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Examining Exchange Rate Exposure, Hedging and Executive Compensation in US
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In

Financial Economics

by

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Abstract

In essay one, my primary objective is to see the sensitivity of foreign exchange rate risk on firm performance in US manufacturing industry and examine if the hedging help reduce the foreign exchange rate risk. I am particularly interested in manufacturing industry because of the nature of business operation of manufacturing firms. Manufacturing firms in US are not only exposed to foreign exchange fluctuation from sales and revenue but also are exposed to foreign exchange rate risk for procurement, placement and investment. I find that the firms with extreme foreign exchange rate risk exposure exhibit lower daily return and firms with very low foreign exchange rate risk exhibit higher daily return using the portfolio approach. I also find that the firms that hedge has lower foreign exchange rate exposure compared to firms that don't hedge. The coefficient for hedge is negative and statistically significant.

In essay two, I investigate the effect of executive compensation on exchange rate risk in US manufacturing industry. There is a large theoretical and empirical interest on executive compensation using agency framework that investigates the conflict of interest between shareholders and corporate executives. That interest has been largely aligned with the use of managerial performance dependent on observable measures of firm performance. Since US manufacturing firm is largely exposed to foreign exchange transactions by design, I investigate if the value of in-the-money unexercised vested executive stock option has any impact on foreign exchange rate exposure. I investigate if the value of in-the-money unexercised unvested executive stock option has any impact on executive stock option. Using pooled OLS, fixed effect panel data and random effect panel data, I find that in all 3 model value of in-the-money unexercised vested executive stock option has negative coefficient and is statistically significant.

At the same time in all 3 models the value of in-the-money unexercised unvested executive stock option is positive and is statistically significant.

Exchange Rate, Manufacturing Industry, Hedge, Executive Compensation, Daily Return, Risk Management, Exposure

Chapter 1

Exchange Rate Sensitivity and Effectiveness of Hedging in US Manufacturing Industry

1.0 Introduction

A firm maximizes shareholders wealth by taking calculated risks in various areas directly related to its business. Other risks arise in the process of doing business for which no single firm enjoys any unique competitive advantage. The foreign exchange rate risk is an example of the second category. In the age of globalized competition firms continuously strive for competitive advantage in every stage of business. For manufacturing firms, this involves decisions from finding raw materials from overseas to export finished good to overseas market. This competitive advantage can be stymied by the exchange rate swings in the opposite direction, incentivizing firms to manage this risk.

Take the example of a US car manufacturer that imports majority of the raw materials from overseas due to cost advantage and, exports a huge amount of finished product (i.e. cars) abroad. Now if the US dollar appreciates against major currencies or the currency of the concerned trading partner, from the cost point of view the car manufacturer has a gain because the cost of raw materials will be reduced, at the same time it will hurt the car manufacturer in the export market since the manufacturer's car will be more expensive than cars manufactured in other countries. Conversely if the US dollar depreciates against major currencies or the currency of the concerned trading partner, then raw materials will become expensive but from the export point of

view the car manufacturer will gain a huge advantage since his/her cars will be cheaper than cars from competing car manufacturers belonging to other countries.

According to Bartram (2008) degree of risk is a function of two variables- volatility of exchange rates and amount of exposure. Thus foreign exchange risk affects a firm's accounting as well as market performance. Forbes (2002) examines how major depreciation affects firm performance. Forbes (2002) use 13,500 companies from around the world and find that year after depreciations firms have significantly higher growth in market capitalization, but significantly lower growth in net income. Forbes (2002) also finds that firms with greater foreign sales exposure have significantly better performance after depreciation. Kolari, Moorman and Sorescu (2008) found that the portfolios with the extreme exchange rate risk has significantly lower return compared to the portfolios that are not exposed to extreme exchange rate risk. Here extreme exchange rate risk as defined by Kolari, Moorman and Sorescu (2008) as "vulnerability of operating income when exchange rate either appreciate or depreciate significantly".

Corporate managers are, therefore, incentivized to actively manage exchange rate exposure via effective hedging. Wallace (2008) found that a modern risk management program is sustained over a period of time with the objective of raising the awareness level of key risks in the business, proactively mitigating significant risks, incorporating risk management into capital allocation decisions and strong controls and meaningful reporting. Wallace (2008) pointed out few common mistakes by multinational companies when it comes to foreign exchange hedging: First, substantial and pervasive foreign exchange risk denial; second, the belief that foreign exchange rate changes even out over time, causing companies to underestimate foreign exchange rate exposure; third, assuming that derivatives are the best way to manage foreign exchange exposure; fourth, limited reporting; fifth, no foreign exchange performance analysis of

hedging; sixth, refusing to use options because they are "too expensive"; and seventh, obsession on whether derivatives makes money.

Managing foreign exchange exposure involves taking the appropriate measures to eliminate or hedge against the risk. To hedge a foreign exchange exposure, one takes an equal and opposite position from that of the exposure. For example, if a firm has a long position in US dollar, it would have to take an offsetting short position to hedge their exposure. One who is long in a market is betting on an increase in the value of the thing, whereas with a short position they are betting on a fall in its value. Executives can choose to not hedge, selectively hedge or systematically hedge as part of risk management. Executives can take natural position which is a situation where company's operations are covered against foreign exchange risk. Executives can also choose foreign exchange forward, futures or swaps, as well as foreign exchange call or put options. Each method has its pros and cons.

To illustrate process of hedging let's take a look at a simple example. A US manufacturing company has a division that operates in Mexico. At the end of June the parent company anticipates that the foreign division will have profits of 4 million Mexican pesos (P) to repatriate. The parent company has a foreign exchange exposure, as the dollar value of the profits will rise and fall with changes in the exchange value between the P and the dollar. The firm is long the peso, so to hedge its exposure it will go short [sell P] in the futures market. The face amount of each peso future contract is P500,000, so the firm will go short 8 contracts. If the peso depreciates, the dollar value of its Mexican division's profits falls, but the futures account generates profits, at least partially offsetting the loss. The opposite holds for an appreciation of the peso. An increase in the value of the peso increases the dollar value of the underlying long

position and decreases the value of the futures position. A decrease in the value of the peso decreases the value of the underlying position and increases the value of the futures position

I use the FASB required income statement item called after-tax amount of unrealized gain/loss on derivative transactions or cash flow hedges and "gains and loss from imperfect hedging" - which is the amount of gain or loss on a hedge transaction that exceeds the risk faced by the company, to find out whether imperfect hedging is causing foreign exchange exposure.

This research will contribute to the existing literature on foreign exchange rate risk and hedging. I do a comprehensive study on manufacturing industry in US using daily return for all the firms that existed from 1992 to 2012 and capture the foreign exchange rate exposure for all firms as well as for all firms in each year. I use the portfolio approach to find the sensitivity of foreign exchange rate exposure on daily return for the portfolio. The findings will be helpful in understanding international financial management for US manufacturing firms.

All previous research related to hedging is primarily based on survey data. The main reason for that is hedge data was not reported by firms clearly until recently when FASB (Financial Accounting Standard Board) required all firms to report accounting for derivative instrument and hedge activities through SFAS No. 133. Compustat reports on hedge related yearly data is available through 2006. I use income statement data called after tax unrealized gain/loss on derivative transaction and cash flow hedges and look at the break down to determine if a firm hedged in a particular year. To best of my knowledge use of accounting data to determine whether a firm hedged or not hasn't been done previously. Consequently this research will open door for future research on hedging without the use of survey data.

The intuition of risk management implies that imperfect or not hedging will cause bigger exchange rate exposure. On the other hand firms that are hedging will have very little foreign exchange exposure. The finding of this study is consistent with this intuition. I find that firms that hedge has lower foreign exchange rate exposure compared to the foreign exchange rate exposure of the firms that do not hedge.

2.0 Literature Review

2.1 Literature related to firm performance and exchange rate risk

Dominguez and Tesar (2006) examine the relationship between exchange rate movement and firm value, and find that for a significant fraction of firm, the exchange rate movement is a factor and the direction of exposure depends on the specific exchange rate and varies over time. Dominguez and Tesar (2006) use Data stream OECD data between 1980 to 1999 period that include 300 firms each for 8 countries including Chile, France, Germany, Italy, Japan, The Netherlands, Thailand and United Kingdom.

Hirshleifer, Hou and Teoh (2009) examines whether the firm-level accrual and cash flow effects extend to the aggregate stock market .In sharp contrast to previous firm-level findings, aggregate accruals is a strong positive time series predictor of aggregate stock returns, and cash flows is a negative predictor. In addition, Hirshleifer, Hou and Teoh (2009) finds innovations in accruals are negatively contemporaneously correlated with aggregate returns , and innovations in cash flows are positively correlated with returns. These findings suggest that innovations in accruals and cash flows contain information about changes in discount rates, or that firms manage earnings in response to market wide undervaluation. Hirshleifer, Hou and Teoh (2009) use the

value-weighted portfolio of the subsample of CRSP firms that have sufficient accounting information to calculate operating accruals and cash flows (SAMPLERET).

Santos and Veronesi (2010) explores Non-linear external habit persistence models, which feature prominently in the recent ''equity premium'' asset pricing and macroeconomics literature, generate counter factual predictions in the cross- section of stock returns. Santos and Veronesi 2010 show that in the absence of cross-sectional heterogeneity in firms' cash-flow risk, these models produce a ''growth premium,'' that is, stocks with high price-to-fundamental ratios command a higher premium than stocks with low price-to-fundamental ratios. Santos and Veronesi (2010) simulate 10 years of quarterly data of 200 firms that then sort into 10 portfolios according to price-dividend ratio.

HE and NG (1998) examine the exchange rate exposure of Japanese Multinational Corporations. HE and NG (1998) find that about 25% of 171 Japanese firms are having positive exchange rate exposure. HE and NG (1998) find that highly leveraged firms with low liquidity have low exposure and it increase with firm size.

Jorin (1990) examines the exposure of U.S. multinationals to foreign currency risk. Jorin (1990) presents evidence that the relationship between stock returns and exchange rates differs systematically across multinationals. Jorin (1990) focuses on the determinants of exchange- rate exposure. Jorin (1990) finds that he comovement between stock returns and the value of the dollar is positively related to the percentage of foreign operations of U.S. multinationals.

Patro, Wald and Wu (2002) estimate a time-varying two-factor international asset pricing model for weekly equity index returns of 16 OECD countries. A trade-weighted basket of exchange rates and the MSCI world market index are used as risk factors. Patro, Wald and Wu (2002) find

significant currency risk exposures in country equity index returns. Patro, Wald and Wu (2002) explain these currency betas using several country-specific macroeconomic variables with a panel approach. Patro, Wald and Wu (2002) find that imports, exports, credit ratings, and tax revenues significantly affect currency risks in a way that is consistent with some economic hypotheses. Patro, Wald and Wu (2002) draws similar conclusion by using lagged explanatory variables, and thus these macroeconomic variables may be useful as predictors of currency risk exposures.

Forbes (2002) examines how major depreciation affects firm performance. Forbes (2002) use 13,500 companies from around the world and find that year after depreciations firms have significantly higher growth in market capitalization, but significantly lower growth in net income. Forbes (2002) also finds that firms with greater foreign sales exposure have significantly better performance after depreciation. Forbes (2002) use performance as a dependent variable and depreciation as a dummy independent variable, inflation as an independent variable and period as a vector dummy variable.

Friberg ang Ganslandt (2007) look into the impact of exchange rate change on cash flow. Friberg ang Ganslandt (2007) use a simulation method using Monte Carlo approach and find that different brands face different exchange rate risk. Friberg ang Ganslandt (2007) use the market of bottled water in Sweeden and examine the data to look at points in the distribution of median profits. Friberg ang Ganslandt (2007) use historical Cash flows to generate a large pool of forecast errors on cash flows. Friberg ang Ganslandt (2007) find profound impact of exchange rate on competitive position and profitability of many firms.

Bartram (2007) estimates the foreign exchange rate exposure of 6917 U.S. nonfinancial firms on the basis of stock prices and corporate cash flows. Bartram (2007) shows that several firms are significantly exposed to at least one of the foreign exchange rates including Canadian Dollar, Japanese Yen and Euro, and significant exposures are more frequent at longer horizons. The percentage of firms for which stock price and earnings exposures are significantly different is relatively low, though it increases with time horizon. Overall, the impact of exchange rate risk on stock prices and cash flows is similar and determined by a related set of economic factors.

Hsin, Shiah-Hou and Chang (2007) investigates the absence of prevailing evidence on the significant exposure of US stocks to exchange rate risk by considering a firm's pre-hedging currency exposure, its expected hedging activity and the delayed reaction of its stocks to currency movements. Hsin, Shiah-Hou and Chang (2007) demonstrate the importance of lagged exposure relative to contemporaneous exposure and include the lagged effect in the exposure measurement that fails to raise the significance of the exchange rate risk with regard to the pricing for the overall sample of stocks. Hsin, Shiah-Hou and Chang (2007) demonstrate that the weak evidence on priced currency risk is at least partly attributable to hedging activity, particularly for large firms. Hsin, Shiah-Hou and Chang (2007) provide support for the asymmetric hedging hypothesis, in that asymmetric hedging is found to be responsible for reshaping the relationship between a firm's characteristics and its currency exposure.

Bartram (2008) presents results from an in-depth analysis of the foreign exchange rate exposure of a large nonfinancial firm based on proprietary internal data including cash flows, derivatives and foreign currency debt, as well as external capital market data. While the operations of the multinational firm have significant exposure to foreign exchange rate risk due to foreign currency-based activities and international competition, corporate hedging mitigates this gross

exposure. Bartram (2008) illustrates that the insignificance of foreign exchange rate exposures of comprehensive performance measures such as total cash flow can be explained by hedging at the firm level. Bartram (2008) finds that the residual net exposure is economically and statistically small, even if the operating cash flows of the firm are significantly exposed to exchange rate risk. Bartram (2008) suggest that managers of nonfinancial firms with operations exposed to foreign exchange rate risk take savvy actions to reduce exposure to a level too low to allow its detection empirically.

Irvine and Pontiff (2008) find that idiosyncratic return volatility has dramatically increased and is mirrored by volatility of fundamental cash flow. Irvine and Pontiff (2008) use various cross-section and time-series test to support the idea. Irvine and Pontiff (2008) use data from CRSP/Compustat merged database. Irvine and Pontiff (2008) use quarterly data that has sales, depreciation and amortization, end-of-quarter stock price, number of common shares used to calculate earnings per share, and earnings per shsre excluding extraordinary items. Irvine and Pontiff (2008) examines cash flow volatility using three different measures, i) earning per share, ii) cah flow per share – calculated as adding depreciation per share to earning, and iii) Sales per share. Irvine and Pontiff (2008) also control for documented persistence in cash flow.

Muller and Verschoor (2009) examine the relationship between financial crisis exchange rate variability and equity return volatility for US multinationals. Muller and Verschoor (2009) performs empirical analysis of the major financial crises of the last decades that reveals the stock return variability increases significantly in the aftermath of a crisis, even relative to the increase in stock return volatility for other firms belonging to the same industry and market capitalization class. Muller and Verschoor (2009) also find that in conjunction with this increase in total volatility, there is also an increase in stock market risk for multinational firms. Muller and

Verschoor (2009) suggest that trade and service oriented industries appear to be particularly sensitive to these changing exchange rate conditions.

Huffman, Makar and Beyer (2010) investigate the likelihood of extreme foreign exchange-rate exposure, conditioning upon key firm factors and an expanded view of hedging. Huffman, Makar and Beyer (2010) incorporate the Fama and French (1993) three-factor (FF three-factor) model terms in reconciling equity returns and exchange-rate exposure Huffman, Makar and Beyer (2010) suggest that consistent with effective hedging, non-hedging firms tend to have greater foreign exchange-rate exposure than hedging firms. Huffman, Makar and Beyer (2010) also find all key factors that explain the likelihood of high foreign exchange-rate exposure are economically and statistically significant using the more complete FF three-factor model. Huffman, Makar and Beyer (2010) conclude that firm size is important in explaining foreign exchange-rate exposure and more foreign exchange-rate exposure coefficients that are significant using the FF three-factor model compared to the traditional market model.

Bali and Wu (2010) investigates the significance of an inter temporal relation between expected returns on countries' stock market portfolios and their risk exposures to the world market portfolio. Bali and Wu (2010) find that inter temporal risk–return relation differs significantly under different currency denominations. Bali and Wu (2010) find that the slope coefficient is the largest at around seven when the returns are denominated in Japanese yen, moderate at about five when the returns are denominated in the Canadian or US dollars, and the smallest at around three when the returns are denominated in pound or euro and its predecessors. Bali and Wu (2010) find the ranking of the risk–return coefficients across different currency denominations remains the same when the study replace country equity indices with global industry portfolios in estimating the inter temporal relations, when Bali and Wu (2010) change the return frequency

from monthly to daily, and when Bali and Wu (2010) consider different specifications for the conditional covariance process.

Williamson (2000) examines the effect of real exchange rate changes on multinational firms and incorporates the effect of intra-industry competition on the relation between exchange rates and firm value. Williamson (2000) conducts tests using a sample of automotive firms from the United States and Japan. Consistent with theoretical predictions, Williamson (2000) finds that there is significant exposure to exchange rate shocks. Moreover, Williamson (2000) find evidence of time-variation in exchange rate exposure, which is consistent with changes in the competitive environment within the industry. Williamson (2000) presents evidence that is consistent with foreign sales being a major determinant of exposure and the effectiveness of operational hedging through foreign production.

Friberg and Ganslandt (2007) extend a simulation method developed in industrial organization to answer how exchange rate exposure impact firm's cash flow. Friberg and Ganslandt (2007) use prices, quantities, and product characteristics for differentiated products, coupled with a discrete choice framework and an assumption of price competition, to estimate marginal costs for all producers. Friberg and Ganslandt (2007) Use a Monte Carlo approach and generate counterfactual prices and profits for different levels of exchange rates. Friberg and Ganslandt 2007 illustrate the method using the market for bottled water. Friberg and Ganslandt (2007) find that even in a relatively simple market such as this one, different brands face very different exchange rate risks.

2.2 Literature related to hedging

Wilosn and Rasch (1998) find that as financial market players have become more competent in identifying and evaluating financial risks, their risk management tools have become more creative. FASB has been hard-pressed to keep pace with the rapid development of these new products, resulting in a somewhat piecemeal, and often internally inconsistent, set of rules to account for these instruments. Wilosn and Rasch (1998) argues that FASB began deliberating issues related to derivatives and hedging activities in January 1992. Because of the urgency for improved financial information about derivatives and related activities, FASB decided to redirect some of its efforts toward enhanced disclosures. In October 1994, FASB issued SFAS No. 119, Disclosure about Derivative Financial Instruments and Fair Value of Financial Instruments, as an interim step. In June 1998, SFAS No. 133, Accounting for Derivative Instruments and Hedging Activities, was issued. It deals with recognition and measurement and provides comprehensive guidance for all derivatives--even those instruments yet to be developed. Although not a perfect solution, the new approach of SFAS No.133 addresses many of the problems with previous accounting. According to Wilosn and Rasch (1998) it reduced Inconsistency. SFAS No. 52, Foreign Currency Translation, assessed risk on a transaction basis, while SFAS No. 80, Accounting for Futures Contracts, required the risk condition to be assessed on an enterprise level. An action taken to reduce the risk of an individual item could simultaneously increase risk exposure of the enterprise as a whole. SFAS No. 80 allowed hedge accounting for both firm commitments and forecasted transactions, while SFAS No. 52 allowed only firm commitments to be hedged.

January 1997, the Securities and Exchange Commission (SEC) issued Financial Reporting Release No. 48 (hereafter "FRR 48"), which, effective for all firms for fiscal year ending after

June 15, 1998, expands disclosure requirements for market risk.8 Under FRR 48, firms are required to present quantitative information about market risk in one of the three formats, namely. Tabular, sensitivity analysis, or Value-at-Risk - Under this method, instruments should be classified by the following characteristics: (1) fixed or variable rate assets or liabilities; (2) long or short forwards or futures, including those with physical delivery; (3) written or purchased put or call options with similar strike prices; and, (4) receive fixed or variable swaps. FRR 48 requires disclosures of contract amounts and weighted average settlement prices for forwards and futures, weighted average pay and receive rates and/or prices for swaps, and contract amounts and weighted average strike prices for options.

Aretz, Bartram and Dufey(2007) find that when there are imperfections in capital markets, corporate hedging can enhance shareholder value through its impact on agency costs, costly external financing, direct and indirect costs of bankruptcy, as well as taxes. Aretz, Bartram and Dufey(2007) also find that corporate hedging can alleviate underinvestment and asset substitution problems by reducing the volatility of cash flows, and it can accommodate the risk aversion of undiversified managers and increase the effectiveness of managerial incentive structures through eliminating unsystematic risk. Aretz, Bartram and Dufey(2007) show that lower volatility of cash flows also leads to lower bankruptcy costs and corporate hedging can also align the availability of internal resources with the need for investment funds, helping firms to avoid costly external financing. Aretz, Bartram and Dufey(2007) also find that corporate risk management can reduce the corporate tax burden in the presence of convex tax schedules. Aretz, Bartram and Dufey(2007) find empirical support for rationales of hedging at the firm level.

Campbell and Viceira(2010) finds that for the period 1975 to 2005, the U.S. dollar, the euro, and the Swiss franc moved against world equity markets. Campbell and Viceira(2010) argues that the

risk-minimizing currency strategy for a global bond investor is close to a full currency hedge, with a modest long position in the U.S. dollar. Campbell and Viceira(2010) finds little evidence that risk minimizing investors should adjust their currency positions in response to movements in interest differentials.

Adam, Chitru and Fernando (2005) document that gold mining firms have consistently realized economically significant cash flow gains from their derivatives transactions. Adam, Chitru and Fernando (2005) conclude that these cash flows have increased shareholder value since there is no evidence of an offsetting adjustment in firms' systematic risk. Adam, Chitru and Fernando (2005) finding contradicts a central assumption in the risk management literature that derivatives transactions have zero net present value, and highlights an important motive for firms to use derivatives that the literature has hitherto ignored. Adam, Chitru and Fernando (2005)e find considerable evidence of selective hedging in our sample, the cash flow gains from selective hedging appear to be small at best. Adam, Chitru and Fernando (2005) use hedge ratio based on survey data on 244 fortune 500 firms.

Jin and Jorion(2006) studies the hedging activities of 119 U.S. oil and gas producers from 1998 to 2001 and evaluates their effect on firm value. Theories of hedging based on market imperfections imply that hedging should increase the firm's market value. To test this hypothesis, Jin and Jorion(2006) collect detailed information on the extent of hedging and on the valuation of oil and gas reserves. Jin and Jorion(2006) find that hedging reduces the firm's stock price sensitivity to oil and gas prices. Contrary to previous studies, however, Jin and Jorion(2006) find that hedging does not seem to affect market values for this industry. Jin and Jorion(2006) obtain hedging information from 1998 to 2001 annual reports.

Liu and Parlour (2009) consider firms that wish to minimize variability in their internal capital. The firms can hedge the cash flow risk of the project, but not that of winning or losing the auction. Liu and Parlour (2009) characterize optimal hedging and bidding strategies in this competition frame work. Liu and Parlour (2009) show that access to financial markets makes firms bid more aggressively, possibly even above their valuation for the project. Liu and Parlour (2009) find that hedging increases the variance of bids and makes firm values more dispersed.

Mian (1996) provides empirical evidence on the determinants of corporate hedging decisions. Mian (1996) examines the evidence in light of currently mandated financial reporting requirements and, in particular, the constraints placed on anticipatory hedging. Mian (1996) obtains hedging data from 1992 annual reports for a sample of 3,022 firms. Mian (1996) finds that out of the 771 firms classified as hedgers, 543 firms disclose information in their annual reports on their hedging activities; the remaining 228 firms report use of derivatives but no information on hedging activities. Based on the evidence, Mian (1996) finds that evidence is inconsistent with financial distress cost models; evidence is mixed with respect to contracting cost, capital market imperfections, and tax-based models; and evidence uniformly supports the hypothesis that hedging activities exhibit economies of scale.

Perfect and Howton (2000) examines whether the design of managerial compensation contracts affects a firm's hedging policy. Perfect and Howton (2000) use a recently developed empirical methodology to quantify the sensitivity of a firm's value to the interaction of its internal funds and the price changes in exogenous hedge able risks. Perfect and Howton (2000) use this approach as it permits an examination of the relation between managerial compensation and corporate hedging activities. Perfect and Howton (2000) suggest that differences in the risk

exposure of the sample firms is related to the levels of stock options and deferred compensation used by the firms.

3.0 Foreign Exchange Rate Exposure – Portfolio Approach

3.1 Methodology

In this study, first I capture the exchange rate exposure of manufacturing firms in US. Then I rank the firms based on foreign exchange exposure. After ranking the firms I create 25 portfolios following Vassalou (2000) and Kolari, Moorman and Sorescu (2008) and try to see the relationship between the exchange rate exposure and daily return using portfolio approach

Looking into the work of Dumas (1983), subsequent empirical work by Jorion (1990), Bodnar and Marston (2002) and Kolari, Moorman and Sorescu (2008), I measures foreign exchange rate exposure for each firm by regressing its daily stock return variables (R_{jt}). FXR_t captures the return on the US dollar per currency basket. The main approach is based on Fama-French-Carhart (1997):

$$R_{jt} = \alpha_j + \beta_{1j}(MKTRF_t) + \beta_{2j}SMB_t + \beta_{3j}HML_t + \beta_{4j}UMD_t + \beta_{5j}FXR_t + \varepsilon_{jt} \quad \ldots\ldots\ldots\ldots(1)$$

Where, R_{jt} = Daily stock return for j firm in t time, $MKTFR_t$ = Daily market return minus risk free return in t time, SMB_t = Daily return on portfolio of small stock minus the return on portfolio of large US stock in time t. HML_t = Daily return on portfolio of high book to market stocks minus the return on portfolio of low book to market US stock in time t. UMD_t = Daily return on portfolio of past winner stocks minus past loser stocks in time t. FXR_t = Daily Change in Federal Reserve's Trade weighted currency (Broad Currency) Index return in time t.

Following Kolari, Moorman and Sorescu (2008) I also check the consistency with

$$R_{jt} = \alpha_j + \beta_{5j}\, FXR_t + \varepsilon_{jt} \qquad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..(2)$$

Then I capture the coefficient of foreign exchange index return for all firms and rank them from low to high coefficient. I then create 25 portfolio of firms based on the first to last portfolio. The first portfolio will have the extreme negative foreign exchange rate exposure and the last portfolio will have the extreme positive foreign exchange exposure. The portfolios in the middle will have lower foreign exchange rate exposure. I perform regression for each portfolio separately using equation (1) and capture portfolio foreign exchange rate exposure and calculate portfolio return. Then I graph the portfolio return and portfolio foreign exchange rate exposure so see the pattern.

3.2 Data description and foreign exchange risk exposure

The sources of data in this study are the Center for Research in Security Prices (CRSP), Federal Reserve Bank Reports and Fama-French Portfolios and Factors. From Center for Research in Security Prices (CRSP), I use CRSP/Compustat Merged Database - Security Daily and find daily closing price and calculate the return from it. Initial data set has 12,665,108 observations from January 1, 1992 to December 31, 2011. During this period I have 5,041 working days. I choose the firms having Sic code between 2000 and 4000 that represents manufacturing firms. The initial data set has 6,117 firms.

I obtain Fama-French factor daily frequency for the time period of January 1, 1992 to December 31, 2011 from WRDS. I obtain SMB (Small Minus Big) that is the average return on the three small portfolios minus the average return on the three big portfolios, SMB = 1/3 (Small Value + Small Neutral + Small Growth) - 1/3 (Big Value + Big Neutral + Big Growth). SMB for July of year t to June of t+1 include all NYSE, AMEX, and NASDAQ stocks for which market equity

data for December of t-1 and June of t, and (positive) book equity data for t-1, exists. I have 5,041 observations for the study and denote it as SMB. I also obtain HML (High Minus Low) that is the average return on the two value portfolios minus the average return on the two growth portfolios, HML = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth). HML for July of year t to June of t+1 include all NYSE, AMEX, and NASDAQ stocks for which market equity data for December of t-1 and June of t, and (positive) book equity data for t-1, exist. I also obtain UMD (up minus down) Momentum (Up Minus Down as defined by Fama French). I also obtain MKTRF (or Rm-Rf) that is the excess return on the market. It is calculated as the value-weight return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month Treasury bill rate. I also get the UMD which calculated the momentum.

[Insert Table 1]

Table 1 provides summary statistics for SMB, HML, UMD and Market return minus risk free return. During the sample period SMB has a mean of .000042 with a maximum value of .04 and a minimum value of -.04. The standard deviation of the sample is 0.0053. During the sample period HML has a mean of .0000148 with a maximum value of .03 and a minimum value of -.04. The standard deviation of the sample is 0.0054. During the sample period UMD has a mean of .0003 with a maximum value of .07 and a minimum value of -.08. The standard deviation of the sample is 0.0077. During the sample period MKTRF has a mean of .00029 with a maximum value of .09 and a minimum value of -.09. The standard deviation of the sample is 0.0097.

The multilateral trade-weighted index of the foreign exchange value of the U.S. dollar against the currencies of the other countries in the Group of Ten (G-10), developed at the Federal Reserve Board in 1971, has played an important role in analysis of foreign influences on the U.S.

economy for more than twenty-five years. However, changes in international trading relationships and in the structure of international financial markets have led to increased interest in the currencies of U.S. trading partners outside the G-10 countries. The trade weighted currency index is that of the currencies of important U.S. trading partners. This group is the basis for the construction of what the staff terms the broad index of the dollar's foreign exchange value. The broad index includes thirty-five currencies until the beginning of Stage III of EMU on January 1, 1999. At that time, the euro will replace the ten euro-area currencies, and the broad index will have twenty-six currencies. Shares in U.S. trade largely determined the currency selection for the broad index. The currencies of all foreign countries or regions that had a share of U.S. non-oil imports or nonagricultural exports of at least 1⁄2 percent in 1997 are included in the broad indexes, as rankings of U.S. trading partners by share of U.S. trade in that year. The countries with currencies in the broad index are also important in global trade. The countries and regions whose currencies are included in the indexes generate more than 75 percent of the world's gross national product (outside the United States), measured on the basis of purchasing power parity. The list of currencies included in the broad index is re-evaluated annually when the currency weights are updated[1].

In this study I obtain the daily trade-weighted index and calculate the daily index return as

$FXR_t = (FX_t - FX_{t-1})/FX_{t-1}.$

Where, FXR_t = daily trade weighted index return, FX_t = trade weighted index in current time, FX_{t-1} = trade weighted index in pervious time. Table1 reports summary statistics for daily stock

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[1] Federal Reserve Bulletin October 1998

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return. During the sample period FXR_t has a mean of -.000023 with a maximum value of 0.02 and a minimum value of -0.04. The standard deviation of the sample is 0.004.

I use daily closing stock price from CRISP. The Data range from January 1, 1992 to December 31, 2011. I found 6,131 firms that have complete data set of up to 5,041 days. Out of that few firms have completely blank data so I drop those firms and final number of firm in this study is 6,117. The total number of observation in the study is 12,665,108. A return is the change in the total value of an investment in a common stock over some period of time per dollar of initial investment. RET(I) is the return for a sale on day I. It is based on a purchase on the most recent time previous to I when the security had a valid price. Usually, this time is I - 1. Returns are calculated as :For time t (a holding period), let: t = time of last available price < t, r(t) = return on purchase at t, sale at t, p(t) = last sale price or closing bid/ask average at time t, d(t) = cash adjustment for t, f(t) = price adjustment factor for t, p(t) = last sale price or closing bid/ask average at time of last available price < t. Then I subtract the daily risk free return and calculate the daily excess return.

[Insert table 2]

The raw data has few extreme values with a maximum return of 1595% and a minimum return of -97%. Such extreme values are outliers that can potentially affect the outcome. So I followed Huber (1981) and Ruymagaart (1981) method of dropping 500 extreme observation from top and bottom. By extreme I mean observations with ridiculously high or low daily return. I found few observations with over 1000% daily return or -90% daily returns. Those are definitely outliers. So I remove 500 very high return observations and 500 very low return observations. The final number of observation in the study stands at 12,664,108. Table 2 reports the year by year break

down of all firm return during the period of 1992 through 2011, with a grand average of .08% daily return. In the year of 2011, 2008 and 2002 the average return in negative in the other 17 years have positive return. The lowest return is observed in 2011 (-0.00051) and highest return is observed in the year 2009 (0.0032). I observe that number of firm increase every year from 1992 to 1997. In 1992 the number of manufacturing firm stood at 2769 and in 1997 the number reached 3510.Since 1997 every year the number dropped and in 2011 I have 1820 manufacturing firms. Using equation 1 I capture the coefficient of foreign exchange rate on yearly basis. I find that in year 1996, 2000, 2001,2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010 and 2011 the coefficient is negative and in 1992, 1993, 1994, 1995, 1997, 1998, 1999 and 2002 the coefficient is positive. The maximum value of foreign exchange rate exposure is 0.05877 and that took place in 1992, the lowest value of foreign exchange rate exposure took place in 2003 and the value is -0.00456. The average daily return for the entire sample is 0.000805 and the average of foreign exchange rate exposure is -0.0288

3.3 Result of portfolio analysis

From equation 1, I capture foreign exchange rate exposure – which is the coefficient of FXR (β_5 $_j$) for each firm. Out of 6,131 firms that I examine in the study 3,862 firms has the foreign exchange rate exposure ($\beta_{5\,j}$) that has a T-statistics greater than 1.67. So in our study 63% coefficients are statistically significant. I rank the 6,131 foreign exchange rate exposures that I collect from running 6,131 regressions from lowest to highest. After that I remove few firms with too extreme values, that is firms having of extreme foreign exchange exposure and firms having extreme mean return. I trim the number of firm to 6,075. Then I divide the 6,075 firms into 25 portfolios - each portfolio having 243 firms.

[Insert Table 3]

Table 3 reports the result of 25 regression results using equation one and two. The results are consistent. From equation 1 I observe that, for portfolio number 1 the foreign exchange exposure is -7.047 and when I use equation 2 I observe that the foreign exchange exposure is -7.18. The T-stats for both the equation is very close -2.53 and -2.87. For portfolio number 25, the foreign exchange rate exposure is 1.03 using equation 1 and 1.10 using equation 2. Both the coefficients are statistically significant at 2.3 and 2.5. For the portfolios in the middle of the pack like portfolio number 12 or 13 the portfolio coefficient is not statistically significant using either of the equation. But both equation gives similar and close and consistent result.

[Insert Table 4]

From the regression I capture portfolio foreign exchange rate exposure and I also calculate inter temporal portfolio mean for each portfolio. I report the portfolio mean and portfolio foreign exchange rate exposure in table 4. The portfolio with extreme foreign exchange rate exposure i.e. portfolio 1 and 25 has negative daily return of -.00011 and -.000112 and the foreign exchange rate exposure for those to portfolios are -7.05 and 1.033 respectively and Tstat for the coefficients are statistically significant. On the other hand the portfolios right in the middle i.e., portfolio # 12 and # 13 has a return of .0021 and .0018 and the portfolio foreign exchange rate exposure is -.055 and .015 respectively. I plot the portfolio foreign exchange rate exposure on X axis and port polio return on Y axis. I find that the portfolios that exhibit extreme foreign exchange rate exposure has lower return and Portfolios that exhibit lower foreign exchange rate exposure has higher return.

[Insert Figure 1]

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Figure 1 shows the inverse U relation ship between portfolio retrun versus portfolio risk exposure. It tells us that the firms that are exposed to too much foreign exchange rate risk exhibit lower daily return and firms with low foreign exchange rate risk exhibit high daily return.

Vasslou (2000) finds that the common component of exchange risk is not priced but the residual component of the exchange risk has a positive market price. Vasslou (2000) restricts the analysis to only 400 companies that have continuously been traded during the sample period. Vasslou (2000) uses relative coarse measure of foreign exchange-sensitivity by dividing US firms into eight portfolios according to their loading on the world market factor, foreign exchange, and inflation factors. Our finding is inconsistent with Vasslou (2000) in terms of market price for exchange rate risk. In our finding I observe that for 63% of the firms the coefficient for exchange rate is significant on market return.

He and Ng(1998) use quarterly data of 171 Japanese Multinational firms between 1979 and 1993. He and Ng (1998) obtain data from Pacific Basin Capital Markets (PACAP) and find that for the period from January 1979 to December 1993, 25 percent of the 171 Japanese multinationals have significant positive exposure. In this study I observe that 3,180 firms have negative exposure and 2,924 firms have positive exposure.

Kolari, Moorman and Sorescu (2008) use monthly data for all the stock listed on 2003 CRSP database excluding financial firms. For book to market data Kolari, Moorman and Sorescu (2008) use COMPUSTAT data base. Kolari, Moorman and Sorescu (2008) measure US dollar (USD) returns against the Federal Reserve's Major Currencies Index (MCI) based on foreign exchange values of the dollar against currencies of major industrial countries. Kolari, Moorman and Sorescu (2008) is in contrast with prediction of standard asset pricing models that suggest a

linear relationship between expected and risk factor loading. I observe similar inverse "U"
relationship between portfolio return and exchange rate that was found by Kolari, Moorman and
Sorecscu (2008).

4.0 Effectiveness of Hedging

4.1 Research design:

In this section I examine the effect of hedging on foreign exchange exposure. Financial managers
often engage in hedging activity as an insurance against risk and exposure. If a firm has higher
risk exposure it can result in significant performance decline, so in order to reduce the risk
financial manager take an opposite position in the foreign exchange market to protect against
possible loss. A financial manager would also aim to reduce the exposure over time.
Consequently, one would expect that the firm that hedges regularly will have a lower foreign
exchange rate exposure compared to the firm that is not engaged in hedging. I explore that aspect
of the relationship between hedging and exchange rate exposure in this study.

In this context I use the methodology from the work of Dumas (1983), subsequent empirical
work by Jorion (1990), Bodnar and Marston (2002) and Kolari, Moorman and Sorescu (2008), I
measures foreign exchange rate exposure for each firm by regressing its daily stock return
variables (R1jt). FXR1t captures the return on the US dollar per currency basket. The main
approach is based on Fama-French-Carhart (1997):

$$R1_{nk} = \tau_j + \gamma_{1kp} (MKTRF1_n) + \gamma_{2\,kp} SMB1_n + \gamma_{3\,kp} HML1_n + \gamma_{4\,kp} UMD1_n + \gamma_{5\,kp} FXR1_n + \upsilon_{kp} \quad (3)$$

Where, $R1_{nk}$ = Daily stock return for k firm in n time, $MKTFR1_n$ = Daily market return minus risk
free return in n time, $SMB1_n$ = Daily return on portfolio of small stock minus the return on

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portfolio of large US stock in time n. $HML1_n$ = Daily return on portfolio of high book to market stocks minus the return on portfolio of low book to market US stock in time n. $UMD1_n$ = Daily return on portfolio of past winner stocks minus past loser stocks in time n. $FXR1_n$ = Daily Change in Federal Reserve's Trade weighted currency (Broad Currency) Index in time n.

The primary difference between equation 1 and equation 3 lies in the coefficient output. In equation 1 I capture the coefficients for each firm for the entire sample period, but in equation 3 I capture coefficients for each firm in each year for the sample period. From equation 3 I will primarily get the yearly exchange rate exposure which will be captured in $\gamma_{5\ kp}$. For each firm $\gamma_{5\ kp}$ will give us yearly risk exposure. Using these observations I try to establish the relationship between hedge and risk exposure following Wilosn and Rasch (1998). I will use the captured coefficient from equation 3 $\gamma_{5\ kp}$ as the dependent variable. I will denote it as EXP, as the independent variable I will use Hedge which is a dummy variable, if the firm hedge in the year the value will be 1 and if the firm does not hedge in that year the value will be 0. As a control variable I use the foreign sales value that I got from segment data and use foreign sales as a percentage of total asset. I denote is by FxSales. I also use capital expenditure as a dependent variable and denote it as CapExpenditure

$$EXP_{mz} = \theta + \sigma_1 Hedge_{mz} + \sigma_2 FxSales_{mz} + \sigma_3 CapExpenditure_{mz}\ \lambda \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots.(4)$$

Where, EXP_{mz} = Foreign exchange rate exposure for firm z in quarter m, $Hedge_{mz}$ = 0 if firm z didn't hedge in quarter m and = 1 if firm z hedge in quarter m, $FxSales_{mz}$ = foreign sales as ratio of total asset for firm z in quarter m and $CapExpenditure_{mz}$ is capital expenditure as a ratio of .total asset

4.2 Description of hedging activity

Since October 1994, FASB issued SFAS No. 119, Disclosure about Derivative Financial Instruments and Fair Value of Financial Instruments, as an interim step. In June 1998, SFAS No. 133, Accounting for Derivative Instruments and Hedging Activities, was issued. It deals with recognition and measurement and provides comprehensive guidance for all derivatives--even those instruments yet to be developed. Although not a perfect solution, the new approach of SFAS No.133 addresses many of the problems with previous accounting.

Firms started reporting the derivative transactions but Compustat doesn't have that report before January 2006. That is the reason why hedging data is not available before 2006. So I start the study period on January 1, 2006 to 31 December 2011. The sample period has 1500 days. In order to capture the foreign exchange rate exposure I use Kolari, Moorman and Sorescu (2008) method that I used in section 3.

I obtain daily closing stock price from CRISP. The Data range from 2006 -2011. I found 1663firms that have complete data set for 1500 days. The total number of observation in the study is 7,869 with matching hedge information. I use Fama-French factor daily frequency for the time period from WRDS. I have 1,500 observations for the study and denote it as SMB1. I also get HML (High Minus Low) that is the average return on the two value portfolios minus the average return on the two growth portfolios and denote it as HML1. I also get UMD (up minus down) Momentum (Up Minus Down as defined by Fama French) and denote it as UMD1. I also get MKTRF (or Rm-Rf) that is the excess return on the market and denote as MKTRF1. In this study I take the daily trade-weighted index and calculate the daily index return FXR_t

I use hedge data from Compustat annual update. This item is the after-tax amount of unrealized gain/loss on derivative transactions or cash flow hedges. This item includes: 1)Unrealized gains or losses on derivatives, 2) Unrealized gains or losses on cash flow hedges, 3) A hedge of a foreign currency exposure to a forecasted transaction, 4) Reclassification adjustments pertaining to derivatives, 5) Cumulative effect of accounting change adjustments associated with the adoption of SFAS #133. This item excludes: 1) Unrealized gains or losses on marketable securities or available-for-sale securities 3) Reclassification adjustments for non-derivatives 4) Hedge of a foreign currency exposure of a net investment in a foreign operation. This item contains a Combined Figure data code if derivative or cash flow hedge is combined with another component of Accumulated Other Comprehensive Income. This annual data is not available before 2006, so the data period is from 2006 to 2012. I carefully look in the break- down of the data and use the foot note to identify hedge of foreign currency. I get the hedge data in 2 steps. First I look for firms that have any value for unrealized gain/loss on derivative transaction or cash flow hedges. If the value is zero, I conclude that the firm didn't hedge and assign 0 as the hedge value. If the value is not zero, I look in to the footnote for that firm in that year and see the breakdown of the value. If I see that there is any report on "A hedge of a foreign currency exposure to a forecast transaction" I conclude that the firm has hedged in that year and assign the hedge value of 1, if I see that the value for "A hedge of a foreign currency exposure to a forecast transaction" is not reported or zero, I also conclude that the firm didn't hedge in that year. During the sample period I have 1663 firms totaling 7869 observations. This observations represent firms having foreign exchange rate exposure hedging information in a given year. Most previous study like Mian (1996), Jin and Jorion (2006), Aretz, Bartam and Dufey (2007) use survey data to find whether firm hedge or do not hedge. Mian (1996) finds that out of the 771

firms classified as hedgers, 543 firms disclose information in their annual reports on their hedging activities; the remaining 228 firms report use of derivatives but no information on hedging activities. Campbel (2010) use after-tax amount of unrealized gain/loss on derivative transaction or cash flow hedge to determine whether a firm hedge or not.

[Insert table 5]

I have 5174 observations where firms don't hedge against foreign exchange risk and I have 2695 observation where firms hedge against foreign exchange risk. Table 5 reports the summary statistics of hedge information. The all firm mean foreign exchange rate exposure is -.104, with standard deviation of 2.29, maximum of 98.35 and minimum of -141.63, whereas firms that do hedge has a mean of -.096 with standard deviation of .48, maximum of 2.5 and minimum of –4.4 and firms that do not hedge has a mean foreign exchange rate exposure of -.109, with standard deviation of 2.29, maximum of 98.35 and minimum of -141.63.

For Robustness check I also use Gains and loss from imperfect hedging from Compustat. As Wilosn and Rasch (1998) argue it is not possible to have a perfect hedge. So having gains and loss from hedging means that firm was engaged in hedging activity. And I will use it as a binary variable. If the firms have any gains and loss then I will assign 1 and if the firm doesn't have any gains or loss from hedging activity then I will assign 0 as the value. I denote this variable ash *Hedge.*

I obtain segment data from CRSP through WRDS to find out total sales coming from foreign operations. Segment data provides geographic segment sales data, so from this segment I find the yearly foreign sales data for the 1663 firms from 2006 to 2011. In order to standardize the sales figure following Perfect and Howton (2000) I divide the total yearly foreign sales for a firm with

Total Asset of that year. The all firm mean foreign sales to Total Asset ratio is .37874, with standard deviation of .28, maximum of 4.469 and minimum of -.00153, whereas firms that do hedge has a mean of .38 with standard deviation of .234, maximum of 3.04 and minimum of –0 and firms that do not hedge has a mean foreign sales to Total Asset ratio of .376, with standard deviation of .303, maximum of 4.469 and minimum of -.00153

As suggested by Graham and Harvey (2001) I also use capital expenditure for firms during 2006 to 2011. And standardize the capital expenditure by dividing it with total asset of that year. The all firm mean capital expenditure to total asset ratio is .1795, with standard deviation of 10.5 maximum of 906.07 and minimum of 0, whereas firms that do hedge has a mean of 0.019 with standard deviation of .84, maximum of 43.87 and minimum of 0 and firms that do not hedge has a mean capital expenditure to total asset ratio of 0.26, with standard deviation of 12.98 maximum of 906.07 and minimum of 0.

4.3 Empirical finding

From equation 4 I primarily obtain the yearly exchange rate exposure which will be captured in $\gamma_{5\ kp}$. For each 1663 firm $\gamma_{5\ kp}$ This operation is performed on the entire data set of 12,664,108 observation. The algorithm was carefully designed to capture foreign exchange rate exposure for all firms in all of 6 years from 2006 to 2011. To achieve that I perform 11,845 regression and obtain as many coefficients that represent foreign exchange rate exposure for a particular firm in a particular year. After capturing the yearly foreign exchange exposure I match the hedge data (unrealized gain/loss from derivative or cash flow hedge) from Compustat and historic segment data from Compustat. The Compustat hedge and historical segment data were limited, so the

matching firm/year allowed us to work with 7869 yearly risk exposure for all the firms, hedge information and foreign sales information in the study.

[Insert Table 6]

Using this 7869 observation I try to establish the relationship between hedge and risk exposure following Wilosn and Rasch (1998). The result of the regression is reported in table 6. The coefficient for hedge is -.4164 and T-stat is -1.819. This result is statistically significant at 7.6% confidence level. The result shows that foreign sales are statistically insignificant with a coefficient of 0.0078 and T-stat of .015. Capital expenditure has a coefficient of 2.3246 with T-statistics of 0.2953 which is statistically insignificant. I have 2695 observation where firm hedge and 5174 observations where firms don't hedge. That means 34.25% of the time all firms hedge. I observe the negative sign for the coefficient of hedge which denotes that the firms that hedge has lower foreign exchange exposure compared to firms that do not hedge. The finding is consistent with the finding of Wilosn and Rasch (1998).

Jin and Jorion (2006) use Q ratio – a proxy similar to Tobin's Q to measure firm value in relation to hedging and examines stock return sensitivity to hedging by observing monthly stock return for firm during the period of 1999-2002 for 119 oil and gas companies. Jin and Jorion (2006) obtains hedge data from "Market Risk Disclosure" data. Jin and Jorion(2006) find that out of 330 firm year, 174 report hedging activity and hedging help reduce the riskiness of the firm, i.e. Jin and Jorion (2006) found negative beta. Our study is consistent with the findings of Jin and Jorion (2006). Our study has lot more comprehensive data set. 7869 firm year compared to 300 firm year and I report 2695 hedging compared to 174 hedging report by Jin and Jorion (2006). I observe negative beta which means hedging helps reduce foreign exchange rate risk. Aretz,

Bartram and Dufey (2007) find rational of corporate hedging as it reduces overall risk and help increase value of the firm. Our observation is very consistent with Aretz, Bartram and Dufey (2007) as I found negative coefficient for hedge which shows that hedging help reduce risk.

Gande, Schenzler and Senbet (2009) find that foreign sales affect valuation of the firm by reducing overall risk through diversification. In our study I don't find any evidence of foreign sales reducing foreign exchange rate exposure. There can be few explanations for that. Foreign sales may not be the only determinant for foreign currency exposure for manufacturing firms in US. There are a lot more transaction than sales that might be exposed to foreign exchange rate like purchasing of raw material, outsourcing and so on. This is an avenue to look in details for future research.

Graham and Harvey (2001) looks into capital expenditure for 392 firms with complete survey result and finds that CFOs make capital expenditure decision based on number of factors and reducing degree of financial leverage is one factor. In our study I didn't find capital expenditure to have any impact on foreign exchange rate risk.

5.0 Conclusion

In this study I comprehensively examined all the manufacturing firms and found that the firms with extreme risk exposure exhibit lower daily return and firms with moderate foreign exchange exposure exhibit higher daily return. I found that the risk exposure measure is highly significant in explaining returns using various models. The findings will be helpful in understanding international financial management for US manufacturing firms. The fact that I use income statement data called after tax unrealized gain/loss on derivative transaction and cash flow hedges and look at the break down to determine if a firm hedged in a particular year will open

door for future research on hedging without the use of survey data. I also found that firms that hedge have lower foreign exchange return compared to firms that do not hedge. I did robustness check using alternative measurement of hedge which is gain/loss from hedging activity and found consistent result.
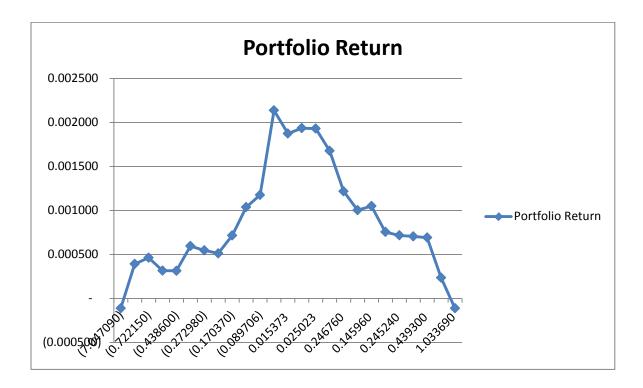
Figures

Fig 1. Shows the Inverse "U" relationship between portfolio Return and portfolio exchange rate Risk exposure.

Tables

Table 1: Summary statistics of variables used in determining foreign exchange exposure

	Mean	Std Dev	Minimum	Maximum	Variance	Skewness	Kurtosis
MKTRF	0.000299	0.009746	(0.090000)	0.090000	0.000095	(0.415180)	10.206270
HML	0.000148	0.005440	(0.040000)	0.030000	0.000030	0.054973	4.346490
SMB	0.000042	0.005313	(0.040000)	0.040000	0.000028	(0.281670)	2.823110
UMD	0.000303	0.007754	(0.080000)	0.070000	0.000060	(1.181790)	14.308320
FXR	(0.000023)	0.004101	(0.040000)	0.020000	0.000017	(0.221550)	2.075380

This table reports the mean, standard deviation, minimum, maximum, skewness and Kurtosis of the variables used in equation used to determine exchange rate exposure. SMB (Small Minus Big) is the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios. UMD (up minus down) Momentum (Up Minus Down as defined by Fama French) and FXR_t is the daily trade weighted index return. I obtain the Famma-French factor data from Kenneth French's web site at Dartmouth through WRDS (Wharton Research Data Service) and obtain the trade weighted broad currency Index from Federal Reserve bank and calculated the daily Index return.

Table 2: Year by year all firm return breakdowns from 1992 to 2011

Year	Mean of RET	#of observation	#of firms	FxExposure
1992	0.00122	589432	2769	0.05877
1993	0.00138	621675	2950	0.02481
1994	0.00047	672528	3108	0.01208
1995	0.00156	706148	3256	0.01692
1996	0.00100	757939	3427	(0.01734)
1997	0.00084	787639	3510	0.02118
1998	0.00021	767871	3455	0.07452
1999	0.00179	714739	3273	0.02500
2000	0.00057	686418	3187	(0.01896)
2001	0.00132	621066	2943	(0.11701)
2002	(0.00015)	603922	2640	0.00722
2003	0.00260	547250	2468	(0.00456)
2004	0.00063	525044	2407	(0.03472)
2005	0.00021	519626	2387	(0.01387)
2006	0.00052	512424	2391	(0.08189)
2007	(0.00001)	502081	2304	(0.05230)
2008	(0.00190)	495068	2142	(0.16846)
2009	0.00322	444791	1996	(0.07872)
2010	0.00114	411342	1877	(0.13476)
2011	(0.00051)	398825	1820	(0.09472)
Grand Average	0.0008052			-0.02884109

This Table reports all firm daily average return, number of observation, number of firm during the period, and average foreign exchange exposure during the period on yearly basis. The yearly foreign exchange rate exposure is captured using β_5 equation 1 $R_{jt} = \alpha_j + \beta_{1jk} (MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$ I obtain the daily Ret (return) data from CRSP(The Center for Research in Security Prices) stock/security file accessed through WRDS (Wharton Research Data Service).

Table 3: Portfolio Regression output

Portfolio	Eqation	Portfolio Exposure	Tstat
1	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-7.04709	-2.55393
	$R_{jt} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-7.18546	-2.87601
2	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-1.11591	-0.99583
	$R_{jt} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.76402	-0.69402
3	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{jt}$	-0.72215	-0.62593
	$R_{jt} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.52404	-0.46841
4	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{jt}$	-0.54377	-0.32072
	$R_{jt} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{jt}$	-0.011078	-0.0066133
5	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-0.4386	-1.10347
	$R_{it} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.66432	-1.737
6	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-0.34469	-2.2909
	$R_{it} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.29625	-1.9845
7	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-0.27298	-1.6835
	$R_{it} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.33566	-2.08305
8	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{jt}$	-0.21583	-0.74592
	$R_{jt} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{jt}$	-0.093864	-0.32214
9	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{jt}$	-0.17037	-2.32821
	$R_{it} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.383	-4.97638
10	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-0.12941	-0.86737
	$R_{it} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.15863	-0.99438
11	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-0.089706	-0.5554
	$R_{it} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	-0.16156	-1.00962
12	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{it}$	-0.055943	-0.19408
	$R_{it} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	0.19155	0.65187
13	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk}SMB_t + \beta_{3jk}HML_t + \beta_{4jk}UMD_t + \beta_{5jk}FXR_{Xt} + \varepsilon_{jt}$	0.015373	0.02878
	$R_{jt} = \alpha_j + \beta_{jk}FXR_{Xt} + \varepsilon_{it}$	0.38246	0.69726

Table 3 Portfolio Regression output Continued

Portfolio	Eqation	Portfolio Exposure	Tstat
14	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	-0.00077	-0.01713
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	-0.22808	-4.15494
15	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.025023	0.19009
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	-0.05161	-0.39399
16	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.050357	0.48228
	$R_{jt} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	0.20654	1.86322
17	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.24676	0.6327
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	-0.05668	-0.14681
18	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.11068	1.10663
	$R_{jt} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	0.16218	1.60173
19	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.14596	1.18411
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	0.21252	1.68781
20	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.18881	1.26083
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	0.3514	2.28101
21	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.24524	2.2583
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	-0.2879	-2.39743
22	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.31808	0.75832
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	0.27356	0.65334
23	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.4393	2.50678
	$R_{jt} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	0.53838	3.06479
24	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	0.3991	1.72792
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	0.41452	1.80136
25	$R_{jt} = \alpha_j + \beta_{1jk}(MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$	1.03369	2.36866
	$R_{it} = \alpha_j + \beta_{jk} FXR_{Xt} + \varepsilon_{jt}$	1.10592	2.53483

This table reports the coefficient of foreign exchange rate exposure and T-statistics based on portfolio constructed based on ranking of foreign exchange rate exposure coefficient. Each of the 25 portfolios have 243 firms

Table 4: Portfolio risk exposure and Portfolio return

Portfolio	Portfolio Return	Portfolio Exposure	Tstat
1	(0.000111)	(7.047090)	(2.553930)
2	0.000391	(1.115910)	(0.995830)
3	0.000463	(0.722150)	(0.625930)
4	0.000316	(0.543770)	(0.320720)
5	0.000314	(0.438600)	(1.103470)
6	0.000595	(0.344690)	(2.290900)
7	0.000547	(0.272980)	(1.683500)
8	0.000512	(0.215830)	(0.745920)
9	0.000716	(0.170370)	(2.328210)
10	0.001036	(0.129410)	(0.867370)
11	0.001176	(0.089706)	(0.555400)
12	0.002136	(0.055943)	(0.194080)
13	0.001873	0.015373	0.028780
14	0.001934	(0.000772)	(0.017128)
15	0.001930	0.025023	0.190090
16	0.001676	0.050357	0.482280
17	0.001218	0.246760	0.632700
18	0.001003	0.110680	1.106630
19	0.001049	0.145960	1.184110
20	0.000755	0.188810	1.260830
21	0.000717	0.245240	2.258300
22	0.000705	0.318080	0.758320
23	0.000691	0.439300	2.506780
24	0.000236	0.399100	1.727920
25	(0.000112)	1.033690	2.368660

This table reports the portfolio Return and portfolio exposure that shows the inverse "U" relationship between the foreign Exchange rate exposure and portfolio Return.

Table 5: Summary statistics of variables used for Hedge analysis

#of observation			Mean	Std Dev	Min	Max	Skew	Kurtosis
		FXEXPOSURE	-0.10498	2.29662	-141.632	98.35926	-20.8002	2347.95
All								
Firm	7869	HEDGE	0.34248	0.47457	0	1	0.664	-1.5595
1663		FXSALES	0.37874	0.28209	-0.00153	4.4692	2.51805	14.7455
		CAPEXP	0.1795	10.53911	0	906.0769	81.75752	6959.557
Firms		FXEXPOSURE	-0.10946	2.81053	-141.632	98.35926	-17.2578	1591.81
That do	5174	HEDGE	0	0	0	0		
not								
Hedge		FXSALES	0.37617	0.30381	-0.00153	4.4692	2.60125	14.5927
		CAPEXP	0.26283	12.9825	0	906.0769	66.5067	4596.13
Firms		FXEXPOSURE	-0.09639	0.48637	-4.40401	2.53129	-0.72137	6.2301
That do	2695	HEDGE	1	0	1	1		
Hedge		FXSALES	0.38368	0.2348	0	3.0447	1.9772	10.6388
		CAPEXP	0.01949	0.84543	0	43.8768	51.8593	2691.20

This table reports mean, standard deviation, minimum, maximum, skewness and Kurtosis for variables used in equation broken down by whether firms hedged or did not hedge in that particular year. I obtain hedge and capital expenditure data from Standard & Poor's Compustat. I obtain foreign sales from historical segment data of Standard & Poor's Compustat.

Table 6: Regression result from hedge analysis

Variable	Estimated Coefficient	Standard Error	t-statistic	P-value
C	0.3833	0.3649	1.0503	[.294]
HEDGE	-0.4164	0.2289	-1.8190	[.076]
Percentage of foreign sales	0.0078	0.4974	0.0157	[.987]
Capital Expenditure	2.3246	7.8719	0.2953	[.768]

This table reports regression from equation $EXP_{mz} = \theta + \sigma_1 Hedge_{mz} + \sigma_2 FxSales_{mz} + \sigma_3 CaptitalExpenditure_{mz} + \lambda$

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Chapter 2

Effect of Executive Compensation on Exchange Rate Risk in US Manufacturing Industry

1.0 Introduction

Executive compensation attracts considerable interest from the public, scholars and policy makers. Executive compensation packages worth millions of dollars make the news headlines. The broader issue of ''stake-holder capitalism'' versus ''share-holder capitalism'' in the recent policy debate deals with, among other issues, the responsibility of executives with respect to outside parties.

A large theoretical and empirical literature has investigated executive compensation, often using an agency framework. In particular, executives are viewed as agents of shareholders, who hire them to run firms. As executives are typically better informed about firm conditions than shareholders, a potential conflict of interest arises. Agency theory offers several predictions that have been widely tested by an extensive and growing body of empirical research. The interests of the shareholders and the executives can be partly aligned by making executive compensation dependent on observable measures of firm's performance. Numerous studies support the presence of such a relationship but find that the sensitivity of pay to stock returns is fairly low. A stronger relationship is commonly found between top executive pay and firm size. The idea here is that if there are complementarities between individual talent and the productivity of control, it is efficient to assign greater control to more talented people. Thus a competitive market allocates talented people to higher level positions in larger firms. Incentives in an organization can be

provided not only by linking pay to performance but also by vertical mobility from less to more rewarding jobs. When the firm has a hierarchical structure and organizes jobs into career ladders, career concerns and the probability of promotion are powerful incentive devices. The presence of

career concerns implies that, because at the top of the hierarchy there are no further possibilities of promotion, alternative incentive schemes such as pay for performance should be stronger for top executives and in general for managers close to retirement. According to Holmstrom (1979) agency theory also predicts that executive pay should be optimally based on measures of performance that are as informative as possible. This provides the theoretical foundation for relative performance evaluation that focuses on firm performance relative to a benchmark. Compared to absolute performance, relative performance provides incentives and, at the same time, insulates managers from common sources of uncertainty that affect the firm and its competitors.

Most US manufacturing firm are in the business of either importing raw materials from foreign countries or exporting finished good to foreign countries. Some manufacturing firms are engaged in both importing and exporting. So there is always an inherent foreign exchange exposure for US manufacturing firms. There has been considerable amount of study like Frobes (2002) that examines impact of major depreciation on firm performance. Kolari, Moormna and Sorescu (2008) found portfolios with extreme exchange rate risk has significantly lower return compared to portfolios that are not having extreme exchange rate risks. He and NG (1998) find exchange rate exposure for highly leveraged firms and finds lower exchange rate exposure for firms having lower liquidity.

On the other hand corporate governance is getting lot of attention from researchers. Coles, Daniel and Naveen (2006) provide empirical evidence of a strong causal relationship between managerial compensation and investment policy, debt policy and firm risk. Chen, Steiner and Whyte (2006) investigates the relationship between option-based executive compensation and market measures of risk and finds structure of executive compensation induces risk taking. Dong, Wang and Xie (2010) examine whether stock options can induce excessive risk taking by managers in firms security issue decisions and find that stock option sometimes make managers take on too much risk and in the process pursue suboptimal capital structure policies.

However, there haven't been many studies that tried to capture the relationship between executive compensation and foreign exchange rate risk. In this paper I try to explore that area and address the issue of foreign exchange rate exposure and executive compensation.

The core concept of this study goes back to the classical study of agency theory. The executives are the agents taking care of the business on behalf of the shareholders. If the executives are well compensated then it is expected that the executives should take good care of the business. Taking good care of business ultimately translates into maximizing share holders' wealth. In an effort to align the wellbeing of share holders' wealth with executives' wealth, stock options are given to the executives. When the stock options given to an executive become vested or exercisable but the executive doesn't exercise it, his wealth becomes tied to the value of stock. According to Ross (2004) this makes the executive like an equity holder instead of a debt holder. And as an equity holder an executive will prefer to take higher risk because it will yield higher expected return as opposed to a debt holder who would prefer low risk and low return. Among a lot of other risk that a business needs to manage, foreign exchange rate exposure is a critical one for

manufacturing industries. Consequently, the value of executive stock option is expected to be instrumental in reducing foreign exchange rate risk.

Wallenstein (2000), Martin (2009) looks into risk taking behavior of executives and explores demographic attributes like gender and age. Their findings support the argument that male executives and CEOs are more risk taking in their decision making than their female counterpart. They also find that younger CEO's and executives' exhibit more risky decision making trait compared their older counter part. That is why in this paper I also investigate if age and gender has any impact on foreign exchange rate exposure.

In this paper I explore manufacturing industry of US. I capture the foreign exchange rate exposure using methodology used by Vassalou (2000) and Kolari, Moormna and Sorescu (2008) and then use that foreign exchange rate exposure to find if executive compensation, age, and gender have any impact on foreign rate exposure. The findings are consistent with Rajgopal and Shevlin (2002), and Chen, Steiner and Whyte (2006). I find the value of in-the-money unexercised vested and unvested executive stock option is statistically significant in determining firm's exchange rate exposure.

2.0 Executive Compensation in United States

In 1996 the average CEO of S&P 500 manufacturing companies owned less than 1% of company shares, while median ownership was only 0.11%. There is no contract that would perfectly align the interests of managers and shareholders. The optimal contract is therefore the one that minimizes agency costs, that is, the sum of contracting, monitoring, other expenditures made in achieving a certain level of compliance with the principal's interest and the costs of the residual divergence. Under the optimal contracting view, this is exactly what executive compensation

packages are designed to do. The board, attempting to maximize shareholder wealth, seeks to establish optimal incentives for the executives. This view is captured in various formal models that view the board of directors as selecting an optimal compensation program for shareholders. As I will discuss, a great deal of empirical work has been done from this perspective.

The designer attempting to optimize an executive compensation program would be concerned with (1) attracting and retaining high quality executives, (2) providing executives with incentives to behave in the shareholders' interest both by exerting effort and by making decisions that will serve those interests, and (3) minimizing overall costs.

A successful CEO of a large public company undoubtedly possesses a rare combination of skills and instincts. The CEO must manage an organization with thousands of employees, provide the strategic direction for the firm, and decide when or whether the company should absorb other firms or be absorbed. Individuals who possess the necessary attributes may be scarce, and competition among firms, particularly for rising stars, may be intense. Of course, compensation is not the only factor in attracting and retaining talent at the very top of the corporate pyramid, but it is an important one.

To induce an executive to take and retain a position, then, a firm must offer an overall package of benefits that meets or exceeds the executive's opportunity cost. An executive's appetite for risk is relevant in this regard. A firm that requires a risk-averse executive to accept risky elements of compensation will have to provide more total compensation on an expected value basis to offset the risk-bearing costs. Under the optimal-contracting view, inducing the executive to take and retain a position only provides a lower bound on compensation. A firm should not attempt to pay less than the executive's reservation wage, but it may pay more in order to provide desirable

incentives. If the firm does exceed the reservation wage in order to optimize incentives, providing those incentives through risky compensation devices should not present a problem to the executive.

There are two dimensions to the executive incentive problem. A firm must provide incentives that induce the executive to expend effort as well as incentives that motivate the executive to take shareholder-regarding decisions. As in any agency relationship, there is the risk that the agent may expend too little effort on the principal's behalf. That is, executives may have an incentive to work less than is optimal for shareholders as a group. This distortion arises because executives enjoy all of the benefits of their leisure time (or other non-work activities) but capture only a fraction of the value their work generates for the firm.

The second agency problem in most public companies rests in the possibility that executives will make decisions that maximize their own utility but that fail to maximize shareholder value. Such decisions might include the erection of lavish skyscraping office buildings to house corporate headquarters staff or other excessive perquisite consumption; the selection of low risk business strategies; attempts to block value-adding takeover attempts; or the failure to reorganize and reduce the scope of operations when that is called for. The variety of critical decisions that may be faced by a CEO is extremely large, and the compensation device that properly aligns incentives in one case may be less effective in another. Moreover, the nature of the truly key decisions in the coming years often will be unforeseeable, thus complicating further the design of the optimal compensation plan.

The reservation wage places a lower bound on executive compensation, but a firm may wish to pay executives much more than the reservation wage to incentivize behavior that adds

shareholder value. Under the optimal contracting view, shareholders should continue to give value to executives until the incremental cost of doing so outweighs the value of the incremental productivity achieved. Optimizing incentives probably will not require transferring a substantial fraction of firm value to the executives, however. As I will discuss below, creating desirable incentives is less a matter of the fraction of value transferred to the executives than the manner

In which value is transferred. A compensation plan designer attempting to maximize shareholder value would take all of the incentive effects into account and would then optimize the mix based upon a forecast of the business environment over the plan period. Although the specifics of the optimal executive compensation program will vary according to the circumstances, I can make certain general predictions about these contracts. First, variable pay schemes, such as bonus and stock options programs, will be adopted for performance sensitivity and will thereby shape the individual executive's incentives.

Second, compensation devices will be selected and combined in a manner that attempts to balance incentive generation with the individual executive's appetite for risk. Third, optimal executive pay might well exceed the reservation wage in order to provide the incentives discussed above.

Executive stock option pay rose dramatically in the United States after scholarly support from Professors Michael C. Jensen and Kevin J. Murphy. Due to their publications in the Harvard Business Review 1990 and support from Wall Street and institutional investors, Congress passed a law making it cost effective to pay executives in equity.

Supporters of stock options say they align the interests of CEOs to those of shareholders, since options are valuable only if the stock price remains above the option's strike price. Stock options

are now counted as a corporate expense (non-cash), which impacts a company's income statement and makes the distribution of options more transparent to shareholders. Critics of stock options charge that they are granted without justification as there is little reason to align the interests of CEOs with those of shareholders Empirical evidence shows since the wide use of stock options, executive pay relative to workers has dramatically risen. Moreover, executive stock options contributed to the accounting manipulation scandals of the late 1990s and abuses such as the options backdating of such grants. Finally, researchers have shown that relationships between executive stock options and stock buybacks, implying that executives use corporate resources to inflate stock prices before they exercise their options.

Stock options also incentivize executives to engage in risk-seeking behavior. This is because the value of a call option increases with increased volatility. Stock options also present a potential up-side gain (if the stock price goes up) for the executive, but no downside risk (if the stock price goes down, the option simply isn't exercised). Stock options therefore can incentivize excessive risk seeking behavior that can lead to catastrophic corporate failure. If they are short-term vesting, they can also incentivize short-term.

In the Financial crisis of 2007-2009 in the United States, pressure mounted to use more stock options than cash in executive pay. However, since many then-proportionally larger 2008 bonuses were awarded in February, 2009, near the March, 2009, bottom of the stock market, many of the bonuses in the banking industry turned out to have doubled or more in paper value by late in 2009. The bonuses were under particular scrutiny, including by the United States Treasury's new special master of pay, Kenneth R. Feinberg, because many of the firms had been rescued by government Troubled Asset Relief Program (TARP) and other funds.

3.0 Literature Review

Most of the models of executive pay have been developed to fit the reality of Anglo-Saxon capitalism, where stringent disclosure rules make data on top executives' compensation readily available, and less is known about executive pay outside these two countries. Managerial compensation, recruiting, promotion and firing are essential components of the broader mechanism of corporate governance. An effective mechanism of corporate governance relies on some combination of monitoring by large shareholders and of adequate legal protection of minority investors (Shleifer and Vishny, 1996).

Jensen and Murphy (1990) find the CEO wealth changes $3.25 for every $1,000 change in shareholder wealth. They also find that salary and bonus (as opposed to wealth) changes only 2.2¢ per $1,000 change in shareholder wealth, and total pay2 changes by about 3.3¢ per $1,000 change in shareholder wealth. They suggest that this link between pay and performance, while statistically significant, is too weak to provide proper incentives to the CEO. The link is economically insignificant, they argue, because CEO compensation is constrained by political forces.

Lippert (1996) present a theoretical model of the agency conflict between managers and shareholders. Lippert (1996) examine the problem in an expected-utility-maximization scenario in which the explicit cost of the agency conflict that arises between the manager and shareholders is derived. Lippert (1996) determines the effect of changes in firm variance on various compensation components. Lippert (1996) recognize that an individual firm's propensity for variance is firm specific and that the manager has limited control over the risk of the firm's future cash flows. Lippert (1996) show the ability of the manager to affect the variance of the

firm's future cash flows be an important characteristic in the development of an effective incentive compensation package.

Carpenter (2000) solves the dynamic investment problem of a risk adverse manager compensated with a call option on the assets he controls. Under the manager's optimal policy, the option ends up either deep in or deep out of the money. As the asset value goes to zero, volatility goes to infinity. Carpenter (2000) find that the option compensation does not strictly lead to greater risk seeking. Sometimes, the manager's optimal volatility is less with the option than it would be if he were trading his own account. Carpenter (2000) conclude giving the manager more options causes him to reduce volatility

Brunello, Graziano and Parigi (2001) use survey data to investigate the determinants of executive pay in a sample of Italian firms. Brunello, Graziano and Parigi (2001) has hypothesis that the characteristics of the Italian capital market, corporate governance and the specific relationship between banks and firms imply a low fraction of incentive pay over total compensation and a low sensitivity of incentive pay to firm performance. Brunello, Graziano and Parigi (2001) find evidence that supports this hypothesis. Brunello, Graziano and Parigi (2001) estimate that an increase of real profits per firm by 1 billion lire increases the pay of upper and middle managers by only 31 thousand lire, more than the increase found for lower management (6 thousand). Brunello, Graziano and Parigi (2001) also find pay–performance sensitivity is higher in foreign-owned firms, in listed firms, and in firms affiliated to a multinational group. Brunello, Graziano and Parigi (2001) use survey data of executive compensation by an international consultation firm between 1993 -1996.

Rajgopal and Shevlin (2002) examine whether executive stock options (ESOs) provide managers with incentives to invest in risky projects. Rajgopal and Shevlin (2002) examine whether the coefficient of variation of future cash flows from exploration activity increases with the sensitivity of the value of the CEO's options to stock return volatility (ESO risk incentives). Rajgopal and Shevlin (2002) uses both ESO risk incentives and exploration risk and treat them as endogenous variables by adopting a simultaneous equations approach. Rajgopal and Shevlin (2002) find evidence that ESO risk incentives has a positive relation with future exploration risk taking. Rajgopal and Shevlin (2002) also indicate that ESO risk incentives exhibits a negative relation with oil price hedging in a system of equations where ESO risk incentives and hedging are allowed to be endogenously determined. Rajgopal and Shevlin (2002) concludes that the results are consistent with ESOs providing managers with incentives to mitigate risk-related incentive problems.

Ross (2004) find that simple, intuitive, necessary and sufficient condition under which incentive schedules make agents more or less risk averse. Ross (2004) explore the duality between a fee schedule that makes an agent more or less risk averse and gamble that increase or decrease risk.

Baker and Hall (2004) develop a model that clarifies how to measure CEO incentive strength and how to reconcile the enormous differences in pay sensitivities between executives in large and small firms. Baker and Hall (2004) show a crucial parameter to be the elasticity of CEO productivity with respect to firm size. Baker and Hall (2004) find that CEO marginal products rise significantly with firm size. Baker and Hall (2004) confirms that CEOs of large firms have a "chain letter" effect on firm performance, and overall CEO incentives are roughly constant, or decline slightly, with firm size. Baker and Hall (2004) employ a multitask model to discuss implications for the design of control systems.

Tian (2004), using a utility-maximization framework show that the incentive to increase stock price does not always increase as more options are granted. Keeping the total cost of his compensation fixed, granting more options creates greater incentives to increase stock price only if optionwealth does not exceed a certain fraction of total wealth. Tian (2004) find that beyond this critical level, granting more options actually reduces incentive effects and becomes counterproductive. Tian (2004) concludes that stock options also create incentive to reduce (increase) idiosyncratic (systematic) risk and these incentive effects are sensitive to the choice of exercise price.

Coles, Daniel and Naveen (2006) provide empirical evidence of a strong causal relation between managerial compensation and investment policy, debt policy, and firm risk. Controlling for CEO pay-performance sensitivity and the feedback effects of firm policy and risk on the managerial compensation scheme, Coles, Daniel and Naveen (2006) find that higher sensitivity of CEO wealth to stock volatility implements riskier policy choices, including relatively more investment in R&D, less investment in property plan and equipment (PPE), more focus, and higher leverage. Coles, Daniel and Naveen (2006) also find that riskier policy choices generally lead to compensation structures with higher volatility and lower Sensitivity. Coles, Daniel and Naveen (2006) find that Stock-return volatility has a positive effect on both volatility and Sensitivity. Coles, Daniel and Naveen (2006) use Standard & Poor's ExecuComp database for data on CEO compensation for the period of 1992-2002.

Burns and Kedia (2006) examine the effect of CEO compensation contracts on misreporting. Burns and Kedia (2006) find that the sensitivity of the CEO's option portfolio to stock price is significantly positively related to the propensity to misreport. Burns and Kedia (2006) do not find that the sensitivity of other components of CEO compensation, i.e., equity, restricted stock,

long-term incentive payouts, and salary plus bonus have any significant impact on the propensity to misreport. Burns and Kedia (2006) find that relative to other components of compensation, stock options are associated with stronger incentives to misreport because convexity in CEO wealth introduced by stock options limits the downside risk on detection of the misreporting.

Chen, Steiner and Whyte (2006) investigate the relation between option-based executive compensation and market measures of risk for a sample of commercial banks during the period of 1992–2000. Chen, Steiner and Whyte (2006) show that following deregulation; banks have increasingly employed stock option-based compensation. As a result, the structure of executive compensation induces risk-taking, and the stock of option-based wealth also induces risk-taking. Chen, Steiner and Whyte (2006) find that the results are robust across alternative risk measures, statistical methodologies, and model specifications. Chen, Steiner and Whyte (2006) results support a management risk-taking hypothesis over a managerial risk aversion hypothesis. Chen, Steiner and Whyte (2006) results have important implications for regulators in monitoring the risk levels of banks. Chen, Steiner and Whyte (2006) uses risk measures from CRSP and the control variables are obtained from ExecuComp Database. Chen, Steiner and Whyte (2006) has a sample size of 68 commercial bank between the period of 1995-1998.

Bergstresser and Philippon (2006) provide evidence that the use of discretionary accruals to manipulate reported earnings is more pronounced at firms where the CEO's potential total compensation is more closely tied to the value of stock and option holdings. Bergstresser and Philippon (2006) also find that during years of high accruals, CEOs exercise unusually large numbers of options and CEOs and other insiders sell large quantities of shares.

Sun and Emanuel (2009) examines whether the relationship between future firm performance and chief executive officer (CEO) stock option grants is affected by the quality of the compensation committee. Sun and Emanuel (2009) measures compensation committee quality using six committee characteristics – the proportion of directors appointed during the tenure of the incumbent CEO, the proportion of directors with at least ten years 'board services, the proportion of directors who are CEOs at other companies, the aggregate shareholding of directors on the compensation committee, the proportion of directors with three or more additional board seats, and compensation committee size. Sun and Emanuel (2009) find that future firm performance is more positively associated with stock option grants as compensation committee quality increases.

Cunat and Guadalupe (2009) study the effect of product market competition on the compensation packages that firms offer to their executives. Cunat and Guadalupe (2009) use a panel of US executives in the 1990s and exploit two deregulation episodes in the banking and financial sectors as quasi-natural experiments. Cunat and Guadalupe (2009) provide difference-in-differences estimates of their effect on (1) total pay, (2) estimated fixed pay and performance-pay sensitivities, and (3) the sensitivity of stock option grants. Cunat and Guadalupe (2009) find results that indicate that the deregulations substantially changed the level and structure of compensation: the variable components of pay increased along with performance-pay sensitivities and, at the same time, the fixed component of pay fell. Cunat and Guadalupe (2009) also find that the overall effect on total pay was small.

Dong, Wang and Xie (2010) examine whether executive stock options can induce excessive risk taking by managers in firms' security issue decisions. Dong, Wang and Xie (2010) find that CEOs whose wealth is more sensitive to stock return volatility due to their option holdings are

more likely to choose debt over equity as a capital-raising vehicle. Dong, Wang and Xie (2010) also find the pattern holds not only in firms that are under levered relative to their optimal capital structure but also in over levered firms. Dong, Wang and Xie (2010) find the evidence to be inconsistent with executive stock options aligning the interests of managers and shareholders; rather, Dong, Wang and Xie (2010) find that it supports the hypothesis that stock options sometimes make managers take on too much risk and in the process pursue suboptimal capital structure policies. Dong, Wang and Xie (2010) use data from SDC for common equity and straight debt offering, and use ExecuComp for compensation data. The data range is for the period of 1993 -2007.

Core, Holthausen, and Larcker (1999) find that measures of board and ownership structure explain a significant amount of cross-sectional variation in CEO compensation, after controlling for standard economic determinants of pay. Core, Holthausen, and Larcker (1999) finds that the signs of the coefficients on the board and ownership structure variables suggest that CEOs earn greater compensation when governance structures are less effective. Core, Holthausen, and Larcker (1999) also find that the predicted component of compensation arising from these characteristics of board and ownership structure has a statistically significant negative relation with subsequent firm operating and stock return performance. Core, Holthausen, and Larcker (1999) suggest that firms with weaker governance structures have greater agency problems; that CEOs at firms with greater agency problems receive greater compensation; and that firms with greater agency problems perform worse.

Brockman, Martin and Unlu (2010) find executive compensation influences managerial risk preferences through executives' portfolio sensitivities to changes in stock prices (delta) and stock return volatility (vega). Brockman, Martin and Unlu (2010) find that large deltas discourage

managerial risk-taking, while large vegas encourage risk-taking. Brockman, Martin and Unlu (2010) suggest that short-maturity debt mitigates agency costs of debt by constraining managerial risk preferences. Brockman, Martin and Unlu (2010) find evidence of a negative (positive) relation between CEO portfolio deltas (vegas) and short-maturity debt. Brockman, Martin and Unlu (2010) also find that short-maturity debt mitigates the influence of vega- and delta-related incentives on bond yields. Brockman, Martin and Unlu (2010) find empirical evidence that shows that short-term debt mitigates agency costs of debt arising from compensation risk.

Florin and Hallack (2010) investigate the pay-for-performance link in executive compensation and document main issues in the pay-performance debate and explain practical issues in setting pay as well as data issues including how pay is disclosed and how that has changed over time. Florin and Hallack (2010) provide a summary of the state of CEO pay levels and pay mix in 2009 using a sample of over 2,000 companies and describe main data sources for researchers. Florin and Hallack (2010) also investigate the root of fundamental confusion in the literature across disciplines – methodological issues. In exploring methodological issues, Florin and Hallack (2010) focus on empirical specifications, causality, fixed-effects, first- differencing and instrumental variables issues. Florin and Hallack (2010) conclude by examining a series of research areas where further work can be done, within and across disciplines. Florin and Hallack (2010) use ExecuComp Data from 1992 t0 2010.

Wallenstein (2000) argues that the statistical link between executive compensation and firm performance is well established. Wallenstein (2000) explore whether the relationship itself change depending on firm performance and find that, on average, executives are rewarded in good years but are not punished in bad years. Wallenstein (2000) finds that the result is

consistent with a model that attempts to induce risk-taking behavior by rewarding good performance and limiting downside punishment. Wallenstein (2000) also examines whether the relationship change with the executive's rank in the company and find that the top executive's compensation is most strongly linked with performance, the second-highest ranking executive less so, and the third-highest even less. Wallenstein (2000) argues that the result is consistent with linking compensation to performance only to the extent that the employee has some direct influence on it. Wallenstein (2000) use ExecuComp date from 1991 -1995.

An emergent view in financial economics argues that the relationship between the convexity of a manager's compensation profile and risk-seeking behavior may not be monotonic as argued by Ross (2004). Therefore, a countervailing hypothesis is that executives' holdings of vested in-the-money options (in relation to personal wealth) should be negatively associated with a firm's foreign exchange rate exposure. Having in-the-money options may prompt an executive to reduce the volatility of a firm's cash flows to prevent the options from going out of the money, in which case unvested in-the-money options would also be negatively correlated with interest rates.

Oakley (2000) reports that only seven of the Fortune 1000 firms had a female chief executive officer (CEO) in 1997. In their study of corporate board members, Carter, Simkins, and Simpson (2003) describe the average firm in their sample gathered from the Fortune 1000 in 1997 as having only 1.1 women board members of 11 total board members. It also has been reported by Catalyst (2006), a nonprofit organization that focuses on women in business, that the average Fortune 500 firm in 2005 had 21.8 corporate officers and 3.6 of these positions were held by women. They also specify that eight Fortune 500 firms in 2005 had women CEOs, which represents a slight increase in female CEOs in these high profile firms. In 2006 alone, PepsiCo

and Archer Daniel Midland appointed female CEOs. Thus, as increases in the number of prominent female business leaders occur over time, attitudes toward female business leaders may be changing. The glass ceiling may be disappearing.

Martin (2009) use 70 announcements of female CEO appointments over 1992-2007 and a matched sample of 70 male CEO appointments. Martin (2009) evaluate whether gender influences capital market measures of valuation and risk for CEO appointments. The three-day cumulative abnormal returns are not significantly different between female and male CEO appointments, indicating a gender bias is not reflected by the financial market. Martin (2009) find changes in risk following CEO appointments are significantly lower for female CEOs, supporting the view that the market perceives female CEOs to be relatively risk averse. Martin (2009) find evidence consistent with our hypothesis that firms with relatively high risk (total risk and idiosyncratic risk) are more likely to appoint female CEOs so that risk might decrease.

4.0 Methodology

In this study, first I capture the exchange rate exposure of manufacturing firms in US. And then I try to establish the relationship between executive compensation and foreign exchange rate exposure.

I use the methodology that has been used by Dumas (1983), subsequent empirical work by Jorion (1990), Bodnar and Marston (2002) and Kolari, Moorman and Sorescu (2008), I measure FXR_{Xt} as a foreign exposure for each firm by regressing its daily stock return variables (R_{jt}). FXR_{Xt} captures the return on the US dollar per currency basket. The main approach is based on Fama-French-Carhart (1997):

$$R_{jt} = \alpha_j + \beta_{1jk} (MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt} \qquad \text{.....(1)}$$

Where, R_{jt} = Daily stock return for firm j in time t, $MKTRF_t$ = CRSP value-weighted index of US stocks minus one-month T-bill rate in time t, SMB = return on portfolio of small stock minus the return on portfolio of large US stock in time t, HML = return on portfolio of high book to market stocks minus the return on portfolio of low book to market US stock in time t, UMD = return on portfolio of past winner stocks minus past loser stocks in time t. FXR_{Xt} = Percent Change in Federal Reserve's Trade weighted currency (Broad Currency) Index in time t.

From equation 1, I capture and use foreign exchange rate exposure, which is the coefficient of FXR_{xt} (β_{5jk}) for each firm j in year k. The value of $\beta_{5\,jk}$ describes the foreign exchange rate exposure for the firm j in year k. The higher the value $\beta_{5\,jk}$ the higher foreign exposure the firm will have. This analysis will allow us to create an array of data having yearly exchange rate exposure for each firm in the study. And I use this exposure to establish the relationship between executive compensation and exchange rate risk.

Following Sun and Emanuel (2009), Rephael, kandel and Wohl (2012), Rajgopal and Shevlin (2002), Wallenstein (2000) and Chen, Steiner and Whyte (2009), I regress the coefficient of exchange rate risk exposure that I captured for equation 2 β_{5jk} , I name it $FXRisk_{jk}$ as a measurement of foreign risk exposure for j firm in year k on number of independent variables including executives' average total compensation for the year. I call it $TotalCompensationy_{jk}$, this includes salary, benefits, bonus and value of stock option granted (using black-scholes). Following Dong, Wang and Xie (2010), Rephael, kandel and Wohl (2012) and Barns and Kedia (2009), I also use estimated value of in-the-money unexercised vested option as independent variable and call it vested stock option$_{jk}$ for j firm, in year k, I also use Estimated value of in-the-money unexercised unvested option as Unvested Stock Option$_{jk}$ for firm j in year k. As a control variable I use the ration of male and female employee I call it MFRatioj$_k$ for the j firm in year k

and average executive age for firm j in year k as Age_{jk} following Hallahan, Faff, and Mckenzie (2004).

$$FXRisk_{jk} = \alpha + \beta_1\,TotalCompnesation_{jk} + \beta_2\,MFRatio_{jk} + \beta_3\,Age_{jk} + \beta_4\,VestedStockOPtion_{jk}$$

$$+\beta_5\,UnEx\_ExOptions_{jk} + \upsilon_j \qquad\qquad ....\ (2)$$

I use pooled OLS as well as look for fixed effect and random effect in the panel data. I ran fixed effect panel data and random effect panel data to see if fixed or random effect exist and check for consistency. The objective of the study is to look into the relationship between foreign exchange rate exposure and executive compensation from equation.

5.0 Data

The source of data in this study is Center for Research in Security Prices (CRSP), ExecuComp, Federal Reserve Bank Reports and Fama-French Portfolios and Factors. From Center for Research in Security Prices (CRSP), I use CRSP/Compustat Merged Database - Security Daily and find daily closing price and calculate the return from it. Initial data set has 12,665,108 observations from January 1, 1992 to December 31, 2011. During this period I have 5,041 working days. I choose the firms having Sic code between 2000 and 4000 that represents manufacturing firms. The initial data set has 6,117 firms.

I obtain Fama-French factor daily frequency for the time period of January 1, 1992 to December 31, 2011 from WRDS. I obtain SMB (Small Minus Big) that is the average return on the three small portfolios minus the average return on the three big portfolios, SMB = 1/3 (Small Value + Small Neutral + Small Growth) - 1/3 (Big Value + Big Neutral + Big Growth). SMB for July of year t to June of t+1 include all NYSE, AMEX, and NASDAQ stocks for which market equity

data for December of t-1 and June of t, and (positive) book equity data for t-1, exists. I have 5,041 observations for the study and denote it as SMB. I also obtain HML (High Minus Low) that is the average return on the two value portfolios minus the average return on the two growth portfolios, HML = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth). HML for July of year t to June of t+1 include all NYSE, AMEX, and NASDAQ stocks for which market equity data for December of t-1 and June of t, and (positive) book equity data for t-1, exist. I also obtain UMD (up minus down) Momentum (Up Minus Down as defined by Fama French). I also obtain MKTRF (or Rm-Rf) that is the excess return on the market. It is calculated as the value-weight return on all NYSE, AMEX, and NASDAQ stocks (from CRSP) minus the one-month Treasury bill rate. I also get the UMD which calculated the momentum.

[Insert Table 1]

Table 1 provides summary statistics for SMB, HML, UMD and Market return minus risk free return. During the sample period SMB has a mean of .000042 with a maximum value of .04 and a minimum value of -.04. The standard deviation of the sample is 0.0053. During the sample period HML has a mean of .0000148 with a maximum value of .03 and a minimum value of -.04. The standard deviation of the sample is 0.0054. During the sample period UMD has a mean of .0003 with a maximum value of .07 and a minimum value of -.08. The standard deviation of the sample is 0.0077. During the sample period MKTRF has a mean of .00029 with a maximum value of .09 and a minimum value of -.09. The standard deviation of the sample is 0.0097.

The multilateral trade-weighted index of the foreign exchange value of the U.S. dollar against the currencies of the other countries in the Group of Ten (G-10), developed at the Federal Reserve Board in 1971, has played an important role in analysis of foreign influences on the U.S.

economy for more than twenty-five years. However, changes in international trading relationships and in the structure of international financial markets have led to increased interest in the currencies of U.S. trading partners outside the G-10 countries. The trade weighted currency index is that of the currencies of important U.S. trading partners. This group is the basis for the construction of what the staff terms the broad index of the dollar's foreign exchange value. The broad index includes thirty-five currencies until the beginning of Stage III of EMU on January 1, 1999. At that time, the euro will replace the ten euro-area currencies, and the broad index will have twenty-six currencies. Shares in U.S. trade largely determined the currency selection for the broad index. The currencies of all foreign countries or regions that had a share of U.S. non-oil imports or nonagricultural exports of at least 1⁄2 percent in 1997 are included in the broad indexes, as rankings of U.S. trading partners by share of U.S. trade in that year. The countries with currencies in the broad index are also important in global trade. The countries and regions whose currencies are included in the indexes generate more than 75 percent of the world's gross national product (outside the United States), measured on the basis of purchasing power parity. The list of currencies included in the broad index is re-evaluated annually when the currency weights are updated[2].

In this study I obtain the daily trade-weighted index and calculate the daily index return as

$FXR_t = (FX_t - FX_{t-1})/FX_{t-1}.$

Where, FXR_t = daily trade weighted index return, FX_t = trade weighted index in current time, FX_{t-1} = trade weighted index in pervious time. Table1 reports summary statistics for daily stock

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[2] Federal Reserve Bulletin October 1998

return. During the sample period FXR_t has a mean of -.000023 with a maximum value of 0.02 and a minimum value of -0.04. The standard deviation of the sample is 0.004.

I use daily closing stock price from CRISP. The Data range from January 1, 1992 to December 31, 2011. I found 6,131 firms that have complete data set of up to 5,041 days. Out of that few firms have completely blank data so I drop those firms and final number of firm in this study is 6,117. The total number of observation in the study is 12,665,108. A return is the change in the total value of an investment in a common stock over some period of time per dollar of initial investment. RET(I) is the return for a sale on day I. It is based on a purchase on the most recent time previous to I when the se curity had a valid price. Usually, this time is I - 1. Returns are calculated as :For time t (a holding period), let: t = time of last available price < t, r(t) = return on purchase at t, sale at t, p(t) = last sale price or closing bid/ask average at time t, d(t) = cash adjustment for t, f(t) = price adjustment factor for t, p(t) = last sale price or closing bid/ask average at time of last available price < t. Then I subtract the daily risk free return and calculate the daily excess return.

[Insert table 2]

The raw data has few extreme values with a maximum return of 1595% and a minimum price of -97%. So I followed Huber(1981) and Ruymagaart (1981) I dropped 500 extreme observation from top and bottom. So the final number of observation in the study stands at 12,664,108. Table 2 reports the year by year break down of all firm return during the period of 1992 through 2011, with a grand average of .08% daily return. In the year of 2011, 2008 and 2002 the average return in negative in the other 17 years have positive return. The lowest return is observed in 2011 (-0.00051) and highest return is observed in the year 2009 (0.0032). I observe that number of firm

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increase every year from 1992 to 1997. In 1992 the number of manufacturing firm stood at 2769 and in 1997 the number reached 3510.Since 1997 every year the number dropped and in 2011 I have 1820 manufacturing firms. Using equation 1 I capture the coefficient of foreign exchange rate on yearly basis. I find that in year 1996, 2000, 2001,2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010 and 2011 the coefficient is negative and in 1992, 1993, 1994, 1995, 1997, 1998, 1999 and 2002 the coefficient is positive. The maximum value of foreign exchange rate exposure is 0.05877 and that took place in 1992, the lowest value of foreign exchange rate exposure took place in 2003 and the value is -0.00456. The average daily return for the entire sample is 0.000805 and the average of foreign exchange rate exposure is -0.0288

I obtain executive compensation data from Compustat Executive Compensation - Annual Compensation. From the entire data base I choose the manufacturing firms having sic code between 2000 and 4000. I use TDC1 variable from ExuComp, which is total compensation for the individual year, comprised of the following: salary, bonus, other annual, total value of stock options (using Black-Scholes), long-term incentive payouts, and bonus. I use estimated value of in-the-money unexercised vested option and estimated value of in-the-money unexercised unvested option. Estimated value of in-the-money unexercised vested option is an estimated amount across all of stock option grants. This value is calculated by multiplying the total number of vested stock options that are exercisable by the spread. Exercisable options are an estimate of the number of stock options from those originally granted that have been held long enough for one to have right of ownership and to be available for exercise. Option in-the-money amount refers to a gain in an option contract one hold. For a call option, a gain occurs when the underlying security's current market price is greater than the option contract price. For a put

option, a gain occurs when the underlying security's current market price is less than the option contract price.

The stock option plans becomes vested (become exercisable) on one single date (e.g., four years from date of grant). This is referred to as cliff vesting. More frequently, though, awards specify that recipients gradually become eligible to exercise their options gradually rather than all at once. This is called graded vesting. For instance, a company might award stock options that vest 25% the first year, 25% the second year, and 50% the third year, or maybe 25% each year for four years. In other instance company can choose cliff-vesting plans. It can estimate a single fair value for each of the options, even though they vest over different time periods, using a single weighted-average expected life of the options. The company then allocates that total compensation cost (fair value per option times number of options) over the entire vesting period. Vested option thus refers to when one have earned the right of ownership and the stock options are eligible for exercise. This variable is termed in ExecuComp as "opt_unex_exer_est_val".

For participants in employee stock option plans, unvested options are options that are not yet available to exercise under the terms of company's plan and any agreements between executive and the company. It is customary for a company to take back unvested options when an employee leaves the company for any reason. Sometimes, however, companies have a severance policy that provides special benefits (e.g., accelerated option vesting) for situations like layoffs. Companies use stock options to attract and retain talent, and to encourage employees to think like owners. Vesting schedules ensure that each employee has a financial incentive to stay with the company at least until the vesting period is over. The value is calculated as the estimated aggregate value of in-the-money unvested options at fiscal year-end, calculated based on the

difference between the exercise price of the options and the close price of the company's primary issue of stock at year end. This variable is termed in ExecuComp as "opt_unex_unexer_est_val".

Following Hallahan, Faff, and Mckenzie (2004) and Martin (2009) I use gender and age as a control variable. ExecuComp collects up to 9 executives for a given year, though most companies do only report 5. Hence, per company one will obtain several entries depending on how many executives they file in their proxy statement. I list down how many male top executive does a particular firm has in a particular year. I do the same for female top executives. And create a new variable called MFRatio which is equal to number of male executives divided by number of female executives. I also obtain age data for each executive from the data set of ExecuComp –which reports the latest known age of the top executives (5 or 9 depending on proxy filing). We calculate the average age of the executives and call it AGE.

[Insert table 3]

The result of the match finds 6,075 firms. That means in our study I have 6,075 firms that has the stock price data for the length of 5041 days and has executive compensation data available. That gives us 10,665,108 observations. Table 3 summarizes the summary statistics. During the sample period the foreign exchange rate exposure has an average of -0.003, standard deviation of 0.5, and maximum value of 2.6 and a minimum value of -6.096. During the sample period the total compensation has an average of $1.992 million, standard deviation of $2.624 million, and maximum value of $50.008 million and a minimum value of $0.167 million. During the sample period the Male/Female ratio has an average of 4.3, standard deviation of 1.73, and maximum value of 4 and a minimum value of 1. During the sample period the average age has an average of 54.08, standard deviation of 3.86, and maximum value of 76 and a minimum value of 47.

During the sample period the Estimated Value of In-the-Money unexercised vested option for executive has an average of $0.231 million, standard deviation of $0.393 million, and maximum value of $6.820 million and a minimum value 0. During the sample period the Estimated Value of In-the-Money unexercised unvested option for executive has an average of $0.143 million, standard deviation of $0.250 million, and maximum value of $4.363 million and a minimum value 0.

6.0 Empirical Findings:

From equation 1 I primarily obtain the yearly exchange rate exposure which will be captured in β_{5jk}. This operation is performed on the entire data set of 12,664,108 observation. The algorithm was carefully designed to capture foreign exchange rate exposure for all firms in all of 20 years from 1992 to 2011. To achieve that I perform 52,541 regressions and obtain as many coefficients that represent foreign exchange rate exposure for a particular firm in a particular year.

[Insert table 4]

Table 4 shows the result obtained from equation 2. For the Total compensation the coefficient is -0.000003 standard error is 0.000005 and T-statistics is -0.682 which is not statistically significant. For the Executive estimated value of in the money unexercised vested option, the coefficient is 0.000072 standard error is 0.000034 and T-statistics is 2.12 which is statistically significant. For the Executive estimated value of in the money unexercised vested option, the coefficient is -0.000119 standard error is 0.000062 and T-statistics is -1.92 which is statistically significant. For the Male/Female the coefficient is -0.0043 standard error is 0.006489 and T-statistics is -0.67 which is not statistically significant. For the average Age the coefficient is 0.000141 standard error is 0.0006 and T-statistics is 0.214 which is not statistically significant.

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As far as sign goes the finding are consistent with existing agency theory literature for total compensation. That is a higher value of total compensation means executives' foreign exchange risk is lower. I do not observe any statistical significance of total compensation variable in our study.

The fixed effect and random effect suggest similar result. The Housman test suggest that fixed effect is insignificant and Beush-Pagan LM test suggest no exogenous effect exist so pooled OLS is the best model to be used.

Corporate executives' future wealth is to a large extent linked to their firms' future performance, rendering executives significantly under diversified. One would consequently expect that executives would often monetize their in-the-money options soon after those options vest in order to diversify their portfolios as argued by Verrecchia (1991), Hall and Murphy (2002). Yet, many executives do not do so, voluntarily leaving themselves with a highly-levered long position in their firms and making managers' personal wealth even more susceptible to their firms' fortunes than would hold shares of equivalent value. It stands to reason, then, that holdings of vested in-the-money options (in relation to personal wealth) may have information content with regard to Executives' private information about their firms' future prospects. By voluntarily maintaining a highly-levered position, an executive may be aligning with equity holders and against debt holders and therefore either anticipate or actively pursue the higher-risk, higher-return cash flows preferred by equity investors, as opposed to the lower-risk, lower-return cash flows preferred by debt investors. Therefore, a natural hypothesis is that executives' holdings of vested in-the-money options (in relation to personal wealth) should be positively associated with a firm's overall risk.

Financial economics argues that the relationship between the convexity of a manager's compensation profile and risk-seeking behavior may not be monotonic as argued by Ross (2004). Having in-the-money options may prompt an executive to reduce the volatility of a firm's cash flows to prevent the options from going out of the money, in which case unvested in-the-money options would be negatively correlated with overall risk. I observe that the coefficient of estimated value of in-the-money vested option is positive and estimated value of in-the-money unvested is negative. Both coefficients are statistically significant. So the data supports the hypothesis.

The findings are also consistent with the findings of Rajgopal and Shevlin (2002) Rajgopal and Shevlin (2002) and Chen, Steiner and Whyte (2006) Chen, Steiner and Whyte (2006) where executive stock option and total compensation can be a means of reducing agency problem as the findings suggest a higher value of executive stock option (in the money unexercised) means higher foreign exchange rate exposure and lower unexercised exercisable option means higher foreign exchange rate risk. The findings are not consistent with the findings of Martin (2009) which tell that a male dominated firm will be have higher risk compared to a female dominated firm. This study didn't find any evidence of Age influencing foreign exchange rate exposure.

7.0 Conclusion

In this study I use some other measurement of executive compensation like option grant, option exercise value, and unexercised exercise value for robustness check and the findings are consistent. There has been considerable study that investigated overall riskiness of the firm in relation to executive pay, but not many such researches has been done to examine the relationship between foreign exchange rate exposure and executive compensation. The findings

of my research that establishes a relationship between foreign exchange rate exposure and value of in-the-money unexercised vested and unvested executive stock option can help understand and mange agency conflict puzzle and create interest for future research. The finding of this study confirms the wisdom behind the use of executive stock option which helps reduce the agency problem. Using pooled OLS, fixed effect panel data and random effect panel data, I find that in all 3 model value of in-the-money unexercised vested executive stock option has negative coefficient and is statistically significant. At the same time in all 3 models the value of in-the-money unexercised unvested executive stock option is positive and is statistically significant.

Tables

Table 1: Summary statistics of variables used in determining foreign exchange exposure

	Mean	Std Dev	Minimum	Maximum	Variance	Skewness	Kurtosis
MKTRF	0.000299	0.009746	(0.090000)	0.090000	0.000095	(0.415180)	10.206270
HML	0.000148	0.005440	(0.040000)	0.030000	0.000030	0.054973	4.346490
SMB	0.000042	0.005313	(0.040000)	0.040000	0.000028	(0.281670)	2.823110
UMD	0.000303	0.007754	(0.080000)	0.070000	0.000060	(1.181790)	14.308320
FXR	(0.000023)	0.004101	(0.040000)	0.020000	0.000017	(0.221550)	2.075380

This table reports the mean, standard deviation, minimum, maximum, skewness and Kurtosis of the variables used in equation used to determine exchange rate exposure. Sample period is January 1, 1992 to December31, 2011. Number of observation is 10,665,108. SMB (Small Minus Big) is the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios. UMD (up minus down) Momentum (Up Minus Down as defined by Fama French) and FXR_t is the daily trade weighted index return. I obtain the Famma-French factor data from Kenneth French's web site at Dartmouth through WRDS (Wharton Research Data Service) and obtain the trade weighted broad currency Index from Federal Reserve bank and calculated the daily Index return.

Table 2: Year by year all firm return breakdowns from 1992 to 2011

Year	Mean of RET	#of observation	#of firms	FxExposure
1992	0.00122	589432	2769	0.05877
1993	0.00138	621675	2950	0.02481
1994	0.00047	672528	3108	0.01208
1995	0.00156	706148	3256	0.01692
1996	0.00100	757939	3427	(0.01734)
1997	0.00084	787639	3510	0.02118
1998	0.00021	767871	3455	0.07452
1999	0.00179	714739	3273	0.02500
2000	0.00057	686418	3187	(0.01896)
2001	0.00132	621066	2943	(0.11701)
2002	(0.00015)	603922	2640	0.00722
2003	0.00260	547250	2468	(0.00456)
2004	0.00063	525044	2407	(0.03472)
2005	0.00021	519626	2387	(0.01387)
2006	0.00052	512424	2391	(0.08189)
2007	(0.00001)	502081	2304	(0.05230)
2008	(0.00190)	495068	2142	(0.16846)
2009	0.00322	444791	1996	(0.07872)
2010	0.00114	411342	1877	(0.13476)
2011	(0.00051)	398825	1820	(0.09472)
Grand Average	0.0008052			-0.02884109

This Table reports all firm daily average return, number of observation, number of firm during the period, and average foreign exchange exposure during the period on yearly basis. Sample period is January 1, 1992 to December31, 2011. Number of observation is 10,665,108. The yearly foreign exchange rate exposure is captured using β_5 equation 1 $R_{jt} = \alpha_j + \beta_{1jk} (MKTRF_t) + \beta_{2jk} SMB_t + \beta_{3jk} HML_t + \beta_{4jk} UMD_t + \beta_{5jk} FXR_{Xt} + \varepsilon_{jt}$ I obtain the daily Ret (return) data from CRSP(The Center for Research in Security Prices) stock/security file accessed through WRDS (Wharton Research Data Service).

Table3: Summary statistics used in executive compensation effect determination

	Mean	Std Dev	Minimum	Maximum	Skewness	Kurtosis
Foreign Exchange rate EXPOSURE	-0.003	0.500	-5.096	2.601	-0.803	7.817
Total Compensation	1991.776	2624.251	167.000	50008.417	7.191	95.379
Male/Female RATIO	4.122	1.727	0.200	11.000	0.127	-0.034
AGE	48.108	17.054	0.000	79.000	-2.115	3.535
Estimated Value of In-the-Money Unexercised vested option	231.677	393.126	0.000	6820.206	6.667	74.482
Estimated Value of In-the-Money Unexercised unvested option	143.796	250.366	0.000	4363.259	6.597	69.097

This table shows mean, standard deviation, minimum, maximum, skewness and kurtosis of variables used in equation $FXRisk_{jk} = \alpha + \beta_1 TotalCompnesation_{jk} + \beta_2 MFRatio_{jk} + \beta_3 Age_{jk} + \beta_4 VestedStockOPtion_{jk} + \beta_5 UnEx\_ExOptions_{jk} + \upsilon_j$ *I obtain executive compensation, age and gender data from Standard & Poor's Compustat ExecuComp. Sample period is January 1, 1992 to December31, 2011. Number of observation is 2,077.*

Table 4: Regression report for Executive compensation analysis

Pooled OLS		Estimated Coefficient	Standard Error	t-statistic	P-value
Panel 1	Constant	0.015706	0.039423	0.398409	[.690]
	Total Compensation	-0.000003	0.000005	-0.68297	[.495]
Pooled OLS	Male/Female RATIO	-0.004356	0.006489	-0.67132	[.502]
	AGE	0.000141	0.000657	0.214346	[.830]
	Estimated Value of In-the-Money Unexercised vested option	0.000072	0.000034	2.12934	[.033]
	Estimated Value of In-the-Money Unexercised unvested option	-0.000119	0.000062	-1.92766	[.054]
Panel 1	Total Compensation	0.000001	0.000007	0.124925	[.901]
	Male/Female RATIO	0.002416	0.009818	0.246116	[.806]
Fixed Effects - Individual (WITHIN)	AGE	-0.001115	0.000861	-1.29527	[.195]
	Estimated Value of In-the-Money Unexercised vested option	0.000160	0.000059	2.7309	[.006]
	Estimated Value of In-the-Money Unexercised unvested option	-0.000142	0.000081	-1.74184	[.082]
Panel 3	Constant	0.022215	0.041724	0.532423	[.594]
	Total Compensation	-0.000003	0.000005	-0.58356	[.560]
Random Effects - Individual – GLS	Male/Female RATIO	-0.004546	0.006854	-0.6633	[.507]
	AGE	-0.000074	0.000679	-0.10893	[.913]
	Estimated Value of In-the-Money Unexercised vested option	0.000087	0.000036	2.41965	[.016]
	Estimated Value of In-the-Money Unexercised unvested option	-0.000122	0.000063	-1.91361	[.056]

This table reports the regression results from $FXRisk_{jk} = \alpha + \beta_1 TotalCompnesation_{jk} + \beta_2 MFRatio_{jk} + \beta_3 Age_{jk} + \beta_4 VestedStockOPtion_{jk} + \beta_5 UnEx\_ExOptions_{jk} + \upsilon_j$ using pooled OLS, fixed effect panel and random effect panel data analysis. Sample period is January 1, 1992 to December31, 2011. Number of observation is 2,077.

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