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Resolving the Exchange Rate Puzzle

A study of the CHF/EUR Currency Peg

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Abstract

This paper aims to contribute to the current discussion on the effects of exchange rate exposure on firm value. Particularly, it makes an attempt to resolve the exchange rate puzzle, a phenomenon based on the ambiguous results derived from existing literature. The sample group includes 66 Swiss non-financial firms, for which fundamental firm data for the last fiscal year have been obtained. The accurate data provided by these globally oriented firms in combination with the favourable event studied, the removal of the EUR currency peg on January 15th 2015, form the basis for this thesis. A multivariable regression model conducted on different time horizons finds significance in the exposure variables foreign sales, foreign assets as an approximation for foreign costs, foreign non-current assets in relation to total assets as well as foreign financial debt in relation to total assets. Besides adding to existing literature, the findings in this paper may have implications for both asset managers and risk management within firms as it could add explanatory power to asset pricing models. Lastly, central banks and government institutions may consider the findings in this paper useful in order to determine the impact that a potential foreign exchange market intervention would have.

Keywords: Exchange rate exposure, Switzerland, SIX Swiss Exchange, currency peg, firm value

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1. Introduction

The value of a firm is the present value of all future cash flows (Berk and DeMarzo, 2013) and in turn, the future cash flows are affected by exchange rate fluctuations (Doukas et al., 2003). Consequently, there is a strong theoretical relationship between firm value and exchange rates. However, the extensive amount of existing literature have provided ambiguous results and subsequently, the actual impact of exchange rate exposure on firm value is still unsolved. In literature pertaining to exchange rates, the fact that numerous studies lack findings of statistical significance is referred to as the exposure puzzle (Bartram et al., 2009; Bodnar and Bartram, 2007). Furthermore, whereas there have been many studies investigating the measure of firms' net exchange rate exposure, few studies have been able to conduct a firm level empirical analysis on exchange rate exposures referable to specific firm characteristics (Ito et al., 2015). This paper aims to conduct such an analysis using a never before tested methodology on the event when the Swiss Central bank, SNB, removed the CHF currency peg on the EUR. The unexpected nature and magnitude of the event provides a seldom seen opportunity to analyse exchange rate exposure of firms on a short time horizon with accurate data and little noise. Capitalising on this, coupled with the detailed accounting data provided by Swiss firms, an effect of exchange rate exposure on firm value can hopefully be proved, thereby contributing to academia's efforts of resolving the exposure puzzle.

Adler and Dumas (1984) defined exchange rate exposure as the sensitivity of the value of a firm to unanticipated changes in exchange rates. Madura (1989) specified the unhedged exposure of firms as the possible direct or indirect loss in a firm's cash flows, assets and liabilities or net profit, and in turn, its market capital as a result of exchange rate fluctuations. In this paper, we try to determine if: *Direct exchange rate exposure implies a negative correlation between firm value and exchange rate, while hedging implies a positive correlation between firm value and exchange rate.* In order to be able to separate direct exchange rate exposure referable to specific firm characteristics from possible market wide exchange rate exposure, the main hypothesis is broken down into five complementary hypotheses. These hypotheses concern the three different subcategories of exchange rate exposure derived from previous literature; transaction risk, translation risk and economic risk (Madura, 1989; Jacque 2006; Shapiro, 1975; and Nydahl, 1999). Transaction exposure arises when a contract denominated in a foreign currency is entered into by a firm, which will be settled in the future. Translation exposure relates to the integration of foreign subsidiaries into the consolidated financial statements and economic exposure concerns future cash flows of the firm. If the

exchange rate effects on firms during the event can be explained by the different types of exchange rate exposures, they are to some extent referable to specific firm characteristics and not just market wide exposure.

The exchange rate effects on firms will be measured using compounded stock returns during different periods after the event. Apart from two exceptions, the explanatory variables are derived from previous literature and researched using a new methodology. Transaction risk will be estimated using the portion of a firm's total sales that are foreign sales, as proposed by the preponderance of existing literature. Translation risk will be estimated using foreign non-current assets as a percentage of total assets and a new variable measuring exchange rate effect on cash and cash equivalents. The last exposure, which is economic risk, will be tested using a foreign sales trend variable invented for this paper, which measures the increase in a firm's foreign sales during 2014.

Conjointly, previous research have investigated hedging as a method to reduce exchange rate exposure. For instance, He and Ng (1998) concluded that firms can lower their exposure resulting from foreign activities, by engaging in certain hedging activities. Diverging from the majority of previous research, this paper will discuss such hedging activities on a firm level. There are several strategies a firm can undertake in order to reduce its exchange rate exposure, including both operational and financial hedges. The most common hedging practices include operational hedges in the form of production and costs in the same currencies as sales, and financial hedges in the form of financial debt in the same currencies as non-current assets. Furthermore, the importance of financial derivative instruments as a financial hedge on foreign activities has been growing, which could indicate a general reduction in exchange rate exposure. In a report conducted by the Bank of International Settlements in 2013, the FX derivatives market activity amounted to $5.3 trillion per day in 2013 compared to $4.0 trillion in 2010, an increase of 32.5%. All of these hedging activities will be tested empirically and discussed in relation to the foreign activities intended to be hedged.

The main difference between this paper and previous studies is that it examines exchange rate effects during an event when the exchange rates fluctuated substantially, instead of relying on long time-horizons to observe sufficient variations in exchange rates. The unexpected nature and magnitude of the event provides large variations in exchange rates and stock prices to analyse and simultaneously, the short time-horizon minimises the noise from other factors affecting firm value. This combination presents a rare opportunity to analyse the direct effect of exchange rate exposures and hedges on firms' compounded returns on stock prices during different periods. Furthermore, Swiss firms provide detailed accounting

information on geographical dispersion, allowing for accurate measures of foreign involvement. Because of these fortunate conditions, this paper does not have to rely on the two stage regressions performed by previous studies, which use exchange rate betas from asset pricing models to estimate net exchange rate exposures. Instead, a single pass cross-sectional regression analysis on compounded returns on stock prices, using the previously mentioned explanatory variables, can be performed. Apart from this method being new, the paper also introduces a new variable in an effort to capture economic risk.

While previous research provides ambiguous results, the methodology used in this paper presents significant and intuitive estimations for several variables. Foreign sales, foreign non-current assets and foreign sales trend are proved to correlate with exchange rate exposure as expected, while foreign costs seem to be a perfect hedge against foreign sales and foreign financial debt can be considered a satisfactory hedge against foreign non-current assets. Furthermore, the fact that the regression is performed on different time periods allows for an analysis over time. This analysis shows both how the estimated coefficients have the same sign through all time periods and how they decrease slightly in absolute values over time as the CHF slowly depreciates towards its ex-ante value, as further disclosed in the appendix. Moreover, by analysing the explanatory variables over time, a lagged effect is detected as the highest significance is observed a couple of days after the event, which is in accordance with existing literature by He and Ng (1998). The last interesting observation, which indicates that the variables actually capture exchange rate exposure and hedging, is that all variables express the same tendencies of becoming less significant as the examined time-periods grow larger. This corresponds with the increasing discrepancies in the CHF's performance against different major currencies post the event, which should increase standard errors and confidence intervals of the explanatory variables' coefficients since they do not consider exposures to, or hedges of, specific exchange rates.

The results have implications both in theory and in practice. First of all, the study provides further proof to the existing literature advocating that exchange rate exposures and hedges affect firm value. Secondly, it introduces a new foreign sales trend variable that seems to capture some economic risk. Thirdly, the results suggest that the exchange rate exposures and hedges of firms could add explanatory power to asset pricing models, which has potential implications for both asset managers and risk management within firms. Especially so in the presence of volatile exchange rates or possible exchange rate shocks. Last but not least, the results have potential implications for central banks and government institutions with the possibility to affect exchange rates. Since the results concern average effects of certain

exchange rate exposures and hedges on firm value, the results could possibly be used by these institutions to estimate the impact that possible exchange rate shocks would have on stock markets and large stock indices.

The remainder of this paper is organised as follows. The next chapter will provide a background to the instalment and subsequently the removal of the currency peg. Chapter 3 presents an overview of previous research as well as the identified research gap. Moreover, the chapter includes the hypotheses on exchange rate exposure for Swiss firms. Chapter 4 describe the data selection process and chapter 5 specifies the chosen methodology. Together, chapter 4 and 5 form the empirical strategy. Thereafter, chapter 6 presents the results and comparison to previous literature whilst chapter 7 and 8 provide the conclusion and limitations for this study.

2. Background

In this section follows a brief description of the Swiss economy and the rationale behind the recent removal of the currency peg on the EUR, in order to obtain an understanding of the relevance of examining Switzerland when conducting a study on exchange rate exposure.

2.1 The Swiss economy

Conducting a study of exchange rate exposure on Swiss firms is relevant for several reasons. Firstly, existing studies rely primarily on findings from the U.S. market and it is paramount to test the robustness of these findings with findings from other countries. For instance, evidence of exchange rate exposure for Japanese firms has differed substantially from the findings on U.S. firms (He and Ng, 1998). Despite its small population, Switzerland possesses a financial market of substantial size, with the 13th largest stock exchange in the world in terms of market capitalisation in 2012 (Standard & Poor's). Moreover, Swiss firms are extensively globally oriented, making them more exposed to unanticipated fluctuations in exchange rates. The global orientation of Swiss firms is further emphasised by Switzerland's 13th place on the KOF Index of Globalisation (KOF) and ranking 23rd on WTO's data on share of world trade (WTO).

Additionally, in a study by Jorion (1990) on exchange rate exposure for U.S. firms, the problem of insufficient company data regarding geographic operations was addressed. Swiss firms listed on the SIX Swiss Exchange follow IFRS regulations and thus, provides detailed and transparent data on foreign operations in their annual reports.

2.2 Reasons for installing the peg

The currency peg on the EUR was a policy introduced by the Swiss National Bank, SNB, in 2011. The fundamental reason for the implementation of this policy was to stop the CHF from gaining too much value on the EUR, thereby protecting Swiss export firms. The Eurozone is Switzerland's largest trading partner and the rapid weakening of the EUR implied that Swiss products were quickly becoming unaffordable.

Furthermore, foreign central banks have since the breakout of the global financial crisis in 2007 stockpiled on CHF in accordance with the currency being considered a safe currency, or a safe haven. This refuge in the CHF had been driving its traded value away from its fundamental value, thereby further increasing the prices of Swiss products.

In order to address the above mentioned issues, the peg was constructed as a currency floor, or a minimum value, of 1.20 CHF per EUR. To obtain this level, the SNB has since 2011 spent vast amounts of money on buying EUR (O'Dea, 2015).

2.3 Reasons for dropping the peg

The currency peg was removed on January 15th 2015, causing a shock in the financial market. The reason for this decision was a turbulent macroeconomic environment, including the strengthening of the U.S. dollar, the European Central Bank's decision to implement quantitative easing in the Eurozone, thereby flooding the financial markets with EUR, and the risk of Greece exiting the EUR. However, the decision was still widely unanticipated (Drechsel et al., 2015).

3. Literature Review and Hypotheses Development

The following section provides the relevant existing literature concerning exchange rate exposure and forms the foundation for this paper as well as the hypotheses. Moreover, a research gap is identified.

3.1 Previous research

3.1.1 Foreign exchange rate exposure

Previous studies on the subject of exchange rate effects on firm value aimed at solving the exposure puzzle are abundant. However, due to the numerous aspects of exchange rate exposure, the methodology has varied substantially and the results have been perplexing. Studies conducted by Bartov and Bodnar (1994), Choi and Prasad (1995) and Jorion (1990) found firm value to be insensitive to exchange rate exposure whilst studies by Nydahl (1999), He and Ng (1998) as well as Bodnar and Gentry (1993) concluded that there is a significant relationship between firm value and exchange rate exposure.

For a small open economy, such as Switzerland, with a high degree of exports, the expectation is that the exchange rate exposure should have an impact on firm value. This paper aims at resolving the exposure puzzle and the main hypothesis is stated below:

H1: *Direct exchange rate exposure implies a negative correlation between firm value and exchange rate, while hedging implies a positive correlation between firm value and exchange rate.*

In order to understand the direct exchange rate exposure of firms, it is necessary to go beyond a regular capital asset pricing model with a beta for exchange rate. Existing literature have categorised the direct exchange rate risk of firms into three subsections; transaction, translation and economic risk (Madura, 1989; Jacque 2006; Shapiro, 1975; and Nydahl, 1999), which are described in detail in the following subsections. Furthermore, it is also necessary to understand the two main means of hedging against the currency exposure arising from these subcategories. The currency risk management of firms often entails using complementary operational and financial hedges (Pantzalis et al., 2001). A financial hedge is derived from financial market instruments such as derivatives and foreign debt, whilst operational hedging relates to the operations of the firms. In order to effectively manage the currency exchange rate risk on a long-term basis, it is widely believed that firms should use both strategies (Allayannis, Ihrig

and Weston, 2001). Contributing to our main hypothesis on firm value impact, additional hypotheses within each category of risk will be tested. This is necessary in order to determine if an effect of exchange rate exposure on firm value can be contributed to the fundamentals of a firm.

Before delving into the fundamental exchange rate exposures of firms it is important to address that although the mentioned categories to a large extent is supposed to capture a firm's currency exposure, total currency exposure is not necessarily the sum of them. The categories only capture the direct exposures of firms, which the firms themselves can affect and control. They do not include the potential indirect effects that exchange rates have on firms' domestic operations and accounts. If, for instance, a firm's customer base is exposed to exchange rate risk, it will have an indirect effect on the firm's operations and stock price. Thus, the firm will be exposed to exchange rate risk (Adler and Dumas, 1984). However, these indirect factors are outside of the scope of this paper and will only briefly be discussed. The important thing to consider when reading this paper is that it only discusses direct exchange rate exposures.

3.1.2 Transaction risk

Transaction risk is derived from cash flow risk and concerns exchange rate exposure in a company's transactional accounts, such as receivables and payables, but foremost exports and imports (Madura, 1989; Jacque 2006; Shapiro, 1975; and Nydahl, 1999). The risk management strategy attributable to this form of exchange rate risk involves the use of operational hedges in the form of production and costs in the same currencies as sales and, in some cases, financial derivative instruments designated as cash flow hedges.

Existing studies on the U.S. market indicates that a firm's exchange rate exposure is significantly related to the level of foreign operations. Jorion (1990) investigated the exchange rate exposure of U.S. multinational firms and concluded that estimated foreign exchange sensitivity increased as the firm's foreign involvement increased, which was measured by the level of foreign sales. However, only 5% of the firms in the sample group experienced significant currency exposure. A study of Martin, Madura and Akhigbe (1999) reinforced Jorion's findings when studying exchange-rate sensitivity of 168 U.S. multinational firms with foreign operations primarily in Europe. Martin et al found that 16% of their sample group exhibited currency exposure, determined by the degree of imbalance between foreign cash inflows and outflows as well as the proportion of foreign sales. Furthermore, Williamson (2001) investigated the exchange rate exposure on the U.S. and the Japanese automotive industry from

1973 to 1995 and established that foreign exchange sensitivity can be determined by foreign sales and by operational hedging in the form of foreign production. Pritamani, Shome and Singal (2004) also contributes to previous research, finding a significant positive relationship between exchange rate exposure and S&P 500 firms divided into subgroups depending on the level of exports and imports with data from 1975 to 1997. Moreover, Gao (2000) finds that firms are affected by exchange rate fluctuations through foreign sales and foreign production and that this exposure on profitability is priced by the stock market. Furthermore, Pantzalis, Simkins and Laux (2001) concluded based on a study performed on 220 Fortune 500 firms from 1983 to 1999 that firms with foreign subsidiaries across several countries exhibited less exchange rate sensitivity than those with a more concentrated network of operations. Lastly, Doidge et al. (2002) performs cross-sectional regressions of exchange rate betas and concludes that there is a negative relation between exposure and foreign sales.

However, while the above-mentioned studies find a significant relationship between foreign involvement and exchange rate exposure, several studies focusing on transaction risk and operational results have provided ambiguous results. One potential reason that these findings have been inconclusive may relate to the difficulties in identifying and measuring operational hedging strategies of firms (Guay and Kothari, 2003). Chow, Lee and Solt (1997) investigated exchange rate sensitivity of 213 multinational firms (1977-91) and found significant relationship to firm size but not to foreign sales, at least on a short time span. Dominguez and Tesar (2001), were also not able to conclude a significant relationship between exchange rate exposure and foreign sales. Moreover, a study conducted in 2007 by Chiang and Lin on Taiwanese manufacturing firms found that operational hedging strategies do not help to reduce foreign exchange rate exposure.

Even though previous research provides ambiguous results regarding transaction risk, it is expected to be an important direct exposure of firms and this paper forms two hypotheses related to transaction risk in order to investigate the main hypothesis:

H2: *Transaction risk increases exchange rate exposure*
H3: *Hedging of transaction risk reduces exchange rate exposure*

3.1.3 Translation risk

Translation risk relates to exchange rate exposure of a company's balance sheet. In particular, translating assets and liabilities of foreign subsidiaries into the consolidated financial statement of the group appertain to this aspect of foreign exchange rate exposure (Madura, 1989; Jacque

2006; Shapiro, 1975; and Nydahl, 1999). The risk management strategy applicable to translation risk is financial hedging with foreign debt, financial derivative instruments are seldom used to hedge translation risk (Papaioannou, 2006).

The magnitude of previous research focusing on the translation risk of firms is more modest than for transaction risk. Choi and Prasad (1995) performed a study on 409 multinational firms and 20 industry portfolios from 1978 to 1989 and found cross-sectional differences between exchange rate sensitivity and level of foreign assets as well as foreign sales. Madura (1989) stated that since currency hedging with financial derivatives often is costly, a firm might instead consider using natural hedges in the form of foreign liabilities. Exchange rate exposure decreases by netting assets and liabilities in the consolidation of foreign subsidiaries. Furthermore, Allayannis and Ofek (2001) found evidence for an inverse relationship between foreign debt and exchange rate exposure, suggesting that it is an effective hedge against currency exposure. Doidge et al. (2002) also found negative relation between exposure and foreign assets when performing cross-sectional regressions on exchange rate betas. However, some ambiguity in previous research exist for translation risk as well. For instance, Dominguez and Tesar (2001) found no significant relationship between exchange rate exposure and foreign assets.

The limited research done in regards to translation risk makes it an interesting part of exchange rate exposure to investigate. Two hypotheses related to translation risk is formed in order to add information to the investigation of the main hypothesis of this paper:

H4: *Translation risk increases exchange rate exposure*
H5: *Hedging of translation risk decreases exchange rate exposure*

3.1.4 Economic risk

Economic risk is similar to transaction risk in that it also reflects the cash flow risk of firms. However, it differs in the way that it concerns the future expected cash flows, not the present, and therefore measures the long term risk of currency exposure. In principle, it is the risk associated with future foreign exchange rate exposure on sales and operating expenses (Madura, 1989; Jacque 2006; Shapiro, 1975; and Nydahl, 1999).

Doukas et al. (2003), in their study on firm performance, concluded that firm value is the present value of its future cash flows and the exchange rate exposure variation between firms will affect the future cash flows. However, no study so far have really been able to capture

economic risk due to the difficulty of obtaining an accurate measure of it. The studies that have come closest have shown that exchange rate exposure is more significant on a long term horizon. This was shown in a study of exchange rate sensitivity on U.S. firms from 1977 to 1996, conducted by Bodnar and Wong (2003), where it was also established that there is an inverse relationship between firm size and exposure. Chow et al. (1997) also found that exchange rate exposure increased with the return horizon.

The results from previous research on economic risk is very limited, but this paper forms one hypothesis about economic risk and makes an effort to prove it. However, due to the complicated nature of economic risk and the difficulties associated with drawing any conclusions related to it, it will not be part of the main discussion:

H6: *Economic risk increases exchange rate exposure*

3.2 Research gap

Research within the field of exchange rate exposure is extensive and generally, foreign involvement is considered to be the main determinant of exchange rate exposure. However, as previously mentioned, evidence of the effect on firm value is ambiguous. To some extent, this is due to the difficulty in obtaining stable measures of exchange rate exposure as firms' exposure to different currencies tends to vary over time (Levi, 1994). This has forced previous papers to conduct studies over long time horizons and often on proxy variables. The unexpected nature and magnitude of the event on January 15th 2015, and the fact that only the CHF was substantially affected by it, resulted in equal effects of the same magnitude on all CHF exchange rates. This provides a rare opportunity to isolate large effects on firm value due to exchange rate exposures of firms on a short time horizon with low levels of noise. Furthermore, it does not require any knowledge of the exact currency denomination of the firms' foreign involvement, possibly allowing for high explanatory power in general measures of foreign sales and foreign assets. Consequently, the data in this study enables an accurate empirical analysis on firm level of exchange rate exposure, something which has been lacking in previous literature (Ito et al., 2015).

Furthermore, to the best of our knowledge, no study has yet been conducted on the exchange rate exposure of Swiss firms. Friberg and Nydahl (1999), when investigating the relationship between stock market valuations and exchange rate fluctuations of 11 industrialized countries, concluded that the overall level of foreign involvement in the economy

is positively correlated to the level of exposure. Thus, Switzerland makes an interesting and compelling case due to its export orientation and globally integrated economy. Lastly, Swiss firms provide detailed accounting of foreign involvement in the form of geographical dispersion regarding sales, non-current assets and financial debt, which is also necessary in an accurate analysis of firm level exchange rate exposure.

3.3 Study hypotheses

To conclude this section, the following hypotheses will be tested:

Main hypothesis

H1: Direct exchange rate exposure implies a negative correlation between firm value and exchange rate, while hedging implies a positive correlation between firm value and exchange rate.

Complementary hypotheses

Transaction risk	*H2: Transaction risk increases exchange rate exposure*
Transaction risk	*H3: Hedging of transaction risk reduces exchange rate exposure*
Translation risk	*H4: Translation risk increases exchange rate exposure*
Translation risk	*H5: Hedging of translation risk reduces exchange rate exposure*
Economic risk	*H6: Economic risk increases exchange rate exposure*

4. Data

This section covers the process of collecting and selecting the data used in the study. It entails the research strategy for obtaining data used for the sample group and explanatory variables, both for which the selection procedure is disclosed. Furthermore, in accordance with this paper conducting a firm level analysis, the coverage of the financial statement by the selected independent variables is presented.

4.1 Data sources

The gathered data for this study have been retrieved primarily through the databases Compustat, Capital IQ and Factiva. Furthermore, annual reports for each company in the sample group have been screened for every explanatory variable used in this study in order to verify data and find missing values. Firms with unobtainable data for any of the independent variables used in this thesis were removed from the sample group. The annual reports were accessible on the respective company website and data has been collected on a latest fiscal year-end basis.

Factiva presents figures for international operations made available in detailed company reports. In particular, the report stated firm sales and assets based on geographical region for the fiscal years 2009 to 2013. However, there were some discrepancies with the data. Assets dispersed on geographical regions were defined as non-current assets, or PPE and intangible assets including goodwill. The definition of assets diverged for some firms, which needed to be manually adjusted. Additionally, the data for both sales and assets had to be updated with figures for the fiscal year 2014, found oftentimes in the geographical segment note to the consolidated financial statement. Companies that did not disclose geographical dispersion based on countries were withdrawn from the sample group.

The geographical dispersion of financial liabilities for each company was obtained from Capital IQ. Anew, discrepancies in the gathered data needed to be addressed. Firstly, the data was not complete. The last update differed from 2011 to 2013 and thus, figures for fiscal year 2014 needed to be updated from notes relating to financial liabilities in the annual reports. Furthermore, the currency denomination of debt accounts had to often be adjusted. However, data for the exchange rate effect on cash and cash equivalents variable, also obtained from Capital IQ, was sufficient and accurate.

Regarding financial derivative instruments, information pertaining to hedge accounting was obtained from annual reports in notes concerning risk management as well as in other comprehensive income. Complications with the data gathering relating to financial

derivative instruments included what kind of risk was hedged within the company and the notional amount of the relevant hedges.

4.2 Sample selection

Aforementioned data process generated the sample group used in our study. Initially, it consisted of 99 Swiss companies publicly listed on the SIX Swiss Exchange (SIX) using the regulatory main standard.

4.2.1 Exclusion of financial firms

Although financial firms may disclose data for the relevant variables in this study, these companies are removed from the sample group. Excluding financial firms from the sample group entails omitting Swiss banks, real-estate firms and insurance companies, reducing the sample size by 15 firms in total. This will increase comparability in the data since the international operations of financial firms differ substantially from other industries. Furthermore, the procedure is in accordance with previous research by Martinez-Solano (2000). From here on forward, when discussed, Swiss firms refers to Swiss non-financial firms.

4.2.2 Sample group

Subsequent to the rigorous selection process, the final sample group consists of 66 non-financial firms. All the studied firms are constituted in the SPI index, which comprises practically all of the traded equity securities on the SIX in terms of market capitalisation. Additionally, the largest of the studied firms are included in the SMI index, also referred to as the index for blue-chip stocks. The daily closing stock prices of the respective firms is retrieved from the database Compustat for the period 1st of January 2014 to 24th of March 2015. From these prices, the compounded returns (R_{it}) since the 14th of January 2015 (one day prior to the event) is computed and used as the dependent variable in our study. In accordance with previous literature, stock price will serve as a proxy for firm value (Ito et al., 2015). The compounded returns of firm i for each period, t, was computed as the following equation:

$$R_{it} = \frac{\Delta P_t}{P_{t0}}$$

ΔPt = change in price of firm i for the period from day t_0 (14th of January 2015) to day t

Pt_0 = price at day t_0 (14th of January 2015)

4.3 Comparison with previous literature

The scope of this paper is generally smaller than previous studies, both in terms of sample size and time frame, which needs be addressed. Firstly, our time frame is naturally shorter since we conduct the study on an event that surpassed in January this year. Previous research have relied on long time horizons in order to obtain sufficient variation in the exchange rates and dependent variables. However, that is not needed in this paper due to the magnitude and unexpected nature of the event studied, the short time horizon should therefore not be a concern. In fact, the short time horizon increases the reliability of the results in this case due to the low level of noise included in the dependent variable. Secondly, although our final sample group consists of 66 firms, they constitute approximately 70% of the market capitalization of the entire SIX Swiss Exchange. Excluding firms from the sample group with deviating or missing data, the final sample group can be considered a group of highly comparable firms in terms of firm regulations and legislations. Lastly, for the firms used in this study the data has been manually proved for each firm thereby eliminating any risk for potential data error.

4.4 Variable selection

In this thesis, the main hypothesis entails studying exchange rate exposure in all three subcategories of risk discussed. The current section discusses potential variables used for a multivariable regression in order to explain the exposures and categorises them into the relevant risk. The independent variables are derived from previous research that have aspired to explain exchange rate exposure of firms. Additionally, the variables are defined either as an exposure variables or a hedging variables.

4.4.1 Transaction risk

Choi and Prasad (1995), Laux et al. (2001), Dominguez and Tesar (2006), Allayannis and Ofek (2001), Jorion (1990), Doidge and Griffin (2005), Bartram et al. (2009), Allayannis Ihrig and Weston (2001) and Nydahl (1999) conduct some of the previous research that examine the level of foreign sales in an effort to determine firm exposure to transaction risk.

Regarding hedging variables, Allayannis and Ofek (2001) and Bartram et al. (2009) discuss foreign production as a proxy for foreign costs, which is often considered a natural hedge against the exchange rate exposure of a company's sales. Accurate data on geographical dispersion of firm costs are not available through databases nor annual reports, but data on

foreign non-current assets may similarly be considered a proxy for foreign costs since the geographical dispersion of a firm's assets provides an indication of where costs are incurred. Moreover, Bartram et al. (2009) further discuss financial derivative instruments designated as cash flow hedges. Jorion (1990) claims that if the financial derivative instrument for exchange rate exposure is known and impounded in the stock price, the instrument will serve to reduce correlation between the stock price and the exchange rate. Due to difficulty in obtaining accurate data for financial derivative instruments, as aforesaid, a dummy for hedge accounting of FX derivatives was constructed.

Variable	**Measure**	**Definition**
Exposure variable	Foreign sales	Foreign sales/Total sales
Hedging variable	Foreign costs	Foreign non-current assets/Total non-current assets
Hedging variable	FX derivative instruments	Dummy=1 if hedge accounting is applied on FX derivatives

4.4.2 Translation risk

Pertaining to translation risk, a major factor of exchange rate exposure is foreign assets as disclosed by Dominguez and Tesar (2006), Choi and Prasad (1995), Kim et al. (2006), Doidge and Griffin (2005) and Bartram et al. (2009). However, the variable in this study will be constructed as foreign non-current assets/total assets. The logic for using non-current assets relates to the geographical dispersion in the annual reports, which as previously stated uses non-current assets. Furthermore, including total assets in translation risk would overlap with transaction risk, since several working capital accounts pertaining to revenues are already accounted for in foreign sales.

Allayannis and Ofek (2001), Bartram et al. (2009) as well as González et al. (2010) introduce foreign debt as a form of natural hedge against foreign assets. Allayannis and Ofek (2001), constructs a variable of foreign financial debt divided by total assets to determine the relative size of their foreign debt involvement. Apart from the detailed accounting data on financial debt, it is a good measure since some of the operational debt is already accounted for

in foreign costs which pertains to transaction risk. Lastly, exchange rate effect on cash and cash equivalents are subject to translation adjustments and consequently, forms an exposure variable in this study.

Variable	Measure	Definition
Exposure variable	Foreign non-current assets	Foreign non-current assets/Total assets
Exposure variable	Exchange rate effect on cash and cash equivalents	Exchange rate effect on cash and cash equivalents/Total assets
Hedging variable	Foreign debt	Foreign financial debt/Total assets

4.4.3 Economic risk

Generally, economic risks have been hard to capture in explanatory variables for exchange rate exposure in previous studies. Oftentimes, it is only considered a risk that should be managed strategically (Shapiro, 1975). However, some of the economic risks of firms are probably included in the foreign sales variable, due to current foreign sales providing an indication of future foreign cash flows. However, using data on foreign sales for the years 2013 and 2014, a trend exposure variable can be constructed that might capture pure economic risk. The rationale is that the exposure trend for aforesaid period can be used to extrapolate an estimation for future exchange rate exposure in sales, thereby creating an estimation of exchange rate exposure of future cash flows for firms.

Variable	Measure	Definition
Exposure variable	Foreign sales trend	(Foreign sales 2014 - foreign sales 2013)/Total sales 2013

4.4.4 Additional variables

Variables not directly relating to either of the subcategories of risk are disclosed in this section. If not included in the regression, they may end up in the error term. Laux et al. (2001), Chiang and Lin (2007), Dominguez and Tesar (2006), Doidge and Griffin (2005) as well as Bartram et al. (2009) discuss firm size as a potential explanatory variable to determine exchange rate exposure. To measure firm size, market capitalisation is used. The rationale for a firm size variable is specified by He and Ng (2006), claiming that a firm of larger size has better access to risk management and economies of scale in hedging costs. Consequently, larger firms should be less exposed to exchange rate fluctuations. In this study, a relative market capitalisation variable has been considered. In other words, the percentage of market capitalisation for a firm to the total market capitalisation of the sample group is used.

Dominguez and Tesar (2006) and Bartram et al. (2009) consider industry competition and the ability of firms to pass-through exchange rate movements onto the prices of their products or services, using the Herfindahl index as a variable. Williamson (2001) presents the justification for a competition variable declaring exchange rate exposure to be a function of demand elasticity and firms' abilities to adjust prices to fluctuations in exchange rates. However, competition will not be included as an explanatory variable in this thesis since the aim is to research the correlation between direct exchange rate exposures and hedges and firm value. There is no reason for including competition as a control variable either, because there is no intuition or literature suggesting that there should be a correlation between competition and any of the explanatory variables used. Hence, no problems of heteroscedasticity or endogeneity should arise from this decision.

The last additional variable that was found in previous literature is multinational status of companies, which is reviewed as an independent variable by Dominguez and Tesar (2006) and Jorion (1990) claiming that the unique ability of multinational firms to shift production to another country lessens their exchange rate exposure. However, the simplification of foreign involvement from examining multinational status of firms entails some overlapping with the more elaborate explanatory variables used in this paper. Hence, the variable of multinational status will not be considered further.

Variable	Measure	Definition
Exposure variable	Market share at event	Market capitalisation of firm i/Total market capitalisation of sample
Exposure variable	Competition	Pass-through (Herfindahl index)
Exposure variable	Multinational status	Dummy=1 if present in more than one country

4.5 Financial statement coverage

The extensive amount of independent explanatory variables used in this study aim at inducing a complete coverage of potential exchange rate exposure of firms. This can be explained by relating the variables to the financial statements of firms. Transaction risk primarily relates to exposure in the income statement through sales and costs. Moreover, translation risk concerns balance sheet exposure resulting from the foreign involvement of a company's assets and liabilities. Exposure in assets are included in the variables measuring non-current assets, financial derivative instruments and exchange rate effect on cash and cash equivalents as well as the geographical dispersion of sales as a proxy for current operational assets. Similarly, foreign costs may provide a proxy for current operational liabilities, whilst foreign debt covers exchange rate exposure in both current and noncurrent financial liabilities. Additionally, exchange rate effect on cash and cash equivalents also covers potential exposure in the cash flow statement, and lastly, revaluations in other comprehensive income due to exchange rate fluctuations is observed by financial derivative instruments used in accordance with IFRS 9 "Hedge accounting" regulations.

4.6 Potential selection biases

Given that the study was not conducted on a randomized experiment, potential sample selection biases might occur due to the risk that some variables might be correlated with the error term in the cross-sectional regressions.

Furthermore, there might be a problem with the sampling process. First of all, firms missing detailed accounting data on geographical dispersion have been dropped from the regressions. Secondly, only firms using the main standard used for listing of equity securities

on the SIX Swiss Exchange were selected for the sample. This is the most rigorous standard for listing equity securities. These two sampling selection criteria could present a problem if they are correlated with any firm characteristic that increases or decreases exchange rate exposure, since it would cause the estimators to become biased. However, no such correlations have been identified and the estimators are therefore expected to be unbiased.

5. Methodology

The following section discloses the statistical and econometric models applied in our study. Firstly, we conduct an event study on the 15th of January 2015 when the EUR currency peg was removed. Secondly, we perform a multivariable regression on different time horizons for the empirical analysis in order to obtain a more accurate explanation of the exchange rate exposure of Swiss firms.

5.1 The event study

The event study methodology is widely considered the most appropriate way of studying the impact of an event, discussed in research by Fama, Fisher and Jensen (1969) as well as Brown and Warner (1985). Implementation of the event study methodology is based on the efficient market hypothesis, which states that share prices adjust to new information (Fama et al., 1969). Therefore, the unexpected nature of the event examined in this study should yield a reaction in the share prices of Swiss firms. Furthermore, if a significant reaction is observable in the event study, it is likely to be an effect of the new information concerning the removal of the currency peg.

Equally weighted compounded returns for each firm at time t (R_{it}) is applied, obtainable in the Compustat database. The reason for not using abnormal returns pertain to the lack of a suitable control group. This is due to the assumption that the entire SIX Swiss Exchange was affected by the event, which renders all possible Swiss control groups useless. Furthermore, an extrapolation of returns prior to the event date for Swiss firms is considered a better control group than other European stock exchanges, which might not be comparable to the SIX Swiss Exchange due to idiosyncratic factors.

Applying the compounded returns, the estimation window is constructed as the average compounded return for the period 1st of January 2014 to 14th of January 2015 and is thereupon extrapolated over the event window. The event window contains the interval from the 15th of January 2015, the day of the removal of the currency peg, and for eight full trading days onwards. In an effort to understand the results of the event study, a multivariable regressions will follow.

5.2 Regression model specification

In order to more accurately determine the underlying reasons for the share price effect on Swiss firms in relation to the removal of the currency peg, conducting multivariable cross sectional

regression analyses of equally-weighted compounded stock returns will complement the event study in explaining exchange rate exposure.

The compounded returns for each firm has been used as the dependent variable instead of the alternative which would be to use daily returns and to cluster on firms when conducting the multivariable regression. This decision decreases the number of observations, however it is more suitable because of the fact that the independent variables are obtained from annual reports and thus static.

In an effort to correctly capture the exchange rate factors affecting compounded stock returns, two separate regressions will be performed. In the main regression (1), the effect of transaction risk and translation risk will be tested. The independent variables selected for this regression are foreign sales, foreign costs, foreign non-current assets and foreign financial debt as defined in the previous section. In the secondary regression (2), an attempt to capture the effect of economic risk will be tested using foreign sales trend, also defined in previous chapter, as the explanatory variable. Both regressions are tested continuously for every possible time period, with increments of one full day of trading. Besides obtaining explanatory levels and significance for the independent variables over time, this will allow for an analysis of the changes in the explanatory power of the regressions over time.

Additionally, the reasons for conducting the regressions separately stem from the absence of previous empirical research on economic risk and from the fact that there are no intuitive correlations between the variables used to research economic risk and those used to research transaction- and translation risk. Hence, there should not be any problems of heteroscedasticity or endogeneity from separating the risks. On the other hand, the variables used to estimate transaction risk and translation risk must be in the same regression in order to prevent the aforementioned problems. The most obvious issue that needs to be addressed is that a company with substantial foreign non-current assets is likely to have substantial foreign costs as well. This problem is further exacerbated by the fact that the foreign costs variable is derived from foreign non-current assets.

The only way to prevent the foreign costs variable from capturing some of the effect of foreign non-current assets and vice versa is to include both variables in the same regression. It is possible to separate the two variables because the exchange rate effect of foreign non-current assets is dependent on the size of foreign non-current assets relative to total assets. Contrary, the effect of foreign costs is best estimated by the size of foreign non-current assets relative to total non-current assets, since production and costs usually are located where non-current assets are, and hence not dependent on total assets. Therefore, by estimating the foreign

non-current assets variable as foreign non-current assets/total assets, while estimating the foreign costs variable as foreign non-current assets/total non-current assets, and including both variables in the same regression, problems with biased estimators can be prevented. Presented below are the resulting main regression and the secondary regression:

Main regression (1)

$$Compounded\ return\ on\ stock\ price_i = \beta_0 + \beta_1 Foreign\ sales_i + \beta_2 Foreign\ costs_i + \beta_3 Foreign\ non\ current\ assets_i + \beta_4 Foreign\ financial\ debt_i + \beta_5 Market\ share\ at\ event_i + \beta_6 Exchange\ rate\ effect\ on\ cash\ and\ cash\ equivalents_i + \beta_7 Currency\ derivatives_i + \varepsilon_i$$

Secondary regression (2)

$$Compounded\ return\ on\ stock\ price_i = \beta_0 + \beta_1 Foreign\ sales\ trend_i + \varepsilon_i$$

5.2.1 Comparison with previous literature

The limited number of studies previously conducted on firm level exchange rate exposure have relied on long time-horizons in order to obtain sufficient variation in exchange rates and dependent variables. This has forced them to device different methodologies than the regression of this report to capture the different exchange rate exposures of firms. Previous research have performed different versions of a two pass regression. For instance, Dominguez and Tesar (2006) perform a two pass regression in which exchange rate betas are first estimated from a two-factor regression including market return and exchange rate as explanatory variables for each of the sample firms' stock returns. The exchange rate betas are subsequently considered the exchange rate exposure of the respective firm. In the second pass, the exchange rate betas are regressed on individual firm and industry characteristics in an effort to identify specific exposures. Other research are similar in the way that a first pass regression initially is performed where exchange rate exposure is estimated in what usually is a two-factor model including exchange rate as one of the explanatory variables. In the second pass, research varies in choice of either single- or multivariable regressions. For example, Doidge and Griffin (2005) perform

single variable second pass regressions on different firm characteristics separately whilst Allayannis and Ofek (2001) perform multivariable second pass regressions.

The unexpected nature and magnitude of the event studied in this paper provides a scarce opportunity to regress stock price returns directly on firm characteristics without performing a first pass regression. Furthermore, the large variations in the variables allow for the inclusion of more explanatory variables than most previous papers have used, which makes it easier to draw accurate conclusions of the true impact of variables.

5.2.2 Validation of data and regressions

In order to ensure that accurate results are obtained from the data and multivariable regressions, additional econometric tests are performed. Specifically, multicollinearity is studied by observing the variance inflation factor, heteroscedasticity is tested using the Bruesch-Pagan test, robustness is tested using Cook's distance test and the data is winsorised when deemed appropriate.

5.2.2.1 Variance Inflation Factor

The variance inflation factor, or VIF, is applied to study multicollinearity between the independent variables and is the reciprocal value of tolerance in the independent variables or the variance in a variable that is not related to the supplementary variables (Rogerson, 2001). The VIF provides an index that measures by how much multicollinearity increases the variance of estimated OLS regression coefficients. The measure is calculated by first regressing an independent variable on the other independent variables of the main regression and obtaining the R^2 from that regression. The obtained R^2 is then used to calculate the VIF for the independent variable as:

$$VIF = \frac{1}{(1 - R^2)}$$

A low level of VIF is desirable as it is an indication that there is no multicollinearity in the multiple regression analysis. There is no absolute maximum tolerable value for the VIF test, although previous research have indicated that a VIF value of 4 (Pan and Jackson, 2008) and even 5 (Rogerson, 2001) is acceptable. In the main regression, the average VIF is 1.89 and multicollinearity should hence not be a problem.

5.2.2.2 Bruesch-Pagan test of heteroscedasticity

In order to test for heteroscedasticity, a Bruesch-Pagan test is performed for a few selected time periods. It tests if there is a correlation between the variance of the estimated residuals of a regression and the observed values of its independent variables. This is done by regressing the squared values of the residuals on the independent variables included in the regressions and a resulting F-test will then indicate whether the independent variables are jointly significant or not. If they are, the null hypothesis of homoscedasticity must be rejected.

In order to test for heteroscedasticity, the Breusch-Pagan test was performed on the main and secondary regressions for five different time periods ranging from one day to the whole period from the event up until 24th of March 2015. As disclosed in more detail in the appendix, none of our tests where even close to indicating that the null hypothesis of homoscedasticity could be rejected. The p-values of the F-tests ranged from 0.619 to 0.928.

5.2.2.3 Cook's distance test of robustness

Cook's distance test is performed on the main and secondary regressions on the same selected dates as the Breusch-Pagan test in order to identify outliers that have extraordinary large effects on the multivariable regression. A conservative measure of 4/n was used as a cut-off value for spotting highly influential observations. The results of the tests can be found in the appendix. A few observations were found to be highly influential, however they had little effect on the results. As a precaution, observations pertaining to the company Cytos were dropped after performing Cook's distance test. This was due to their exceptional compounded returns which are not comparable with other companies of the group and not referable to the event, thereby incorrectly affecting the results. There were a few other outlying observations, however, after carefully investigating those observations no reason to drop them could be found. Although influential, these observations were correct and relevant.

5.2.2.4 Winsorising data

Histograms of observations for all the explanatory variables, presented in the appendix, revealed a few substantial outliers in the variables market share at event, foreign financial debt, foreign non-current assets trend and foreign sales trend. In order to prevent these observations from skewing the obtained coefficients and significance of the independent variables, the variables were winsorised on both the 90th and 95th percentile. Specifically, values exceeding

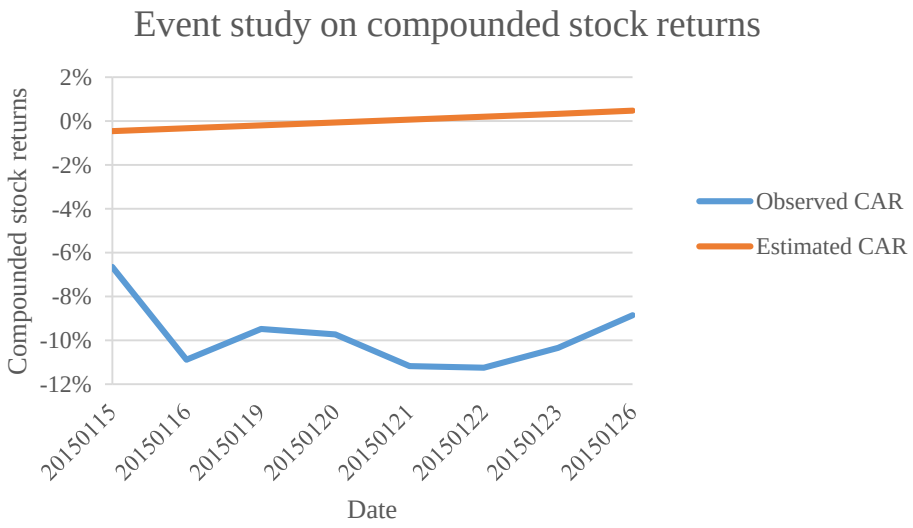
the 90th (95th) percentile was replaced with the value of the 90th (95th) percentile and outliers below the 10th (5th) percentile was subsequently replaced with the value of the 10th (5th) percentile. For transparency, regressions including both the original and the winsorised variables are included in the appendix although the analysis will be conducted on the variables that were winsorised on the 95th percentile. This is because winsorising proved to affect the results and increase the significance of the variables. The choice of winsorising on the 95th percentile instead of the 90th percentile when conducting the analysis was due to the fact that it provided coefficients that were more reasonable while still eliminating major outliers.

6. Results and discussion

The following chapter will discloses the empirical findings from the event study and the subsequent multivariable regression and how it relates to the hypotheses of this paper as well as to previous literature. Moreover, the results from the attempt to capture economic risk will be presented separately. Lastly, descriptive statistics for the explanatory variables used in both regressions is presented in appendix.

6.1 The event study

Figure 1: The event study (The removal of the EUR currency peg)



Note: This figure visualises the stock performance of all firms included in the SMI- and SPI Index on the SIX Swiss Exchange for the period 15th of January 2015 to the 26th of January 2015, as presented on the horizontal axis. It studies the difference between observed and estimated compounded average stock return subsequent to the removal of the EUR currency peg on January 15th 2015. Both the **Observed CAR** and the **Estimated CAR** measure average compounded stock returns in terms of percentage points, the vertical axis is given in percentage points.

The results derived from the event study, which can be observed in more detail in the appendix, indicate that the event had an effect on stock prices for Swiss firms included in the sample group. According to the results from the event study, the observed compounded returns for the sample firms during the eight first trading days after the event were on average 9.8% less than the expected compounded returns for the same period. This suggests that investors priced the removal of the currency peg and that it negatively affected the firm values of the sample firms. Hence, it suggests that the firms are in fact subject to exchange rate exposure. Furthermore, the

low standard errors of the observed CAR together with the small spread of its 95% confidence interval indicates that the reactions of the sample firms did not vary substantially. However, from solely investigating the event study, it is impossible to draw any conclusions regarding whether the event sparked market wide, seemingly unanimous, reactions to a general exchange rate exposure or if the reactions are correlated with individual firm characteristics. In an effort to further understand the underlying factors of the unexpected movements of the share prices, the multivariable regressions described in the methodology chapter are performed.

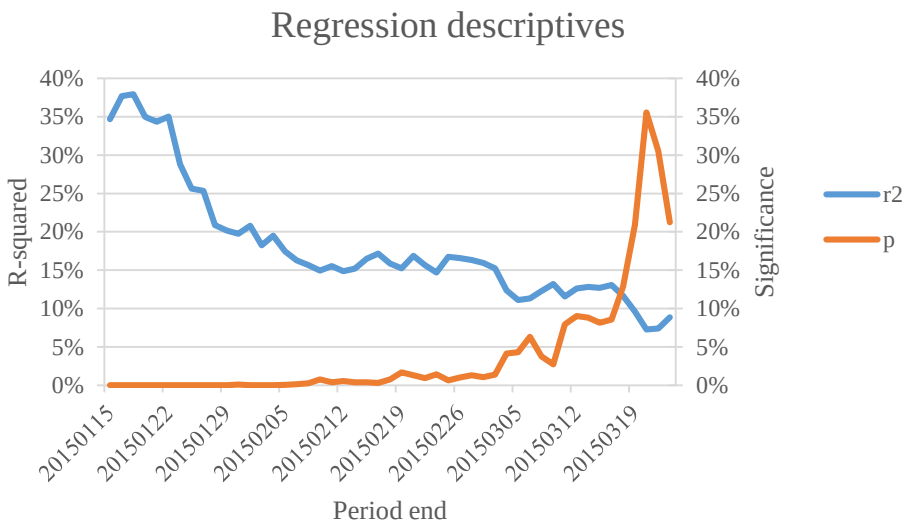
6.2 The regression model

The results from the main regression (1), with the components previously presented in the methodology chapter, constitutes the foundation for an examination of the main hypothesis in this paper in order to determine whether it holds any merit. The expectation is to find a negative correlation between direct exchange rate exposure and firm value as well as a positive correlation between hedging of exchange rate exposure and firm value in the period after the event when the CHF appreciated. As aforesaid, previous research have provided perplexing results on this matter. This section will start off by briefly analysing the results and significance of the main regression and subsequently breaking it down into the different exchange rate exposures in order to further examine the complementary hypotheses. However, before analysing the results it is necessary to mention that market share at event, exchange rate effect on cash and cash equivalents and foreign currency derivatives were dropped as explanatory variables.

The market share at event variable was dropped due to several reasons. First of all, including market share at event did not add much explanatory power to the model. Secondly, the variable was insignificant in two-sided t-tests for all but two periods. Thirdly, it rendered the foreign financial debt variable less significant, which is probably due to the rationale behind a firm size variable being extensively used in previous research. Large firms are believed to have better access to risk management and economies of scale in hedging costs. It is therefore logical that market share at event correlates with the hedging variable foreign financial debt and consequently, does not add much explanatory power to the model. This in combination with the unreasonably high and volatile coefficients that were predicted for the market share at event variable led to the conclusion that foreign financial debt is a more accurate variable for hedging and that market share at event should be dropped. However, the reason for the market share at event variable yielding insignificant results may be due to a selection bias, as previously

described in the data chapter. Moreover, the variables exchange rate effect on cash and cash equivalents and foreign currency derivatives were dropped due to reasons further explained in the subsections regarding translation risk and transaction risk respectively. The results from the main regression containing the original variables can be found in the appendix. From here on forward, they will not be included in the discussed results.

Figure 2: Regression descriptive for the main regression (1) model



Note: This figure visually presents the explanatory level, R-squared, and the significance of the **main regression (1) model** for the period 15th of January 2015 to the 24th of March 2015. On the left vertical axis, R-squared is measured whilst the vertical axis on the right-hand side shows the significance. The explanatory variables used in the main regression (1) are **foreign sales**, as a percentage of total sales; **foreign costs**, approximated by foreign non-current assets; **foreign non-current assets**, in relation to total assets and **foreign financial debt**, as a percentage of total assets.

As previously stated in the methodology chapter, the main regression was tested for all possible time periods in order to transparently analyse the changes in the main regression's explanatory power and significance over time. The results of these regressions are illustrated in the figure above and are also included in the appendix.

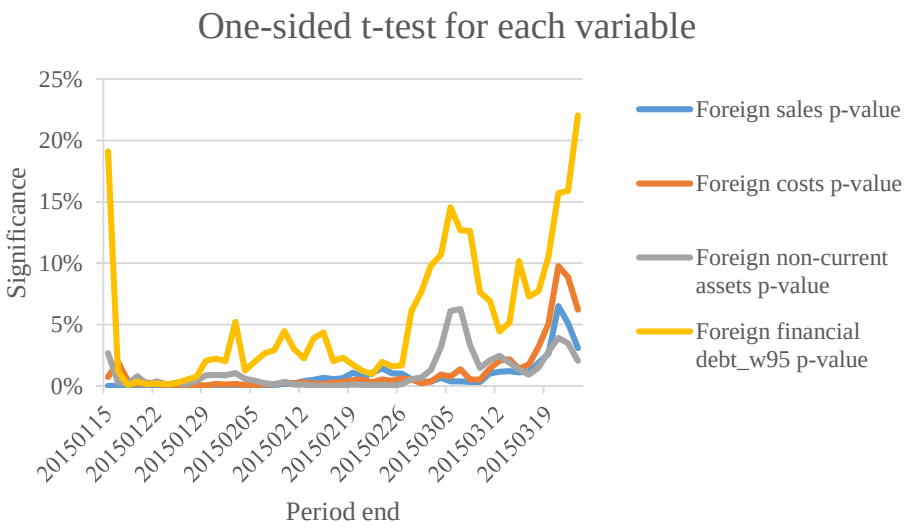
There are several interesting results to address when analysing this graph before dissecting the main regression and separately analysing the different exchange rate exposures incorporated in it. First of all, the R^2 of the model peaks at 37.9% on the third trading day after the event. Thereafter, it declines steadily and bottoms out at around 7.3% on 20/03/2015. This is interesting because it illustrates how the regression's explanatory power without a doubt was strongest in the periods closest to the event when the volatility of the CHF was the greatest. The

CHF slowly stabilised after the event, and more noise from other information affected share prices. For comparison, the compounded change of the CHF against other major currencies can be observed in the appendix, showing how the CHF has depreciated against most major currencies after the event, but also the discrepancies in the development of different exchange rates since the event. This implies both that the impact of the exchange rates on the compounded stock returns should have decreased with time and that the variation in the CHF's performance against different currencies post the event should decrease the precision and R^2 of the model since it does not take into account the specific exchange rates of the exposures and hedges.

The second interesting observation that can be made is that the p-value of the regression's F-test never exceeds 5% before 06/03/2015, indicating that the model is statistically significant on a 5% level for all periods ending before that date. Thereafter, the model rapidly becomes insignificant. Apart from the fact that the model does not take into account the variation in performance of the CHF against different currencies, this is very likely due to the publications of the annual reports for the fiscal year 2014 in early March. The annual reports release substantial new information for traders, thereby creating noise that the model does not control for.

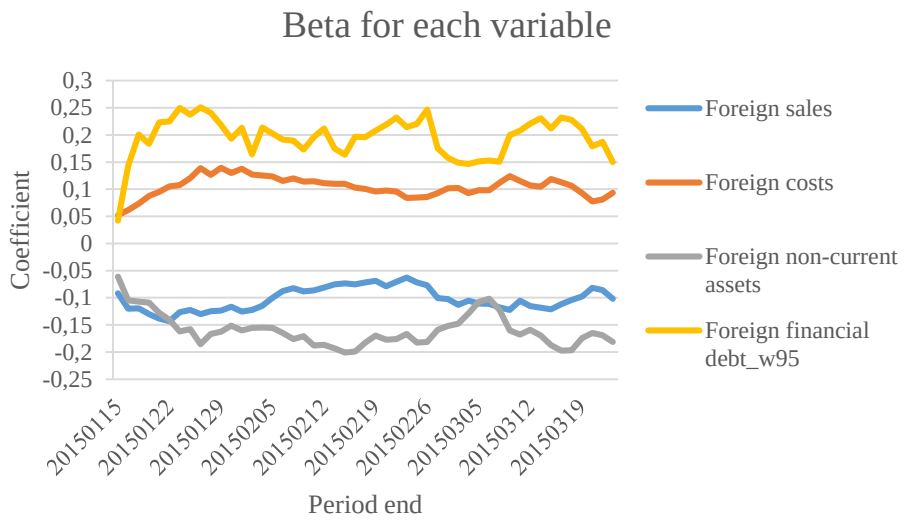
To conclude, the R^2 and p-values of the model are in line with what could be expected if the model does, indeed, predict the real exchange rate exposure of the firms. Furthermore, the R^2 is rather high considering that it solely includes average effects of exchange rate exposures and hedges. However, when analysing the R^2 and p-values, one must keep in mind that the model only predicts compounded returns for the different periods after the event, not daily returns. Therefore, one cannot draw any conclusions regarding on which exact day the daily exchange rate fluctuations significantly affect the stock price changes. The only conclusion that can be drawn is that the sample firms' exchange rate exposures and hedges, as defined in this paper and included in the regression, significantly correlates with their compounded stock price returns during the periods after the event up until 05/03/2015.

Figure 3: Variable significance for the variables included in the main regression (1) model



Note: This figure visualises the significance in each of the variable used in the **main regression (1)** for the period 15th of January 2015 to 24th of March 2015. Significance level is measured on the vertical axis and the p-value for each variable is plotted from a one-sided t-test. The **foreign financial debt** variable is winsorised on a 95-percentage level.

Figure 4: Coefficients for the variables included in the main regression (1) model



Note: This figure visualises the coefficient for each of the variable used in the **main regression (1)** is plotted for the period 15th of January 2015 to 24th of March 2015. The coefficient is measured on the vertical axis. The **foreign financial debt** variable is winsorised on a 95-percentage level.

The last thing worth commenting on before delving into the analysis of specific exchange rate exposures, are the general patterns of the t-tests and coefficients for each variable. One-sided t-tests were performed due to the intuition and literature behind the hypotheses, which explicitly predicts the direction of the coefficients in the main regression. For transparency, the two sided t-tests are disclosed in the appendix. The only variable which is slightly affected by the use of one-sided t-tests is the foreign financial debt variable, which becomes significant on a 5% level during seven, out of 49, more periods. However, no conclusions are affected by the choice of using one-sided t-tests. Regardless, it can be seen that the p-values for the t-tests display the same patterns as the p-values for the F-tests of the entire regression, although not to the same extent. The further away from the event date, the less significant the variables become. Especially, the winsorised foreign financial debt variable promptly becomes insignificant in the beginning of March when the annual reports are released.

The general developments of the coefficients of the regression are on the other hand maybe not as intuitive at first sight. As can be seen in the graph, the absolute values of the coefficients seem to reach their first peek after about one week, depending on variable. This might be considered counterintuitive since the changes in the CHF were greatest during the first day after the event and that it did not appreciate much after that. However, several previous studies, including the study conducted by He and Ng (1998), have found a lagged or delayed effect of exchange rate exposure on firm value, which would support this gradual increase of the coefficients during the first week of trading after the event.

Determining the validity of the main hypothesis entails dissecting the main regression model into findings attributable to the relevant categories of risk. This is performed by examining the complementary hypotheses, thereafter using the results to discuss the main hypothesis. Again, the analysis of economic risk will be conducted separately.

6.2.1 Transaction risk

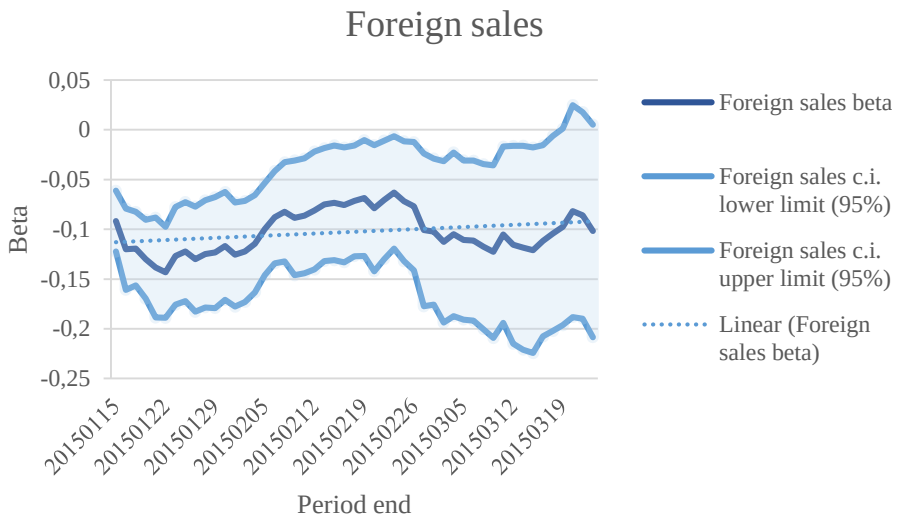
Transaction risk is the most widely researched category of risk. To recapture, it refers to the present cash flow risk of companies, estimated by the variables foreign sales and foreign costs. In this section, the complementary hypotheses H2 and H3 and their null hypotheses, which are derived from the transaction risk of firms, are discussed one at a time in regards to the results from the main regression.

H2: *Transaction risk increases exchange rate exposure*

$H2_0$: *Transaction risk does not increase exchange rate exposure*

The most widely used measure to capture transaction risk is foreign sales. However, as discussed in the variable selection chapter, one should keep in mind that the foreign sales variable is likely to capture some economic risk as well.

Figure 5: Coefficient descriptive for foreign sales variable



Note: This figure visually presents the coefficient for the **foreign sales** variable, defined as the percentage of total sales, for the period 15th of January 2015 to 24th of March 2015, with the value of the coefficient on the vertical axis. Additionally, the shaded area represents a 95-percentage confidence interval for the coefficient and a trend line over the given period is also presented for the coefficient.

The foreign sales variable is significant with a negative coefficient for every period from the event up until, and including, 19/03/2015 in a one-sided t-test. The negative sign of the coefficient is in line with the hypothesis that transaction risk increases exchange rate exposure, which would have had a negative effect on firm value when the CHF quickly appreciated against all major currencies of the world. Finding significance in the explanatory variable foreign sales is in line with the preponderance of previous research. For instance, the result obtained from this paper regarding the foreign sales variable is in line with Laux et al. (2001) and Choi and Prasad (1995), who found a significant and positive correlation between exchange rate exposure and foreign sales. However, although finding significance in the variable foreign sales, the study conducted by Doidge and Griffin (2005) found a negative correlation. This is not in line with the findings in this paper since a negative correlation with exposure consequently indicates a positive correlation with firm value.

According to the estimated coefficient for the foreign sales variable, the compounded return on stock prices of Swiss firms decreased on average by approximately 0.1% for every percent of their sales that were foreign. In other words, Swiss firms with 100% of their sales abroad dropped, on average, approximately 10% more in market capital than firms with only domestic sales. This is a substantial difference that intuitively is due to the fact that firms with a lot of foreign sales will not be able to keep up their sales as well as their margins when the CHF appreciates and Swiss products become more expensive. Thus, as predicted, the exposure negatively affects the firm values of Swiss firms during the periods tested. Because the coefficient significantly differs from zero with a negative sign during all periods up until 19/03/2015, the null hypothesis that transaction risk does not increase exposure can be rejected and hence, H2 has been proven.

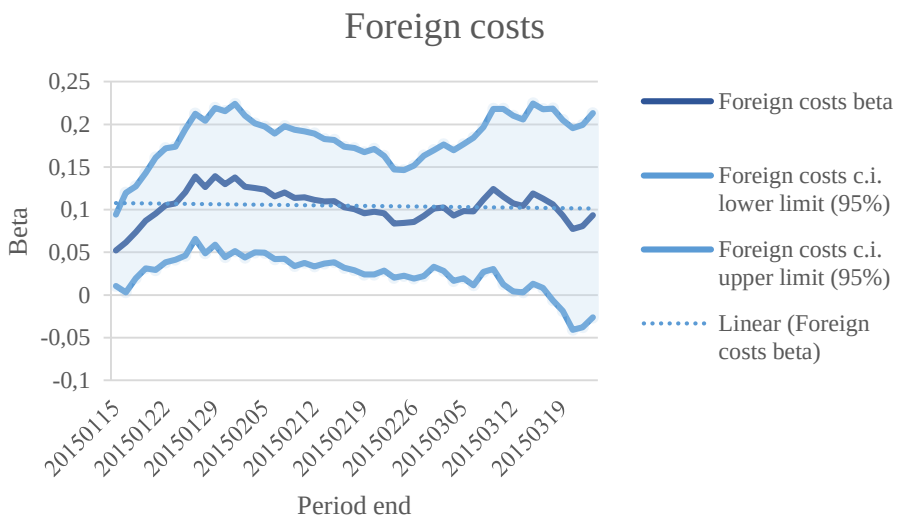
By studying the coefficient and its 95% confidence interval, further observations and intuition can add to the relationship between exchange rates and transaction risk and consequently, the robustness of the conclusions in the preceding examination of the validity of H2. Two results are especially interesting when studying the coefficient. Firstly, the trend for the estimated coefficient is sloping towards zero. This corresponds well with the expectation that the effect on compounded price returns since the event, derived from the exposure induced by foreign sales, should have decreased slightly due to the recent depreciation of the CHF relative to most major currencies. Furthermore, the confidence interval of the foreign sales coefficient grows larger as time passes subsequent to the event. This corresponds well with the increasing discrepancies in the CHF's performance against major currencies, which can be observed in the appendix. Since the foreign sales variable does not take into account the specific exchange rates that a firm's sales are exposed to, it makes perfect sense that the standard errors as well as the confidence interval of the explanatory variable would increase as the discrepancies in the compounded returns of different exchange rates increase.

H3: *Hedging of transaction risk reduces exchange rate exposure*
$H3_0$: *Hedging of transaction risk does not reduce exchange rate exposure*

In order to examine the third hypothesis, two relevant variables capturing the hedging of transaction risk were considered, foreign costs and hedge accounting of currency derivatives. The foreign costs variable yielded substantial explanatory power and turned out to be significant, which is consistent with the majority of existing literature. For instance, a study

conducted by Bartram et al. (2009) found that foreign costs, as proxied by foreign assets, increases the natural hedge from foreign operations and reduces exchange rate exposure significantly. However, the dummy variable for hedge accounting of currency derivatives showed no significance in any time period, which deviates from findings in existing literature. Allayannis and Ofek (2001) found that the use of currency derivatives is negatively and significantly correlated to exchange rate exposure, and Bartram et al. (2009) established that financial currency derivative instruments reduce exchange rate exposure. Furthermore, it did not correspond with expectations since firms often use currency derivatives as a method for hedging against transaction risk and hedge accounting only is allowed under certain conditions, including hedge effectiveness requirements, specified in IFRS 9. However, the fact that no significance could be found might be due to the difficulty in obtaining accurate data on which companies in the sample group that are hedging currency risk. The reporting of hedge accounting varies widely between companies and it can be difficult to determine the nature of a hedge, whether it pertains to currency hedging or another form of hedging. Even though this report took a conservative approach as described in the methodology chapter, it is possible that a lack of accuracy in the observations of the variable resulted in the deficiency to observe an existing negative relationship between the use of currency derivatives and exchange rate exposure of firms. Regardless of the reasons for it, a null hypothesis that hedging of transaction risk with currency derivatives does not decrease exchange rate exposure cannot be rejected using the sample of this paper. Hence, H3 cannot be proved using currency derivatives as an explanatory variable and the variable was therefore discarded from the main regression. The results from including currency derivatives in the main regression can be found in the appendix, and henceforward, foreign costs will be considered the only effective hedging activity against transaction risk.

Figure 6: Coefficient descriptive for foreign costs variable



Note: This figure visually presents the coefficient for the **foreign costs** variable, approximated by foreign non-current assets, for the period 15th of January 2015 to 24th of March 2015, with the value of the coefficient on the vertical axis. Additionally, the shaded area represents a 95-percentage confidence interval for the coefficient and a trend line over the given period is also presented for the coefficient.

In a one-sided t-test, the foreign costs variable is significant with a positive coefficient for every period from the event up until, and including, 18/03/2015. The positive sign of the coefficient is in accordance with the hypothesis that hedging of transaction risk decreases exchange rate exposure which would have had, contrary to the foreign sales variable, a positive effect on firm value when the CHF quickly appreciated against all major currencies of the world. According to the estimated coefficient, the compounded return on stock prices of Swiss firms increased by approximately 0.1% for every percent of their costs that were foreign, on average. Alternatively, Swiss firms with 100% of their costs abroad increased their compounded return in stock price with, on average, approximately 10% compared to firms with only domestic costs. This is due to the simple fact that costs in foreign currencies became relatively cheaper to pay for Swiss firms when the CHF appreciated. What is fascinating though is that the coefficient of foreign costs is the exact opposite of the coefficient of foreign sales. According to these results, foreign costs is a perfect hedge for foreign sales, meaning that a firm with the same amount of foreign costs abroad as foreign sales would not be affected by exchange rate fluctuations, unless it is unprotected against other sorts of exchange rate exposures. This relationship is illustrated graphically in the appendix. The intuition behind the relationship is sound as well. If a firm has the same portion of costs abroad as it has sales abroad, the problem with lower margins and less

sales induced by an appreciating CHF will disappear. Such a firm will be able to keep margins at regular levels due to the fact that costs will decrease by the same rate as the prices that foreign customers are willing to pay for Swiss products. Thus, as predicted, the hedging of transaction risk positively affects the firm values of Swiss firms during the periods tested. Furthermore, because the coefficient significantly differs from zero with a positive sign during all periods up until 18/03/2015, the null hypothesis that hedging of transaction risk does not decrease exchange rate exposure can be rejected and hence, H3 has been proven.

When studying the coefficient of foreign costs and its 95% confidence interval, the most interesting observation is that the coefficient for the foreign costs variable changes in the exact same manner as the coefficient for the foreign sales variable, only in the opposite direction at all times. The trend for the estimated coefficient of foreign costs is, similarly to the foreign sales variable, sloping towards zero, only downwards instead of upwards. The intuition is the same as before, the effects of exchange rate exposures and hedges on compounded price returns since the event should have decreased slightly due to the recent depreciation of the CHF against most major currencies. However, the decrease in this case is arguably too small to be validation of anything. Beyond dispute is at least that the confidence interval of the foreign costs coefficient grows larger with the time that pass after the event. Similarly to the case of foreign sales, this corresponds very well with the increasing discrepancies in the CHF's performance against major currencies, which as aforementioned is further disclosed in the appendix. This is once again due to the fact that the variables of the regression do not take into account which specific exchange rates that a firm is exposed to, thereby increasing standard errors and confidence intervals as the discrepancies in the compounded returns of different exchange rates increase.

6.2.2 Translation risk

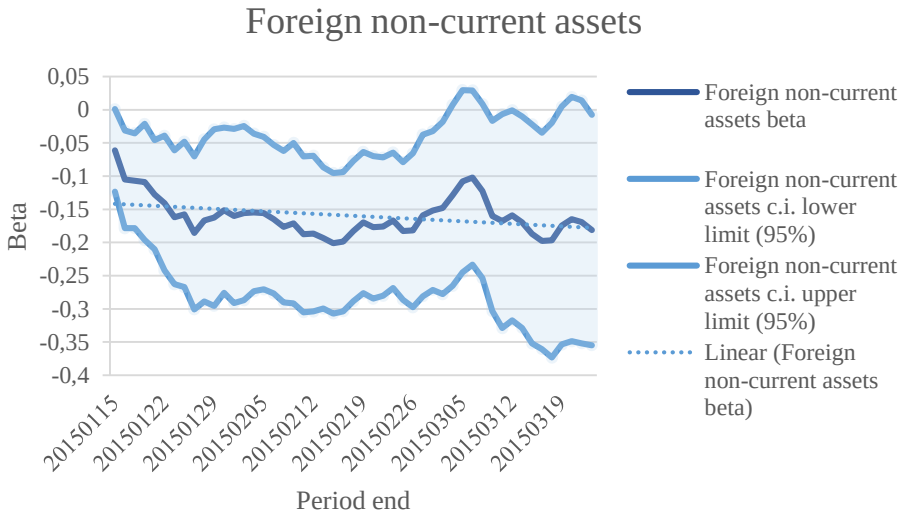
Translation risk is interesting to investigate due to the varying results surrounding it in previous literature. In this section, the complementary hypotheses H4 and H5 and their null hypotheses, which are derived from the translation risk of firms, are discussed individually in regards to the results from the main regression.

H4: *Translation risk increases exchange rate exposure*

$H4_0$: *Translation risk does not increase exchange rate exposure*

Translation risk refers to the exchange rate exposure of a company's balance sheet, and as stated earlier in the data chapter, the variables foreign non-current assets and exchange rate effect on cash and cash equivalents should be able to estimate this exposure. Performing the main regression on the sample group of this paper, the independent variable foreign non-current assets is found to be significant, which is in line with the expectations of this thesis. However, the variable exchange rate effect on cash and cash equivalents do not seem to have any consistent and significant relationship with exchange rate exposure. This is not completely surprising considering that the exchange rate effect on cash and cash equivalents might be considered negligibly small compared to other exchange rate exposures. The observations of the variable in the sample ranged from 0.000 to 0.023 of total assets. No matter the reasons for it though, a null hypothesis that translation risk in the form of exchange rate effect on cash and cash equivalents does not increase exchange rate exposure cannot be rejected using the regression and sample of this thesis. H4 can hence not be proved using exchange rate effect on cash and cash equivalents as an explanatory variable and the variable was therefore discarded from the main regression. The results from including exchange rate effect on cash and cash equivalents in the main regression can be found in the appendix, from here on forward foreign non-current assets will be considered the only translation risk.

Figure 7: Coefficient descriptive for foreign non-current assets variable



Note: This figure visually presents the coefficient for the **foreign non-current assets** variable, defined as the percentage of total assets, for the period 15th of January 2015 to 24th of March 2015, with the value of the coefficient on the vertical axis. Additionally, the shaded area represents a 95-percentage confidence interval for the coefficient and a trend line over the given period is also presented for the coefficient.

The foreign non-current assets variable is significant with a negative coefficient for every period researched, with the exception of the two periods starting with the event and ending on 05/03/2015 and 06/03/2015 respectively, in a one-sided t-test. The negative sign of the coefficient corresponds with the hypothesis that translation risk increases exchange rate exposure, which consequently would have had a negative effect on firm value during the investigated event, as previously described. Interestingly, the finding on foreign non-current assets in this paper contradicts previous research. For instance, Bartram et al. (2009) found a negative correlation, or that the use of foreign assets reduce exchange rate exposure, on a firm level basis. Their findings are due to the fact that, as previously described, foreign assets are a good approximation of foreign costs, which they investigate in their subsequent regression analysis. Contrary, this paper manages to capture the translation effect of non-current assets by including foreign costs as a separate variable in the same regression, as explained in the methodology chapter, which is the reason for the differing results. However, the same study conducted by Bartram et al. (2009) did find a positive correlation but on an industry level, in accordance with the finding in this paper. Moreover, as aforementioned in the literature section and contrary to the findings in this thesis, Dominguez and Tesar (2001) established no significant relationship between exchange rate exposure and foreign assets.

According to the estimated coefficient, the compounded return on stock prices of Swiss firms decreased on average by approximately 0.15% for every percent of their assets that were foreign non-current assets. In other words, Swiss firms with 100% of their assets abroad in the form of non-current assets dropped, on average, approximately 15% more in market capital than firms with only domestic non-current assets. Surprisingly, in the sample, the effect of foreign non-current assets, in relation to total assets, on stock prices exceeds that of foreign sales. This is counterintuitive due to the fact that cash flows are used more extensively than assets when valuing companies in literature. Given that the sample correctly represent the population, there are two possible explanations for this observation. Either the variable foreign non-current assets is correlated with some other variable that has negatively affected market capital of the firms during the same period, or investors are deeming foreign non-current assets as having more impact on firm value than foreign sales. It is impossible to conclude the reason for the unexpected magnitude of the foreign non-current assets coefficient. However, it is worth noting that the standard errors and confidence intervals are larger for foreign non-current assets than for foreign sales, suggesting that the coefficient for foreign non-current assets is harder to accurately predict than the one for foreign sales. Nevertheless, the intuition behind the sign of

the coefficient is definitely sound and along the lines of the expectations. Foreign non-current assets are by definition exposed to exchange rate fluctuations due to the fact that the price of selling or recreating a foreign non-current asset for a company is dependent on the relevant exchange rate. Thus, as predicted, the exposure negatively affects the firm values of Swiss firms during the periods tested. Because the coefficient significantly differs from zero with a negative sign during all periods except for the ones ending on 05/03/2015 and 06/03/2015, the null hypothesis that translation risk does not increase exposure can be rejected and subsequently, H4 has been proven.

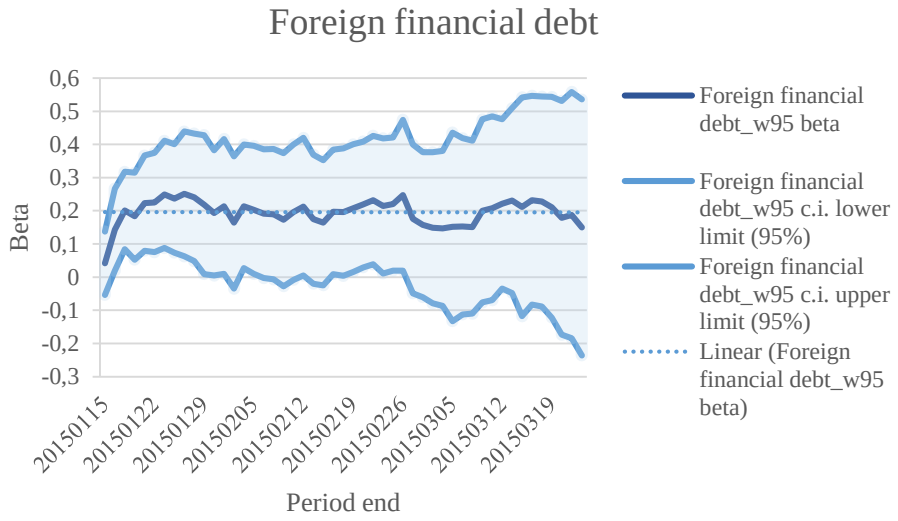
Examining the coefficient and its 95% confidence interval allows for further observations and intuition that can add to the understanding of the relationship between exchange rates and translation risk. This, in turn, can add support to the conclusions in the preceding examination of the validity of H4. Two results are especially interesting when studying the coefficient. First of all, as with the previously examined variables, the confidence interval of the foreign non-current assets coefficient grows larger as more time pass after the event. As explained for the foreign sales and foreign costs variables, this is very intuitive since new information inevitably creates additional noise that the predictive model cannot handle and the variables do not include specific exchange rates that a firm is exposed to. The accuracy of the prediction is expected to decrease as the discrepancies in the compounded returns of different exchange rates increase. Secondly, the trend for the estimated coefficient is not sloping towards zero as expected. According to expectations, the effect on compounded price returns since the event, from the exposure incurred by foreign non-current assets, should have decreases slightly due to the recent depreciation of the CHF against most major currencies. A reasonable explanation for this is the lagged effect that seems to be observable in all variables, which was mentioned previously when briefly discussing the general developments of the coefficients. If the observations from the first full week of trading is discarded from the data, the trend for the coefficient is sloping slightly, however negligibly, upwards towards zero.

H5: *Hedging of translation risk reduces exchange rate exposure*
H5$_0$: *Hedging of translation risk does not reduce exchange rate exposure*

Hedging of translation risk is most commonly performed with foreign debt, and for reasons stated in the data section, the effect of this form of hedging will be estimated using foreign

financial debt. Even though the foreign financial debt variable is least significant of all variables used in the main regression, significance is still found in the foreign financial debt variable.

Figure 8: Coefficient descriptive for foreign financial debt variable (winsorised at 95th percentile)



Note: This figure visually presents the coefficient for the **foreign financial debt** variable, defined as the percentage of total assets, for the period 15th of January 2015 to 24th of March 2015, with the value of the coefficient on the vertical axis. The variable is winsorised on a 95 percentage level. Additionally, the shaded area represents a 95-percentage confidence interval for the coefficient and a trend line over the given period is also presented for the coefficient.

The foreign financial debt variable is the variable that seems to experience the most lag in its exchange rate exposure. The variable only becomes significant in the main regression after two or more days of trading have passed. It is then significant with a positive coefficient for every period from the event up until 26/02/2015 in a one-sided t-test, with the exception for the period ending in 03/02/2015. Nevertheless, the positive sign of the coefficient is consistent with the hypothesis that hedging of translation risk decreases exchange rate exposure, which consequently would have had a positive effect on firm value during the event studied in this paper. According to the estimated coefficient, on average the compounded return on stock prices of Swiss firms increased by approximately 0.2% for every percent of their assets that were financed with foreign financial debt. Differently put, Swiss firms with 100% of their assets financed with foreign financial debt, although practically impossible, would have increased their compounded return in stock price with, on average, approximately 20% compared to firms with no foreign financial debt. Intuitively, the absolute exchange rate effect of financial debt is

larger than the absolute effect of non-current assets, which is likely due to the nature of debt entails a more direct impact on future cash flows in the form of repayment and often interest costs. According to these results, foreign debt is not a perfect hedge for foreign non-current assets, but it is a very suitable hedge. These results are intuitive as well. A firm's equity, which is the net of its assets and debt, will not be affected by exchange rate movements if the value of its foreign assets are of the same magnitude as its foreign debt. This is because even though it's foreign assets will decrease in value, so will its foreign debt. Thus, as predicted, the hedging of translation risk positively affects the firm values of Swiss firms during the periods tested. Furthermore, the coefficient significantly differs from zero with a positive sign during all periods up until 26/02/2015 with only two exceptions. Therefore, the null hypothesis that hedging of translation risk does not decrease exchange rate exposure can be rejected and H5 has hence been proven. This is an intriguing finding, because no previous study performing a direct correlation analysis of a foreign debt variable and exchange rate exposure and subsequently, firm value could be found. One possible explanation for this being the, seemingly, first time that such an analysis has been performed is the accurate accounting data provided by Swiss firms. Previous empirical studies have instead been focused on investigating the correlation between foreign involvement and the use of foreign debt (Allayannis and Ofek, 2001; González et al., 2010).

By investigating the coefficient of foreign financial debt and its 95% confidence interval, interesting to notice is that the development of the confidence interval for the foreign financial debt coefficient is the same as for the previously described variables. It grows larger with the time that pass subsequent to the event. This is, once again, intuitive in the way that it corresponds with the increasing discrepancies in the CHF's performance against different major currencies, which should increase standard errors and confidence intervals of the explanatory variables' coefficients. Furthermore, the trend for the coefficient is sloping slightly towards zero as expected. Considering the lag that seems to be present in the coefficient, the slope is interesting since it corresponds with the recent depreciation of the CHF, which would have decreased the effect of the exchange rate hedge on compounded returns on stock price.

6.2.3 Economic risk

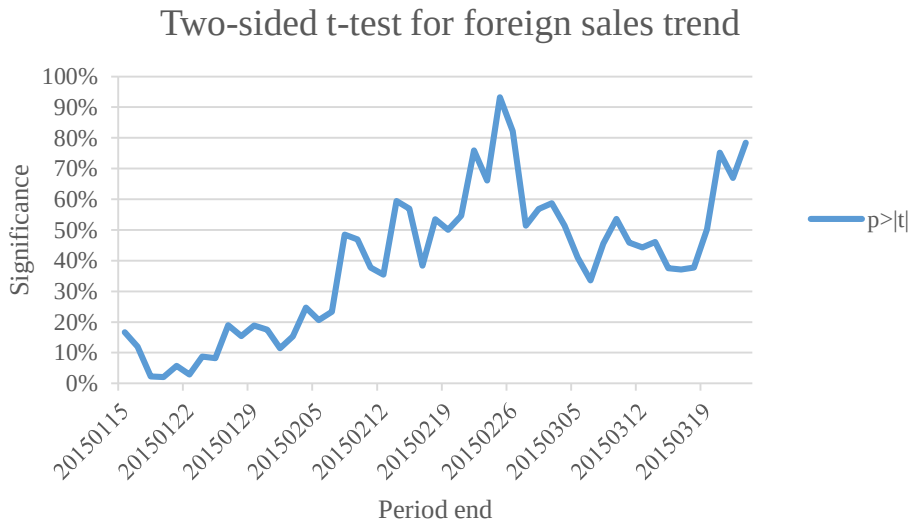
As aforementioned, the examination of economic risk is not part of the main discussion in this paper and some of the economic risk is likely to be captured by foreign sales, which has already been discussed. Results aimed at capturing an effect of pure economic risk on firm value are derived from the secondary regression (2), as defined in the methodology section. The variable

that will be examined in this section is foreign sales trend. The expectation is to find a negative correlation between the variable and the compounded returns on stock prices. The hypothesis that will be tested is H6 which is stated below with the corresponding null hypothesis.

H6: *Economic risk increases exchange rate exposure*

H6$_0$: *Economic risk does not increase exchange rate exposure*

Figure 9: Significance for the foreign sales trend variable (winsorised at the 95th percentile) in the secondary regression (2) model

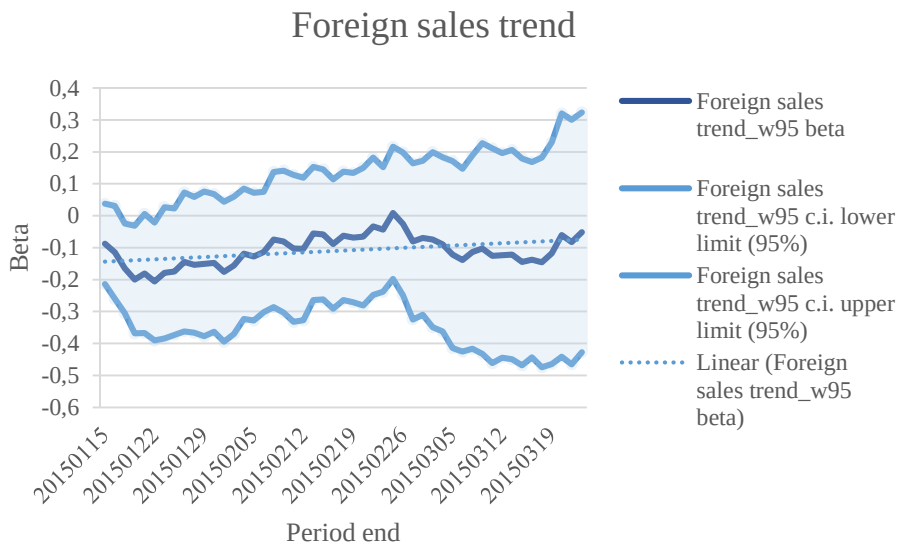


Note: This figure visually presents the significance of the foreign sales trend variable included in the **secondary regression (2) model** for the period 15th of January 2015 to the 24th of March 2015. The vertical axis shows the level of significance for the period from a two-sided t-test. The variable is winsorised at the 95th percentile.

For the foreign sales trend variable, a two-sided t-test is performed. Compared to the case with the other explanatory variables, no previous literature has tested the foreign sales trend variable and although intuitive, the support for a one-sided test was deemed insufficient. The graph therefore illustrates the p-values from testing whether the coefficient for the foreign sales trend variable in the secondary regression differs from zero on different time periods. As can be seen, the foreign sales trend variable is significant with a negative sign on a 5% level for the periods starting with the event and ending 19/01/2015, 20/01/2015 and 22/01/2015. It also shows how the variable is significant on a 10% level in all periods up until the one ending on 26/01/2015, with exceptions for the periods ending on the first two days of trading. These results indicate that, for the mentioned periods, the null hypothesis that economic risk does not increase

exchange rate exposure can be rejected. However, the results are not as conclusive as for the variables included in the main regression and before drawing any conclusions an analysis of the coefficient and its confidence interval should be conducted.

Figure 10: Coefficient descriptive for foreign sales trend variable (winsorised at the 95th percentile)



Note: This figure visually presents the coefficient for the **foreign sales trend** variable, using the same definition for foreign sales as for the foreign sales variable included in the main regression (1) but considering the fiscal years 2013 and 2014, for the period 15th of January 2015 to 24th of March 2015, with the value of the coefficient on the vertical axis. The variable is winsorised on a 95 percentage level. Additionally, the shaded area represents a 95-percentage confidence interval for the coefficient and a trend line over the given period is also presented for the coefficient.

First of all, the sign of the coefficient is correct and it corresponds with the hypothesis. A negative correlation is expected between an exchange rate exposure and stock price during an event where the currency suddenly appreciates. As can be seen in the graph above, the estimated coefficient indicates that the compounded return on stock prices of Swiss firms decreased by approximately 0.1% with every percent of total sales that they increased their foreign sales during 2014. Alternatively, a Swiss firm that increased their foreign sales during 2014 with 100% of its total sales in 2013 would have dropped approximately 10% more in market capital than a firm that did not increase its foreign sales in 2014.

Supportive of the H6 hypothesis is also that the trend for the coefficient has the correct slope. It is sloping upwards, towards zero, which is expected from the effect of an exchange

rate exposure when the currency is depreciating back towards its original value. Furthermore, the confidence interval of the coefficient behaves in the same way as the ones for the coefficients in the main regression. The foreign sales trend variable does not include exposure to specific exchange rates. As time passes after the event, the confidence interval is thus expected to increase due to the discrepancies in the performance of the CHF towards different currencies.

To conclude the above analysis of foreign sales trend, there seems to be an intuitive correlation between the foreign sales trend variable and exchange rate exposure. The null hypothesis that economic risk does not increases exchange rate exposure is therefore rejected on a 5% significance level for the periods starting with the event and ending 19/01/2015, 20/01/2015 and 22/01/2015. The same null hypothesis can also be rejected on a 10% level for all periods up until the one ending on 26/01/2015, with exceptions for the periods ending on the first two days of trading. H6 has therefore been proved in this sample for certain periods and significance levels. However, these results are not as robust as the results from the other variables due to the fact that less significance was found and the variable has not been considered and investigated in previous literature. Further research should probably be conducted in order to fully understand the implications of foreign sales trend for exchange rate exposure, which is suggested in the chapter concerning limitations and suggestions for future research.

As aforementioned, an effort to capture pure economic risk has never been made in previous literature, at least to the best of our knowledge. Thus, relying on research to determine an accurate measurement of exchange rate exposure concerning future cash flows of a firm has not been possible. Consequently, no comparison can be performed. However, it is the belief of the authors that foreign sales trend together with foreign sales should be able to capture much of the economic risk of firms.

6.2.4 Main hypothesis

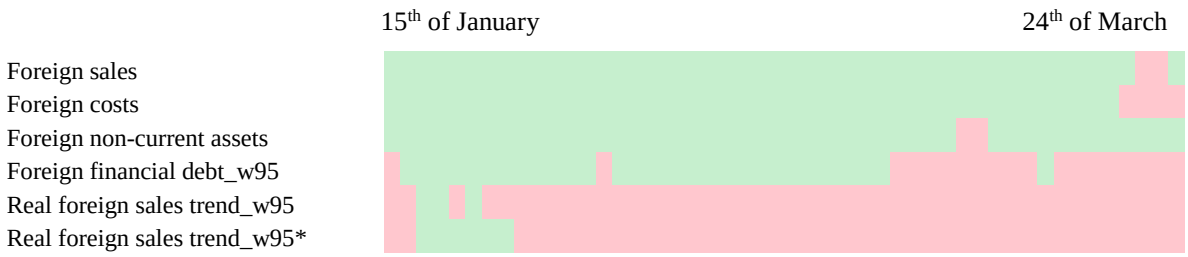
The analyses so far have focused on the specific exchange rate exposures of firms in order to prove or reject the complementary hypotheses. Capitalising on these results, the validity of the main hypothesis can be determined.

H1: *Direct exchange rate exposure implies a negative correlation between firm value and exchange rate, while hedging implies a positive correlation between firm value and exchange rate.*

H1$_0$: *Direct exchange rate exposure does not imply a negative correlation between firm value and exchange rate, and hedging does not imply a positive correlation between firm value and exchange rate*

The main hypothesis implies that fundamental, direct, exchange rate exposures referable to individual firm characteristics should be observable, not solely market wide exposure that can be proved by observing the results of the event study previously conducted. By performing the main and secondary regressions of this thesis and breaking them down into exposures referable to specific firm characteristics, it was possible to prove significant correlations between each of the traditional exchange rate exposures and the compounded returns on stock prices during most of the periods researched. A figure of significance is shown below that indicates the significance over time.

Figure 11: Significance over time



Note: The figure shows a green colour if the variable is significant or red if insignificant. The observations are for the periods starting on the 15th of January 2015 and ending between the 15th of January 2015 and the 24th of March 2015.

*10% significance level

The figure illustrates during which periods the variables and the corresponding risks were significant. However, as mentioned in the section discussing economic risk, some care should be taken when drawing conclusions regarding foreign sales trend. Nevertheless, the table proves that the specific exposures and hedges significantly correlate with compounded returns on stock prices of the sample firms during most of the periods researched. Furthermore, the correlation was in the correct direction and of reasonable magnitude as explained in detail in the previous

subsections discussing the specific exposures and hedges. The null hypothesis that direct exchange rate exposure does not imply a negative correlation between firm value and exchange rate, and that hedging does not imply a positive correlation between firm value and exchange rate can therefore be rejected. Note that all of the variables do not have to be statistically significant at the same time in order to be able to reject the null hypothesis. It is sufficient that solely one variable is significant. However, most variables are significant at the same time, which increases the robustness of the conclusion.

To conclude, the main hypothesis of this thesis has been proved by systematically discussing each exposure and hedge of the sample firms. However, as mentioned before, no conclusions can be made in regards to on which specific dates that exchange rate exposures and hedges had an effect on stock returns. The conclusion that can be made is that direct exchange rate exposure and hedges correlated with compounded stock returns during certain periods. As presented previously in the literature section, the findings in this paper are in accordance with previous papers such as Nydahl (1999) as well as He and Ng (1998) in observing an impact of exchange rate exposure on firm value.

7. Conclusion

This thesis has made an effort to study whether exchange rate exposure and hedges affect firm value and if they are relatable to specific firm characteristics. As expected, significant correlations were found between certain exchange rate exposures and hedges and compounded stock returns. The results have both theoretical as well as practical implications.

The study provides additional validation to the existing literature claiming that exchange rate exposures and hedges affect firm value. Moreover, it introduces a foreign sales trend variable that seems to capture some economic risk.

Apart from adding to previous research on the subject, the results also have potential practical implications for entities that are affected by firm values. These implications will be briefly mentioned, even though further research should be conducted in order to verify the robustness of the results. First of all, the results suggest that the exchange rate exposures and hedges of firms could add explanatory power to asset pricing models, which has potential implications for both asset managers and risk management within firms. Especially so in the presence of volatile exchange rates or possible exchange rate shocks.

The most obvious practical implication of the results concern central banks and government institutions, with the possibility to affect exchange rates. Since the results concern average effects of certain exchange rate exposures within firms, it is only possible to make predictions regarding average effects on compounded returns on stock prices. In order to predict stock price movements for specific companies, many more variables regarding for instance factors such as debt-equity ratios would have to be included, which goes beyond the scope of this paper. However, the results could possibly be used to estimate the impact that possible exchange rate shocks would have on stock markets and large stock indices, and they are thus potentially valuable for aforesaid institutions. Once again though, it must be stressed that such predictions are subject to many more factors than those incorporated in this thesis. Predictions using the results provided should only be used in order to get an indication of what effects an exchange rate shock might have and should not stand alone as a basis for decision making.

8. Limitations and suggestions for future research

8.1 Limitations

Most of the limitations in the results have been discussed already, however it is worth summing them up briefly in order to prevent readers from drawing too farfetched or false conclusions. First of all, there are many aspects of stock pricing and this paper only takes exchange rate exposures and hedges into account. The complicated nature of stock pricing might render the results inapplicable when analysing other stock markets than the SIX Swiss Exchange.

Secondly, the study only concerns average correlations between exchange rate exposures and hedges and compounded returns on stock prices. The results should therefore not be used in an effort to predict exchange rate effects on stock prices of individual firms.

Thirdly, the study was conducted on non-financial firms, other average correlations, if any, might exist between exchange rate exposures and hedges of financial firms and their compounded returns on stock prices.

Fourthly, as has been mentioned several times, the study was performed on compounded returns during certain periods, not daily returns. No conclusions can therefore be made about the correlation between exchange rate exposures and hedges and stock price returns during specific dates, only during certain periods.

Last but not least, the study was performed on an event where the CHF appreciated between 18% and 21% in two days against the major currencies. Needless to say, this is a very rare event and it is impossible to conclude how the results are relatable to everyday exchange rate conditions.

8.2 Validity and reliability

The largest source of uncertainty in this paper is the sample size, which might be considered small. The results have been tested for robustness by examining outliers and dropping influential observations or winsorising explanatory variables. These regressions are included in the appendix. However, the robustness of the results would have benefited from a larger sample size. It is possible that a larger sample size would also have increased the significance of the explanatory variables and decreased the confidence intervals of their coefficients.

8.3 Suggestions for future research

First of all, a study of exchange rate exposures and hedges has, to the best of the authors' knowledge, never been performed using the method of this thesis. Therefore, the results and method of this study would benefit from more research using the same method. Below follows a few suggestions of how similar studies could be conducted.

The first suggestion is obviously that the same study should be performed on a larger sample size of Swiss firms during the same event. This is due to the reasons stated in the preceding section on validity and reliability.

The second suggestion is that the study should be performed on longer time-horizons. This would be interesting for all stakeholders affected by exchange rates. The results of this thesis illustrated a trend among all variables of becoming less significant with time, which was explained by the increasing discrepancies in the CHF's performance against different major currencies. A study that captures exposures to, and hedges of, specific exchange rates during a longer time-horizon could possibly add to the understanding of long-term effects of exchange rate exposures and hedges on firm value.

The third suggestion is that the study should be performed on other similar events. For instance, Denmark is considering removing the DKK peg on the EUR. Again, if similar effects of exposures and hedges were to be found in such a study, the results of this study could be considered much more robust. Furthermore, it would allow for a comparison of differences in average exchange rate exposures and hedges across countries.

The fourth suggestion concerns the modifications that could be made to the methodology in order to increase the usability of the results when analysing specific firms. By relating all variables derived from the balance sheet to the debt-to-equity ratios rather than total assets of the sample firms, predictions could be made of the impact that exchange rate exposures and hedges have on stock prices of specific firms. This method might also generate higher R^2 and more significant variables since the variables become more related to the equity value. However, these are just expectations and a study must be made in order to completely understand the implications of changing the methodology in the proposed manner.

The last suggestion concerns the foreign sales trend variable which was tested for the first time in this thesis. The results generated by it were significant in some periods, although, it could be modified in many ways which might generate more robust results. For instance, a better measure of foreign sales trend might be obtained if the variable is changed to contain the average trend in foreign sales during the last two, or more, years.

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10. Appendix

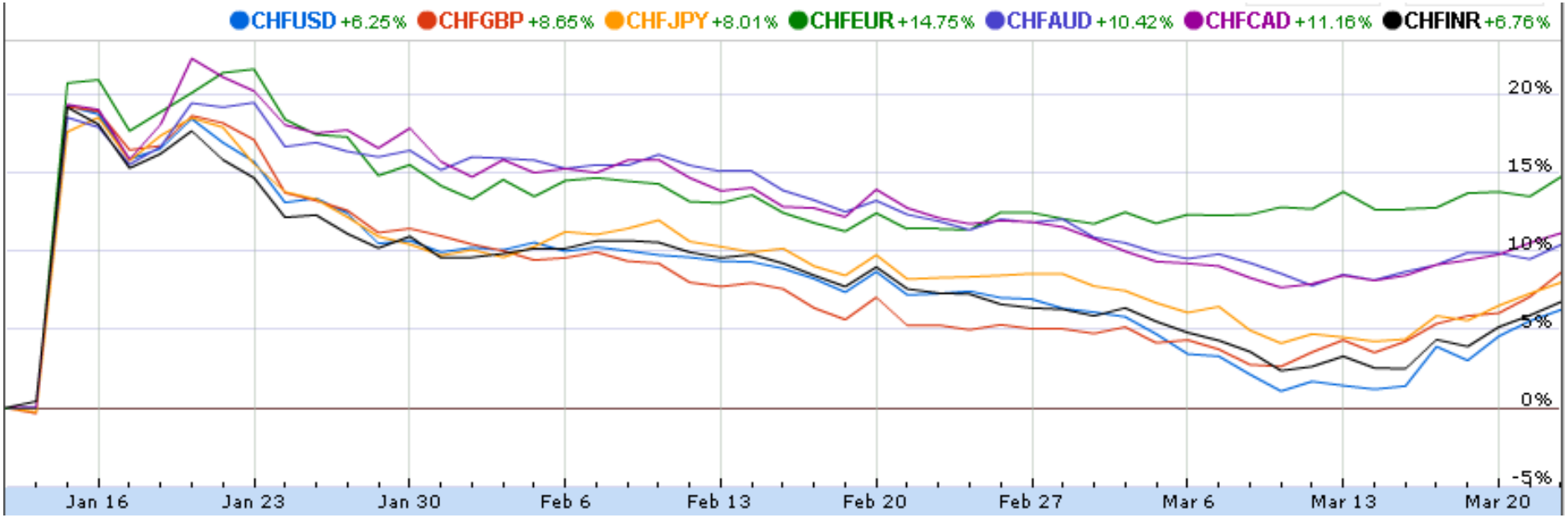
Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Compounded return on stock prices	23680	.1907329	1.696508	-.6424731	25.9086
Foreign sales	22400	.8236206	.2952167	0	1
Foreign costs	22080	.6232446	.3175206	0	1
Foreign non-current assets	21760	.2581842	.1898467	0	.7954534
Foreign financial debt	21440	.0612402	.1135578	0	.743489
Market share at event	23680	.0123154	.0408119	.0000245	.2341054
Exchange rate effect on cash	22400	.0022493	.0032834	0	.0230889
Currency derivatives	22400	.3428571	.4746748	0	1
Foreign sales trend	20800	.0632255	.216413	-.3478788	1.488235

Variable	Obs	Mean	Std. Dev.	Min	Max
Compounded return on stock prices	23680	.1907329	1.696508	-.6424731	25.9086
Foreign sales	22400	.8236206	.2952167	0	1
Foreign costs	22080	.6232446	.3175206	0	1
Foreign non-current assets	21760	.2581842	.1898467	0	.7954534
Foreign financial debt	21440	.0536018	.0791959	0	.2768461
Market share at event	23680	.0055965	.0101015	.0000645	.0406434
Exchange rate effect on cash	22400	.001931	.0018857	4.05e-06	.0069216
Currency derivatives	22400	.3428571	.4746748	0	1
Foreign sales trend	20800	.0397877	.0746348	-.0947722	.2253596

Note: Presented are the **descriptive statistics** for all the variables that have been considered. The latter include variables that have been winsorised.

Figure 12: CHF performance against major currencies of the world



Note: This table illustrates the performance of the CHF against some major currencies during the period 14th of January 2015 to 24th of March 2015. It illustrates how the CHF appreciated approximately 18% to 21% against most major currencies during the first two days after the event and how the currency has depreciated towards its ex ante value since. Furthermore, it also illustrates the increasing discrepancies in the CHF's performance against different major currencies post the event.

Table 2: Bruesch-Pagan test of heteroscedasticity for the main regression (1) model

Period start	20150114	20150114	20150114	20150114	20150114
Period end	20150115	20150116	20150123	20150213	20150324
Dependent variable	sqres_20150115	sqres_20150116	sqres_20150123	sqres_20150213	sqres_20150324
Foreign sales beta	.0010648	.0014289	.0000319	.0003389	-.004634
Foreign sales p>|t|	.1742063	.3294601	.9914749	.9125112	.4929595
Foreign assets beta	-.0009013	-.0009118	.0009075	.0009471	-.0024458
Foreign assets p>|t|	.3750879	.6317866	.8157461	.8136531	.7807905
Foreign non-current assets beta	.0013489	-.0000644	.0011984	-.001017	-.0018837
Foreign non-current assets p>|t|	.3733339	.9818713	.8364921	.8651918	.8856761
Foreign financial debt beta	-.0024434	-.002242	-.0085529	-.0115385	.016598
Foreign financial debt p>|t|	.354901	.6501789	.399303	.2713652	.4681707
_cons beta	.0005114	.0013189	.0027251	.0043707	.0152046
_cons p>|t|	.3740797	.2232419	.2192774	.0582999	.003201
N	66	66	66	66	66
F	.6641539	.3349039	.2162594	.3972848	.4338531
p > F	**.6193084**	**.8534164**	**.9284144**	**.8098257**	**.7836316**
r2	.0417335	.021489	.0139827	.02539	.0276624

Note: This table illustrates the Breusch-Pagan test for the main regression on different time periods. The table shows the results from regressing the squared residuals of the main regression on the explanatory variables of the main regression. In the table, the coefficients (beta) for each explanatory variable can be observed. Furthermore, the p-values from conducting two-sided t-tests for all explanatory variables are stated. However, the important numbers to observe are the p-values for the F-tests conducted on the regressions, which are written in bold.

Table 3: Bruesch-Pagan test of heteroscedasticity for the secondary regression (2) model

Date	20150115	20150116	20150123	20150213	20150324
Dependent variable	sqres_20150115	sqres_20150116	sqres_20150123	sqres_20150213	sqres_20150324
Foreign sales trend beta	.0003021	-.000325	-.0022233	-.0038483	-.0061229
Foreign sales trend p>|t|	.8137698	.897896	.5671928	.251975	.3690391
_cons beta	.0015188	.0028029	.0043442	.0045931	.010117
p>|t|	1.74e-06	6.33e-06	5.13e-06	6.61e-08	8.75e-09
N	65	65	65	65	65
F	.0559581	.0165993	.3308755	1.336742	.8185921
p > F	**.8137698**	**.897896**	**.5671928**	**.251975**	**.3690391**
r2	.0008874	.0002634	.0052246	.0207773	.0128269

Note: This table illustrates the Breusch-Pagan test for the secondary regression on different time periods. The table shows the results from regressing the squared residuals of the secondary regression on the explanatory variables of the secondary regression. In the table, the coefficients (beta) for each explanatory variable can be observed. Furthermore, the p-values from conducting two-sided t-tests for all explanatory variables are stated. However, the important numbers to observe are the p-values for the F-tests conducted on the regressions, which are written in bold.

Table 4: Cook's distance test of robustness

Company name	Compounded return	Foreign sales	Foreign costs	Foreign non-current assets	Foreign financial debt	Cook's distance
LECLANCHE SA	-.03904555	.52879105	.96397733	.79545335	0	.0743
LONZA GROUP AG	-.17839607	.89807692	.78437917	.54727527	.093619	.0823336
EVOLVA HOLDING SA	-.05405405	.02717796	.82751117	.57056623	.016255	.0926274
MYRIAD GROUP AG	-.04387991	.95204795	.01216223	.00675195	.0810322	.1417274

Company name	Compounded return	Foreign sales	Foreign costs	Foreign non-current assets	Foreign financial debt	Cook's distance
STRAUMANN HOLDING AG	-.27746606	.95635603	.86097598	.31012999	0	.0721242
LONZA GROUP AG	-.24754501	.89807692	.78437917	.54727527	.093619	.0635174
EVOLVA HOLDING SA	-.10135135	.02717796	.82751117	.57056623	.016255	.0753631
MYRIAD GROUP AG	-.073903	.95204795	.01216223	.00675195	.0810322	.1197977

Company name	Compounded return	Foreign sales	Foreign costs	Foreign non-current assets	Foreign financial debt	Cook's distance
NESTLE SA/AG	-.07754552	.98290617	.94423639	.58570251	0	.0736954
AFG ARBONIA-FORSTER HOLDING	-.30487805	.60374189	.6076746	.36753754	.02455	.0726309

Company name	Compounded return	Foreign sales	Foreign costs	Foreign non-current assets	Foreign financial debt	Cook's distance
ROCHE HOLDING AG	-.14255544	.97733927	.83865084	.44376727	.2768461	.0660146
TAMEDIA AG	.09984399	0	0	0	0	.1330296

Company name	Compounded return	Foreign sales	Foreign costs	Foreign non-current assets	Foreign financial debt	Cook's distance
ADECCO SA	.20689655	.9782	.92546584	.04300204	.1044492	.0648257
TAMEDIA AG	.34555382	0	0	0	0	.2268119
GATE GROUP HOLDINGS AG	.24642857	.88907351	.83182616	.40061102	.2768461	.145175

Note: These tables illustrate the observations, which were deemed influential according to the Cook's distance tests performed.

Table 5: Main regression (1) model

Period start	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114
Period end	20150115	20150116	20150119	20150120	20150121	20150122	20150123	20150126	20150127	20150128	20150129	20150130	20150202	20150203	20150204	20150205
Foreign sales beta	-0.0919	-0.12	-0.1195	-0.13	-0.1385	-0.1434	-0.1267	-0.1224	-0.13	-0.1248	-0.1234	-0.1168	-0.1254	-0.1224	-0.1146	-0.0998
Foreign sales std. err.	0.0153	0.0204	0.0185	0.0198	0.0251	0.0228	0.0245	0.0248	0.0264	0.0269	0.0278	0.0271	0.0262	0.0254	0.0244	0.0232
Foreign sales t-stat	-6.0145	-5.8707	-6.4656	-6.5655	-5.5224	-6.2753	-5.17	-4.9303	-4.9196	-4.6374	-4.4328	-4.307	-4.7913	-4.8247	-4.6956	-4.3024
Foreign sales p>|t|	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0001	0.000	0.000	0.000	0.0001
Foreign sales p<t	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Foreign sales c.i.l.l (95%)	-0.1224	-0.1609	-0.1564	-0.1696	-0.1887	-0.1891	-0.1758	-0.1721	-0.1828	-0.1786	-0.1791	-0.171	-0.1777	-0.1731	-0.1633	-0.1461
Foreign sales c.i.u.l (95%)	-0.0613	-0.0791	-0.0825	-0.0904	-0.0884	-0.0977	-0.0777	-0.0728	-0.0772	-0.071	-0.0678	-0.0626	-0.0731	-0.0717	-0.0658	-0.0534
Foreign costs beta	0.0524	0.0615	0.0735	0.0872	0.0952	0.1051	0.1075	0.1204	0.139	0.1265	0.1391	0.13	0.1377	0.127	0.1254	0.1234
Foreign costs std. err.	0.0209	0.0292	0.027	0.0279	0.033	0.0334	0.0331	0.0371	0.0367	0.0388	0.0401	0.0428	0.0432	0.0416	0.0378	0.037
Foreign costs t-stat	2.5086	2.1061	2.728	3.1219	2.8858	3.1444	3.2502	3.2437	3.7883	3.2587	3.4717	3.0388	3.1867	3.0512	3.3206	3.3389
Foreign costs p>|t|	0.0148	0.0393	0.0083	0.0027	0.0054	0.0026	0.0019	0.0019	0.0003	0.0018	0.001	0.0035	0.0023	0.0034	0.0015	0.0014
Foreign costs p>t	0.0074	0.0197	0.0042	0.0014	0.0027	0.0013	0.0009	0.001	0.0002	0.0009	0.0005	0.0017	0.0011	0.0017	0.0008	0.0007
Foreign costs c.i.l.l (95%)	0.0106	0.0031	0.0196	0.0314	0.0292	0.0383	0.0414	0.0462	0.0656	0.0489	0.059	0.0445	0.0513	0.0438	0.0499	0.0495
Foreign costs c.i.u.l (95%)	0.0941	0.1199	0.1274	0.1431	0.1612	0.1719	0.1736	0.1946	0.2124	0.2041	0.2192	0.2156	0.224	0.2102	0.201	0.1973
Foreign non-current assets beta	-0.0611	-0.1049	-0.1069	-0.1088	-0.128	-0.1406	-0.162	-0.1577	-0.1855	-0.1667	-0.1625	-0.1514	-0.1601	-0.1558	-0.1548	-0.1557
Foreign non-current assets std. err.	0.031	0.0368	0.0357	0.0437	0.0412	0.0508	0.0505	0.0548	0.0576	0.0611	0.0665	0.0623	0.0656	0.0657	0.0594	0.0575
Foreign non-current assets t-stat	-1.9687	-2.854	-2.9925	-2.4872	-3.1048	-2.7669	-3.2088	-2.8779	-3.2197	-2.7288	-2.4416	-2.4305	-2.4427	-2.3711	-2.6045	-2.7074
Foreign non-current assets p>|t|	0.0535	0.0059	0.004	0.0156	0.0029	0.0075	0.0021	0.0055	0.0021	0.0083	0.0175	0.018	0.0175	0.0209	0.0115	0.0088
Foreign non-current assets p<t	0.0268	0.0029	0.002	0.0078	0.0014	0.0037	0.0011	0.0028	0.001	0.0041	0.0088	0.009	0.0087	0.0105	0.0058	0.0044
Foreign non-current assets c.i.l.l (95%)	-0.1232	-0.1784	-0.1783	-0.1963	-0.2104	-0.2423	-0.263	-0.2673	-0.3007	-0.2888	-0.2955	-0.2759	-0.2912	-0.2871	-0.2737	-0.2707
Foreign non-current assets c.i.u.l (95%)	0.001	-0.0314	-0.0355	-0.0213	-0.0456	-0.039	-0.0611	-0.0481	-0.0703	-0.0445	-0.0294	-0.0268	-0.029	-0.0244	-0.036	-0.0407
Foreign financial debt_w95 beta	0.042	0.1428	0.2007	0.1836	0.2231	0.2251	0.2495	0.2371	0.2508	0.2406	0.2184	0.1933	0.2131	0.1644	0.2135	0.2027
Foreign financial debt_w95 std. err.	0.0477	0.0619	0.0584	0.0655	0.0718	0.075	0.0808	0.0817	0.0942	0.0961	0.1047	0.0943	0.1018	0.0997	0.0932	0.0965
Foreign financial debt_w95 t-stat	0.881	2.3091	3.4352	2.8038	3.1084	3.0019	3.0882	2.903	2.6636	2.5033	2.0863	2.0495	2.094	1.6489	2.2908	2.1017
Foreign financial debt_w95 p>|t|	0.3818	0.0243	0.0011	0.0068	0.0029	0.0039	0.003	0.0051	0.0099	0.015	0.0411	0.0447	0.0404	0.1043	0.0254	0.0397
Foreign financial debt_w95 p>t	0.1909	0.0122	0.0005	0.0034	0.0014	0.0019	0.0015	0.0026	0.0049	0.0075	0.0206	0.0224	0.0202	0.0522	0.0127	0.0199
Foreign financial debt_w95 c.i.l.l (95%)	-0.0534	0.0191	0.0839	0.0527	0.0796	0.0752	0.0879	0.0738	0.0625	0.0484	0.0091	0.0047	0.0096	-0.035	0.0271	0.0098
Foreign financial debt_w95 c.i.u.l (95%)	0.1374	0.2665	0.3175	0.3145	0.3666	0.3751	0.411	0.4004	0.4392	0.4327	0.4277	0.3819	0.4165	0.3637	0.3998	0.3956
_cons beta	-0.0247	-0.049	-0.0463	-0.0491	-0.062	-0.0628	-0.0627	-0.0635	-0.0631	-0.0687	-0.0726	-0.0672	-0.0587	-0.0436	-0.045	-0.0533
_cons std. err.	0.0079	0.0117	0.0116	0.011	0.0147	0.0161	0.0191	0.0178	0.0204	0.0208	0.0213	0.0187	0.0188	0.022	0.0211	0.0184
_cons t-stat	-3.1431	-4.1997	-3.9833	-4.468	-4.2238	-3.8882	-3.2783	-3.572	-3.0887	-3.3058	-3.4023	-3.5975	-3.1143	-1.9806	-2.1373	-2.8929
_cons p>|t|	0.0026	0.0001	0.0002	0.000	0.0001	0.0003	0.0017	0.0007	0.003	0.0016	0.0012	0.0006	0.0028	0.0521	0.0366	0.0053
_cons c.i.l.l (95%)	-0.0404	-0.0723	-0.0695	-0.071	-0.0914	-0.0951	-0.101	-0.0991	-0.104	-0.1103	-0.1153	-0.1045	-0.0964	-0.0877	-0.0872	-0.0902
_cons c.i.u.l (95%)	-0.009	-0.0257	-0.0231	-0.0271	-0.0327	-0.0305	-0.0245	-0.028	-0.0223	-0.0271	-0.0299	-0.0298	-0.021	0.0004	-0.0029	-0.0165
N	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
F	14.8227	15.3869	14.1076	14.5187	10.7445	11.6127	8.6236	7.5497	7.6587	6.6745	6.2352	5.4697	6.617	6.9872	6.9778	6.0464
p > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0001	0.000	0.0002	0.0003	0.0008	0.0002	0.0001	0.0001	0.0004
r2	0.3467	0.3769	0.3794	0.3499	0.3434	0.3502	0.2879	0.2561	0.2533	0.2088	0.2016	0.1973	0.2077	0.1825	0.1951	0.1746

Period start	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114
Period end	20150206	20150209	20150210	20150211	20150212	20150213	20150216	20150217	20150218	20150219	20150220	20150223	20150224	20150225	20150226	20150227
Foreign sales beta	-0.0879	-0.0824	-0.0885	-0.0865	-0.0812	-0.0752	-0.0734	-0.0755	-0.0715	-0.0687	-0.0789	-0.0705	-0.0631	-0.0718	-0.0769	-0.1007
Foreign sales std. err.	0.0231	0.0249	0.0288	0.0289	0.0297	0.0283	0.0288	0.0288	0.0278	0.0291	0.0317	0.0298	0.0282	0.0301	0.0323	0.0384
Foreign sales t-stat	-3.7963	-3.3118	-3.0695	-2.9961	-2.7353	-2.653	-2.5484	-2.6227	-2.5732	-2.3579	-2.4895	-2.3683	-2.236	-2.3826	-2.3843	-2.6261
Foreign sales p>|t|	0.0003	0.0016	0.0032	0.0039	0.0081	0.0102	0.0134	0.011	0.0125	0.0216	0.0155	0.0211	0.029	0.0203	0.0202	0.0109
Foreign sales p<t	0.0002	0.0008	0.0016	0.002	0.0041	0.0051	0.0067	0.0055	0.0063	0.0108	0.0078	0.0105	0.0145	0.0102	0.0101	0.0055
Foreign sales c.i.l.l (95%)	-0.1341	-0.1322	-0.1461	-0.1442	-0.1405	-0.1318	-0.1311	-0.1331	-0.1271	-0.127	-0.1422	-0.13	-0.1195	-0.132	-0.1414	-0.1775
Foreign sales c.i.u.l (95%)	-0.0416	-0.0327	-0.0308	-0.0288	-0.0218	-0.0185	-0.0158	-0.0179	-0.0159	-0.0104	-0.0155	-0.011	-0.0067	-0.0115	-0.0124	-0.024
Foreign costs beta	0.1155	0.1201	0.1138	0.1146	0.1114	0.1097	0.1101	0.1027	0.1006	0.0956	0.0976	0.0957	0.0837	0.0844	0.0855	0.0928
Foreign costs std. err.	0.0368	0.0389	0.0399	0.0385	0.039	0.0364	0.0359	0.0355	0.0358	0.0358	0.0368	0.0336	0.0317	0.0309	0.0331	0.0353
Foreign costs t-stat	3.1411	3.0901	2.8485	2.9787	2.8577	3.0125	3.0685	2.8941	2.8128	2.6701	2.6515	2.846	2.6387	2.7281	2.5844	2.6314
Foreign costs p>|t|	0.0026	0.003	0.006	0.0042	0.0058	0.0038	0.0032	0.0053	0.0066	0.0097	0.0102	0.006	0.0105	0.0083	0.0122	0.0108
Foreign costs p>t	0.0013	0.0015	0.003	0.0021	0.0029	0.0019	0.0016	0.0026	0.0033	0.0049	0.0051	0.003	0.0053	0.0042	0.0061	0.0054
Foreign costs c.i.l.l (95%)	0.042	0.0424	0.0339	0.0377	0.0334	0.0369	0.0383	0.0317	0.0291	0.024	0.024	0.0285	0.0203	0.0225	0.0193	0.0223
Foreign costs c.i.u.l (95%)	0.189	0.1979	0.1937	0.1916	0.1893	0.1826	0.1818	0.1737	0.1721	0.1672	0.1711	0.1629	0.1471	0.1462	0.1516	0.1633
Foreign non-current assets beta	-0.1651	-0.1763	-0.171	-0.1877	-0.1866	-0.1932	-0.2012	-0.1989	-0.1827	-0.1699	-0.1772	-0.1761	-0.1666	-0.1826	-0.1817	-0.1592
Foreign non-current assets std. err.	0.056	0.057	0.0605	0.0587	0.0587	0.0532	0.0529	0.0525	0.0529	0.0532	0.0537	0.0521	0.0511	0.0519	0.058	0.061
Foreign non-current assets t-stat	-2.9499	-3.0929	-2.8269	-3.1961	-3.1803	-3.6299	-3.7997	-3.79	-3.4525	-3.1918	-3.299	-3.3801	-3.2593	-3.5218	-3.1322	-2.612
Foreign non-current assets p>|t|	0.0045	0.003	0.0063	0.0022	0.0023	0.0006	0.0003	0.0003	0.001	0.0022	0.0016	0.0013	0.0018	0.0008	0.0027	0.0113
Foreign non-current assets p<t	0.0023	0.0015	0.0032	0.0011	0.0012	0.0003	0.0002	0.0002	0.0005	0.0011	0.0008	0.0006	0.0009	0.0004	0.0013	0.0057
Foreign non-current assets c.i.l.l (95%)	-0.277	-0.2903	-0.292	-0.3052	-0.3039	-0.2996	-0.307	-0.3038	-0.2885	-0.2764	-0.2846	-0.2803	-0.2688	-0.2864	-0.2977	-0.2811
Foreign non-current assets c.i.u.l (95%)	-0.0532	-0.0623	-0.05	-0.0703	-0.0693	-0.0868	-0.0953	-0.094	-0.0769	-0.0635	-0.0698	-0.0719	-0.0644	-0.0789	-0.0657	-0.0373
Foreign financial debt_w95 beta	0.1911	0.1897	0.1729	0.1958	0.2122	0.1748	0.1638	0.1969	0.1958	0.2081	0.2189	0.2322	0.2146	0.2204	0.247	0.1757
Foreign financial debt_w95 std. err.	0.097	0.0983	0.1002	0.1022	0.1038	0.0972	0.0943	0.0939	0.0961	0.0962	0.0949	0.0968	0.1018	0.1005	0.1136	0.1121
Foreign financial debt_w95 t-stat	1.9688	1.9292	1.7255	1.9168	2.044	1.7979	1.7376	2.0964	2.0383	2.1632	2.3071	2.3973	2.1074	2.1929	2.1742	1.5664
Foreign financial debt_w95 p>|t|	0.0535	0.0584	0.0895	0.0599	0.0453	0.0771	0.0873	0.0402	0.0459	0.0345	0.0245	0.0196	0.0392	0.0321	0.0336	0.1224
Foreign financial debt_w95 p>t	0.0268	0.0292	0.0447	0.03	0.0226	0.0386	0.0437	0.0201	0.0229	0.0172	0.0122	0.0098	0.0196	0.0161	0.0168	0.0612
Foreign financial debt_w95 c.i.l.l (95%)	-0.003	-0.0069	-0.0275	-0.0085	0.0046	-0.0196	-0.0247	0.0091	0.0037	0.0157	0.0292	0.0385	0.011	0.0194	0.0198	-0.0486
Foreign financial debt_w95 c.i.u.l (95%)	0.3851	0.3863	0.3732	0.4001	0.4197	0.3691	0.3523	0.3847	0.3879	0.4005	0.4086	0.4258	0.4181	0.4213	0.4741	0.3999
_cons beta	-0.0541	-0.0562	-0.0426	-0.0412	-0.0382	-0.0308	-0.0214	-0.0163	-0.0119	-0.0088	0.0005	0.0006	0.0066	0.0189	0.0225	0.0402
_cons std. err.	0.0179	0.0189	0.0237	0.0234	0.0238	0.0242	0.0238	0.0235	0.0221	0.0254	0.0268	0.0259	0.0248	0.0264	0.0262	0.0285
_cons t-stat	-3.0206	-2.9713	-1.8013	-1.7638	-1.6045	-1.27	-0.8966	-0.6919	-0.5405	-0.3473	0.0179	0.0229	0.2651	0.7151	0.8572	1.4093
_cons p>|t|	0.0037	0.0042	0.0766	0.0828	0.1138	0.2089	0.3735	0.4916	0.5908	0.7295	0.9858	0.9818	0.7919	0.4773	0.3947	0.1638
_cons c.i.l.l (95%)	-0.0899	-0.0941	-0.09	-0.088	-0.0858	-0.0792	-0.069	-0.0633	-0.056	-0.0597	-0.0531	-0.0511	-0.043	-0.0339	-0.03	-0.0169
_cons c.i.u.l (95%)	-0.0183	-0.0184	0.0047	0.0055	0.0094	0.0177	0.0263	0.0308	0.0322	0.042	0.054	0.0523	0.0561	0.0717	0.0749	0.0973
N	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
F	5.1833	4.6477	3.8238	4.3247	4.0696	4.3007	4.3208	4.5331	3.8441	3.2808	3.4637	3.6797	3.3936	3.9687	3.6261	3.4592
p > F	0.0012	0.0024	0.0077	0.0038	0.0055	0.0039	0.0038	0.0029	0.0075	0.0168	0.0129	0.0095	0.0143	0.0063	0.0102	0.013
r2	0.1626	0.1566	0.1497	0.1554	0.1487	0.1522	0.165	0.1716	0.1585	0.1524	0.1685	0.1567	0.1469	0.1676	0.1656	0.1634

Period start	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114
Period end	20150302	20150303	20150304	20150305	20150306	20150309	20150310	20150311	20150312	20150313	20150316	20150317	20150318	20150319	20150320	20150323	20150324
Foreign sales beta	-0.1023	-0.1128	-0.1051	-0.1108	-0.1115	-0.1175	-0.1225	-0.1054	-0.1156	-0.1186	-0.1211	-0.1117	-0.1042	-0.0977	-0.0817	-0.0861	-0.1017
Foreign sales std. err.	0.0367	0.0406	0.0412	0.04	0.0402	0.0415	0.0434	0.0443	0.0497	0.0512	0.0516	0.048	0.049	0.0494	0.0532	0.0519	0.0534
Foreign sales t-stat	-2.7872	-2.7817	-2.5535	-2.7714	-2.7702	-2.8327	-2.8262	-2.3799	-2.3266	-2.3148	-2.3466	-2.3267	-2.1259	-1.9782	-1.5342	-1.6585	-1.9039
Foreign sales p>|t|	0.0071	0.0072	0.0132	0.0074	0.0074	0.0062	0.0064	0.0205	0.0233	0.024	0.0222	0.0233	0.0376	0.0524	0.1301	0.1024	0.0616
Foreign sales p<t	0.0035	0.0036	0.0066	0.0037	0.0037	0.0031	0.0032	0.0102	0.0117	0.012	0.0111	0.0117	0.0188	0.0262	0.0651	0.0512	0.0308
Foreign sales c.i.l.l (95%)	-0.1757	-0.1939	-0.1874	-0.1908	-0.1919	-0.2004	-0.2092	-0.1939	-0.215	-0.221	-0.2243	-0.2076	-0.2022	-0.1964	-0.1881	-0.1898	-0.2085
Foreign sales c.i.u.l (95%)	-0.0289	-0.0317	-0.0228	-0.0309	-0.031	-0.0345	-0.0358	-0.0168	-0.0163	-0.0161	-0.0179	-0.0157	-0.0062	0.0011	0.0248	0.0177	0.0051
Foreign costs beta	0.1014	0.1024	0.093	0.0982	0.098	0.1119	0.1243	0.1153	0.1072	0.1044	0.1189	0.113	0.1061	0.0931	0.0774	0.0809	0.0933
Foreign costs std. err.	0.0341	0.0371	0.0383	0.0392	0.0433	0.0423	0.047	0.0514	0.0515	0.0507	0.0528	0.0524	0.0562	0.056	0.0591	0.0593	0.0599
Foreign costs t-stat	2.9701	2.7624	2.4272	2.5012	2.2642	2.6426	2.6463	2.2435	2.0817	2.0596	2.2522	2.1574	1.8873	1.663	1.3103	1.3639	1.5587
Foreign costs p>|t|	0.0043	0.0076	0.0182	0.0151	0.0271	0.0104	0.0103	0.0285	0.0416	0.0437	0.0279	0.0349	0.0639	0.1014	0.195	0.1776	0.1242
Foreign costs p>t	0.0021	0.0038	0.0091	0.0075	0.0136	0.0052	0.0052	0.0143	0.0208	0.0219	0.014	0.0175	0.0319	0.0507	0.0975	0.0888	0.0621
Foreign costs c.i.l.l (95%)	0.0331	0.0283	0.0164	0.0197	0.0114	0.0272	0.0304	0.0125	0.0042	0.003	0.0133	0.0083	-0.0063	-0.0188	-0.0407	-0.0377	-0.0264
Foreign costs c.i.u.l (95%)	0.1697	0.1766	0.1696	0.1766	0.1845	0.1965	0.2181	0.2181	0.2102	0.2058	0.2245	0.2177	0.2186	0.205	0.1955	0.1994	0.2131
Foreign non-current assets beta	-0.1517	-0.1481	-0.1289	-0.1077	-0.102	-0.1225	-0.1601	-0.1677	-0.1592	-0.1695	-0.1872	-0.1975	-0.1966	-0.1745	-0.1648	-0.1691	-0.1812
Foreign non-current assets std. err.	0.0598	0.0649	0.0682	0.0687	0.0656	0.0656	0.0717	0.0806	0.0792	0.0797	0.0826	0.0816	0.0884	0.0896	0.0921	0.0915	0.0868
Foreign non-current assets t-stat	-2.5368	-2.2802	-1.8913	-1.5675	-1.5541	-1.8678	-2.233	-2.0795	-2.0091	-2.127	-2.2659	-2.4223	-2.2232	-1.947	-1.7902	-1.8479	-2.0876
Foreign non-current assets p>|t|	0.0138	0.0261	0.0633	0.1222	0.1253	0.0666	0.0292	0.0418	0.049	0.0375	0.027	0.0184	0.0299	0.0561	0.0784	0.0695	0.041
Foreign non-current assets p<t	0.0069	0.0131	0.0317	0.0611	0.0627	0.0333	0.0146	0.0209	0.0245	0.0187	0.0135	0.0092	0.015	0.0281	0.0392	0.0347	0.0205
Foreign non-current assets c.i.l.l (95%)	-0.2713	-0.2779	-0.2652	-0.2452	-0.2333	-0.2537	-0.3035	-0.329	-0.3176	-0.3289	-0.3523	-0.3606	-0.3735	-0.3536	-0.3489	-0.352	-0.3548
Foreign non-current assets c.i.u.l (95%)	-0.0321	-0.0182	0.0074	0.0297	0.0292	0.0086	-0.0167	-0.0064	-0.0008	-0.0102	-0.022	-0.0345	-0.0198	0.0047	0.0193	0.0139	-0.0076
Foreign financial debt_w95 beta	0.1579	0.1487	0.1468	0.1514	0.1531	0.1507	0.1998	0.2078	0.221	0.2308	0.212	0.2319	0.2279	0.2105	0.1787	0.187	0.1498
Foreign financial debt_w95 std. err.	0.1092	0.1139	0.1167	0.1421	0.1329	0.1305	0.138	0.1386	0.1277	0.1393	0.1649	0.1574	0.1582	0.1664	0.1762	0.1857	0.1929
Foreign financial debt_w95 t-stat	1.4458	1.3058	1.2575	1.0653	1.1519	1.1549	1.4482	1.4993	1.7303	1.6563	1.2857	1.4733	1.4407	1.2647	1.0145	1.0069	0.7761
Foreign financial debt_w95 p>|t|	0.1534	0.1965	0.2134	0.291	0.2539	0.2526	0.1527	0.139	0.0886	0.1028	0.2034	0.1458	0.1548	0.2108	0.3144	0.3179	0.4407
Foreign financial debt_w95 p>t	0.0767	0.0983	0.1067	0.1455	0.1269	0.1263	0.0763	0.0695	0.0443	0.0514	0.1017	0.0729	0.0774	0.1054	0.1572	0.159	0.2203
Foreign financial debt_w95 c.i.l.l (95%)	-0.0605	-0.079	-0.0866	-0.1328	-0.1127	-0.1102	-0.0761	-0.0694	-0.0344	-0.0478	-0.1177	-0.0828	-0.0884	-0.1223	-0.1735	-0.1843	-0.2361
Foreign financial debt_w95 c.i.u.l (95%)	0.3763	0.3764	0.3802	0.4356	0.4188	0.4115	0.4757	0.4851	0.4763	0.5094	0.5417	0.5465	0.5442	0.5433	0.5309	0.5582	0.5356
_cons beta	0.0378	0.0425	0.0372	0.0388	0.043	0.042	0.0378	0.0409	0.0531	0.069	0.0708	0.0597	0.0582	0.0607	0.0713	0.0725	0.0836
_cons std. err.	0.0267	0.0295	0.0314	0.0314	0.0304	0.0321	0.0332	0.0334	0.0418	0.0451	0.0467	0.0455	0.046	0.0453	0.0453	0.0436	0.046
_cons t-stat	1.4126	1.4392	1.1855	1.2351	1.4141	1.3099	1.1401	1.225	1.2717	1.5301	1.5163	1.3117	1.2659	1.3412	1.5758	1.6628	1.8172
_cons p>|t|	0.1629	0.1552	0.2404	0.2215	0.1624	0.1951	0.2587	0.2253	0.2083	0.1312	0.1346	0.1945	0.2104	0.1848	0.1203	0.1015	0.0741
_cons c.i.l.l (95%)	-0.0157	-0.0166	-0.0255	-0.024	-0.0178	-0.0221	-0.0285	-0.0259	-0.0304	-0.0212	-0.0226	-0.0313	-0.0337	-0.0298	-0.0192	-0.0147	-0.0084
_cons c.i.u.l (95%)	0.0912	0.1016	0.0999	0.1016	0.1039	0.1061	0.1042	0.1077	0.1366	0.1593	0.1642	0.1507	0.1502	0.1513	0.1618	0.1597	0.1755
N	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66	66
F	3.6182	3.4146	2.6565	2.6254	2.3613	2.7178	2.9419	2.2008	2.1113	2.1283	2.1837	2.1493	1.8632	1.5146	1.1199	1.2358	1.5033
p > F	0.0104	0.0139	0.0412	0.0431	0.0631	0.0377	0.0273	0.0794	0.0902	0.0881	0.0814	0.0855	0.1284	0.2091	0.3555	0.3052	0.2124
r2	0.1594	0.1523	0.1238	0.111	0.1133	0.1226	0.132	0.1156	0.1262	0.1281	0.1269	0.1307	0.1165	0.0959	0.0725	0.0738	0.0886

Table 6: Secondary regression (2) model

Period start	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114
Period end	20150115	20150116	20150119	20150120	20150121	20150122	20150123	20150126	20150127	20150128	20150129	20150130	20150202	20150203	20150204	20150205
Foreign sales trend_w95 beta	-0.088	-0.1148	-0.1647	-0.2001	-0.1805	-0.206	-0.179	-0.1753	-0.1445	-0.1536	-0.1508	-0.1476	-0.1755	-0.1554	-0.1191	-0.1282
Foreign sales trend_w95 std. err.	0.0629	0.0729	0.0703	0.0842	0.0933	0.0923	0.1029	0.0991	0.1089	0.1065	0.1134	0.1077	0.1098	0.1074	0.1019	0.1003
Foreign sales trend t-stat	-1.3995	-1.5757	-2.3433	-2.3755	-1.9344	-2.2311	-1.7387	-1.7685	-1.3276	-1.4421	-1.3304	-1.3708	-1.5982	-1.4461	-1.1689	-1.2776
Foreign sales trend p>|t|	0.1666	0.1201	0.0223	0.0206	0.0576	0.0292	0.087	0.0818	0.1891	0.1542	0.1882	0.1753	0.115	0.1531	0.2468	0.2061
Foreign sales trend p<t	0.0833	0.0601	0.0111	0.0103	0.0288	0.0146	0.0435	0.0409	0.0946	0.0771	0.0941	0.0877	0.0575	0.0766	0.1234	0.103
Foreign sales c.i.l.l (95%)	-0.2137	-0.2604	-0.3052	-0.3684	-0.3669	-0.3905	-0.3847	-0.3733	-0.3621	-0.3665	-0.3774	-0.3628	-0.3948	-0.3701	-0.3227	-0.3286
Foreign sales c.i.u.l (95%)	0.0377	0.0308	-0.0243	-0.0318	0.006	-0.0215	0.0267	0.0228	0.073	0.0593	0.0757	0.0676	0.0439	0.0593	0.0845	0.0723
_cons beta	-0.0791	-0.1266	-0.1108	-0.1134	-0.1319	-0.1335	-0.1243	-0.113	-0.1152	-0.1205	-0.1162	-0.1097	-0.1041	-0.0976	-0.0911	-0.0882
_cons std. err.	0.0049	0.0072	0.0071	0.0078	0.0088	0.0087	0.0095	0.0094	0.01	0.0102	0.0102	0.0098	0.0101	0.0094	0.0098	0.0098
_cons t-stat	-15.9984	-17.6234	-15.6749	-14.5064	-14.9614	-15.2815	-13.0125	-12.0534	-11.5229	-11.8183	-11.3688	-11.1613	-10.2854	-10.4096	-9.2478	-9.0333
_cons p>|t|	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
_cons c.i.l.l (95%)	-0.089	-0.1409	-0.125	-0.129	-0.1495	-0.151	-0.1433	-0.1318	-0.1351	-0.1409	-0.1366	-0.1293	-0.1244	-0.1163	-0.1108	-0.1077
_cons c.i.u.l (95%)	-0.0692	-0.1122	-0.0967	-0.0978	-0.1143	-0.1161	-0.1052	-0.0943	-0.0952	-0.1001	-0.0957	-0.09	-0.0839	-0.0788	-0.0714	-0.0687
N	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
F	1.9587	2.4827	5.4909	5.6428	3.7419	4.9779	3.0232	3.1277	1.7625	2.0795	1.7699	1.879	2.5542	2.0912	1.3664	1.6324
p	0.1666	0.1201	0.0223	0.0206	0.0576	0.0292	0.087	0.0818	0.1891	0.1542	0.1882	0.1753	0.115	0.1531	0.2468	0.2061
r2	0.028	0.0264	0.0567	0.069	0.0466	0.0594	0.0424	0.0391	0.0235	0.0254	0.0244	0.0264	0.0361	0.0318	0.0182	0.0218

Period start	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114
Period end	20150206	20150209	20150210	20150211	20150212	20150213	20150216	20150217	20150218	20150219	20150220	20150223	20150224	20150225	20150226	20150227
Foreign sales trend_w95 beta	-0.1136	-0.0743	-0.0809	-0.1023	-0.1041	-0.0558	-0.0583	-0.0887	-0.0627	-0.0685	-0.0656	-0.0331	-0.043	0.0089	-0.0253	-0.0803
Foreign sales trend_w95 std. err.	0.0945	0.1059	0.1112	0.1151	0.1117	0.1044	0.102	0.1012	0.1006	0.1012	0.108	0.1075	0.0976	0.1035	0.1119	0.1223
Foreign sales trend t-stat	-1.202	-0.7021	-0.728	-0.8887	-0.932	-0.5351	-0.5718	-0.8771	-0.6234	-0.6772	-0.6071	-0.3075	-0.4408	0.0858	-0.2261	-0.6566
Foreign sales trend p>|t|	0.2339	0.4852	0.4693	0.3775	0.3549	0.5944	0.5695	0.3837	0.5353	0.5008	0.546	0.7595	0.6608	0.9319	0.8218	0.5138
Foreign sales trend p<t	0.1169	0.2426	0.2346	0.1888	0.1774	0.2972	0.2847	0.1919	0.2676	0.2504	0.273	0.3797	0.3304	0.4659	0.4109	0.2569
Foreign sales c.i.l.l (95%)	-0.3025	-0.2859	-0.3031	-0.3323	-0.3273	-0.2644	-0.262	-0.2909	-0.2637	-0.2708	-0.2814	-0.2479	-0.2381	-0.198	-0.2489	-0.3247
Foreign sales c.i.u.l (95%)	0.0753	0.1372	0.1412	0.1277	0.1191	0.1527	0.1454	0.1134	0.1383	0.1337	0.1503	0.1818	0.152	0.2158	0.1983	0.1641
_cons beta	-0.0873	-0.0862	-0.0818	-0.081	-0.0743	-0.069	-0.0614	-0.059	-0.0486	-0.042	-0.0407	-0.0327	-0.0262	-0.0273	-0.0238	-0.0186
_cons std. err.	0.0093	0.0097	0.0097	0.0101	0.0103	0.0098	0.0097	0.0099	0.0098	0.0097	0.0102	0.0106	0.0099	0.0098	0.0106	0.011
_cons t-stat	-9.344	-8.9042	-8.4255	-8.0053	-7.2327	-7.0243	-6.2966	-5.9694	-4.964	-4.3434	-3.9895	-3.0977	-2.6582	-2.7873	-2.2492	-1.6923
_cons p>|t|	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0001	0.0002	0.0029	0.0099	0.007	0.028	0.0955
_cons c.i.l.l (95%)	-0.106	-0.1056	-0.1011	-0.1012	-0.0948	-0.0886	-0.0808	-0.0788	-0.0681	-0.0613	-0.0611	-0.0538	-0.0459	-0.0469	-0.0449	-0.0406
_cons c.i.u.l (95%)	-0.0687	-0.0669	-0.0624	-0.0608	-0.0538	-0.0494	-0.0419	-0.0393	-0.029	-0.0227	-0.0203	-0.0116	-0.0065	-0.0077	-0.0026	0.0034
N	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
F	1.4448	0.493	0.53	0.7898	0.8687	0.2864	0.327	0.7694	0.3886	0.4586	0.3686	0.0945	0.1943	0.0074	0.0511	0.4311
p	0.2339	0.4852	0.4693	0.3775	0.3549	0.5944	0.5695	0.3837	0.5353	0.5008	0.546	0.7595	0.6608	0.9319	0.8218	0.5138
r2	0.0182	0.0074	0.0085	0.0128	0.0129	0.004	0.0046	0.0105	0.0054	0.0069	0.0059	0.0013	0.0023	0.0001	0.0007	0.0073

Period start	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114	20150114
Period end	20150302	20150303	20150304	20150305	20150306	20150309	20150310	20150311	20150312	20150313	20150316	20150317	20150318	20150319	20150320	20150323	20150324
Foreign sales trend_w95 beta	-0.0691	-0.0749	-0.0897	-0.1217	-0.1391	-0.1138	-0.1027	-0.1254	-0.1238	-0.1218	-0.1449	-0.1378	-0.146	-0.1172	-0.0605	-0.0822	-0.0518
Foreign sales trend_w95 std. err.	0.1206	0.1373	0.1366	0.1467	0.1434	0.1516	0.1649	0.1682	0.1603	0.164	0.1622	0.1531	0.1642	0.1736	0.1905	0.1916	0.1879
Foreign sales trend t-stat	-0.5732	-0.5457	-0.6569	-0.83	-0.97	-0.7507	-0.6225	-0.7455	-0.7726	-0.7423	-0.8929	-0.9002	-0.8891	-0.6749	-0.3178	-0.429	-0.2756
Foreign sales trend p>|t|	0.5685	0.5872	0.5137	0.4097	0.3357	0.4556	0.5359	0.4588	0.4426	0.4606	0.3753	0.3714	0.3773	0.5022	0.7517	0.6694	0.7838
Foreign sales trend p<t	0.2843	0.2936	0.2568	0.2048	0.1679	0.2278	0.2679	0.2294	0.2213	0.2303	0.1877	0.1857	0.1887	0.2511	0.3758	0.3347	0.3919
Foreign sales c.i.l.l (95%)	-0.31	-0.3493	-0.3627	-0.4148	-0.4257	-0.4167	-0.4323	-0.4616	-0.4441	-0.4495	-0.469	-0.4438	-0.4742	-0.4641	-0.4412	-0.4651	-0.4272
Foreign sales c.i.u.l (95%)	0.1718	0.1994	0.1832	0.1714	0.1475	0.1891	0.2269	0.2108	0.1965	0.206	0.1793	0.1681	0.1822	0.2298	0.3201	0.3007	0.3237
_cons beta	-0.0148	-0.0174	-0.0169	-0.0088	-0.0025	-0.0067	-0.0151	-0.0041	-0.004	0.0047	0.0083	-0.0006	0.0002	0.0032	0.0151	0.0163	0.0147
_cons std. err.	0.0107	0.0117	0.0118	0.0131	0.0126	0.0126	0.0133	0.013	0.0126	0.0127	0.0132	0.0126	0.013	0.0134	0.014	0.0145	0.0143
_cons t-stat	-1.3817	-1.4929	-1.4302	-0.6704	-0.1957	-0.5339	-1.1347	-0.315	-0.3163	0.3686	0.6327	-0.0505	0.0185	0.2404	1.0767	1.1232	1.028
_cons p>|t|	0.172	0.1404	0.1576	0.5051	0.8454	0.5953	0.2608	0.7538	0.7528	0.7137	0.5292	0.9599	0.9853	0.8108	0.2857	0.2656	0.3079
_cons c.i.l.l (95%)	-0.0362	-0.0407	-0.0404	-0.0349	-0.0276	-0.0319	-0.0416	-0.0301	-0.0293	-0.0207	-0.018	-0.0258	-0.0257	-0.0236	-0.0129	-0.0127	-0.0139
_cons c.i.u.l (95%)	0.0066	0.0059	0.0067	0.0174	0.0226	0.0184	0.0115	0.0219	0.0213	0.03	0.0347	0.0245	0.0262	0.03	0.0431	0.0454	0.0433
N	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
F	0.3286	0.2978	0.4315	0.6889	0.9409	0.5636	0.3875	0.5557	0.5969	0.5511	0.7973	0.8103	0.7906	0.4554	0.101	0.1841	0.076
p	0.5685	0.5872	0.5137	0.4097	0.3357	0.4556	0.5359	0.4588	0.4426	0.4606	0.3753	0.3714	0.3773	0.5022	0.7517	0.6694	0.7838
r2	0.0055	0.0054	0.0074	0.0116	0.0152	0.0099	0.0072	0.0109	0.0114	0.0105	0.0143	0.0139	0.0148	0.0091	0.0022	0.0038	0.0015

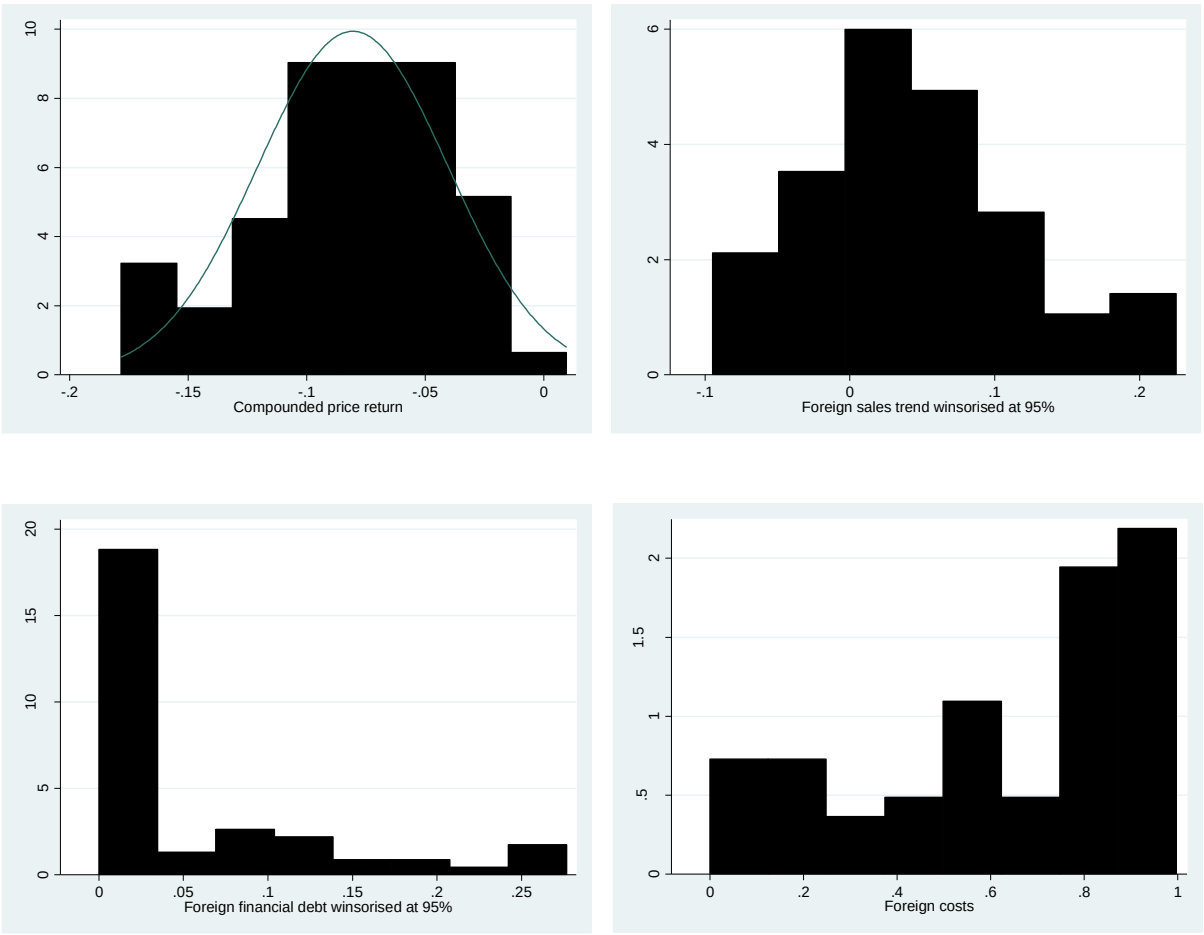
Table 7: Event study

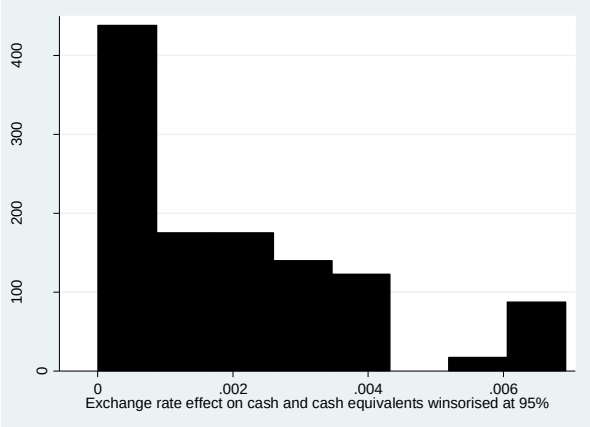
Group	Obs	Mean	Std. Err.	Std. Dev.	95% Conf.	Interval
Expected CAR	792	9,24E-05	0,015575	0,438331	-0,030482	0,030666
Observed CAR	792	-0,097944	0,002543	0,071556	-0,102935	-0,092953
combined	1584	-0,048926	0,007984	0,317757	-0,064586	-0,033266
diff		0,098037	0,015782		0,067082	0,128992

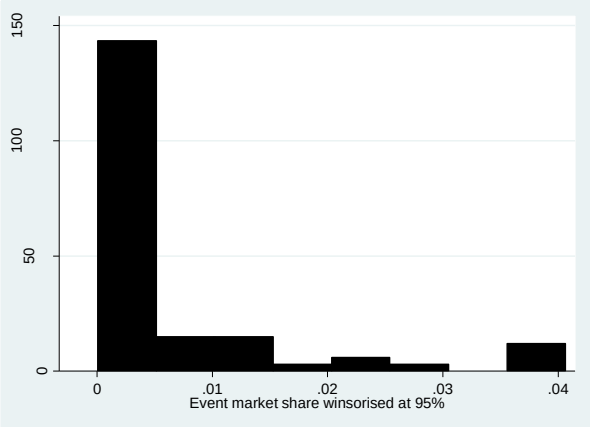
diff = mean(0) – mean(1)	t = 6,2121	
Ho: diff = 0	degrees of freedom = 1582	
Ha: diff < 0	Ha: diff != 0	Ha: diff > 0
Pr(T < t) = 1,0000	Pr(|T| > |t|) = 0,0000	Pr(T > t) = 0

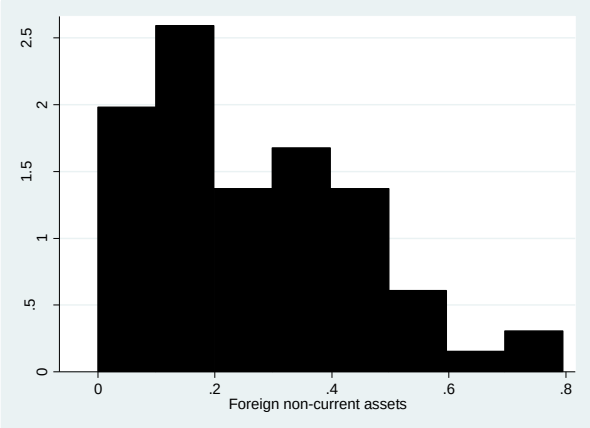
Note: The table illustrates in detail the effect that the event, the removal of the EUR currency peg, had on Swiss firms included in the sample group. The event study was performed for the period 15th of January 2015 to the 26th of January 2015

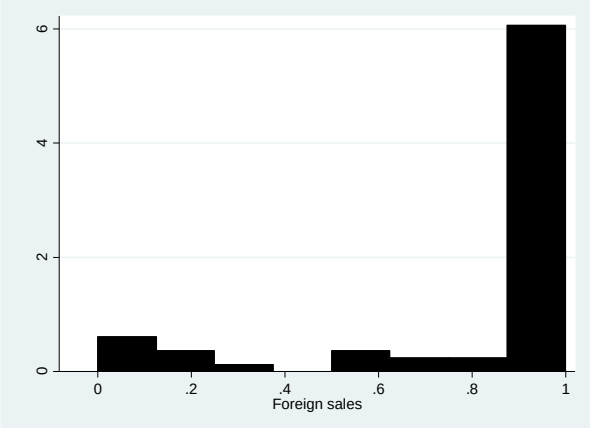
Figure 13: Histograms for all explanatory variables

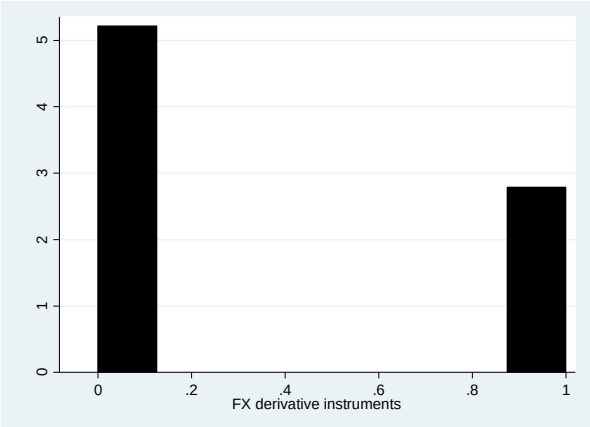






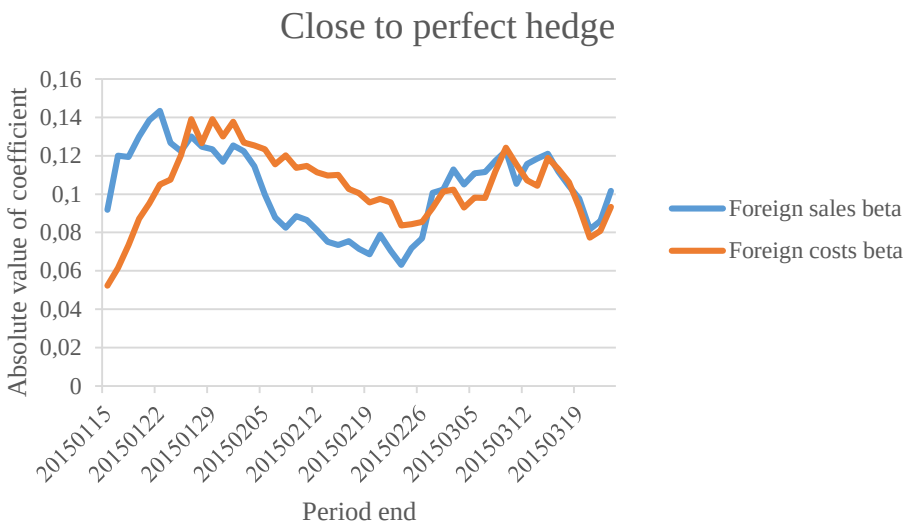






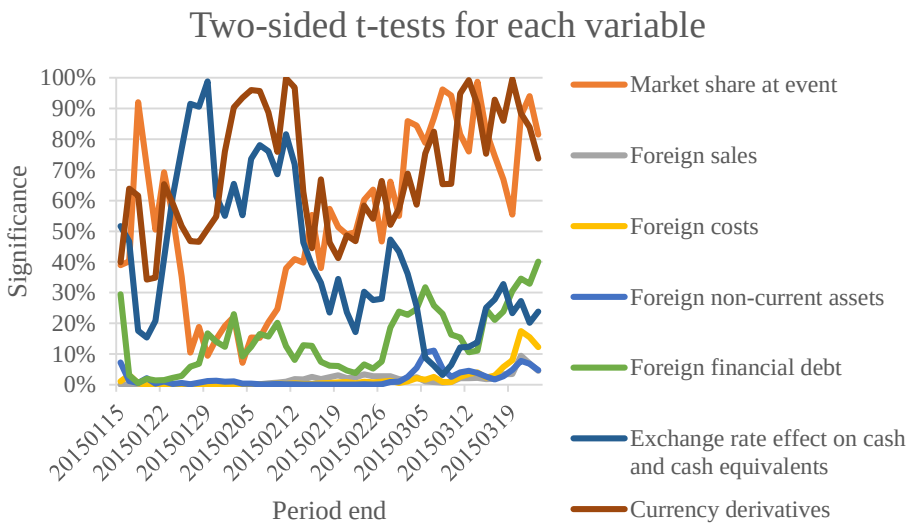
Note: Histograms for the variables investigated in this study are presented above, containing observations for each variable during the period 15th of January 2015 to 24th of March 2015.

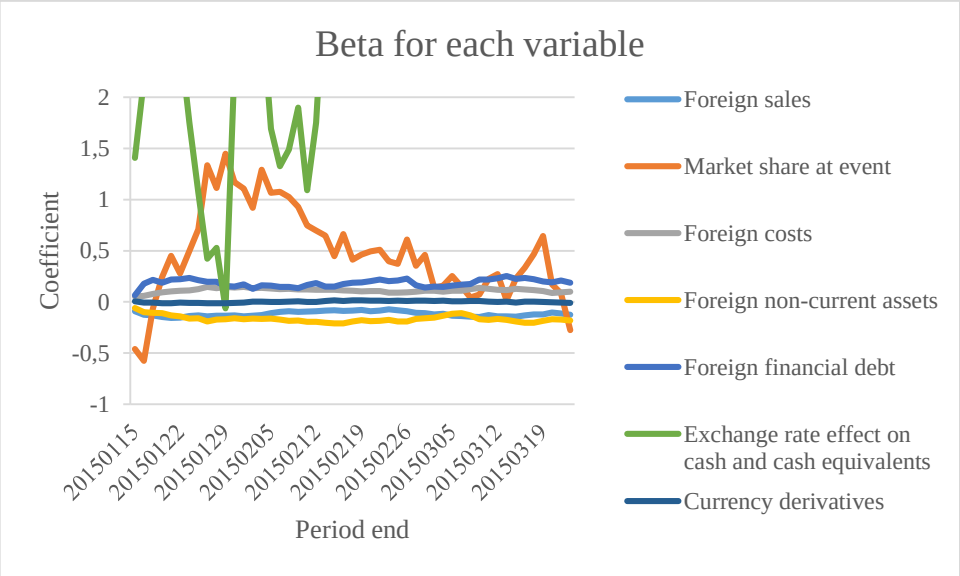
Figure 14: Graph of perfect hedge of foreign sales with foreign costs



Note: The figure visualises the variables foreign sales and foreign costs in the same plotted graph for the period 15th of January 2015 to 24th of March 2015 as is measured by the average percentage point of the sample group.

Figure 15: Main regression including dropped variable





Note: The two figures visually presented are the significance and the value of the coefficients for each of the variables that, at some stage, have been considered in this paper. The period for which the observations are plotted are from the 15th of January 2015 to the 24th of March 2015.