reason for only using the top three countries is simply that these three top players' accounts for about 80 % of total weights. The other 25 countries share the rest of the 20 % weights.

Data Stream was then used to import data on the different interest rates. The choice was made to use the official discount rates. This was done in order get a more general picture of the

8 Bank of England: <http://213.225.136.206/mfsd/iadb/notesiadb/eri.pdf>

interest rates, thus the interest rate will give a picture of both the commercial and private lending rates. This portfolio of interest rates formed our last variable, the effective interest rate.

Regression

In this study we used the OLS approach when testing for the significance of the two variables. The confidence interval was set to 10%. The OLS method will give us the coefficient variables, as well as the R^2 . The coefficients will reveal what kind of exposure and degree of significance the different portfolios have towards the macroeconomic variables.

$$R_{k,t} = \alpha + \beta_1 \Delta FX_t + \beta_2 I_t + \varepsilon_t$$

Where:

$R_{k,t}$ = The return for portfolio k in period t.

ΔFX = The change in the foreign exchange rate in period t.

I = The effective interest rate in period t.

This study was constructed to confirm or deny the effects of interest rate and exchange rate changes on four main different portfolios' of firms'. The following hypotheses was therefore set up for the regression:

- Exporters:
 - o Exchange rate exposure insignificant
 - o Interest rate exposure significant.
- Importers:
 - o Exchange rate exposure significant and negative
 - o Interest rate exposure insignificant
- MNCs:
 - o Exchange rate exposure insignificant
 - o Interest rate exposure insignificant
- Domestic:
 - o Exchange rate exposure significant and negative
 - o Interest rate exposure significant.

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- High vs. low D/A:
 - o Firms' with high D/A ratio is expected to have slightly or medium additional exposure towards exchange rate and/or interest rate changes.
- Durables vs. non-durables:
 - o Firms' with durables is also expected to have slightly or medium additional exposure towards exchange rate and/or interest rate changes

Notice that the exchange rate used is amount of GBP per USD, which means that if the GBP appreciates this factor will decrease and hence the relationship between exchange rate changes and importing firms is ought to be negative, since $\text{GBP} \uparrow \rightarrow \text{Exchange rate factor} \downarrow \rightarrow \text{Share return importing firm} \uparrow$.

RESULTS

The results from this study will be presented in this chapter.

The main objective of this study was to evaluate the effects of macroeconomic variables on firm values. The two macroeconomic variables used in this study were the interest rate and the exchange rate.

Regression Results

We estimated the univariate regression at the portfolio level, each portfolio complying with the different measures already discussed. **Table 1** will present the number of different firms in each portfolio, giving an overview of the firm classification (See also appendix 1 for more details).

		Exporting	Importing	MNC	Domestic	Sum
Durables	Low D/A	32	21	8	20	81
	High D/A	12	11	4	12	39
Non-Dur.	Low D/A	16	7	10	26	59
	High D/A	9	4	11	35	59
Sum		69	43	33	93	238

Table 1

In order to have reasonably well diversified portfolios, the number of firms in each portfolio should be at least ten firms. As shown in table 1, there are only 5 portfolios not consisting of that number of firms. In the two portfolios consisting of only 4 firms, every firm become increasingly important as the portfolio becomes very reliant on firm specific events. This issue will be discussed further with the rest of the results. For the rest of portfolios, there seems to be a rather good distribution of companies.

Interpretation of the Results

The univariate regression is estimated at the portfolio level, each portfolio complying with the different measures already discussed. **Table 2** and **Table 3 (next page)** represent the results for the regression. Table 2 represents the market weighted regression and Table 3 the portfolio weighted regression.

The amount of significant results is similar between the two measures indicating that the larger firms are not influencing the results. The three largest firms are put in the same portfolio, because of their similar attributes, thus they are only affecting the portfolio called; low D/A - non-durables - MNC portfolio.

The main difference between the two different approaches is the size of the beta, which is most likely due to the increase of the variance in the returns in the portfolio weighted approach. This results in a higher beta since the increase of the covariance is greater than the increase in the variance.

Since the object of this study is to evaluate whether the variables were significant or not, this study will concentrate on the portfolio weighted approach, which the authors feel gives a more correct picture of the reality.

Table 2. Results from regression of portfolios with market weighting⁹

Market Weighted			Exporting			Importing			MNC			Domestic		
			Beta	p-value	R2	Beta	p-value	R2	Beta	p-value	R2	Beta	p-value	R2
Durables	Low D/A	Exchange	-0,0140	0,0800	0,0303	-0,0080	0,1186	0,0156	-0,0199	0,0174	0,0346	-0,0103	0,0362	0,0283
		Interest	-0,0210	0,0281		-0,0077	0,2078		-0,0183	0,0665		-0,0101	0,0852	
	C	0,0006	0,0168		0,0002	0,1074		0,0006	0,0240		0,0004	0,0113		
	High D/A	Exchange	-0,0065	0,3276	0,0168	0,0019	0,8418	0,0105	-0,0078	0,1739	0,0093	-0,0032	0,1421	0,0161
		Interest	-0,0146	0,0664		-0,0188	0,1028		-0,0050	0,4633		-0,0036	0,1578	
		C	0,0005	0,0194		0,0006	0,0470		0,0002	0,3546		0,0001	0,0353	
Non-Dur.	Low D/A	Exchange	-0,0068	0,6240	0,0084	-0,0001	0,9691	0,0012	-0,1160	0,2144	0,0158	-0,0165	0,0736	0,0280
		Interest	-0,0230	0,1658		-0,0022	0,5792		-0,1768	0,1132		-0,0223	0,0437	
	C	0,0007	0,1014		0,0001	0,3787		0,0043	0,1241		0,0006	0,0196		
	High D/A	Exchange	-0,0014	0,2588	0,0181	-0,0016	0,7469	0,0005	-0,0194	0,0852	0,0116	-0,0146	0,1309	0,0235
		Interest	-0,0027	0,0657		0,0007	0,9102		-0,0017	0,8965		-0,0226	0,0512	
		C	0,0001	0,0096		0,0000	0,7449		0,0002	0,5810		0,0008	0,0085	

See appendix.

All numbers in bold style are significant at the 10% level

⁹ All firms are weighted with respect to total market value. This means that all firm returns are adjusted to the market cap of the firms. In this adjustment we have multiplied all returns with the corresponding market cap percentage of total market cap of all the firms in our portfolio.

Table 3. Results from regression of portfolios with portfolio weighting ¹⁰

Portfolio Weighted			Exporting			Importing			MNC			Domestic		
			Beta	p-value	R2	Beta	p-value	R2	Beta	p-value	R2	Beta	p-value	R2
Durables	Low D/A	Exchange	-0,3823	0,1034	0,0247	-0,4027	0,0782	0,0184	-0,5434	0,0170	0,0341	-0,5100	0,0304	0,0306
		Interest	-0,5401	0,0531		-0,3462	0,2018		-0,4820	0,0741		-0,5051	0,0709	
	C	0,0153	0,0277		0,0103	0,1273		0,0143	0,0335		0,0172	0,0134		
	High D/A	Exchange	-0,2125	0,5340	0,0125	0,0109	0,9515	0,0087	-0,2419	0,1361	0,0095	-0,2358	0,1531	0,0145
Interest		-0,6839	0,0928		-0,3183	0,1347		-0,0897	0,6412		-0,2536	0,1957		
C	0,0209	0,0390		0,0095	0,0718		0,0033	0,4849		0,0096	0,0480			
Non-Dur.	Low D/A	Exchange	-0,0757	0,6624	0,0086	-0,0308	0,8995	0,0017	-0,2609	0,2172	0,0151	-0,2923	0,0793	0,0261
		Interest	-0,2933	0,1553		-0,1886	0,5159		-0,3854	0,1252		-0,3802	0,0548	
	C	0,0086	0,0923		0,0068	0,3437		0,0093	0,1375		0,0110	0,0261		
	High D/A	Exchange	-0,3739	0,0995	0,0239	-0,1118	0,7072	0,0006	-0,2540	0,1323	0,0089	-0,2314	0,1379	0,0217
Interest		-0,5035	0,0621		-0,0127	0,9714		0,0267	0,8940		-0,3422	0,0651		
C	0,0160	0,0170		0,0039	0,6563		0,0016	0,7446		0,0114	0,0137			

See appendix.

All numbers in bold style are significant at the 10% level.

¹⁰ All firms are weighted with respect to total portfolio value. This means that all firm returns are adjusted to the market cap of the portfolio. In this adjustment we have multiplied all returns with the corresponding market cap percentage of total market cap of all the firms in our portfolio (as for the market weighting above), and then divided by the portfolio weight with respect to total market cap.

ANALYSIS

This section will provide the reader with in detail analysis of the results.

The main objective of this thesis is to evaluate the interest rate and exchange rate exposure on firms classified in different categories; Exporting, importing, MNCs and domestic. The thesis will also seek out to evaluate if high vs. low D/A ratio and non-durables vs. durables trading are playing a significant role for the exposure estimates.

The following sections in the analysis will evaluate the results from the regressions with the help of the results obtained from both the market weighted and the portfolio weighted approach. Since the results for the two approaches were very similar except for the beta, differences will only be mentioned when they are differing, aside from the beta. The analysis will incorporate theories like the MUST-analysis and the Dual-Effect Hypothesis, described in the theory chapter, in the discussion and assess if they are strengthening or contradicting the results of this thesis.

Exporting

The portfolios of exporting firms contain 23, 12, 16 and 9 which should provide a reasonable protection against firm specific events that could disturb the results.

The exchange rate exposure are significant at the 10% level for exporting firms trading with durables and having a low D/A ratio and non-durables high D/A ratio, using the portfolio weighted approach. The market weighted approach confirms the significance of the exchange rate for low D/A and durables trading firms. These results are contradicting the study's hypothesis, based on the Dual-Effect Hypothesis and also to some extent the MUST-analysis.

The Dual-Effect hypothesis states that the exchange rate exposure on exporting firms is insignificant due to the natural hedge for exporters caused by the home-country demands negative correlation with the country's exchange rate. Another reason why the exposure should be insignificant is the fact that exporting firms may have management that is used to frequent use of hedging derivatives thereby decreasing the exposure, and these activities should influence our

results.

The results indicate that these factors are not as influencing and strong as the Dual-Effect hypothesis assumes and hence can not be confirmed. The significant exchange rate exposure could also be explained by the fact that the exporting firms are trading with durable goods, since it could imply a higher transaction exposure (“sticky pricing”).

These result contradict Pritmani et. Al. (2003). One factor that probably makes a difference is that Pritmani et. Al. (2003) is investigating firms in the U.S. market, while this thesis investigates firms in the U.K. market. Since the U.S. is a far larger market, it is possible that the exporting firms are more indifferent to exchange rate fluctuations than exporting firms in the U.K. market. The argument follows the fact that since the U.S. based exporters have a larger home market to rely on and are therefore doing a larger part of their business in the domestic (still below 50%) than the U.K. firms, they are less affected by exchange rate movements. This is also confirmed by the study of Donnelly and Sheehy (1996), that large U.K. exporters are being more exposed to foreign exchange risks than their U.S. counterparts.

The significance of the interest rate exposure for low D/A – durables trading, high D/A – durables trading and high D/A – non-durables is confirming the hypothesis of significant interest rate exposure for exporting firms mentioned earlier. Foreign interest rates influence the demand for the exporting firms’ products in the foreign markets. These negative or positive effects affect the share price for the evaluated export portfolios except for firms with low D/A – non-durables portfolio. The latter may be more capable of changing prices to different market conditions, decreasing their exposure towards macroeconomic movements.

Importing

The exchange rate results are only significant for low D/A – durables trading firms and this is only supported in the portfolio weighted approach. These results contradict the Dual-Effect hypothesis, that importing firms are exposed towards an additive exposure, based on the monetary theory.

The fact that the changes in GDP which affects the importing firms in a additive way together with the exchange rate, not has an impact with the strength to evolve into a significant

exposure towards the exchange rate, is interesting. One possible explanation for this result could be that the small home market does not bring such a strong additive effect to the change in the exchange rate that the exposure will be significant when the importing firm conducts active hedging.

The only significant exposure for the interest rate is provided only in the market weighted portfolio and that is for high D/A – durables trading firms. This is confirming this thesis hypothesis of importing firms having an insignificant exposure towards the interest rate changes abroad. This since their plants and division are located domestically.

MNCs

The portfolios of MNCs consist of larger, international companies, with both sales and production facilities in multiple countries. This creates a natural diversification for these companies, making them less exposed to exchange rates and interest rate, thus we expect all variables to be insignificant.

This is almost confirmed in our study, the only portfolio being significant (for both variables) is the portfolio consisting of Low D/A – Durables – companies. It is difficult to argue why these companies are the only ones being exposed, and not the high D/A - Durables portfolio as well. The durables industry is often more affected by economic cycles, because of a larger investment need from their customers' viewpoint, making the companies more exposed macroeconomic variables, since these are good indicators of the general economic environment. On the other hand, MNCs are more diversified; a market downturn should affect them less. And according to our study and as predicted, MNCs are not affected.

Domestic

Our hypothesis stated that we expect domestic companies to have a significant and negative exposure to exchange rate changes and significant exposure to interest rates.

Generally, the domestic companies in this study are all exposed to the foreign interest rates. In addition to the results presented in table 2 and 3, tests were done on the total returns for all the companies being domestic companies (Explained later in this chapter, and in Table 4).

These results confirm that all domestic companies, as one group, were significantly exposed to foreign interest rates.

As well as being exposed to interest rates, two of the portfolios are also exposed to exchange rate changes. Both of these portfolios consisted of low D/A companies, but they were both durables and non durables companies.

The major reasons why these companies are exposed to foreign macroeconomic variables, although they are not directly dealing with foreign companies or customers, are their indirect link through their competitors. Their competitors are very much reliant on their domestic interest rates and exchange rate in order to stay competitive; a lower interest rate could lower their cost of capital, allowing them to increase their competitive strength through aggressive pricing. This is negative for the domestic companies, thus as shown in our results, a negative exposure (strengthening exchange rate means more expensive imported goods thus better competitive position for the domestic firms) will be beneficial for these firms.

Concluding this section, an interesting remark about our results could be made. The interest rate is found significant in four cases (using the market weighted approach, two in the portfolio weighted approach), where the exchange rate is insignificant. For all these cases, these firms are placed in the high D/A ratio portfolios. This may suggest that these firms are unaware of the increased risk they are exposed to through higher cost of credits and increased sensitivity to demand changes due to interest rate changes. The question is then; if these companies should protect themselves better through hedging activities or other. This could be further researched upon.

The Choice to Separate into High and Low D/A and Durables or not

As many of the other studies in this area show, most studies have exclusively been focusing on exporting, importing, MNCs and domestic, while not separating into high or low debt and durables or not. Are our results disturbed because of our choice to separate into these categories?

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Portfolio Weighted			Exporting			Importing		
			Beta	p-value	R2	Beta	p-value	R2
Total	Exchange	-1,044	0,196	2,34%	-0,536	0,471	0,54%	
	Interest	-2,016	0,036		-0,819	0,353		
	C	0,061	0,011		0,030	0,172		

			MNC			Domestic		
			Beta	p-value	R2	Beta	p-value	R2
Total	Exchange	-1,300	0,024	2,70%	-1,270	0,038	3,19%	
	Interest	-0,942	0,166		-1,463	0,045		
	C	0,029	0,091		0,049	0,007		

Table 4.

The results from this test, shows that the results are still very similar. The domestic companies are still very exposed to the two macroeconomic variables, while the exporting companies are very exposed to the interest rate differences. These results support the hypothesis explained earlier in the chapter, and strengthens our main results.

There is one surprising result as well; the MNCs have significant exposure to the exchange rate, which is both contradicting our main results and the hypothesis. The Choice to Separate into Exporting, Importing, MNCs and Domestic

Portfolio Weighted			Total		
			Beta	p-value	R2
Durables	Low D/A	Exchange	-1,839	0,018	3,67%
		Interest	-1,845	0,045	
		C	0,057	0,013	
Non-Dur.	High D/A	Exchange	-0,679	0,314	1,49%
		Interest	-1,349	0,092	
		C	0,043	0,030	
Non-Dur.	Low D/A	Exchange	-0,660	0,293	1,50%
		Interest	-1,241	0,096	
		C	0,036	0,055	
Non-Dur.	High D/A	Exchange	-0,972	0,107	1,50%
		Interest	-0,804	0,260	
		C	0,033	0,067	

Table 5

To further get a more detailed picture of our results, we also analysed if the different main groups (exporting, importing, MNCs and domestic) disturbed our results (table 5). By adding all these groups into one column (called Total), we tested for this effect. From this analysis it is

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easier to see that the first portfolio consisting of Durables – low D/A – companies are by far the group mostly affected by exchange rate and interest rate changes. This is strengthening our main results, because of the similar results (only the portfolio for the importing firms showed no significance for the interest rate exposure in our main analysis).

One reason why companies with low D/A are more exposed to exchange rate changes might be the increased risk taking in these businesses. Firms with higher D/A levels may be reluctant to taking high risks because of their debt obligations, as well as they can be less invoked because of more extensive monitoring from their creditors.

CONCLUSIONS

The most significant results were found in the exporting and domestic firm portfolios. For importing and MNCs the thesis found only sporadic significance. The results for MNCs and exporting firms are, in general, in line with earlier research within this field. The insignificant results of the exposure for the importing firms are in direct contradiction towards Pritamani et. Al. (2003) findings for importing firms on the U.S. market. This could be due to several reasons, discussed in the analysis.

The significant results for the domestic firms are interesting in the way that conventional wisdom states that domestic firms should not be exposed towards foreign macroeconomic factors as the exchange rate changes and the foreign interest rate. The relationship between indirect exposures for domestic firms through exposure based on competition is discussed in Pritamani et. Al. (2003) and henceforth is confirmed by the results in this thesis.

The significant results found for exporting firms and the insignificant for importers are contradicting the results found by Pritamani et. Al. (2003) and hence also the Dual-Effect hypothesis. The additive exposure and the offsetting exposure for importing respectively exporting firms do not seem to be applicable to the U.K. market. The difference in the scale of the home markets cancel out the effect of the GDP fluctuations connected to the exchange rate. Neither the offsetting effect for exporters nor the additive effect for importers is significant enough to have an impact on the results. However, the significant results for the domestic portfolios is confirming the hypothesis that domestic firms are indirectly exposed towards exchange rate exposure and interest rate exposure through competition with firms with some part of their sales based on foreign affiliation.

As suggested in the theory chapter, the interest rate is an important factor for share returns. Its interdependency with the exchange rate as well as the argument that larger parts of the demand for the products of these companies are directly affected the interest rate in the individual countries, supports our hypothesis and the MUST-analysis that firms are indeed affected by it. Interestingly, both high and low D/A level companies are affected to some extent. This confirms the hypothesis stated in this thesis to some degree.

REFERENCES

Published Sources

- Allayannis, G., 1996, *Exchange rate exposure revisited*, Working Paper DSWP 97-06, University of Virginia.
- Amihud, Y., 1994, *Evidence of exchange rates and the valuation of equity shares*, in Y. Amihud and R. Levich ed.: *Exchange rates and corporate performance*.
- Bartov, E. and G.M. Bodnar, 1994, *Firm valuation, earnings expectations and the exchange rate exposure effect*, *Journal of Finance* 49, 1755-1785.
- Bodnar, G.M. and W.M. Gentry, 1993, *Exchange rate exposure and industry characteristics: evidence from Canada, U.S. and Japan*, *Journal of International Money and Finance* 12, 29-45.
- Chang, Y., 2002, *The pricing of foreign exchange risk around the Asian financial crisis: evidence from Taiwan's stock market*, *Journal of Multinational Financial Management* 12, 223-238.
- Chow, E.H., W.Y., Lee and M.E., Solt, 1997, *The economic exposure of U.S. multinational firms'*, *Journal of Financial Research* 20, 191-210
- Diorio, A. and R. Faff, 2001, *A test of the stability of exchange rate risk: Evidence from the Australian equities market*, *Global Finance Journal* 12, 179-203.
- Doidge, C., Griffin, J. and Williamson, R., 2000, *An international comparison of exchange rate exposure*, Ohio State University Working Paper.
- Donnelly, R. and E., Sheehy, 1996, *The share price reaction of U.K. exporters to exchange rate movements. An empirical study*, *The Journal of International Business Studies* 27, 157-165.
- Doukas John A, Hall Patricia H and Lang Larry H P, 2003, *Exchange rate exposure at the firm and industry level*. Blackwell Publishing Inc, Malden, USA
- Fang, H. and J.C., Loo, 1994, *Dollar value and stock returns*, *International Review of Economics and Finance* 3, 221-231.
- He, J. and L. Ng, 1998, *The foreign exchange rate exposure of Japanese multinational corporations*, *Journal of Finance* 53, 733-753
- Jorion, P., 1991, *The exchange rate exposure of U.S. multinationals*, *Journal of Business* 63, 331-346.

- Joseph, N.L., 2002, *Modelling the impact of interest rate and exchange rate changes on U.K. stock returns*, Derivatives Use, Trading and Regulation 7, 306-323.
- Krishnamoorthy, A., 2001, *The impact of industrial structure and the exchange rate exposure of industry portfolio returns*, Global Finance Journal 12, 285-297.
- Mankiw N. G and Reis R., 2001, *Sticky information versus sticky prices, a proposal to replace the New Keynesian Phillips Curve*, National Bureau of Economic Research, Cambridge.
- Nance, D., C., Smith, C. and Smithson, 1993, *On the determinants of corporate hedging*, Journal of Finance 48, 391-405
- Oxelheim, Lars and Wihlborg, Claes, 2005, *Corporate Performance and the Exposure to Macroeconomic Fluctuations*, Nordstedts Akademiska Förlag.
- Pritamani, Mahesh D., Shome, Dilip K. and Singal, Vijay, 2003, *Foreign exchange exposure of exporting and importing firms'*, Journal of Banking and Finance 2003.

Electronic Sources

DataStream Advance 4.0

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Bank of England website: <http://www.bankofengland.co.uk/statistics/index.htm>

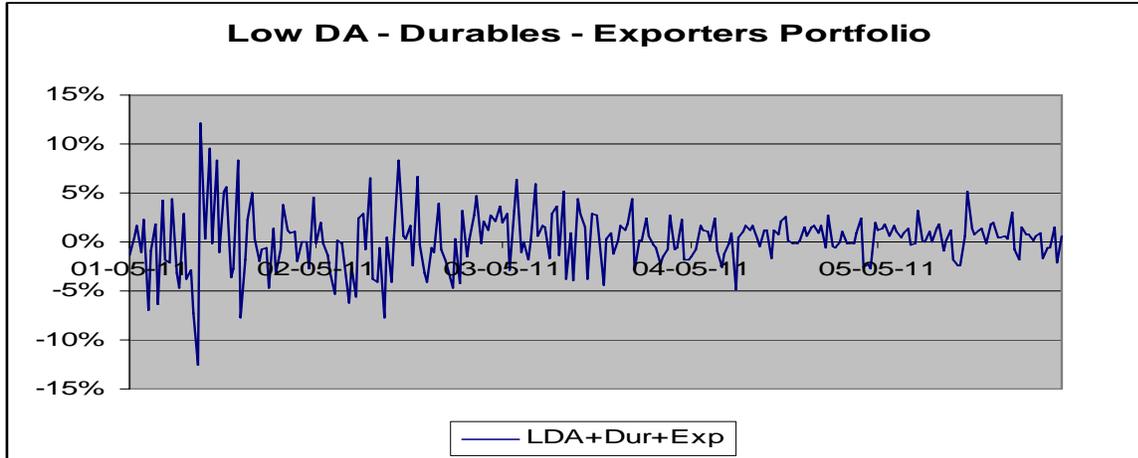
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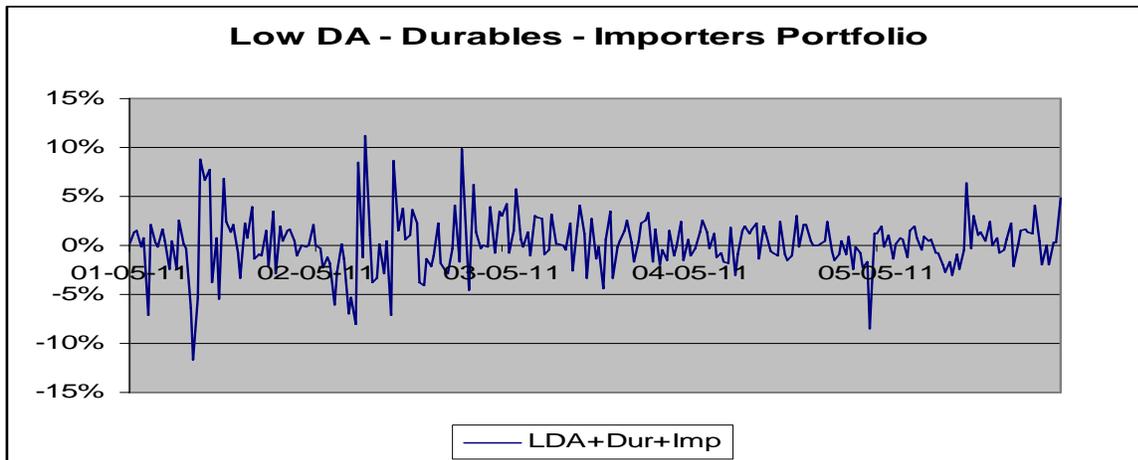
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**Appendix 2: Graphs of the share returns for our 16 portfolios
(Portfolio Weighted).**

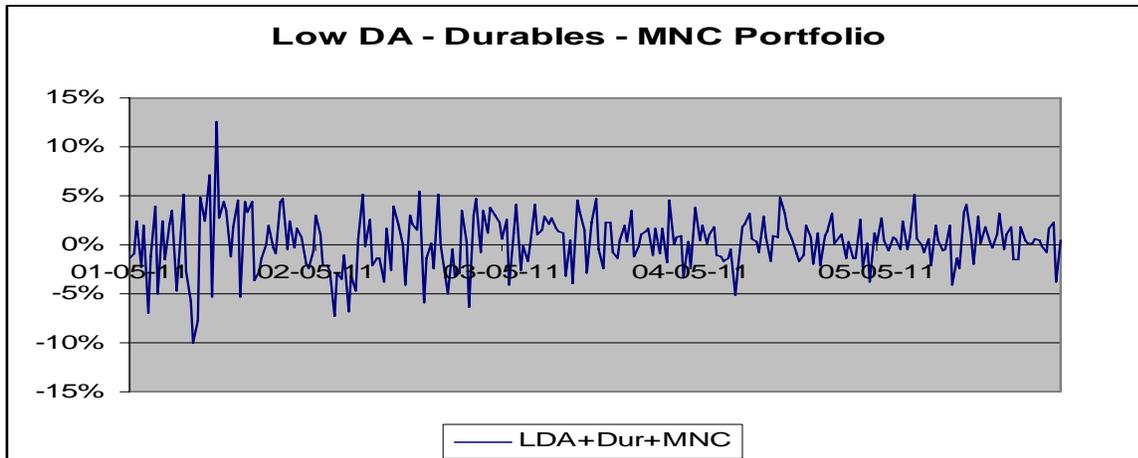
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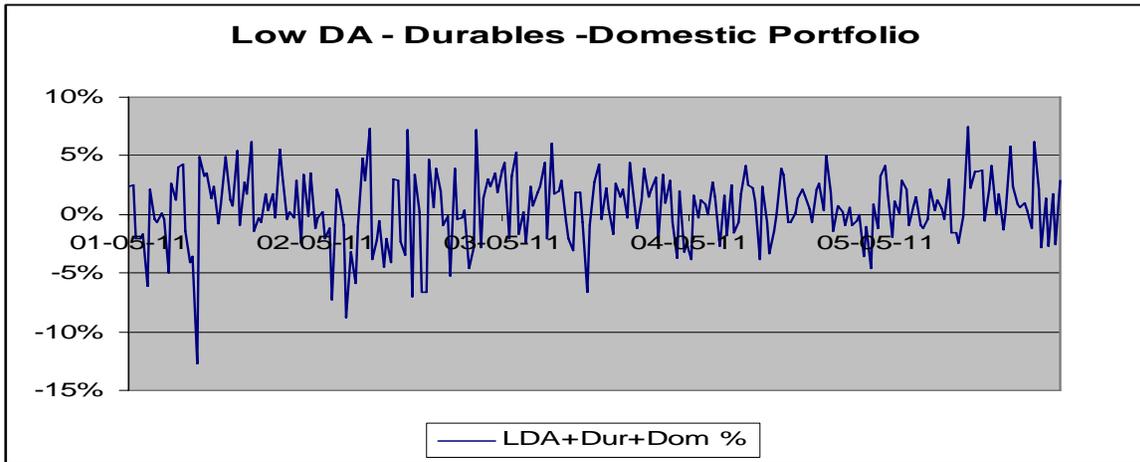


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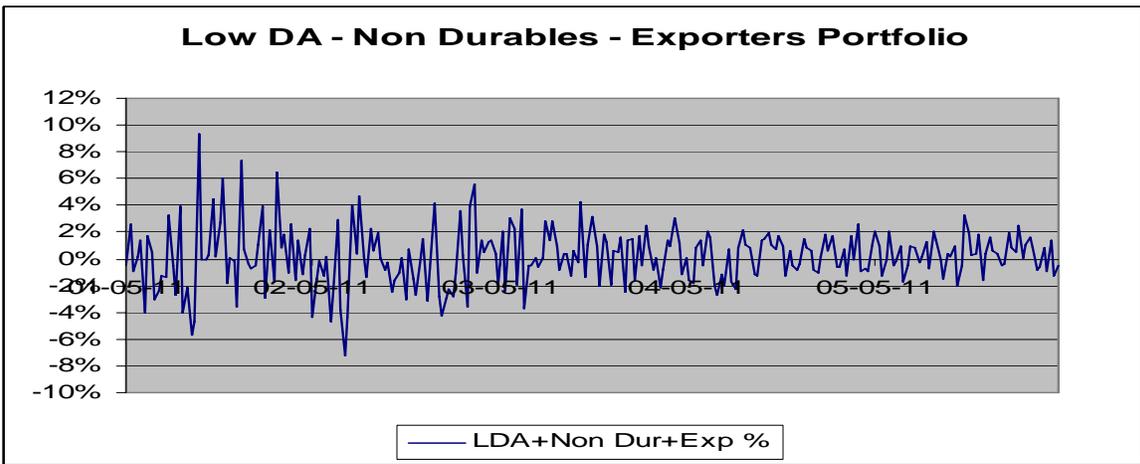


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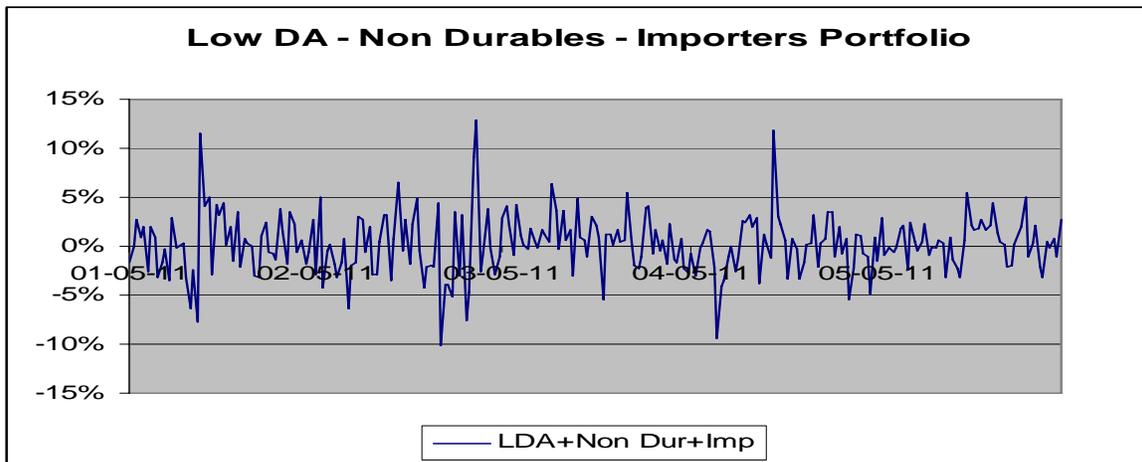
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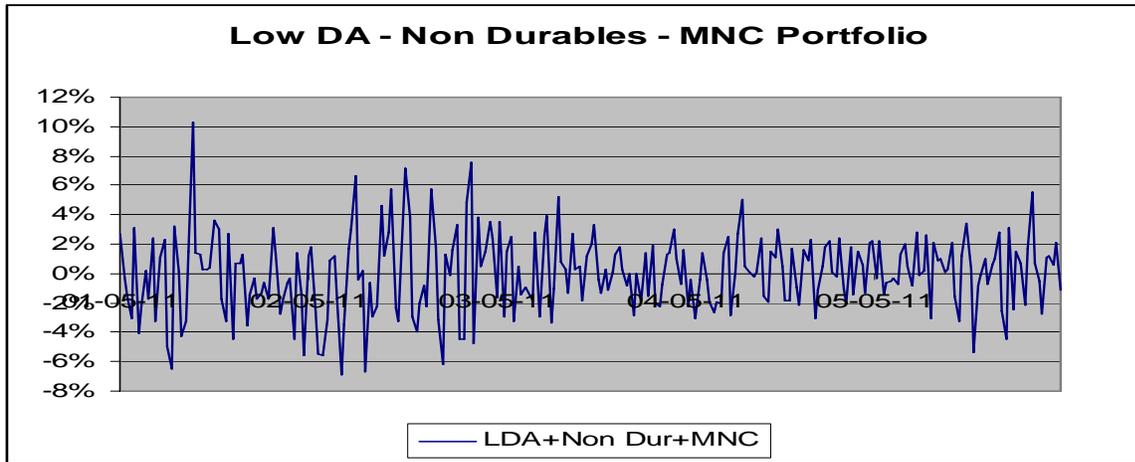


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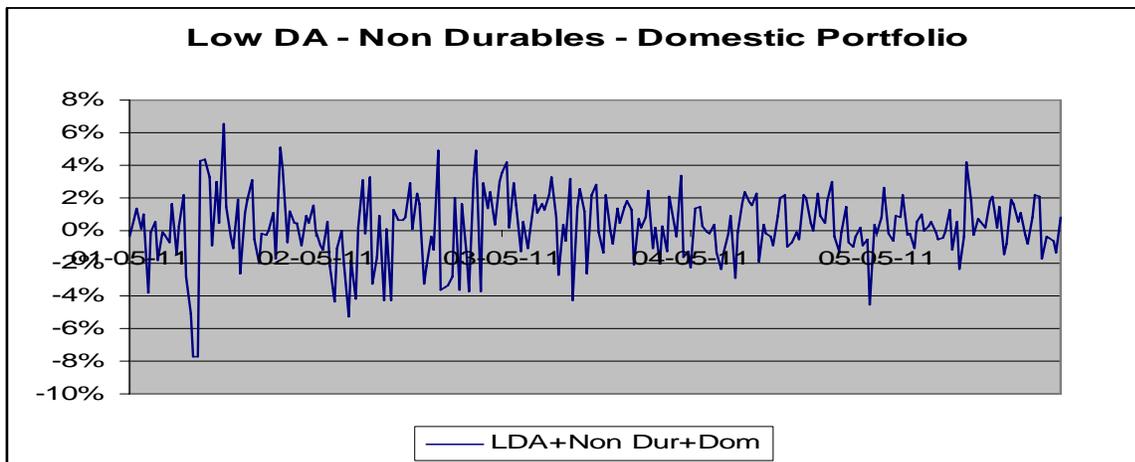


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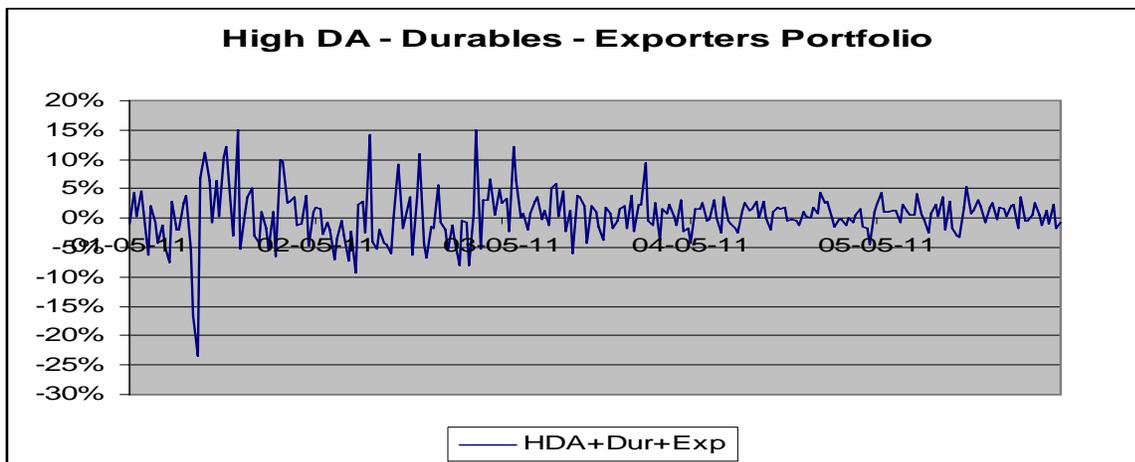
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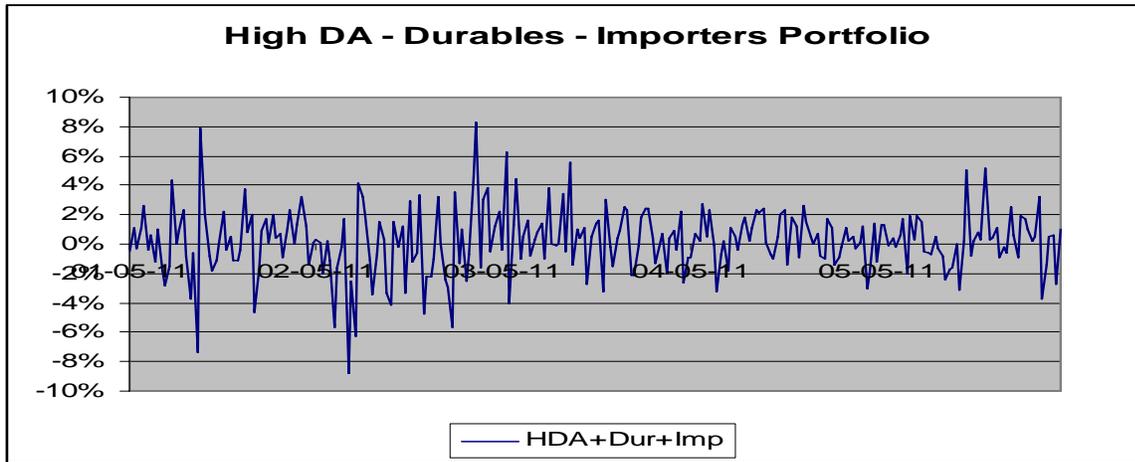


i)

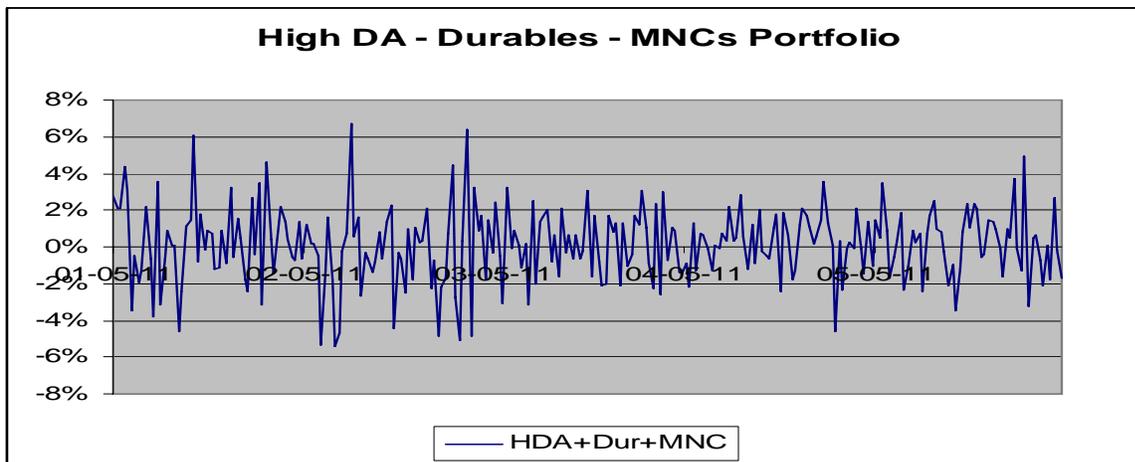


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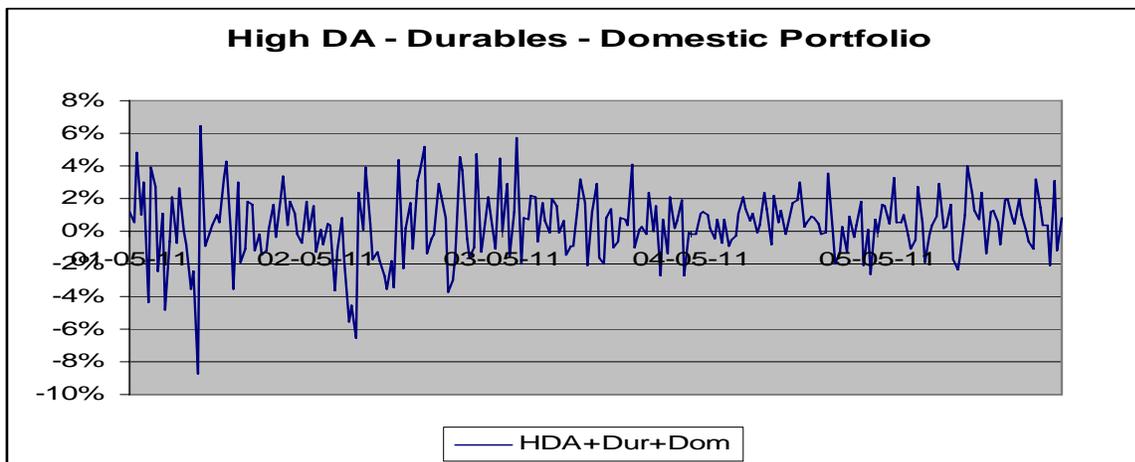
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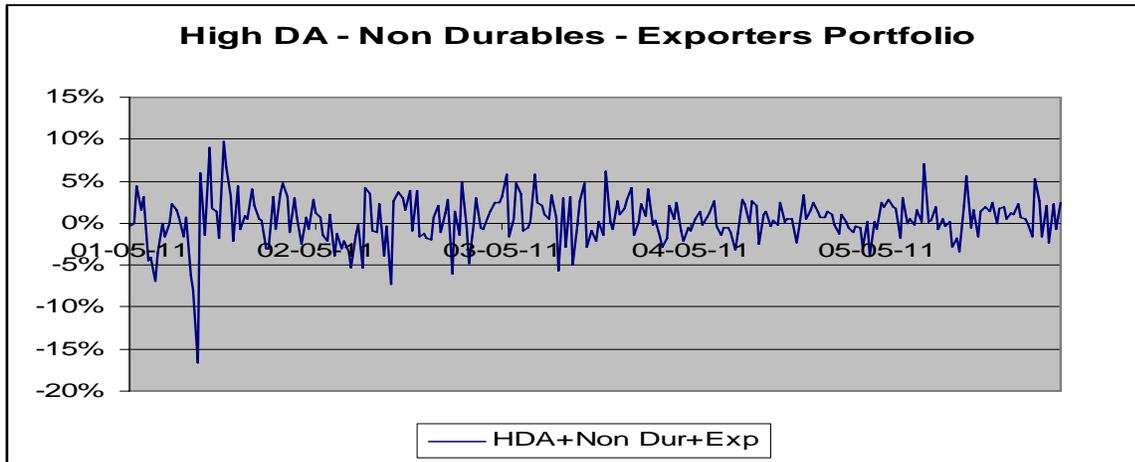
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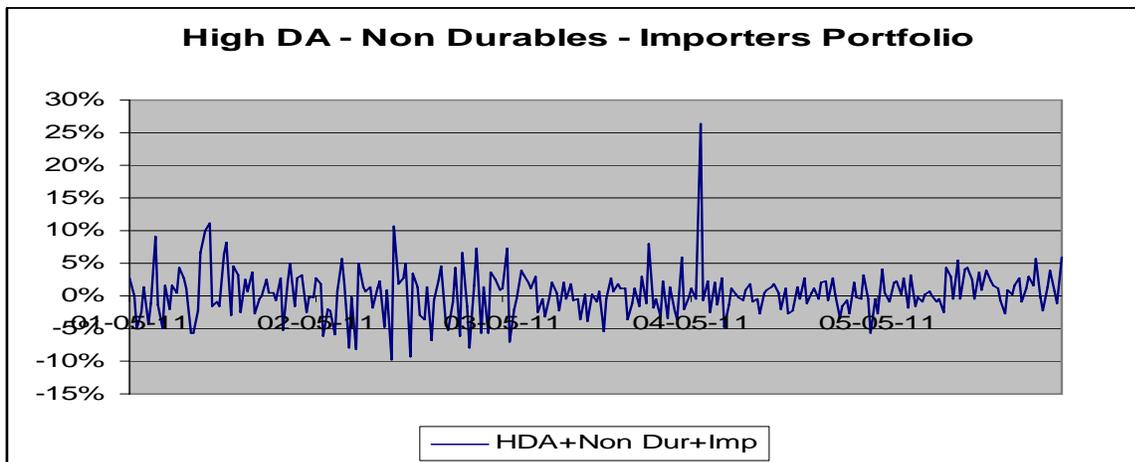
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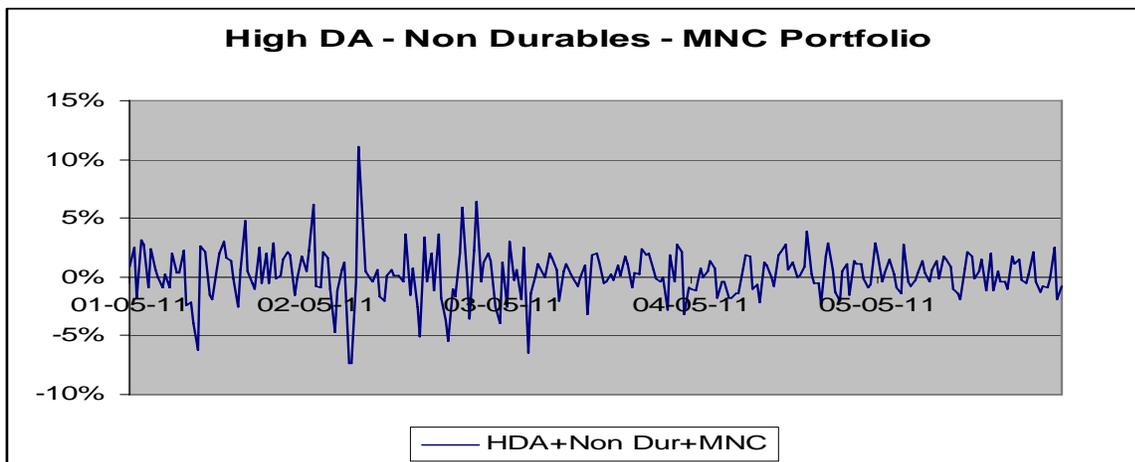
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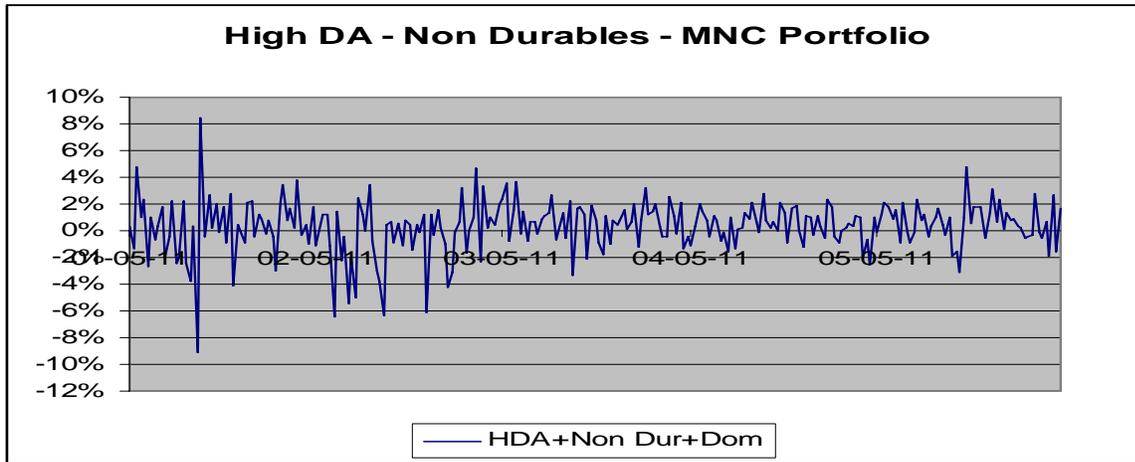
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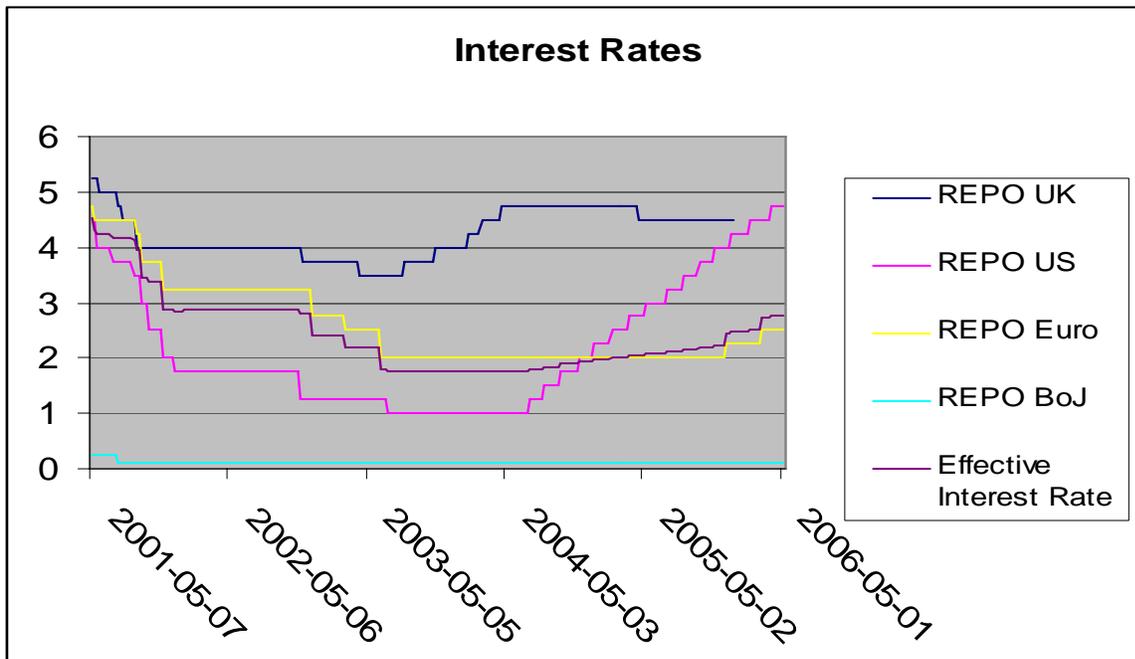
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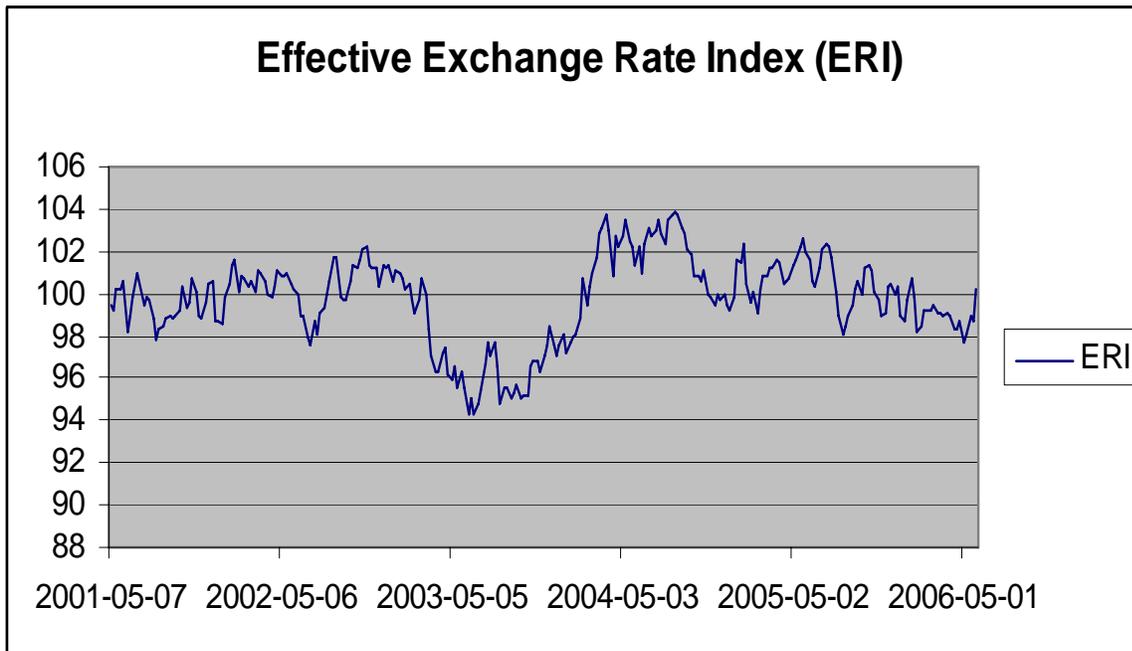


Appendix 3: Interest Rate Comparison

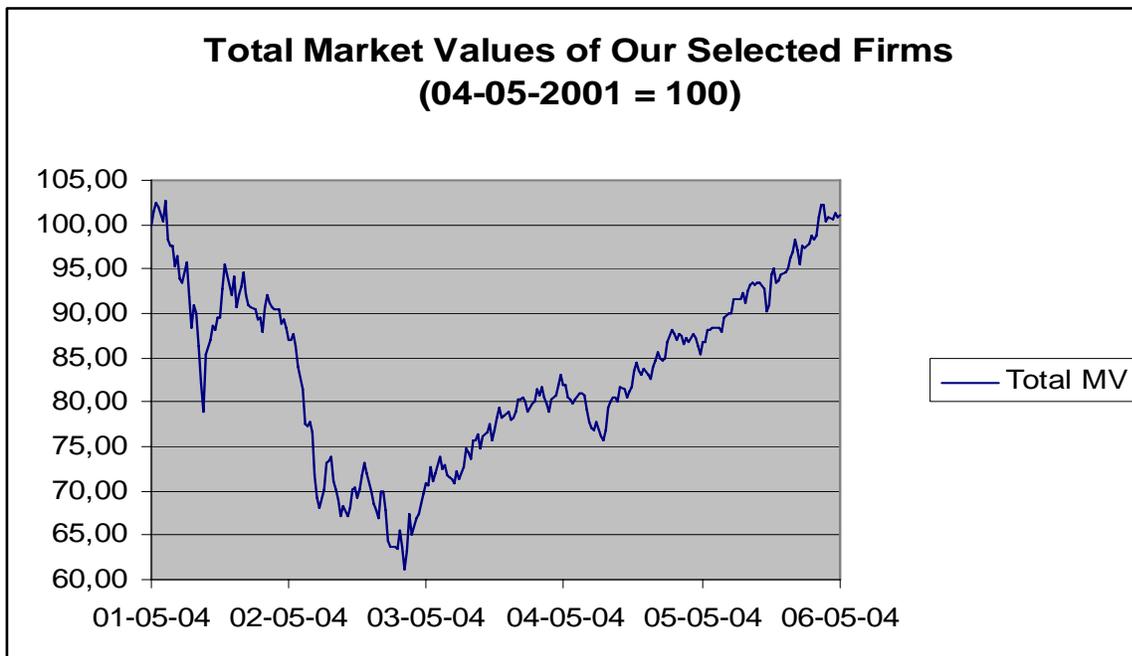


This diagram presents the different interest rates and our computed Effective Interest Rate in comparison to each other.

Appendix 4: The Effective Exchange Rate Index



Appendix 5: Total Market Values of Our Selected Firms.



All market values of our selected firms have been added together each week to form the total market values during the 5 years.