



UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Master Degree Project in International Business and Trade

Determinants of Exchange Rate Risks in the Automotive Industry

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Master Degree Project No. 2016:17
Graduate School

Abstract

The thesis details the analysis of foreign currency exposure determinants based on 21 companies in the automotive industry. The analysis confirms theoretical suggestions that the automotive industry is prone to foreign currency exposure and risks being influenced by competition intensity, functional currency, export ratio, geographic distribution of sales and production networks and operational flexibility. Analysis on company size and stock growth potential and volatility is inconclusive. The results are illustrated by a case study on Volvo Cars, Sweden. The combination of factors identified does not provide a clear explanation why some companies are more affected than others and does not allow for extrapolating economic risks in the long run. Asymmetric effects of foreign currency fluctuations on operational cash flows are deduced to result from differing hedging practices influenced by deliberate strategic moves and imperfect information. The review proposes a model of foreign currency exposure shaped by covariating currency risk determinants and hedging practices.

Keywords: determinants of foreign currency exposure, currency risk hedging, automotive industry

Disclaimer: The opinions expressed in this project are the author's own and they do not reflect the view of the supervisor or the University of Gothenburg.

Acknowledgements

Arriving at the pleasant point of submission I would like to express my sincere gratitude to several individuals and organizations who provided constructive criticism and valuable input to complete this Master thesis project.

Firstly, my special appreciation goes to my supervisor, Professor Inge Ivarsson, who masterfully eased narrowing down the research question and made brilliant suggestions in expanding the study field to get an alternative perspective.

Secondly, I would like to thank the personnel from an array of companies and industry organizations who allowed for a closer look into the automotive industry.

My acknowledgements also go to all the lecturers and Graduate School staff members at the Handelshögskolan whose efforts prepared the class for the final leap.

Additionally, I would like to extend the gratitude to my partner and children who managed to survive on fusion food throughout the two challenging but enjoyable years.

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Abbreviations

FX	Foreign Exchange
HQ	Headquarter
MNE	Multinational Enterprise
OEM	Original Equipment Manufacturer
ARS	Argentine Peso
AUD	Australian dollar
BRL	Brazilian Real
CAD	Canadian Dollar
CHF	Swiss Franc
CNY	Chinese Yuan Renminbi
COP	Colombian Peso
CZK	Czech Koruna
DZD	Algerian Dinar
EUR	Euro
GBP	Pound Sterling
HKD	Hong Kong Dollar
INR	Indian Rupee
JPY	Japanese Yen
KRW	South Korean Won
MXN	Mexican Peso
NZD	New Zealand Dollar
PLN	Polish Złoty
RON	Romania New Leu
RUB	Russian Ruble
SEK	Swedish Krona
SGD	Singapore Dollar
THB	Thai Baht
TRY	Turkish Lira
USD	US Dollar
VEF	Venezuelan Bolívar

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This section outlines the problem background information and establishes the purpose of the project and research question to be explored throughout the analysis. Project delimitations and structure of the paper are also disclosed.

1. INTRODUCTION

1.1 PROBLEM BACKGROUND

Exchange risk within the corporate environment refers to the potential losses resulting from unexpected rate fluctuations which impact on cash flow, sales revenue and competitive position (Papaioannou, 2006; Bartram, et al., 2010). These can arise, for example, due to the disparity between cost and revenue currencies or time lapses between proposal, contract award and completion resulting in lower than expected sales receipts (Ehrlich, et al., 2012). Following the suspension of the Bretton Woods agreement and the US Dollar (USD) to gold peg in 1971, exchange rate risk management has become an imperative corporate function to limit the adverse effect on profitability and market capitalization (Papaioannou, 2006). Companies with relatively stable future earnings and cash flows attract risk-averse investors which reduces capital costs and drives higher market valuations (Wang & Makar, 2015). Due to rising globalization, the issue is relevant to a wide range of market operators including purely domestic firms as well as companies working predominantly in the international arena (Aggarwal & Harper, 2010; Bergbrant, et al., 2014).

The issue of foreign currency risks is becoming increasingly acute due to volatility associated with a potential disequilibrium of the current US dollar-dominated monetary system and global multipolarity in geopolitical and economic terms (Zandonini, 2013; Bradsher, 2015; World Bank, 2011; Campanella, 2014). Analysts concede that temporary macroeconomic volatility is inevitable once the use of currencies alternative to USD is increased for cross-border transactions (Bradsher, 2015; Wei & Trivedi, 2016; Eichengreen, 2015; Wildau, 2015; Otero-Iglesias, 2014; European Central Bank, 2015). On the one hand, despite the USD liquidity concerns, the US dollar remains the main currency for corporations in Asia, Latin America, and the Middle East covering 85% of foreign exchange transactions, over 60% of international reserves, and dollar oriented or USD pegged economies in over 90 countries (Auboin, 2012; Eichengreen, 2015; Dailami & Masson, 2011). On the other hand, with global growth increasingly generated by developing economies, Chinese Yuan Renminbi (CNY)

internationalization and inclusion into the IMF’s basket of currencies with special drawing rights in November 2015, the balance in the use of major currencies for reserve purposes and preferred currency for corporate flows has shifted (Zoellick, 2011; Dailami & Masson, 2009; Bradsher, 2015). At the same time the Brexit outcome in June 2016 has serious repercussions for two major international currencies, Pounds Sterling (GBP) and Euro (EUR), prompting substantial uncertainty in the UK and within the Eurozone and spilling over to other regions (Blitz, 2016; Kawa, 2016).

The degree of exposure is an industry specific phenomenon: industries subject to extensive internationalization and with pronounced global value chains view currency exposure as a major risk factor (Bartram, et al., 2010; Chen, et al., 2016). For instance, in the automotive industry, all the major players are subject to variations in the cash flows throughout a relatively stable period between 2010 and 2015. This could partially be explained by exchange rate fluctuations as reported on Cash Flow Statements - *refer to Table 1¹* (Morningstar, 2016). When the effects of exchange rates as a percentage of operational cash flows are compared, the oscillations over time and magnitude of potential repercussions of foreign currency exposure becomes apparent². Relatively recent market entrants operating mainly within the realm of large domestic territories in China and India report relatively minor effects of exchange rate fluctuations on cash flows. US, European, Japanese and Korean multinationals show variable success in managing cash flow impact with GM, FCA, Honda, Nissan and Hyundai reporting double-digit percentage impact and with select indicators for Daimler and Mazda exceeding 60% (refer to companies highlighted in green).

Table 1 Effect of Exchange Rate Changes on Cash Flows – Selected Companies in the Automotive Sector

Company (HQ)	Feature	Unit	2010-11	2011-12	2012-13	2013-14	2014-15
FORD	Effect of exchange rate changes	USD	-159	51	-37	-517	-815
	Operating cash flow	M	9784	9045	10444	14507	16170
(USA)	% of Operating cash flow		-1.6%	0.6%	-0.4%	-3.6%	-5.0%
GM	Effect of exchange rate changes	USD	-253	-8	-400	-1102	-1345
	Operating cash flow	M	8166	10605	12630	10058	11978
(USA)	% of Operating cash flow		-3.1%	-0.1%	-3.2%	-11.0%	-11.2%
BMW	Effect of exchange rate changes	EUR	-13	-14	-89	86	73
	Operating cash flow	M	5713	5076	3614	2912	960
(Germany)	% of Operating cash flow		-0.2%	-0.3%	-2.5%	3.0%	7.6%

¹ The companies in *Table 1* are listed by country in alphabetical order. This order is preserved in the remaining tables unless otherwise specified to simplify the analysis.

² Extreme values exceeding 10% are marked in red for easy identification. Companies affected are highlighted in green in this and other tables throughout the review with the exception of *Table 2 Sample of 21 Automotive Companies*.

Company (HQ)	Feature	Unit	2010-11	2011-12	2012-13	2013-14	2014-15
DAIMLER	Effect of exchange rate changes	EUR	64	-122	-254	323	138
	Operating cash flow	M	-696	-1100	3285	-1274	222
(Germany)	% of Operating cash flow		9.2%	-11.1%	-7.7%	25.4%	62.2%
FCA	Effect of exchange rate changes	EUR	590	-419	-909	1219	681
	Operating cash flow	M	5195	6444	7589	8169	9751
(UK)	% of Operating cash flow		11.4%	-6.5%	-12.0%	14.9%	7.0%
PSA	Effect of exchange rate changes	EUR	3	-6	-92	48	-128
	Operating cash flow	M	1752	1417	1630	4064	12033
(France)	% of Operating cash flow		0.2%	-0.4%	-5.6%	1.2%	-1.1%
RENAULT	Effect of exchange rate changes	EUR	-22	-308	-355	119	-298
	Operating cash flow	M	3353	3876	3572	3972	6017
(France)	% of Operating cash flow		-0.7%	-7.9%	-9.9%	3.0%	-5.0%
VW	Effect of exchange rate changes	EUR	438	82	-141	-462	294
	Operating cash flow	M	11455	8500	7209	12595	10784
(Germany)	% of Operating cash flow		3.8%	1.0%	-2.0%	-3.7%	2.7%
HONDA	Effect of exchange rate changes	JPY	-79909	-52150	108460	71784	85750
	Operating cash flow	M	1070837	737429	800744	1229191	1020404
(Japan)	% of Operating cash flow		-7.5%	-7.1%	13.5%	5.8%	8.4%
MAZDA	Effect of exchange rate changes	JPY	-10721	-2589	15041	8074	3259
	Operating cash flow	M	15344	-9098	49033	136379	204459
(Japan)	% of Operating cash flow		-69.9%	-28.5%	30.7%	5.9%	1.6%
MITSUBISHI	Effect of exchange rate changes	JPY	-3381	-3208	546	3520	9643
	Operating cash flow	M	103811	119386	172227	210443	177008
(Japan)	% of Operating cash flow		-3.3%	-2.7%	0.3%	1.7%	5.4%
NISSAN	Effect of exchange rate changes	JPY	-60315	-15630	67723	74850	50660
	Operating cash flow	M	667502	696297	390897	728123	692747
(Japan)	% of Operating cash flow		-9.0%	-2.2%	17.3%	10.3%	7.3%
SUZUKI	Effect of exchange rate changes	JPY	-15646	2072	4706	10342	5042
	Operating cash flow	M	226470	226718	190057	322915	255037
(Japan)	% of Operating cash flow		-6.9%	0.9%	2.5%	3.2%	2.0%
TOYOTA	Effect of exchange rate changes	JPY	-127029	-55939	137851	93606	65079
	Operating cash flow	M	2024009	1452435	2451316	3646035	3685753
(Japan)	% of Operating cash flow		-6.3%	-3.9%	5.6%	2.6%	1.8%
HYUNDAI	Effect of exchange rate changes	KRW	37330	-108697	-185992	-190092	-408729
	Operating cash flow	M	3610542	2976821	5339686	1208466	2120845
(Korea)	% of Operating cash flow		1.0%	-3.7%	-3.5%	-15.7%	-19.3%
TATA	Effect of exchange rate changes	INR	3219	11416	2687	16157	-14325
	Operating cash flow	M	141976	218227	222933	371432	365401
(India)	% of Operating cash flow		2.3%	5.2%	1.2%	4.3%	-3.9%
BAIC	Effect of exchange rate changes	CNY	-1	2	-3	-9	
	Operating cash flow	M	-1017	-624	-2403	2262	
(China)	% of Operating cash flow		0.1%	-0.3%	0.1%	-0.4%	
CHANGAN	Effect of exchange rate changes	CNY	-1	0	-8	-2	
	Operating cash flow	M	207	512	1833	3780	
(China)	% of Operating cash flow		-0.5%	0.0%	-0.4%	-0.1%	
DONGFENG	Effect of exchange rate changes	CNY					
	Operating cash flow	M	17903	9216	307	-9694	-985
(China)	% of Operating cash flow						
GEELY	Effect of exchange rate changes	CNY	-10	-10	-2	-41	-12
	Operating cash flow	M	1983	1208	4438	3562	2033
(China)	% of Operating cash flow		-0.5%	-0.8%	0.0%	-1.2%	-0.6%
SAIC	Effect of exchange rate changes	CNY	-42	-114	-20	-151	-12
	Operating cash flow	M	24974	20209	19591	20603	23284
(China)	% of Operating cash flow		-0.2%	-0.6%	-0.1%	-0.7%	-0.1%

Source: compiled by author based on Cash Flow Statements (Morningstar, 2016)

Although all the companies under review utilize some form of foreign exchange exposure management to mitigate the risks of currency fluctuations (BAIC, 2014; BMW, 2014; Changan, 2014; Daimler, 2014; Dongfeng, 2014; FCA, 2015; Ford, 2014; Geely, 2014; General Motor, 2014; Honda, 2015; Hyundai, 2014; Mazda, 2015; Mitsubishi Motor, 2015; Nissan, 2015; PSA, 2015; Renault, 2014; SAIC, 2014; Suzuki, 2015; TATA, 2015; Toyota, 2015; Volkswagen, 2014), there is a considerable disparity of the effects between companies originating in the same geographic region. Moreover, some companies report variable impact on different brands and vehicle segments. For instance, Daimler indicates higher exposure for the Mercedes-Benz brand and in particular its car segment in comparison with trucks, vans, and buses (Daimler, 2014). Additionally, due to the complexity of equity method investments frequented within the industry (Automotive News, 2015), indirect foreign currency exposure is present for many corporations.

Whereas additional operating income attributable to positive impacts of foreign exchange has beneficial connotations, unfavourable currency moves adversely affect financial results and company stability. The effects are amplified in conditions of exchange rates turbulence. Heightened exchange rates volatility is bound to increase corporate exposure at least temporarily which will need to be addressed through the use of risk management instruments (Pasquali, 2015). Consequently, it is important to understand what factors drive foreign currency exposure or transferring the concept onto the *Table 1* data... what specific underlining aspects determine why the seven shortlisted companies experience higher cash flow impact resulting from currency fluctuations in comparison with the rest of the automotive companies in the sample.

1.2 PROPOSED CONTRIBUTION AND RESEARCH QUESTION

Taking into account intensified market volatility and increased geopolitical uncertainty in recent years, the understanding of causes and extent of foreign currency exposure is vital for the health of corporations aiming to refine their risk management strategies in preparation for possible climate deterioration (PWC, 2015b). Even though mathematical risk modelling provides a good indication of overall risks, it is important to establish where and how exchange rate fluctuations can impact the company bottom line and cash flows. There appears to be a substantial difference between the theoretical framework and empirical efforts in evaluating the determinants of foreign currency exposure to allow for a targeted practical implementation of corporate hedging strategies. Despite a broad acceptance of currency risk exposure

differentiation for various economic sectors in terms of severity (Bodnar & Gentry, 1993; Williamson, 2001; He & Ng, 1998; Bartram, et al., 2010; Ito, et al., 2013; Aggarwal & Harper, 2010), detailed empirical evidence on industry specifics that shape the foreign currency exposure is lacking. A comprehensive industry assessment could assist market incumbents in simplifying risk hedging by targeting specific aspects of exposure. Therefore, the present review attempts to identify key determinants of foreign exchange exposure relevant for multinational companies in the automotive sector. The determinants are evaluated against the higher effects of the currency exposure on cash flows as identified in the seven companies highlighted green in *Table 1 Effect of Exchange Rate Changes on Cash Flows*. Hence, the project research question analysed throughout the review is as follows:

What are the determinants of foreign currency exposure in the automotive industry?

1.3 DELIMITATIONS

Considering the above question could be broadly interpreted, the primary focus of this review is on the determinants of foreign currency exposure for auto producers evaluated against the relative hedging success in minimising cash flow fluctuations. The determinants of currency risks and hedging strategies are central concepts defining the depth of the exposure, so strongly coupled and interdependent that one cannot be reviewed without the other. Thus, adverse alteration of determining conditions increases currency risks and consequently prompts companies to rethink their hedging strategies. In turn, successful implementation of hedging tactics reduces the exposure altering the nature of the determinants for individual companies. This interdependence is further explored in the conceptual model in Section 2.2.5.

Furthermore, with current accounting practices allowing for part reporting of corporate transaction and portfolio risk, the review will focus on the real effects on cash flows rather than concentrate on translation risks such as fluctuations in operating profit, foreign exchange income and equity (Goedhart, et al., 2015).

1.4 PROJECT OUTLINE

The thesis is divided into six sections including Introduction, and the structure is as follows:

Introduction

Introduction includes for the theme introduction to facilitate the formulation of the project contribution and research question. Project delimitations are also established.

Literature Review and Theoretical Framework

The literature review and theoretical framework on foreign exchange risk determinants and exposure management is presented in Section 2 to address the automotive industry specifics and potential issues that multinational enterprises could be facing in the international arena. The framework is summarized by a proposed model of foreign exchange rate determinants to be used in further assessment in Section 4.

Methodology

Methodology section includes for the motives of industry, sample and case study selection, information sources and methods of data analysis to deduct the determinants of FX exposure and consequently hedging by companies within the industry. Research limitations such as quality metrics and data accuracy are also defined.

Empirical Findings

The presentation of industry and firm data based on secondary sources, quantitative review and semi-structured interviews in Section 4 outlines possible deviations between the theoretical framework and empirical evidence. Section 4 also includes a case study on Volvo Car Group to further illustrate the theme.

Analysis

Section 5 focus is on the discussion and analysis of implications established in the proceeding section for general application across the industry and for other internationally operating corporations. The foreign currency exchange exposure model is revisited to summarise the results of the evaluation.

Conclusion

The section presents project summary along with managerial implications and suggestions for further research.

This section explores previous efforts in reviewing the issue and consolidates a theoretical framework on foreign currency exposure and risk management. The section also outlines major determinants of foreign exchange exposure. Conceptual framework model is established for further evaluation throughout the project.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 LITERATURE REVIEW

Taking into account the intensifying rate of globalization in many industry sectors and periods of turbulence in international financial markets, the impact of foreign currency fluctuations on corporations has been a popular subject for theoretical and empirical studies. Particular attention was paid to the currency risks in relation to cash flow volatility (Shapiro, 1974; Flood & Lessard, 1986). Among others, a “Simple Model of Foreign Exchange Exposure” devised by Bodnar, Dumas and Marston (2002) suggested exposure dependence on successful netting of foreign revenues and costs and profit margins (Bodnar, et al., 2002). The model was further expanded by Bartram, Brown and Minton (2010) who additionally viewed currency exposure through a competitive lens as a function of market share, product substitution, ability to pass-through currency charges onto consumers and operational hedging³ (Bartram, et al., 2010).

Empirical literature suggested further determinants of foreign currency exposure. Bartram and Karolyi (2006) concluded that for 3220 non-financial companies from 18 European countries, the USA and Japan currency risks are linked with industry factors namely competition and goods traded, regional variations like geographic determinants and currency strength, as well as individual company characteristics such as proportion of foreign sales particularly in Europe (Bartram & Karolyi, 2006). Competition and unfair financial advantages along with firm-level financial constraints were established to drive the exposure in Bergbrant et al (2014) survey of approximately 2400 companies from 55 countries (Bergbrant, et al., 2014). He and Ng (1998) established that 25% of 171 Japanese firms evaluated experience currency risks with low exposure associated with highly leveraged companies with low liquidity and smaller size (He & Ng, 1998).

³ Refer to Section 2.2.3 for further explanation.

Following the analysis of US manufacturing companies from 1980 to 2003, Wei and Starks (2013) established that companies in financial distress, with high growth opportunities and unique products are more likely to be sensitive to currency fluctuations. Due to their restricted access to capital markets to efficiently manage the foreign exchange risk, their subsequent exposure is likely to increase further which makes a strong case in favour of active currency exposure risk management (Wei & Starks, 2013).

Furthermore, there is evidence that currency exposure varies considerably across time and countries with operations focused on developing regions exposed to higher exchange rate volatility (Dominguez & Tesar, 2006; Bergbrant, et al., 2014; Williamson, 2001). Additionally, exposure increases were encountered when country exchange regime and regulatory framework became an obstacle. Changes in currency regimes (for example, fixed to floating) and resulting exchange rate volatility prompted operational uncertainty (Bergbrant, et al., 2014; Jorion, 1990; Bartram & Karolyi, 2006).

Empirical evidence suggests that there are substantial differences in foreign currency exposures between industry sectors which could influence the scope of hedging activities (Bodnar & Gentry, 1993; Williamson, 2001; He & Ng, 1998). Aggarwal and Harper (2010) associate this with the intensity of cross-border operations (Aggarwal & Harper, 2010). Williamson (2001) made a comprehensive assessment of a sample of automotive companies from the US and Japan based on data from 1973 to 1995 finding empirical evidence on substantial foreign currency exposure. Exposure varied over the observed period and heightened at the time of considerable and extended currency shocks and intensifying competition. Exposure also changed across operational locations and was different for individual firms subject to the geographic portfolio, foreign sales proportion, foreign inputs within cost structures matching revenue streams, competition intensity and company hedging techniques (Williamson, 2001). The automotive industry was also focused upon by Bartram et al. (2010) who analysed 1161 manufacturing companies from 16 countries and compared empirical evidence against theoretically modelled exposure⁴ (Bartram, et al., 2010).

Bodnar et al (2002) and Bartram et al. (2010) pointed out significant differences between theoretically predicted exposure and observed levels of exposure in global corporations and linked the gap with risk mitigating strategies (Bartram, et al., 2010; Bodnar, et al., 2002). Risk

⁴ Some of the data in the 2010 study of Bartram et al will be used in further evaluation to analyse the transition in operational restructuring efforts between 2004 and 2014.

reduction or hedging goes back to Phoenician civilization of sea-traders flourishing from 1200 BC (Fedor, 2010) and in 2015 Bank of International Settlements reported \$74.5 trillion investment in over the counter foreign exchange derivatives (Bank for International Settlements, 2015). Whereas risk hedging is widely utilized to reduce foreign currency exposure, there is no definitive theoretical answer whether hedging strategies add value. On the one hand, the Modigliani - Miller theorem (1958) on the irrelevance of capital structure suggests that hedging will not change the value of the firm as the cash flow is shaped by focusing on the core competencies in managing the company assets with their underlying earning potential and risks. The unrealistic assumptions of the theorem on the frictionless capital markets (market efficiency, zero transaction and bankruptcy costs, the absence of taxes, information symmetry, etc.) attract viable criticism (Modigliani & Miller, 1958).

On the other hand, Smith and Shultz indicate the existence of strong incentives for market value maximising corporate behaviour with the purpose of dampening the volatility of income and cash flows. These include for tax advantages, reducing costs of financial distress and risk aversion by managers (Smith & Stulz, 1985). Value creation through corporate risk management by non-financial firms is supported by others, citing further determinants such as alleviating underinvestment problem with hedging used to boost internal financing when external debt is costly (Froot, et al., 1993), and improving explanations on corporate earnings to show management ability and quality of projects undertaken (DeMarzo & Duffie, 1995). Hedging opponents allude to more efficient risk management by shareholders through portfolio diversification, consumption of valuable resources, predisposition to excessive use of hedging for self-protection of management at the expense of shareholders and difficulty in accurate forecasting of market moves (Moffett, et al., 2009).

Empirical evidence on the use of hedging and its success is somewhat contradictory. Bartram et al. (2010) estimated that the currency exposure could be reduced by up to 70% by combining the three hedging methods: 37-43% utilizing financial hedging and by 10-15% each using pass-through and operational hedging (Bartram, et al., 2010). Nelson, Moffitt, and Affleck-Graves concluded that securities of 1308 hedging companies outperformed non-hedging companies by 4.3% per year on average over the period 1995 to 1999. Over performance was driven primarily by larger corporations hedging currency risks, with neutral stock performance results for interest-rate and commodity hedging (Nelson, et al., 2005). Gay Lin and Smith suggested that equity cost is lower for hedging companies by 24-78 basis points (Gaya, et al., 2005). At the same time, despite the suggested hedging benefits, the 2012 evaluation of randomly selected

1075 publically listed US corporations with annual revenues between \$500 million to \$20 billion indicated that 48% of companies do not use any form of hedging even though over 75% are affected. Further analysis revealed significant challenges in establishing a coherent risk management programme. This is determined by the complexity of identifying and quantifying risks, building a holistic framework for risk management across all layers of organization and implementation difficulties (Chatham Financial, 2013).

According to Adam et al. (2007) in addition to a considerable heterogeneity of hedging between different industries, hedging decisions and techniques are influenced by choices of other industry participants with differentiation increasing with competition intensity, lower demand elasticity and higher flexibility of production costs. Furthermore, exchange rate management hedging is also used by some companies for speculative and trading purposes subject to management decisions often based on compensation packages (Adam, et al., 2007). Furthermore, increased institutional ownership of corporate equity reaching up to 60% in the USA, 82% in Japan and 89% in the UK in 2011 (Çelik & Isaksson, 2014) tends to encourage risk exposure hedging using proprietary expertise contained within the corporate environment (Ehrlich, et al., 2012).

2.2 THEORETICAL FRAMEWORK

2.2.1 Financial Risk Management and Foreign Currency Exposure

The theoretical framework for financial risk management stemmed from the works of Mehr and Hedges (1963) and Williams and Hems (1964) on operational risk management. In the absence of adequate and economically viable market insurance instruments, self-protection contingency planning emerged as a new trend within the corporate environment, eventually evolving into the full-fledged financial risk management using derivative instruments in addition to the traditional balance sheet and liquidity reserves in the 1970s and 1980s. Financial and non-financial companies attempted to reduce the exposure against price fluctuations associated with interest rate risks, stock market returns, exchange rates and raw material prices. Despite the development of a broad regulatory framework for self-insurance models, internal controls and governance throughout the 1990s, the risk management rules stipulated for listed companies on stock exchanges in 2002 were deemed inefficient due to poor application and ineffective enforcement (Dionne, 2013).

Enterprise Risk Management became a popular buzzword within the corporate environment following the 2008 financial crisis highlighting the importance of risk oriented thinking across the entire organization (Servaes, et al., 2009). The further urgency in establishing a comprehensive risk management framework was instigated by failures in identifying and controlling risk factors internally within seemingly solid corporations, to name but a few, Lehman Brothers, WorldCom, Tyco, the Mirror Group, BP, Tokyo Electric and Enron (Mikes & Kaplan, 2014).

Whereas within the Enterprise Management Framework the term “risk” has a broad meaning and application across organizational functions and structure, this project will focus on the risk aspects related to currency exposure. Foreign exchange exposure is a financial term defined as a “situation in which an investment or part of investment is in the currency of another country so that the value of the investment may be affected by changes in the value of that currency...” (Cambridge Business English Dictionary Online, 2016). Unexpected exchange rate changes impact firm competitiveness and cash flows affecting earnings and market value (Chen, et al., 2016). Exchange rate risks are categorized into three main types differentiated by the impact on the firm, but frequently encountered in combination (Papaioannou, 2006):

- **Transaction risk** is associated with the rate changes in the currency of denomination of foreign transactions impacting cash flows, including exposure related to receivables (export contracts), payables (import purchasing) and dividends repatriation.
- **Translation risk** refers to the balance sheet exchange rate risks occurring during the consolidation of foreign subsidiary valuations into the parent’s balance sheet based on either end-of-period rate or at the average exchange rate over the period subject to accounting rules. In addition to the accounting methodology used, translation exposure varies considerably subject to the extent of “foreign” content and location of subsidiaries.
- **Economic risk** reflects a possible effect of rate fluctuations on the present value of future cash flows, i.e. overall business impact rather than individual transactions where the overbalance of foreign costs over revenues is unfavourable with stronger foreign currencies.

2.2.2 Exchange Rate Risk Management

Risk hedging encompasses risk measurement of foreign exchange transactions, establishing appropriate methods and their coverage and performance monitoring (Papaioannou, 2006).

These could range from laissez-faire, minimized variance, aggressive and selective strategies. Risk management theories suggest that in the event of earnings volatility and cost becoming an issue, companies are likely to devise an optimum risk hedging strategy to reduce financial distress probability, improving debt capacity and tax advantages (Panaretou, et al., 2013). An optimum hedging strategy usually includes an integrated mechanism providing a balancing act between the maximum exposure coverage and minimum costs of hedging. The selection is done through comparison of hedging-free with 100% hedging approach. The “equilibrium” is very much subject to the management forecasts on exchange rate over a specified period (Papaioannou, 2006). Risk management, therefore, involves opportunistic activities associated with anticipated future risks and could have positive or/and negative consequences (Dionne, 2013). Measuring FX exposure is complex due to multifaceted effects of rate fluctuations on cash flows (Krapla & O’Brien, 2014). Recent trends indicate diversion from a case by case problem resolution to the proactive handling of corporate wide foreign currency exposure by HQ finance administration using “Value-at-Risk” or similar concepts (Hommel & Prokesh, 2012; Papaioannou, 2006; Dionne, 2013). In addition to VAR model companies frequently establish a cut-off limit, for example, stop orders, as an extra control mechanism (Hommel & Prokesh, 2012).

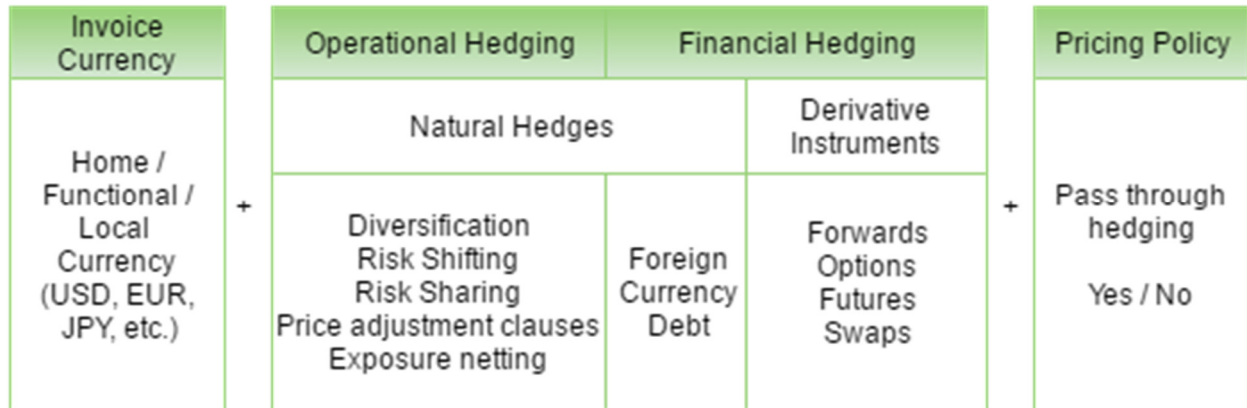
Once the cumulative risk is calculated, its focus, instruments selection, the extent of hedging methods utilization and subsequently results depend to a great extent on the predominant risk type, hedging costs, company size, and management attitude to risk, i.e. aversion or appetite (Papaioannou, 2006; Dionne, 2013). Governance of risk management tends to be a centralized function creating a “reference framework” for the rest of the organization (Dionne, 2013). However, risk management awareness and application of appropriate mitigation methods should in principle be used in planning and operation by employees at all levels as part of daily operations: costs and pricing set up, contracts negotiations, etc. (Servaes, et al., 2009).

2.2.3 Types of Hedging

To reduce or eliminate the exposure companies use a combination of hedging methods: selection of invoice currency, operational or financial risk mitigation, and pass-through technique. Operational hedging and foreign currency debt portfolio are often referred to as natural hedges (Bartram, et al., 2010). Schematically exchange rate management mechanism could be illustrated using the concept presented by Ito et al. as extrapolated from the earlier

framework by Döhring (2008) – refer to *Figure 1 Foreign Currency Exchange Rate Management* (Ito, et al., 2013):

Figure 1 Foreign Currency Exchange Rate Management



Source: recreated by author based on (Ito, et al., 2013) with additional details

Despite providing similar risk mitigating effect, the mechanisms substantially differ in essence. **Invoicing currency** strategy and **pass-through hedging** associated with extra costs being transferred to customer base are predominantly driven by external factors such as market conditions and competition. **Operational hedging** linked with location and currency regimes shopping resulting in the geographic restructuring of operations and **financial hedging** using financial debt and derivative instruments involve a high degree of management decision making. Furthermore, whereas financial hedging has a relatively short efficiency timespan, it offers some advantages including full control by corporate finance without influence of operational constraints such as skilled labour availability, low operational costs, easy adjustment opportunities and lower risk than operational relocations (Bartram, et al., 2010; Ito, et al., 2013; Martin & Mejean, 2012).

The ratio between the hedging strategies is likely to vary between companies subject to opportunities availability, costs, and acceptable exposure level (Bartram, et al., 2010). For instance, operational hedging could be observed on BMW production repositioning towards growing markets of China, India, Eastern Europe and Russia. To reduce exchange rate exposure estimated at €2.4 billion between 2005 and 2009, the company refrained from pass-through hedging method. Instead, it favoured natural hedging through co-locating sales and expenditure in the same currency using local plants in the USA, China, India and Russia and procurement with overseas production increasing from 20% in 2000 to 44% in 2011. Exchange rate risk was also consistently monitored and mitigated on a weekly basis by newly established

specialist finance divisions in the US, UK, and Singapore reporting to the German HQ (Bin & Ying, 2012).

2.2.4 Main Determinants of Exchange Rate Exposure

Determinants of exchange rate exposure have been extensively reviewed in the international business literature. Theoretical evaluation suggests that specific industry characteristics determine the severity of exposure such as input penetration ratio, reliance on foreign inputs, export ratio and foreign to total assets ratio (Bodnar & Gentry, 1993; Williamson, 2001; He & Ng, 1998). Sectors allowing to accommodate high pass-through rate associated with low substitutability of products are characterised by low exposures (Bodnar, et al., 2002). Also companies in the manufacturing sector (Wei & Starks, 2013; Williamson, 2001) and services experience higher foreign currency exposure (Bergbrant, et al., 2014).

Exchange rate exposure is generally evaluated along the following axis:

Competition Intensity

- Foreign currency exposure increases with the **intensity of firm-level competition**⁵, especially when accompanied by severe price competition from domestic suppliers and companies gaining unfair financial advantages such as taxation avoidance, subsidies, and fast-track credit (Bergbrant, et al., 2014; Dominguez & Tesar, 2006; Bartram & Karolyi, 2006).

Functional Currency Strength

- HQ driven **functional currency strength** eases company operations and reduces FX exposure (Bartram & Karolyi, 2006).

Proportion of Foreign Sales to Total Revenue and Geography of Operations

- Companies with a **higher proportion of foreign sales to total revenue** or **newly involved in export/import operations** experience higher unexpected exposure in principle. Breadth and depth of multinational (MNE) network shapes companies' ability to effectively hedge: many multinational companies reduce exposure by counterbalancing foreign revenues against costs or using derivative instruments (Jorion,

⁵ Items highlighted in bold will be discussed relative to the automotive industry in Section 4.

1990; Bergbrant, et al., 2014; Williamson, 2001; Dominguez & Tesar, 2006; He & Ng, 1998; Bartram & Karolyi, 2006).

Operational Flexibility and Financial Indicators

- High exposure is observed for companies with high financial leverage and ill-defined hedging activities (He & Ng, 1998). **Financial constraints** increase exposure: unfavourable exchange rate moves prompt companies to apply for external capital which is likely to be in short supply, limiting financial flexibility. Also companies with higher debt ratio attract higher financial distress costs (Chen, et al., 2016; Smith & Stulz, 1985; Wei & Starks, 2013).
- Dual impact of **company liquidity** on exchange rate exposure has been established. On the one hand, high liquidity allows for extending credit lines to customers, resulting in higher proportion of receivables and consequently higher currency exposure risk. On the other hand, at the time of exchange rate shocks companies with higher liquidity could resort to internal funds. Furthermore, there is a positive correlation between the **dividend payout ratio and the quick ratio** on the degree of exposure, as higher liquidity self-imposed by the company stalls hedging incentives (Bergbrant, et al., 2014; Chen, et al., 2016).
- **Firm size** analysis is somewhat inconclusive. Following the review of multinationals across eight countries, Dominguez and Tesar stipulate correlation between company size and foreign currency exposure prevalent in small sized firms (Dominguez & Tesar, 2006). He and Ng established exposure increases with firm size (He & Ng, 1998). Bergbrant et al. indicate that firm size is not relevant (Bergbrant, et al., 2014). Chen concludes that large companies have lower hedging costs stimulating the use of derivative instruments, while at the same time, small companies are more likely to experience financial distress which prompts hedging (Chen, et al., 2016).
- Firms with a higher **book to market ratio** associated with lower **stock growth opportunity** have less inclination to hedge resulting in higher level of exposure (Chen, et al., 2016; He & Ng, 1998).
- **High R&D expenditure** indicates a predisposition to invest into proprietary technologies which together with **high asset tangibility** is associated with reduced FX exposure (Aggarwal & Harper, 2010).

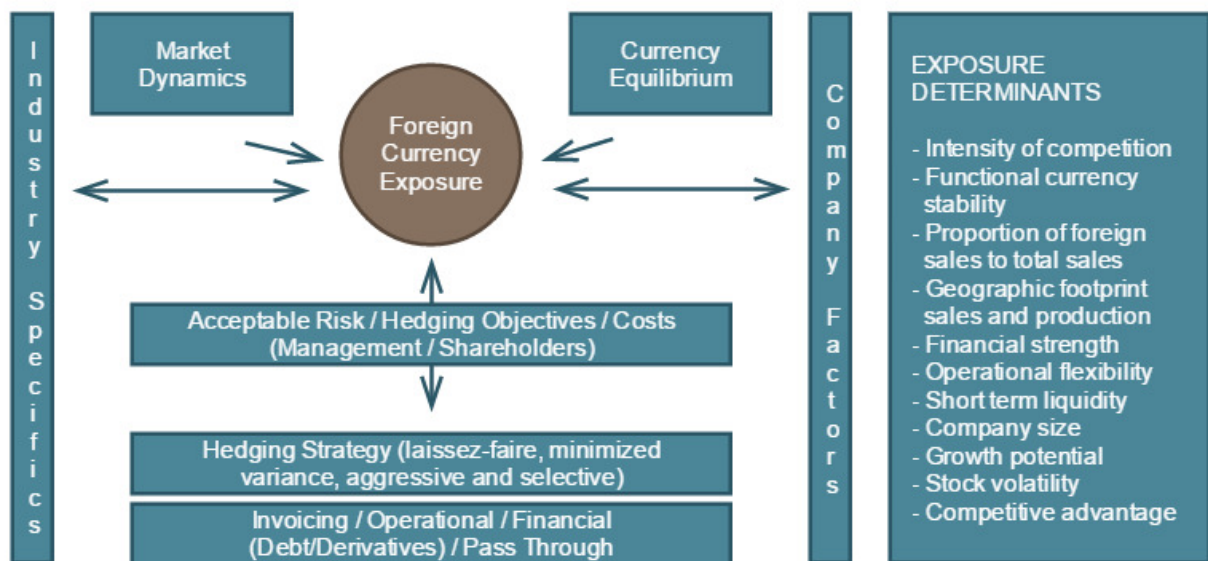
Hedging Approach

- Use of currency **hedging** explained the differences between theoretically predicted and lower empirical levels of currency exposure (Bartram, et al., 2010; Bodnar, et al., 2002).

2.2.5 Conceptual Framework on Foreign Exchange Exposure Determinants and Hedging Strategies

To summarize the section, *Figure 2 Model of Corporate Foreign Exchange Exposure Determinants and Hedging* visualizes various aspects defining the extent of the currency exposure based on theoretical framework evaluation.

Figure 2 Model of Corporate Foreign Exchange Exposure Determinants and Hedging



Source: created by author

Within the equilibrium situation the depth of the exposure for a corporation is determined by the industry specifics and market conditions such as competition intensity, strength of selected functional currency, and individual company characteristics such as geographic footprint of sales, production and sourcing, financial leverage, competitive advantage, etc. The optimum hedging strategy is in turn shaped by the depth of the exposure subject to risk perception and acceptance by management under the influence of the stock market (shareholders), set objectives of the hedging strategy and costs. The hedging choice ranges from laissez-faire, minimum variance, aggressive and selective hedging and is carried out through the selection of invoice currencies, operational hedging, financial techniques using foreign debt or derivative instruments as well as passing some costs of currency exposure onto the customers. Any changes in the equilibrium of the monetary system, resulting in currency moves, prompt system readjustments using hedging mechanism. Failure to adjust could potentially result in

unprecedented levels of exposure and unequivocal damage to the company bottom line. Dynamics is at the core of the concept: the depth of the currency exposure shaped by market, industry and company specifics dictates hedging strategies which in turn alter the nature of currency risks. Therefore, exposure determinants and hedging strategies are reviewed in conjunction throughout the report.

This section outlines the research methodology of the project inclusive of overall research strategy, data collection approaches, sample and case study selection and analysis principles. Study limitations associated with information collection, data accuracy, input and application to analysis are also discussed.

3. METHOD STATEMENT

3.1 STUDY DESCRIPTION

The study aims at examining the major determinants of foreign currency exposure within the automotive industry and is predominantly focused on the external elements outside the boundaries of the company. The evaluation takes an exploratory character with quantitative and qualitative assessment complemented by semi-structured interviews with companies and organizations related to the field of study and further illustrated by a case study of Volvo Car Group. The results are, therefore, not predefined at the beginning of the study but rather reassessed once the data collection and analysis are complete to add contextual interpretations, complement the existing theoretical observations and for subsequent use in further research (Sreejesh, et al., 2014). The analysis comprises a combination of deductive approach, associated with testing the parameters of the theoretical framework using the automotive industry evidence, and inductive reasoning in an attempt to generalize the resulting observational patterns based on aggregation techniques (Bryman & Bell, 2015).

3.2 ANALYSIS FRAMEWORK AND SAMPLE SELECTION REASONING

The structure of the research includes the automotive industry evaluation based on secondary sources and semi-structured interviews accompanied by a case study of Volvo Cars. This section will provide justification for the industry selection, sample analysis, interviewees and case study identification.

3.2.1 Selection of Industry and Sample

The automotive industry is chosen as a subject for review based on the 2009 evaluation of Japanese companies by Ito et al (2013) indicating that the “transportation equipment” sector is the most affected by foreign currency exchange risks (Ito, et al., 2013). The analysis framework of factors determining the depth of foreign currency exposure within the automotive industry

is based on the sample of 21 automotive companies cumulatively producing 90% of globally manufactured vehicles – refer to *Table 2 Sample of 21 Automotive Companies*.

Table 2 Sample of 21 Automotive Companies

Company	Ranking	Market Share	Total Vehicles	Passenger Cars	% Commercial Vehicles
TOYOTA	1	12%	10,475,338	8,788,018	16%
VOLKSWAGEN	2	11%	9,894,891	9,766,293	1%
GM	3	11%	9,609,326	6,643,030	31%
HYUNDAI	4	9%	8,008,987	7,628,779	5%
FORD	5	7%	5,969,541	3,230,842	46%
NISSAN	6	6%	5,097,772	4,279,030	16%
FCA	7	5%	4,865,758	1,904,618	61%
HONDA	8	5%	4,513,769	4,478,123	1%
SUZUKI	9	3%	3,016,710	2,543,077	16%
PSA	10	3%	2,917,046	2,521,833	14%
RENAULT	11	3%	2,761,969	2,398,555	13%
BMW	12	2%	2,165,566	2,165,566	0%
SAIC	13	2%	2,087,949	1,769,837	15%
DAIMLER AG	14	2%	1,973,270	1,808,125	8%
CHANGAN	15	2%	1,447,017	1,089,179	25%
MAZDA	16	1%	1,328,426	1,261,521	5%
DONGFENG	17	1%	1,301,695	745,765	43%
MITSUBISHI	18	1%	1,262,342	1,199,823	5%
BAIC	19	1%	1,115,847	538,027	52%
TATA	20	1%	945,113	614,247	35%
GEELY	21	1%	890,652	890,652	0%
Top 10		71%	64,369,138		
Top 21		90%	81,648,984		
Total			90,717,246	72,068,994	21%

Source: (OICA, 2016)

The shortlisted companies are drawn from the global production statistics database for year 2014 accumulated by the International Organization of Motor Vehicle Manufacturers (OICA, 2016). The companies are selected by ranking from 1 to 21 based on their market share. The market share is calculated using unit quantity of passenger cars, light and heavy commercial vehicles, and buses against the total number of vehicles produced in 2014. The annual production figures are used as a proxy for sale figures in the absence of similar statistical data for sales by manufacturer to establish relative shares within the global environment. *Table 2* indicates manufacturer name, ranking by the quantity of units, market share, quantity of total vehicles and passenger cars produced in year 2014 and percentage of commercial vehicles within company product portfolio. It should be noted, however, that the unit production data is

not representative of sales revenue or profitability due to companies targeting variable vehicle, economic and geographic market segments. The sample is also not fully indicative of global geographic dispersion of automotive companies and only includes major manufacturers from the USA, Europe, Japan, South Korea, and China.

3.2.2 Interviewees Selection

Semi-structured interviews with companies shortlisted for the sample in Section 3.2.1 as well as relevant organizations within the industry were sought as supplementary to the secondary data analysis for triangulation purposes. Whereas some of the 21 sample companies declined to comment citing information sensitivity, the interviews were conducted with senior representatives of six automotive companies: Daimler, Dongfeng Motors, Honda, Changan, Ford and Volvo – refer to Table 3. The interviewees represented varying functional aspects and had substantial experience of international operations and foreign currency risk which was confirmed at the introductory stages. With the exception of Volvo where convenience sampling was utilized, other candidates were nominated by companies. Interviews with relevant organizations focused on obtaining additional insights into multinational companies operating internationally. Deutsche Bank, Santander and China Association of Automotive Manufacturers representatives specialising in the automotive sector were targeted through snowball sampling. In total the project contains information collected from nine organizations indicated in Table 3 (Bryman & Bell, 2015).

Table 3 Interview Material, 2016

Manager	Responsibility	Company	Method / Time
Manager A	FX Corporate Services	Deutsche Bank China	Telephone – 25 mins
Manager B	Business Services	Santander	Telephone – 20 mins
Manager C	Industry Development	China Association of Automotive Manufacturers	Telephone – 45 mins
Manager D	Production Network	Daimler AG	Telephone – 20 mins
Manager E	Corporate Finance	Dongfeng Motor	Telephone – 20 mins
Manager F	Risk Operations	Honda	Telephone – 25 mins
Manager G	Sales Division	Changan	Telephone – 35 mins
Manager H	European Operations	Ford	Telephone – 30 mins
Manager I	Customer Services	Volvo Cars	Telephone – 40 mins

Source: compiled by author

3.2.3 Case Study Selection

The subject of the case study supplements the industry data and interviews with relevant organizations. The company is chosen based on Volvo’s openness in disclosing information on

currency exposures and hedging strategies in their publicly available documentation in comparison with other market incumbents. The company is a daughter division of Zhejiang Geely Holdings associated with Geely Group ranked number 21 in *Table 2 Sample of 21 Automotive Companies*. The case study is based on secondary data supplemented by an interview with a senior representative of the customer services team to test a wider scope of exchange rate exposure.

3.3 DATA SOURCES AND ANALYSIS TOOLS

Literature review and theoretical framework are established by analysing academic and business literature found based on keyword searches “determinants of currency exposure”, “foreign currency exposure”, “currency hedging”, and “automotive industry” among others. The search was conducted using the Gothenburg University Library online database, Google Scholar and Google search engines. In addition to individual company websites, Thomson Reuters Datastream and Morningstar databases were utilized to retrieve financial company data from 2010 / 2011 financial year until the latest date available (Thomson Reuters, 2016; Morningstar, 2016). Sample selection is carried out using the online database of the International Organization of Motor Vehicle Manufacturers, namely “World Motor Vehicle Production. OICA correspondents’ survey. World Ranking of Manufacturers. Year 2014” (OICA, 2016). Porter’s Five Forces framework was used for assessing the level of competition intensity in the automotive industry. The business tool devised by Michael Porter focuses on assessing dynamic forces defining industry attractiveness: the threat of substitutes, competitive rivalry, buyer power, threat of new entrants, and bargaining power of suppliers (Porter, 1979). Statistical calculations of raw data obtained from third party sources were performed using Excel (Microsoft, USA) for data compilations and SPSS Version 22 (IBM, USA) for statistical analysis where appropriate.

The interviews were carried out in the form of an informal discussion over the phone and followed a template of predefined questions to ensure relative comparability between responses but with a degree of freedom to allow for topics switch and improvisation by the interviewee. The company interviews allowed gaining further insight into the internal perception of risks, their possible causes, and applicability within the context of individual companies – *refer to Annex 1*. The purpose of the interviews with relevant organizations was to obtain a more generic external perspective on foreign companies’ operations and to triangulate information from secondary sources and company interviewees. The interview questions varied subject to

organization focus – refer to Annexes 2 and 3. The interview information is treated as complimentary due to subjectivity limitations discussed further in Section 3.4.2 (Bryman & Bell, 2015).

The questionnaires were designed along the key themes to follow the logical sequence being developed in the thesis. Open ended questions afforded flexibility and discussions of issues relevant to a particular operational function and not necessarily anticipated to obtain insights into different effects of currency risks. Detailed notes were taken in shorthand in the course of the interview. Upon completion of raw data collection, interview material was recreated from written notes and memory immediately upon completion. Data was segmented into appropriate determinant category manually to support and triangulate secondary sources information (Bryman & Bell, 2015).

Empirical information is presented in Section 4 for better readability of the text in three segments: Secondary Sources Data (Section 4.2), Interview Results (Section 4.3) and Case Study – Volvo Cars, Sweden (Section 4.4). Every effort is made to present the review in a logical manner with evidence of currency risks and hedging strategies for individual companies serving as a gauge for the depth of corporate exposure. The industry overview is followed up by determinants analysis along the axes established in Section 2.2.4 in the next sequence:

- Intensity of automotive industry competition;
- Functional currency strength;
- Proportion of foreign sales to total revenue and geography of operations;
- Operational flexibility;
- Hedging approach.

3.4 STUDY LIMITATIONS

3.4.1 Validity and Reliability

With validity and reliability as interlinked major criteria of objectivity within quantitative and qualitative research evaluation framework, study transparency and solitary “researcher bias” in interpreting the raw data are important concepts to consider within the contextual constructivist epistemological outlook adopted for the project (Noble & Smith, 2015; Bryman & Bell, 2015). Undermining the assessment framework could lead to difficulties in establishing a bridge between the theoretical platform and empirical observations, consistent interpretation, and extrapolating sample results to a wider population. Every effort is made to accurately collect,

enter and analyse third party and company information through double-entry techniques and without partiality. The author does not have strong preferences with regards to car brands and all assessments are made based on the available financial information. Where possible and relevant, quantitative and qualitative analysis is supplemented by revalidation by industry representatives and triangulation of conclusions (Bryman & Bell, 2015; Madill, et al., 2000).

3.4.2 Other Limitations

Further study limitations to be considered are as follows (Bryman & Bell, 2015):

- Third party data accuracy: financial information retrieved through Thomson Reuters Datastream and Morningstar databases is accepted as accurate based on assurances that it is subject to timeliness, accuracy and completeness of data based on strict internal quality controls (Thomson Reuters, 2016; Morningstar, 2016).

- Data limitations: the dataset covers five years of most recent operational information which might infer asymmetric results. Additionally, there is limited information related to hedging strategies and techniques published in annual reports. Some companies decline to discuss details of foreign currency exposure and hedging politics due to their proprietary nature and citing compliance reasons. Broader internal data on currency exposure and hedging practices if accessible could provide a more accurate representation (Bryman & Bell, 2015). Furthermore, hedging information limitations also include for the disparity between the optimum hedging strategy from an economic point of view and hedging adjusted for better accounting results diminishing hedging benefits (Panaretou, et al., 2013).

- Sample and scope appropriateness: the selected sample includes companies from the developed region and only a small selection of emerging multinationals from developing economies. Furthermore, whereas some assumptions were made on the heterogeneity of the global market, country level data could provide an interesting insight to the review. Moreover, the companies in the sample are considered as a “group” without taking into account market and consumer segment differentials. Additionally, the contextual evaluation considers companies within the automotive sector only which complicates or restricts extrapolation of results to a broader industry selection.

- Variable functions and subjectivity: the interviewees’ selection includes for personnel covering variable organizational functions which provides a broad outlook on the currency phenomenon but could infer asymmetric results. Additionally, opinions issued on variable

aspects of the company business with regards to foreign currency risks could be subjective and not fully reflect the overall corporate position. Given the subject complexity, the interviews conducted might not be sufficient, adequately addressed and appropriately worded to cover all aspects of foreign currency exposure.

- Interview mode: interviews were conducted over the phone limiting the scope for interpretation of personal reactions and potentially restricting interview length and access to other personnel within the company for a more general overview through snowball sampling technique (Bryman & Bell, 2015).

This section includes an automotive sector review to provide a comprehensive representation of the industry dynamics. The determinants of foreign currency exposure identified in section 2.2.4 are applied to the automotive industry based on evidence from 21 companies in the sample based on secondary data. Interview evidence obtained from a selection of companies within the sample is presented along the same currency risk determinant axis. The section concludes with a case study of Volvo Cars headquartered in Gothenburg, Sweden to get a closer insight into the covariation between the determinants of foreign currency exposure and the effects of hedging strategies.

4. DETERMINANTS OF FOREIGN CURRENCY EXPOSURE - EMPIRICAL FINDINGS

The aim of this section is to identify primary determinants of foreign currency exposure in the automotive sector. This will be achieved by considering possible reasons explaining why the seven companies identified in *Table 1 Effect of Exchange Rate Changes on Cash Flows*, namely GM, Daimler, FCA, Honda, Mazda, Nissan and Hyundai, experience higher impact of currency fluctuations on cash flows. A brief industry analysis in section 4.1 is provided to allow for a better understanding of the dynamics and linkages between the automotive industry participants. In the subsequent three subsections – 4.2 (Secondary Sources Data), 4.3 (Interview Data) and 4.4 (Volvo Case Study), the evidence on the relative strength of currency risk determinants is presented along the following axis:

- Intensity of automotive industry competition;
- Functional currency strength;
- Proportion of foreign sales to total revenue and geography of operations;
- Operational flexibility;
- Hedging approach.

4.1 INDUSTRY REVIEW – AUTOMOTIVE SECTOR

With almost €2 trillion and 66 million vehicles annual output, the automotive and auto-components industry generates direct employment for around 9 million people globally impacting further 50 million community jobs once the multiplier effect is considered (OICA, 2016). Industry slump following the 2008 Financial Crisis showed the vulnerability of many companies demanding active governmental support through customer incentives programme

and emergency loans. The drastic drop in capacity utilization prompted substantial restructuring efforts with the transition of established production networks in Western Europe, the USA and Japan to cheaper manufacturing sites and readjustment of global supply chains (Ferrazzi & Goldstein, 2011; KPMG, 2015). In addition to production rationalization and efficiency drive, the move was fostered by demand increases in the emerging markets and repositioning within trading blocs (NAFTA, EU, ASEAN, Mercosur) to reap internal market membership benefits and avoid exchange rate volatility and transportation costs, deeming foreign producers uncompetitive (Deloitte Touche, 2009). Despite market growth prognosis of over 4% compound annual growth until 2020 especially in the compact size segment, there are overcapacity fears in the emerging regions. Consistent scaling down in Russia and Ukraine is aggravated by China's mismatch between 30 million production capacity and 21 million sales projection for 2016 necessitating export of surplus vehicles (The Economist Intelligence Unit, 2016).

The automotive industry has undergone a considerable degree of consolidation over the last decades with the top 10 manufacturers capturing 70% and top 21 suppliers covering 90% of the global vehicle production as a proxy for sales figures (OICA, 2016). With the exception of Hyundai and FCA the Top 10 listing has not undergone drastic changes since 1998. SAIC, Changan, Dongfeng, BAIC and Geely became major industry players within a relatively short period of time. Industry concentration is also reflected in the top 14 automotive giants controlling 55 most prominent global brands as a result of "merger mania" in the proceeding decades (Zhang, et al., 2015). The top industry movers and shakers not only go head to head against each other in local markets but increasingly encounter competition from low-cost newcomers. Despite the attractiveness of fast global expansion, expectations of further amalgamations are relatively low due to poor M&A results within the industry. Some analysts are, however, urging peer and cross-sector cooperation to share the \$2.2 billion weekly R&D burden on new technologies to facilitate the speed of developments (The Economist Intelligence Unit, 2016; Ebhardt, 2015; PWC, 2015a; PWC, 2014).

Additionally, the industry layout is also somewhat unusual due to a complex web of equity stakes, joint venture and contract assembly partnerships and technical alliances. For example, Daimler owns majority stakes in Deutsche Accumotive and Mitsubishi Fuso and minor stakes in BAIC Motor, Kamaz, Tesla Motors, Renault and Nissan. It is also involved in joint ventures with Beijing Benz, Fujian Benz, Fuzo Kamaz Trucks, Engine Holding and Li-Tec Battery;

contracts assembly to Magna Steyr and Gaz and cooperates on technical issues with Renault-Nissan, BMW, AFCC, Deutsche Accumotive, EM-motive and Ford (Automotive News, 2015).

Intense cost pressures within the industry leave little margin for error. The pricing review of 76 models from 1998 indicated profitability reduction in absolute terms due to regulatory, consumer and market forces only sustainable due to efficiency improvements (KPMG, 2015). Fashion for “modular” platforms with a selection of upgrades appears attractive despite the higher cost of common components as it ensures potential for volume increases and easy supplier consolidation. Ford, for example, aims to transition from 1150 to 750 contractors (Kakkar, et al., 2015; McKinsey & Company, 2013; KPMG, 2015). Differentiation between brands increasingly stems from technological content with electronics and software contributing up to 35% and from extra facilities such as financing, comprehensive services and rental available through convenient web platforms similar to Amazon or Google (Kakkar, et al., 2015). This puts extra pressure on R&D budgets and demands cross-industry cooperation. Moreover, recent regulatory moves concerning enhanced safety features and reduced fuel consumption and emissions have intensified due to the “Volkswagen effect”. For instance, compliance with the US CAFÉ standards is estimated at additional \$1,000 per car to production costs (Kakkar, et al., 2015). There is a considerable impetus to pass the increasing production costs through to suppliers or customers (McKinsey & Company, 2013).

On the one hand, suppliers are prompted and strive to attain a global manufacturing footprint to ease collaboration, facilitate rising production volumes and add value through joint product development and vertical partnerships (Kakkar, et al., 2015; McKinsey & Company, 2013). However, the splitting costs concept is an issue for the auto parts segment already under duress from the aftermarket suppliers and local networks. (McKinsey & Company, 2013). On the other hand, there has been a considerable demand transformation. With the premium and entry segments accounting for 10% and 20% respectively, cars are increasingly viewed as a “means of transportation” rather than status symbol by an average consumer. Lower product differentiation resulted from quality improvements across the industry, prompting the expectation of “low price, high tech features and enhanced lifespan” combination. However, greater customer segmentation occurs in emerging regions with new buyers entering value segment and others moving onto higher specifications and top end brands with costs no longer being a major consideration (Deloitte Touche, 2009). At the same time, with Internet, global information visibility and comparison on specifications, performance parameters, pricing, and

discounts have irrevocably shifted power balance towards buyers (Kakkar, et al., 2015; McKinsey & Company, 2013).

The global automotive landscape remains highly heterogeneous. Uneven geographic market forecasts are complicated by variable profitability with higher returns in emerging economies and within premium end vehicle segments (McKinsey & Company, 2013). Whereas well established automotive companies expanded their global footprint over the past decades, recent market incumbents supply their international sales mainly from domestic production facilities (Kakkar, et al., 2015). Some manufacturers are adjusting their market segments: whilst Kia and Hyundai are attempting to break into the luxury segment, Volkswagen and Renault-Nissan divert much attention to the low-cost sector (The Economist Intelligence Unit, 2016). Original Equipment Manufacturers (OEM) are barely entering the value segment in the emerging markets generally occupied by local or regional manufacturers: a combination of global reach and integration into local procurement and supply networks are required to effectively compete (McKinsey & Company, 2013).

4.2 SECONDARY SOURCES DATA

4.2.1 Intensity of Automotive Industry Competition

With the Four-Firm Concentration Ratio CR4⁶ amounting to 41.9% in 2014 (down from 45% in 2002) and close to the 40% mark associated with “perfect competition”, the global automotive sector retains some signs of an oligopolistic industry with (OICA, 2016; Bade & Parkin, 2013):

- top 10 multinational operators controlling almost 70% of the global auto market;
- interdependence of firms strategic behaviour to reduce uncertainty and relative price rigidity;
- high barriers to entry due to substantial capital requirements, control over inputs by existing incumbents, economies of scale for larger firms and excess production capacity;
- and strong incentives to focus on product differentiation through aggressive marketing.

Additionally, Turn calculated Herfindahl-Hirschman Index⁷ against spending by automotive companies in program advertising in May 2014 to May 2015 with a view of establishing the degree of competition in the global automotive industry. The index consistently fluctuated

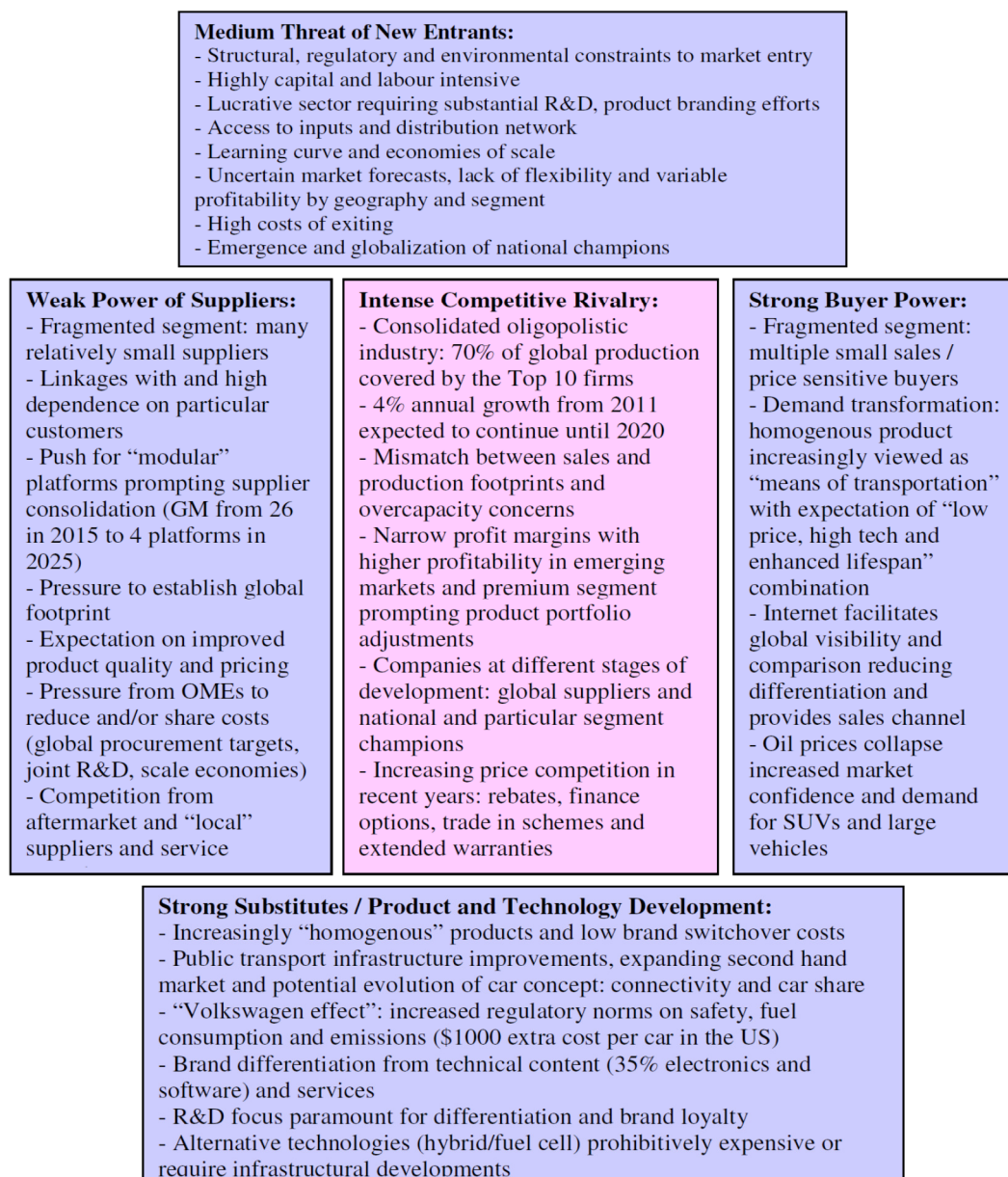
⁶ Four-Firm Concentration Ratio is a commonly used index indicating the proportion of industry output covered by the four largest companies and measuring industry concentration or market competitiveness.

⁷ Herfindahl-Hirschman Index is a widely accepted measure of market concentration often used for the purposes of anti-trust enforcement proceedings (The United States Department of Justice, 2015).

within the “competitive” range across international locations highlighting competition intensity (Turn, 2015).

Moreover, the automotive industry analysis, summarized within the Porter’s Five Forces framework – refer to Figure 3 (Porter, 1979), gives an indication of a highly competitive sector. Despite some variability on the national level with regards to competitive intensity, with only 40 car producing countries globally international companies go head to head across the global arena (Ferrazzi & Goldstein, 2011).

Figure 3 Automotive Industry Analysis

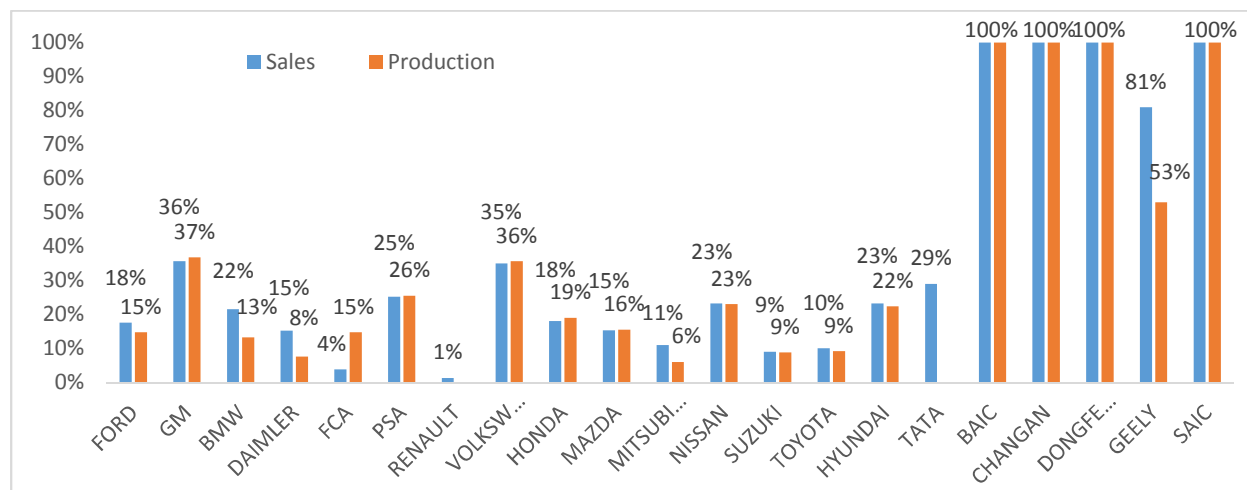


Source: compiled by author based on (Deloitte Touche, 2009; KPMG, 2015; Kakkar, et al., 2015; McKinsey & Company, 2013; The Economist Intelligence Unit, 2016).

A global excess capacity of around 28% of production volume in 2015 and cyclical development patterns exacerbate the competitive environment (Shen, 2015). Additionally, the competitive situation is asymmetric due to unfair advantages gained by some competitors through tax reduction schemes, credit facilities and subsidies (Bergbrant, et al., 2014). Thus, for example, a benchmarking tax study by PWC acknowledges the existence of tax incentives, unrecognized tax benefits up to 6.6 billion USD for automotive and auto parts sector and a backlog of tax submissions due for negotiation with US tax authorities that might have had a favourable impact on some companies (PWC, 2014).

On an individual nation level, for instance, Chinese market volume exceeds 27% in terms of both global sales and production of cars and commercial vehicles (OICA, 2016). The country is well integrated into the global value chain within the automotive sector due to strict regulatory framework intended to facilitate technology transfer to the country (Roland Berger, 2013). In line with the general industry trends, many companies in the automotive sector established some form of production or sourcing facilities in China to take advantage of temporary differentials in factors of production for cost efficiency and exploring the large domestic market following economy liberalization. (Houdard, 2014). The automotive companies capture the territory with a variable commitment of resources subject to competitive pressures and comparative costs of production. Proportion of Chinese sales and production for individual companies are shown in *Figure 4* (BAIC, 2014; BMW, 2014; Changan, 2014; Daimler, 2014; Dongfeng, 2014; FCA, 2015; Ford, 2014; Geely, 2014; General Motor, 2014; Honda, 2015; Hyundai, 2014; Mazda, 2015; Mitsubishi Motor, 2015; Nissan, 2015; PSA, 2015; Renault, 2014; SAIC, 2014; Suzuki, 2015; TATA, 2015; Toyota, 2015; Volkswagen, 2014; OICA, 2016). Ford, GM, BMW, PSA, Volkswagen, Honda, Mazda, Nissan, Hyundai, Tata and Geely have considerable exposure to the Chinese automotive market. The market is strategically important for some OEMs. In particular, according to some estimates, for Volkswagen, Chinese sales constituted over two-thirds of foreign sales in 2014, half of net profit and 71% of cash flow from joint ventures and royalties. GM drew 40% of net income and up to 30% of cash flows from China (Shen, 2015; Taylor, 2015).

Figure 4 Major Auto Manufacturers' Sales and Production in China as Percentage of Global Sales and Production, 2014



Source: (Shen, 2015; OICA, 2016)

From the foreign currency risk perspective, however, more interesting is the exposure arising from the mismatch between production and sales within the territory to review whether netting of revenue and cost streams is a possibility. The variations are sizeable with higher sales than production in case of Ford (3%), BMW (9%), Daimler (7%), Mitsubishi (5%), Tata (29%) and Geely (28%). Higher production than sales proportions are evident for GM (1%), FCA (11%), PSA (1%) and Volkswagen (1%). Domestic Chinese manufacturers BAIC, Changan, Dongfeng and SAIC, do not generally venture away from the home market until and including 2014.

In China, the production inputs or purchases are estimated to reach up to 65.2% of the automotive industry revenue in 2015. These are significant when compared with industry average profits of 10.8% within China (IBIS World, 2016). Hence, the exposure set up is substantially higher for companies with a considerable foreign content of inputs such as engines, transmissions, and electronic modules. For example, BMW, Daimler and Toyota who tend to meet minimum local requirements and ship most parts into China have a higher built in foreign currency exposure effect as opposed to Volkswagen, GM and Hyundai operations that source over 90% components locally (Bloomberg Intelligence, 2015; IBIS World, 2016).

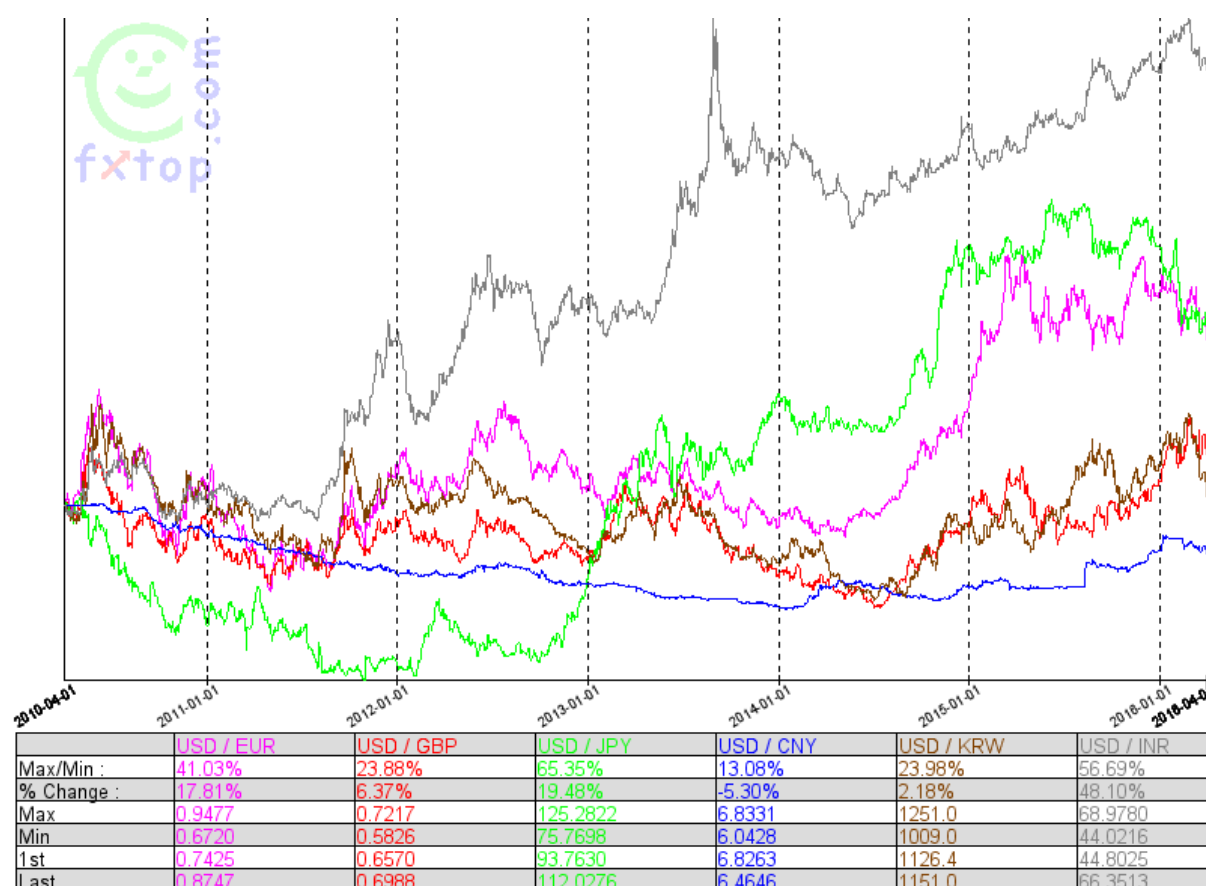
Consequently, currency fluctuations associated with the internationalization of the CNY currency have a substantial impact on the automotive industry (Shen, 2015). Currency

devaluations benefitted Chinese companies gaining 15% growth in the domestic market and growing vehicles export to complex developing markets of Africa, the Middle East, Central Asia and Southeast Asia considering the price advantages of Chinese-made vehicles (IBIS World, 2016; Yu, 2016). The looming changes, however, prompted market uncertainty for consumers reducing overall sales figures and demand for higher customer incentives or lower prices with sales discounts reaching 11.5% in the fourth quarter of 2015 (The Wall Street Journal, 2015; Yu, 2016; Bhattacharya, 2016). A partial explanation for price reductions could be drawn from the 2014 anti-monopoly investigations impacting the conduct of a few luxury auto brands including BMW, Audi, Mercedes-Benz, Toyota and Jaguar (Li, 2016). However, the discounting moves are mainly driven by severe market competition, the excess capacity within the Chinese market of over 30% in 2015 and market segments repositioning with Chinese suppliers targeting the midrange segment and foreign companies eyeing entry level customers (Shen, 2015).

4.2.2 Functional Currency Strength

The selection of functional currency for consolidated financial statements for the observed multinationals is driven by the home currency of the parent company supported by substantial domestic markets or regional financial infrastructure. The choice is dictated by HQ location with the exception of FCA using EUR in consolidated statements whilst citing the UK residence for tax purposes. At the same time for geographic entity operations, the general practice is to use the currency of the primary economic environment. During translation operations transaction values are subject to accounting practices (BAIC, 2014; BMW, 2014; Changan, 2014; Daimler, 2014; Dongfeng, 2014; FCA, 2015; Ford, 2014; Geely, 2014; General Motor, 2014; Honda, 2015; Hyundai, 2014; Mazda; 2015; Mitsubishi Motor, 2015; Nissan, 2015; PSA, 2015; Renault, 2014; SAIC, 2014; Suzuki, 2015; TATA, 2015; Toyota, 2015; Volkswagen, 2014). The subsidiary selection of functional currency could be altered: thus in 2013 a Hyundai's subsidiary amended its functional currency from USD to EUR as its primary economic environment changed (Hyundai, 2014). The potential magnitude of the instantaneous effect of adverse exchange rate movements could be observed by reviewing fluctuations for a selected mix of currencies from developed and developing economies against the US Dollar – refer to Figure 5 (FXTop, 2016). Relatively small range of USD / CNY rate of 13% to date is contrasted by the drastic amplitudes of 41% for USD / EUR pair and 65% for USD / JPY pair.

Figure 5 Exchange Rate Fluctuations against USD 2010-2016



Source: compiled by author based on (FXTop, 2016)

As an indication of currency strength US Dollar, Euro, and Japanese Yen top the list of allocated foreign reserve currencies taking first, second and fourth places correspondingly (IMF, 2016). A further signal of currency strength is related to sovereign credit rating based on long-term economic, financial and country risks by major agencies deeming all the currencies under review “investment grade” (BBB-/BAA3) or above – refer to Table 4 (Standard&Poor's, 2016; FitchRatings, 2016; Moody's, 2016).

Table 4 Sovereign Credit Rating

Agency	S&P		Fitch		Moody's	
	Rating	Outlook	Rating	Outlook	Rating	Outlook
USA	AA+	Stable	AAA	Stable	AAA	Stable
EU	AA+	Stable	AAA/AA/BBB+	Stable *	AAA/AA2/BAA2	Stable *
Japan	A+	Stable	A	Stable	A1	Stable
South Korea	AA-	Stable	AA-	Stable	AA2	Stable
India	BBB-	Positive	BBB-	Stable	BAA3	Positive
China	AA-	Negative	A+	Stable	AA3	Negative

Source: compiled by author based on (Standard&Poor's, 2016; FitchRatings, 2016; Moody's, 2016)

Note: * based on Germany / France / Italy

Based on the currency fluctuations and rating analysis, USD, EUR and JPY selected as functional currencies by many companies in the sample set are associated with “hard” status which should potentially lower the exposure. However, at the time of drastic appreciation hikes of functional currencies against a basket of currencies used based on the global footprint, companies could be at risk of sudden substantial losses. In the 2014 sensitivity analysis Renault, for example, considered EUR 1 million potential loss of income before tax (or 0.067% of Income before Tax) due to a hypothetical adverse fluctuation of USD to EUR by 5%. In contrast for Hyundai the analysis forecasted substantially lower currency risk: the 5% change in KWN against the USD equated to KWN $\pm 3,424$ million on income before tax (or 0.034% of Income before Tax) in 2014 (Renault, 2014; Hyundai, 2014).

Furthermore, whereas until the 21st-century strong currency status was associated with prestige and national government competence, competitive currency devaluation to boost export growth for domestic operators has recently become a popular buzzword. The new wave of devaluations potentially started with China devaluing currency by 1.9% against the USD in August 2015, prompting the European Central Bank to request other central banks to respect international agreements on ensuring the exchange rates are based on fundamental economic factors rather than desire to protect export sectors and boost domestic recovery (Clinch, et al., 2016; Bird, 2015; Thomas Jr, 2016).

Furthermore, there are certain benefits in diversion from functional currency and increasing matching currency flows in local currencies where netting of incoming and outgoing flows is viable. Getting back to the China example, CNY settlement ensures improved price and longer payment terms from local suppliers (usually 90 days for payment in foreign currencies and up to 210 days in CNY), expanded trading partner networks, eliminated surcharges covering volatility of exchange rates (estimated up to 7%), credit facilities in CNY, shorter settlement and transaction time and reduced FX hedging costs. The financial infrastructure is growing with mainstream banks like CityBank, HSBC and Deutsche Bank offering global netting solutions and instant convertibility on current account for CNY transactions simplifying administration for HQ treasury (Advantage BC, 2016; Deutsche Bank, 2016; Citi Group, 2015; HSBC, 2016).

4.2.3 Proportion of Foreign Sales to Total Revenue and Geography of Operations

Due to the industry specifics, most of the companies within the sample expanded their sales networks and production footprints internationally. Based on the percentage variance, the

difference between 2004 and 2014 is especially dramatic for the European conglomerates - refer to Table 5.

Table 5 Foreign Sales and Production - Transition 2004 – 2014

Company	HQ	Foreign Sales to Total Sales			Foreign Production Rate			Footprint Mismatch Sales – Production 2014
		2004	2014	Δ %	2004	2014	Δ %	
FORD	USA	44%	40%	-4%	53%	61%	8%	-21%
GM	USA	41%	42%	1%	53%	78%	25%	-36%
BMW	Germany	51%	84%	33%	35%	48%	13%	35%
DAIMLER	Germany	77%	85%	8%	66%	40%	-26%	45%
FCA	UK	33%	94%	61%	37%	59%	22%	35%
PSA	France	27%	79%	52%	13%	67%	54%	12%
RENAULT	France	31%	76%	45%	11%	81%	70%	-5%
VOLKSWAGEN	Germany	52%	80%	28%	42%	74%	32%	6%
HONDA	Japan	74%	80%	6%	60%	79%	19%	1%
MAZDA	Japan	70%	83%	13%	20%	30%	10%	53%
MITSUBISHI	Japan	63%	80%	17%	35%	49%	14%	31%
NISSAN	Japan	68%	80%	12%	48%	83%	35%	-3%
SUZUKI	Japan	58%	63%	5%	41%	65%	24%	-2%
TOYOTA	Japan	63%	69%	6%	37%	60%	23%	9%
HYUNDAI	Korea	60%	56%	-4%	7%	55%	48%	1%
TATA	India		86%			50%		36%
BAIC	China		0%			0%		
CHANGAN	China		0%			0%		
DONGFENG	China		0%			0%		
GEELY	China		19%			47%		-28%
SAIC	China		0%			0%		
Mean		54%	57%		37%	49%		
Median		58%	76%		37%	55%		

Source: compiled by author based on 2004 data (Bartram, et al., 2010), 2014 data (Annual Reports, 2014 & 2015) & (OICA, 2016; Thomson Reuters, 2016)

Despite the expansion of both foreign sales revenue and production, BMW, FCA and PSA retain a considerable proportion of domestic manufacturing facilities. Renault's international footprint allows for the sale of non-domestic manufactured vehicles in the French market. In contrast, Daimler reduced international production footprint whereas increasing foreign sales with growing mismatch, potentially triggering higher foreign currency exposure. Japanese companies expanded overseas production portfolio to match their widespread sales networks with Mazda and Mitsubishi, however, retaining a substantial domestic capacity for export sales. Notably, US companies with foreign to total sales ratio well below the mean value for the sample, maintained focus on the large domestic market and a substantial part of production volumes is imported for use in the USA territory. Fairly recent market incumbents maintain sales and production footprints within domestic markets with the exception of Tata Motor and Geely groups who instantaneously increased global footprints through M&A route by acquiring

Land Rover and Jaguar in 2008 (Chandran, 2008) and Volvo Cars in 2010 (The Economist, 2014) respectively.

The geographic portfolio distribution could be further observed by reviewing a regional breakdown of sales and production networks – refer to Table 6. The comparison indicates a “mismatch” between sales and production volumes for North America, Europe, Japan and Other for 2004 (Bartram, et al., 2010) and North America, Europe, Asia and Other for 2014 (BAIC, 2014; BMW, 2014; Changan, 2014; Daimler, 2014; Dongfeng, 2014; FCA, 2015; Ford, 2014; Geely, 2014; General Motor, 2014; Honda, 2015; Hyundai, 2014; Mazda, 2015; Mitsubishi Motor, 2015; Nissan, 2015; PSA, 2015; Renault, 2014; SAIC, 2014; Suzuki, 2015; TATA, 2015; Toyota, 2015; Volkswagen, 2014) & (OICA, 2016). Although the regional data breakdown does not fully tie between the two compared periods, it provides a clear indication of the operational restructuring efforts. The difference for separate regions and standard deviation calculations could serve as a guide to gauge foreign currency exposure with excess volumes defining its depth and variation by the region. For instance, Ford, FCA, PSA, Renault and Volkswagen maintained a fairly proportionate manufacturing presence to sales portfolio. Renault, Honda and to a greater extent BMW, Daimler, Mazda, Mitsubishi, Suzuki, Toyota, and Hyundai prioritised production within the home region. Cost pressure restructuring is evident with many companies moving production to low-cost centres in Asia to improve cost efficiency. Relatively new incumbents, Tata and Geely, have unusual patterns by combining tactical production in low-cost regions with existing sales and production footprints inherited from strategic acquisitions.

Table 6 Regional Breakdown of Sales and Production - Transition 2004 - 2014

Company		2004					2014				
		N America	Europe	Japan	Other	St Dev	N America	Europe	Asia	Other	St Dev
FORD	Sales	62%	30%		7%		45%	22%	21%	12%	
	Production	56%	35%		9%		50%	23%	20%	7%	
	Δ %	6%	-5%		-1%	6%	-5%	-1%	1%	4%	4%
GM	Sales	68%	20%		12%		34%	13%	38%	17%	
	Production	65%	24%		11%		35%	13%	45%	8%	
	Δ %	3%	-4%		1%	4%	-1%	0%	-9%	9%	7%
BMW	Sales	31%	65%		5%		23%	43%	31%	3%	
	Production	15%	80%		5%		17%	67%	13%	3%	
	Δ %	16%	-16%		0%	16%	6%	-24%	18%	0%	17%
DAIMLER	Sales	68%	28%		3%		29%	34%	23%	14%	
	Production	63%	35%		2%		12%	78%	8%	2%	
	Δ %	5%	-6%		1%	6%	17%	-45%	15%	12%	30%

Company		N America	Europe	Japan	Other	St Dev	N America	Europe	Asia	Other	St Dev
		2004					2014				
FCA	Sales		80%		20%		56%	27%	4%	13%	
	Production		79%		21%		58%	23%	3%	16%	
	Δ %	0%	1%		-1%	1%	-2%	4%	1%	-3%	3%
PSA	Sales	1%	93%		7%		0%	63%	25%	12%	
	Production	0%	94%		6%		0%	68%	26%	5%	
	Δ %	1%	-1%		1%	1%	0%	-6%	-1%	7%	5%
RENAULT	Sales	1%	91%		9%		2%	54%	19%	25%	
	Production	1%	96%		4%		0%	69%	9%	22%	
	Δ %	0%	-5%		5%	5%	2%	-15%	11%	3%	11%
VOLKSWAGEN	Sales	13%	63%		24%		9%	43%	40%	8%	
	Production	6%	68%		26%		6%	51%	37%	6%	
	Δ %	8%	-5%		-2%	7%	3%	-7%	3%	1%	5%
HONDA	Sales	55%	8%	26%	12%		50%	5%	38%	8%	
	Production	43%	7%	40%	10%		40%	3%	54%	3%	
	Δ %	12%	1%	-15%	2%	11%	10%	2%	-16%	5%	11%
MAZDA	Sales	35%	24%	30%	12%		30%	32%	21%	16%	
	Production	17%		80%	3%		8%	0%	92%	1%	
	Δ %	18%	24%	-51%	9%	34%	23%	32%	-71%	16%	48%
MITSUBISHI	Sales	23%	15%	37%	26%		11%	21%	42%	26%	
	Production	11%	6%	65%	19%		5%	1%	92%	2%	
	Δ %	12%	9%	-28%	7%	18%	5%	20%	-49%	24%	34%
NISSAN	Sales	40%	19%	32%	10%		34%	14%	51%	0%	
	Production	28%	15%	52%	5%		34%	15%	49%	2%	
	Δ %	12%	4%	-20%	4%	14%	0%	0%	2%	-2%	2%
SUZUKI	Sales	5%	14%	42%	39%		2%	6%	80%	12%	
	Production	1%	7%	59%	34%		0%	5%	95%	0%	
	Δ %	4%	8%	-17%	6%	12%	2%	1%	-15%	12%	11%
TOYOTA	Sales	33%	13%	37%	17%		30%	10%	41%	20%	
	Production	19%	7%	63%	12%		19%	6%	71%	5%	
	Δ %	14%	6%	-26%	6%	18%	11%	4%	-30%	15%	21%
HYUNDAI	Sales	31%	18%		51%		18%	13%	49%	20%	
	Production		1%		99%		10%	13%	75%	2%	
	Δ %	31%	16%		-47%	42%	8%	0%	-25%	17%	18%
TATA	Sales						12%	25%	43%	20%	
	Production							49%	51%		
	Δ %						12%	-23%	-9%	20%	20%
BAIC	Sales							100%			
	Production							100%			
CHANGAN	Sales							100%			
	Production							100%			
DONGFENG	Sales							100%			
	Production							100%			
GEELY	Sales							9%	81%	10%	
	Production							47%	53%		
	Δ %							-38%	28%	-10%	34%
SAIC	Sales							100%			
	Production							100%			

Source: compiled by author based on 2004 data (Bartram, et al., 2010), 2014 data (Annual Reports, 2014 & 2015) & (OICA, 2016)

Nevertheless, the figures should be considered with some caution, as the regional breakdown does not encompass the full extent of the exposure based on currency itemisation for individual

countries to allow balancing local revenues and costs. For many producers domestic market domination allows for generating a major proportion of annual revenue in their home regions. Furthermore, regional unit sales and production ratios might not adequately reflect global revenue and purchasing analyses. For instance, in case of Volkswagen, sales revenue split is 14% / 61% / 19% / 7% and sourcing comes to 4% / 64% / 27% / 5% for North America, Europe, Asia and Other respectively in contrast with the sales and production figures shown in *Table 6* above (Volkswagen, 2014).

With the top 15 countries (including China, the USA, Japan, Germany, South Korea, India, Mexico, Spain, Brazil, Canada, France, Thailand, the UK, Russia and Turkey) covering 88% of production (OICA, 2016), perfect operational hedging match to increase netting opportunities is impossible to achieve. However, the geographic dispersion and financial streams netting are eased by deep global penetration by mega-suppliers such as Bosch, Denso, Continental, BASF, Magna, Johnson Controls serving a mix of international brands (Roland Berger, 2014; Crain Communications Inc, 2015; Franjicevic, 2015).

4.2.4 Operational Flexibility and Financial Indicators

The theoretical framework suggests the extent of the foreign currency exposure is firm-specific and is determined by a number of financial variables which will be reviewed further. These suggested determinants of foreign currency exposure are grouped together for ease of analysis. *Table 7* includes for some relevant economic indicators for the automotive sample under consideration marked against the standard deviation and range of foreign currency effect on company cash flows as derived from *Table 1 Effect of Exchange Rate Changes on Cash Flows – Selected Companies in the Automotive Sector* above. The financial variables under evaluation include for Average Debt Ratio, Average Gross Margin, Average Asset Turnover, Average Dividend Payout Ratio, Average Quick Ratio, Beta Coefficient (March 2016), Average Market to Book Value and Market Value in million USD (March 2016) and Average R&D over Sales Revenue. The Average figures are calculated as a statistical mean value in the period of 4 years between 2011/2012 and 2014/2015.

The information collected is analysed further by identifying values exceeding or below the statistical “mean” serving as a proxy for “industry average” – refer to the bottom row of *Table 7* – to assist in determining potential causes of higher comparative exposure for the seven shortlisted companies (highlighted in green). Relevant values highlighting the analysis are marked in red.

Table 7 Effect of Foreign Currency Exposure and Financial Indicators

Company	FX Effect on Cash Flow		4 Year Average (2012 - 2015)							Beta	Market Value M USD	Ave R&D/Sales
	St Dev	Range	Debt Ratio	Gross Margin	Assets Tangibility	Assets Turnover	Dividend Payout	Quick Ratio	Market/Book			
FORD	0.02	0.06	0.61	13.60	0.55	0.74	0.31	1.00	2.21	1.219	51,813	0.04
GM	0.05	0.11	0.27	9.90	0.46	1.07	0.23	0.80	1.45	1.307	48,281	0.06
BMW	0.04	0.10	0.51	20.30	0.62	0.56	0.32	0.74	1.58	1.393	53,613	0.05
DAIMLER	0.34	0.88	0.45	21.73	0.58	0.70	0.38	0.85	1.61	1.491	79,004	0.03
FCA	0.12	0.27	0.34	13.55	0.54	1.04	0.06	0.88	0.83	2.09	11,110	0.01
PSA	0.03	0.07	0.35	16.08	0.47	0.95	0.00	0.74	0.86	1.436	13,782	0.03
RENAULT	0.05	0.13	0.43	18.63	0.42	0.53	0.19	0.94	0.66	1.473	27,765	0.03
VW	0.03	0.07	0.37	18.10	0.62	0.61	0.16	0.77	1.02	1.269	44,000	0.04
HONDA	0.09	0.21	0.37	24.90	0.62	0.73	0.36	0.87	1.13	1.262	50,474	0.06
MAZDA	0.41	1.01	0.35	22.90	0.48	1.16	0.01	0.87	1.82	1.671	9,242	0.04
MITSUBISHI	0.04	0.09	0.21	19.90	0.40	1.35	0.09	0.82	-2.35	0.946	7,476	0.02
NISSAN	0.10	0.26	0.38	17.63	0.40	0.75	0.30	1.23	1.07	0.960	44,304	0.05
SUZUKI	0.04	0.10	0.18	25.98	0.36	1.03	0.14	1.19	1.18	1.167	15,003	0.04
TOYOTA	0.05	0.12	0.40	16.53	0.61	0.61	0.34	0.84	1.49	1.134	181,965	0.04
HYUNDAI	0.09	0.20	0.37	22.27	0.56	0.63	0.09	1.49	0.73	0.995	27,369	0.01
TATA	0.04	0.09	0.31	36.85	0.56	1.13	0.05	0.67	2.46	1.548	15,713	0.01
BAIC	0.00	0.01	0.32	4.77	0.49	0.26	0.51	0.80	1.62		1,614	0.00
CHANGAN	0.00	0.00	0.25	18.03	0.54	0.70	0.15	0.62	2.61	0.858	8,274	0.03
DONGFENG	0.00	0.00	0.08	15.00	0.45	0.66	0.14	0.99	1.29	0.827	3,567	0.03
GEELY	0.00	0.01	0.64	18.93	0.34	0.74	0.11	1.12	1.50	1.574	3,880	0.01
SAIC	0.00	0.01	0.17	14.23	0.38	1.55	0.45	0.77	1.41	0.786	32,832	0.01
Mean	0.08	0.19	0.33	18.56	0.50	0.83	0.21	0.90	1.43	1.27	34813	0.03

Source: compiled by author based on (Morningstar, 2016; Thomson Reuters, 2016)

The data interpretation for financial categories contained in *Table 7* is as follows (Berk & McMarzo, 2014; Petersen & Plenborg, 2011; Aggarwal & Harper, 2010; Bergbrant, et al., 2014; Bartram, et al., 2010):

4.2.4.1 Standard Deviation and Range Values (Min to Max) for individual companies are extracted from the annual percentage effect of exchange rate changes against operating cash flows between 2011/2012 and 2014/2015 as shown in *Table 1 Effect of Exchange Rate Changes on Cash Flows – Selected Companies in the Automotive Sector*. Seven companies are identified as experiencing higher exposure to currency fluctuations: GM (USA), Daimler (Germany), FCA (UK), Honda (Japan), Mazda (Japan), Nissan (Japan), Hyundai (South Korea). With the exception of Hyundai (due to the lack of other companies from South Korea to compare with), the phenomenon is not characteristic to all the firms from the relevant country/region of company origin and is, therefore, firm-specific. All the entities are on the relatively mature spectrum of the industry incumbents compared to Indian and Chinese counterparts.

4.2.4.2 Average Debt Ratio as a proportion of company debt against total assets indicates **financial strength** with a higher ratio as a sign of increased risk and vulnerability to

foreign exchange exposure. With the mean value of 0.33, all but one of the companies shortlisted in 4.3.4.1 have higher than industry average figures. Nevertheless, additional other companies including Ford, BMW, PSA, Renault, Volkswagen, Toyota, and Geely also show high financial leverage without showing substantial vulnerability to currency fluctuations. The high ratio is nearly a given as a direct result of capital intensity requirements relevant for the automotive sector as described in *Figure 3 Automotive Industry Analysis*.

4.2.4.3 **Flexibility** could be analysed through Gross Profit Margin, Assets Tangibility as a ratio of long term to total assets and Assets Turnover derived from sales over total assets. Among the shortlisted companies, only GM, FCA and Nissan have below industry average margin of 18.56% limiting their operational flexibility in the absence of a safety cushion to absorb the unexpected adverse currency fluctuations. The gross profit margin parameter also highlights the diversity of the sector with a wide range of indicators from 4.77% to 25.14% necessitating due diligence in risk management operations.

Below industry average Assets Tangibility Ratio is used as a proxy for vulnerability to exchange rate variations due to lower protection against changing costs of inputs such as raw materials which impacts company balance sheet. Out of the shortlisted seven companies, only GM, Mazda and Nissan display Assets Tangibility below the mean value of 0.50. However, over half of the remaining companies in the total sample display the same signs.

With regards to Assets Turnover, as an indicator of efficiency in exploiting the company assets for revenue generating purposes, four shortlisted companies exhibit below industry average figure of 0.83 associated with lower protection against increasing competitive environment and susceptibility to foreign exchange exposures. Superior Assets Turnover is evident in the minority of the companies in the review. BAIC's indicator is at the minimum level of 0.26.

4.2.4.4 **Short term company liquidity** could be assessed through a combination of Average Dividend Payout Ratio showing the level of retained earnings and Average Quick Ratio measuring firm's ability in meeting short term liabilities with current assets less inventory. GM, Daimler and Honda exhibit above industry average dividend payout and below mean values of quick ratio indicating signs of short term liquidity constraints. In contrast, Nissan and Hyundai display high quick ratios stipulating good turnover of inventory and superior receivables management. FCA and Mazda's

liquidity is adequate with low dividend payout ratio and just below average quick ratio. The combined factor impact on foreign exchange exposure is difficult to assess as many mature companies in the industry are unable or unwilling to reduce dividends payout due to stock market pressures and the majority of companies displaying below 1.0 quick ratio a rule of thumb for healthy liquidity.

4.2.4.5 Average Market to Book coefficient, Beta (March 2016) and Market Value in million USD (spot measurement in March 2016) are reviewed as proxies of company **stock growth potential, stock volatility** in comparison with the overall market and **company size** respectively.

Average Market to Book above the mean industry value of 1.43 and stock volatility above 1.0 for most market participants are signs of greater economic exposure and susceptibility to foreign currency risks. Within the shortlisted sample only GM, Daimler and Mazda exhibit comparatively high market to book ratio indicating low stock growth potential along with many other companies from the original selection. For the majority of companies in the full sample, Beta coefficient is above 1.0 with Nissan and Hyundai very close to the marginal value at 0.960 and 0.995 respectively. This is a sign of automotive stock trends and vulnerability in general.

Moreover, the effect of firm size on the depth of exchange rate exposure is not obviously evident as three out of seven shortlisted companies have market value below the industry average. The analytical argument that larger companies have better access and lower costs of hedging instruments and are more diversified in terms of products portfolio and geography clashes with the hypothesis that smaller companies are more inclined to hedge. The three companies' relative maturity, extensive portfolio diversification, hedging instruments use potentially implicate that the differences lie elsewhere.

4.2.4.6 Analysis of Average R&D over Revenue as an indicator of **competitive advantage due to unique product characteristics and investment into proprietary technologies** is inconclusive. Only three shortlisted companies, namely Daimler (3%), FCA (1%) and Hyundai (1%) displaying equal or below average ratios for the industry at 3%. For Honda the 6% rate of R&D investment, on par with the maximum rate of investment in the industry, is combined with high assets tangibility, a sign of reduced foreign currency exposure which does not fit with the exposure effects demonstrated in the Cash Flow results. Recent market incumbents commit to lower R&D expenditure in percentage rates keeping investment below industry average and more so in absolute terms. This

could be part explained by spillover effects for Tata and Geely from their European operations and enforced technological cooperation for Chinese entities due to legislative and operational restrictions for foreign enterprises.

Furthermore, the R&D ratio element could be distorted by the increased pressure on major suppliers to share costs. Thus, Bosch, supplying many automotive manufacturers, spends an average of 9.5% of sales revenue between 2011 and 2014 on research and development (Bosch, 2016).

4.2.5 Hedging Approach

Taking into account substantial levels of exposure within the automotive industry (Ito, et al., 2013) it is important to understand whether hedging is actively used by companies within the sample to mitigate the level of exposure. The review of annual reports indicates that all the companies considered utilize some form of foreign exchange exposure management to reduce the risks of currency fluctuations. Whereas the functional currency selection is generally associated with the home currency, due to consumer-oriented product offering, international invoicing is accomplished in local currencies. Pass-through techniques to compensate for lower revenue or higher production costs are generally sparingly used to avoid harming price competitiveness and financial results. The use of natural hedging is widespread with established multinational companies expanding their global networks, netting sales revenue with operational expenses or arranging for liabilities denominated in local currencies. Despite the potential flaws of financial hedging, many companies use derivative instruments to minimize the adverse impact of foreign exchange rate fluctuations – *refer to Table 8*. Major affected currency pairs are subject to operational footprints. Mature companies from developed regions appear to utilize a wider variety of derivative instruments. Declarations of non-speculative use are prevalent with a few groups holding derivative instruments for trading purposes, namely PSA, FCA and BMW (BAIC, 2014; BMW, 2014; Changan, 2014; Daimler, 2014; Dongfeng, 2014; FCA, 2015; Ford, 2014; Geely, 2014; General Motor, 2014; Honda, 2015; Hyundai, 2014; Mazda; 2015; Mitsubishi Motor, 2015; Nissan, 2015; PSA, 2015; Renault, 2014; SAIC, 2014; Suzuki, 2015; TATA, 2015; Toyota, 2015; Volkswagen, 2014). The choice of derivative instruments or currency pairs focused upon by the seven companies identified as vulnerable to exchange rate fluctuations does not provide any indication of abnormality.

Table 8 Use of Derivative Instruments by Companies in the Automotive Sector

Name	Functional Currency	Major Currencies Listed on Annual Report	Instrument Types
FORD	USD	CAD / EUR / GBP / CNY	Forwards, cross-currency interest rate swaps
GM	USD	EUR / GBP / KRW / MXN	Forwards, swaps, options
BMW	EUR	CNY / USD / GBP / RUB / JPY	Forwards, options, currency and combined interest/currency swaps
DAIMLER	EUR	USD / GBP / JPY / CNY / RUB	Forwards, options, cross-currency interest rate swaps
FCA	EUR	USD / CAD / CNY / GBP / AUD / MXN / CHF / ARS / VEF / PLN / TRY / JPY / BRL	Forwards, swaps, combined interest and foreign currency instruments
PSA	EUR	GBP / JPY / USD / PLN / CHF / ARS / RUB / CZK	Forwards, swaps, options
RENAULT	EUR	GBP / USD / RUB / DZD / PLN / ARS / CHF / COP / RON / TRY	Forwards swaps
VOLKSWAGEN	EUR	AUD / CAD / CHF / CNY / GBP / KRW / SEK / USD	Forwards, options, cross-currency swaps
HONDA	JPY	USD / EUR	Forwards, swaps, options
MAZDA	JPY	USD / EUR / CAD / AUD / GBP / RUB / THB	Forwards
MITSUBISHI	JPY	USD / GBP / AUD	Forwards
NISSAN	JPY	USD / EUR / GBP / CAD / BRL / CNY / KRW / INR / HKD / MXN / AUD / RUB / SGD / NZD	Forwards, swaps, options
SUZUKI	JPY	USD / EUR / CAD / AUD / NZD / GBP / MXN	Forwards, cross-currency interest rate swaps
TOYOTA	JPY	USD / JPY / AUD / RUB / CAD / GBP	Forwards, options, interest rate currency swaps
HYUNDAI	KRW	USD / EUR / JPY	Forwards, swaps, options
TATA	INR	USD / GBP	Forwards, swaps, options
BAIC	CNY	USD / HKD / CNY	Forwards
CHANGAN	CNY	USD / EUR / GBP	Forwards
DONGFENG	CNY	EUR	N/A
GEELY	CNY	HKD / USD / AUD / EUR / RUB	Forwards, swaps, options
SAIC	CNY	USD / GBP / EUR / JPY / HKD	Forwards

Source: compiled by author from Annual Reports, 2014 & 2015

There is an element of tactical decision making in the way the automotive companies hedge which is evident in the selection of currencies and instruments used by companies origination in the same region as displayed in *Table 8 Use of Derivative Instruments by Companies in the Automotive Sector*. Companies naturally use selective risk management subject to hedging objectives, internal resources, and risk acceptance. The process is also influenced by variations between market incumbents in risk management assessment, forecasting accuracy given the unexpected nature of exchange rate movements, selection and implementation of hedging mechanisms, which could generally be referred to as “asymmetric information” in its broad sense (Smith, 2016). Both the phenomena could be illustrated with the example of Lexus produced by Toyota. The company is decisively abstaining from manufacturing Lexus cars in China due to “quality risk” concerns. As a result of the tactical move the company incurs

disadvantages in China with Lexus IS being priced 30% above BMW 3 series and 35% above Audi A4 due to import taxes as of November 2015. The deliberate strategy restricted growth with the Chinese market contributing 15% to the global Lexus sales, which is meagre in comparison with other premium brands. The decision is contradictory to the industry assessment that the quality of Chinese made vehicles rivals cars manufactured in developed countries. For Lexus, however, the same principle applied to the USA with the 26-year delay between first sales and the establishment of production facilities (Trudell & Hagiwara, 2015).

4.3.6 Summary of Findings

Secondary sources information provided in Section 4.3 aims to establish whether there is an explanation for why the seven companies identified in *Table 1 Effect of Exchange Rate Changes on Cash Flows – Selected Companies in the Automotive Sector* experience higher effects of currency exposure on cash flows in comparison with the remaining companies in the sample. Details on competition intensity, functional currency strength, export ratio and geography of operational portfolio as well as operational flexibility and hedging activities will be further analysed in Section 5 to gain an understanding of factors determining foreign currency exposure.

4.3 INTERVIEW RESULTS

As a further dimension of the project, attempts were made to obtain primary data in the form of interviews of individual company representatives on the determinants of the FX risks to increase awareness on what specific factors define variable financial performance of companies within the 21 companies' sample. Although the subject matter was deemed too sensitive for some companies, a selection of interviews presented in this section gives an initial insight from first-hand corporate perspective. Secured interviews included for managers specializing on or working in the automotive industry and encountering currency risks in their work from Deutsche Bank China (Manager A), Santander Europe (Manager B), China Association of Automotive Manufacturers (Manager C), Daimler AG (Manager D), Dongfeng Motor (Manager E), Honda (Manager F), Changan (Manager G) and Ford (Manager H) (Managers A/B/C/D/E/F/G/H, 2016).

The respondents' assessment on the overall level of foreign currency risks for the automotive companies ranged between medium to high, with Managers B, D and E describing “*medium*”

level of risk. Managers A, F, G and H cited “*high*” FX risks in present market conditions. The reasoning behind the evaluation leaning towards the higher spectrum of the scale generally pointed to increasing market uncertainty (Managers A/B/D/E/F/G/H, 2016). For instance, Manager H linked the “*high level of exposure with the price of oil collapse and the uncertainty of the Brexit vote*” (Manager H, 2016).

The major determinants of currency exposure in the automotive sector are discussed further. Individual responses are summarized in *Table 9 Summary of Interview Respondents’ Responses*.

4.3.1 Intensity of the Automotive Industry Competition

There is a consensus that the international automotive market is very competitive. Six respondents viewed competition intensity as an important determinant of foreign currency exposure (Managers A/D/F/G/H, 2016). Manager A summarised this as: “*There are multiple pressures on the bottom line. Serious competition in conditions of currency fluctuations forces foreign automakers to establish local production sites, adapt products and pricing in part to overcome the exchange rate differences. Some countries are less difficult to operate in than others*” (Manager A, 2016). Managers D and H expressed difficulties of working in extreme currency devaluation conditions combined with highly competitive environment but affirmed that their company was willing to take a calculated risk in view of market expansion in the future (Managers D and H, 2016). For example, with reference to the globally important Chinese market Manager D explains: “*In spite of testing environment... automotive companies want to obtain a good spot here. The market is lucrative and competition will only increase. There are still techno gaps between foreign and Chinese companies, but local makers offer competitive products... For some time currency appreciation favoured importers. Yuan devaluations from autumn 2015 hit companies shipping components in and yet car prices are expected to come down to entice buyers. We are committed to be here long term and continuously improve local content to decrease dependence from exchange rate movements.*” (Manager D, 2016).

4.3.2 Functional Currency Strength

The strength of domestic currency was viewed to be a significant element of the exposure by four respondents (Managers A/E/G/H, 2016). Manager H, for instance, indicated: “*Functional currency strength is important. As a global company we use multiple currencies. The product*

is consumer oriented and we convert local currencies into US Dollars for reporting. It is basically related to translation exposure...” (Manager H, 2016). There was acceptance that the relationship between the functional currency and FX exposure is complex (Manager A/E, 2016). Thus, with reference to a considerable industry integration over the past decades, Manager A highlighted: *“Groups like FCA and Tata have a collection of brands that work with different functional currencies inherited from mergers and acquisitions. Translation losses and gains are a prerequisite”* (Manager A, 2016). At the same time, in contrast to the support of the functional currency as a defining factor for currency risks, Manager F argued: *“The strength of domestic currency is maybe not relevant. Functional currency is what it is... Rather than concentrate of the strength or strength we try to optimise our currency portfolio to reduce earnings variations”* (Manager F, 2016).

4.3.3 Proportion of Foreign Sales to Total Revenue and Geography of Operations

All the respondents concluded that the geography of operational portfolio shapes currency exposure (Managers A/B/C/D/E/F/G/H, 2016). Managers B and E selected it as the *“main”* defining factor (Managers B/E, 2016). For instance, Manager C suggests: *“The lower (exposure) of some companies is because they have a low ratio of foreign operations to complete revenue. Companies in large home market like Ford in America get large revenue in home currency. Low risk is also for Chinese companies that only start to go abroad.”* (Manager C, 2016). Geographic breakdown of sales and production and their overlap or mismatch were also viewed to be important to explain the degree of currency exposure (Managers A/B/C/D/E/F/G/H, 2016) as explained by Manager E: *“Major source of foreign currency exposure is sales and production footprint. Production footprint mainly related to costs for components and assembly... Components and assembly are sourced globally, so fluctuation in currency impacts cost. Sales footprint related mainly to revenue for products we sell globally. The idea is to match flows of currencies to minimize the exposure, but to a limit”* (Manager E, 2016).

4.3.4 Operational Flexibility and Financial Indicators

The majority of respondents indicated the importance of financial strength (Managers A/B/D/F/H, 2016), operational flexibility (Managers A/C/D/F/G/H, 2016), adequate short term liquidity (Managers A/B/D/E/G, 2016) and competitive advantage (Managers A/B/D/F/H, 2016) in providing a safety cushion to make flexible adjustments during periods of severe currency fluctuations. Manager F summarised this as *“Flexible financial footing safeguards*

overall flexibility. Company low on debt, with good liquidity, margin, and competitive edge through technological leadership has a good chance of managing the unexpected” (Manager D, 2016). Managers C and E indicated that excessive stock volatility and low stock growth potential “could” have an effect on the degree of the exposure (Managers C/E, 2016). At the same time, the relationship between the foreign currency exposure and stock growth/volatility was viewed as “too complex in nature” by Manager F and “indirect” by Manager G to be considered a major determinant (Managers F/G, 2016). Company size was viewed as irrelevant by the majority of interviewees (Managers A/B/D/E/F/H, 2016), except for Managers B and C, due to the fact that a “variety of hedging mechanisms are available on the market” to decrease the risks (Manager E, 2016), and multiple “niche players are successfully operating” in the marketplace (Manager G, 2016). Manager C cited “costs, experience and expertise to hedge” considerations which might put smaller companies at a disadvantage (Manager C, 2016).

4.3.5 Hedging Approach

Interviewees D, E, F, G and H confirmed their companies are hedging against currency risks using a combination of methods (Managers D/E/F/G/H, 2016). Manager B indicated that “given market uncertainty, it is pretty standard practice and necessity” for the automotive manufacturers to actively hedge against currency risks: “... companies move production abroad to access local markets and for economic reasons but also to get natural hedging opportunities. Natural practices are often complimented by financial methods.” (Manager B, 2016). Three company representatives referred to consolidated corporate HQ hedging with a “holistic” focus to consider a bigger picture of macro factors, other corporate risks and future strategic implications (Managers E/F/H, 2016). The reasoning behind this is summarised by Manager H: “We hedge certain currencies but leave some unhedged as we follow a holistic hedging approach. Certain currency and commodities are naturally offsetting, so we do not hedge those. This avoids over-hedging positions to limit economic currency exposure. Today’s hedging action plan will determine currency risks for the company over time.” (Manager H, 2016). Manager B went further to imply the possibility of treating a global production network as a mechanism for managing the exposure by altering production schedule: “if available... spare capacity within a company global production and supplier networks allows for extra flexibility to exploit exchange rate variations to improve company profits...” through “scheduling output between company divisions” (Manager B, 2016). However, in addition to

the initial high costs of the strategy⁸, such geographic production readjustments are “*difficult to plan and control*” (Manager F, 2016).

4.3.6 Summary of Findings

Table 9 provides a summary of empirical findings collected from 8 interviewed respondents either specialising on or working in the automotive sector.

Table 9 Summary of Interview Respondents’ Responses

Item	Manager	A	B	C	D	E	F	G	H	Total
4.3	Perception of Currency Risk	H	M		M	M	H	H	H	-
4.3.1	Competition Intensity	Y			Y		Y	Y	Y	5/8
4.3.2	Functional Currency Strength	Y				Y		Y	Y	4/8
4.3.3	Foreign Sales / Total Sales	Y	Y	Y	Y	Y	Y	Y	Y	8/8
	Geography of Operational Portfolio	Y	Y	Y	Y	Y	Y	Y	Y	8/8
4.3.4	Financial Strength (Debt Ratio)	Y	Y		Y		Y		Y	5/8
	Flexibility (Gross Profit, Assets Tangibility/Turnover)	Y		Y	Y		Y	Y	Y	6/8
	Short-term Liquidity (Dividend Payout, Quick Ratio)	Y	Y		Y	Y		Y		5/8
	Stock Growth Potential/Volatility			Y		Y				2/8
	Company Size		Y	Y						2/8
	Competitive Advantage	Y	Y		Y		Y		Y	5/8
4.3.5	Currency Risk Hedging Undertaken				Y	Y	Y	Y	Y	8/8

Notes: 1) H = high / M = Medium / Y = Yes

2) Respondents list:

A - Deutsche Bank China

E - Dongfeng Motor

B - Santander Europe

F - Honda

C - China Association of Automotive Manufacturers

G - Changan

D - Daimler AG

H - Ford

Source: compiled by author

4.4 CASE STUDY - VOLVO CAR GROUP, SWEDEN

Further review incorporates a case study on Volvo Car Group headquartered in Gothenburg, Sweden in order to get a closer insight into the corporate foreign currency exposure determinants gauged against hedging strategy. Following an unusual acquisition by a privately owned Chinese company, Zhejiang Geely Holdings, from Ford Motor in 2010, Volvo has undergone a substantial transformation under the new entrepreneurial leadership. Until 2010, Volvo’s manufacturing footprint was predominantly constrained to Torslanda in Sweden and Ghent in Belgium to avoid eroding the “Swedishness” of the brand. The geographic concentration persisted, despite Ford’s determination to transfer some manufacturing functions

⁸ A ballpark figure is 0.5 to 1 billion USD capital investment per plant (Dong, et al., 2014)

to the US to protect against currency fluctuations which dictated unfavourable prices for Volvo models against competition in the targeted luxury segment. In the two years preceding the acquisition Volvo lost US\$ 2.6 billion (Kiley, 2009; Reed, 2010; Gara, 2012).

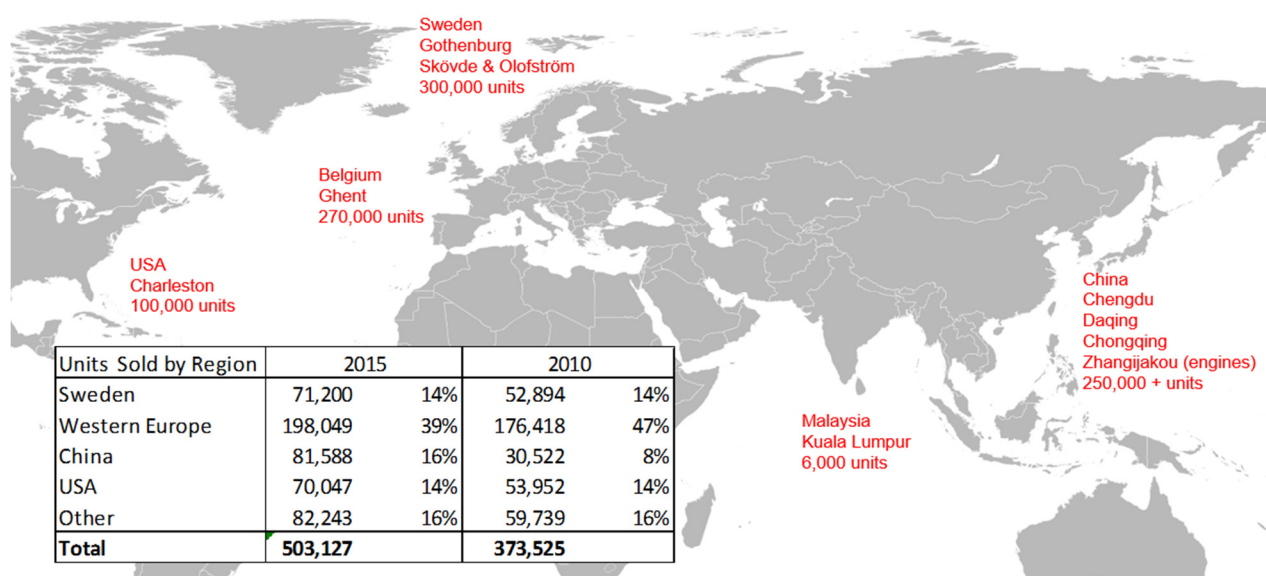
In contrast to analysts' expectations of Volvo being driven to the ground upon completing technology transfers, consistent efforts brought Volvo and Geely designs together through modular platform and components commonality for sharing the supplier networks through coordinated global procurement, assembly flexibility, cost and production time cuts (Bolduc, 2015). As a part of 11 billion USD revival campaign, the company added two assembly plants and an engine factory in China. A new 500 million USD plant in South Carolina, USA with the addition of 120 million USD subsidy by local authorities is due for opening in 2018. The US plant announcement was marked by the Volvo's CEO, Håkan Samuelsson as a vital development: "*Volvo Cars cannot claim to be a true global car maker without an industrial presence in the U.S. Today, we became that*" (Kottasova, 2015). The US factory opening was viewed as an important step in regaining the local sales volumes which dropped from 140,000 in the early 2000s to below 60,000 in year 2014.

Currency exposure determinants are considered using secondary sources of information complimented by the interview with Manager I (Manager I, 2016) and are displayed in the same sequence as in the preceding sections 4.2 and 4.3.:

4.4.1 Intensity of the Automotive Industry Competition

Volvo Car's sales focus includes for extremely competitive markets of Western Europe (53%), the USA (14%) and China (16%) with rivalry expected to intensify further in the light of continuing industry globalization – refer to *Figure 6*.

Figure 6 Volvo Cars Global Production Footprint, Capacity by 2018 & Regional Sales Breakdown 2010 and 2015



Source: (Volvo Car Group, 2015; Geely Sweden AB, 2013; Volvo Car Corporation, 2011)

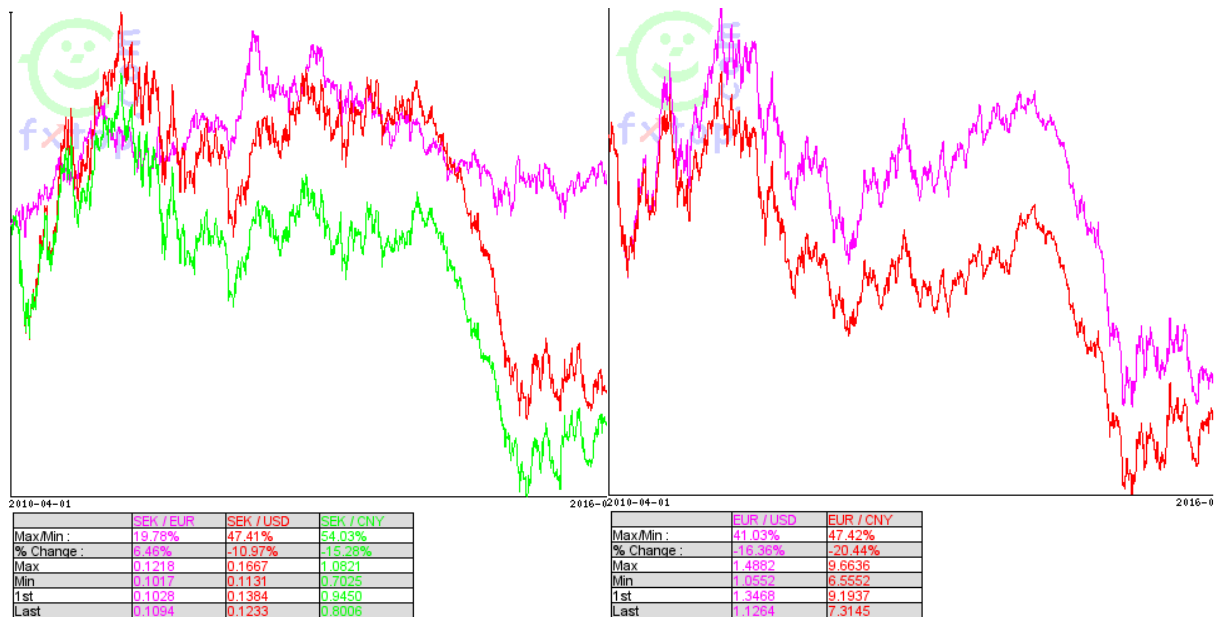
According to Manager I local competition restricts widespread use of functional currency SEK with most invoices issued to national sales companies in local currencies. Moreover, severe competitive market conditions regulate pass-through risk hedging options which might adversely affect Volvo’s financial position in the event of unfavourable rate movements. However, in the event of extreme currency moves, price adjustments take some time to ensure both authorized dealers and the company’s bottom line are protected (Manager I, 2016).

4.4.2 Functional Currency Strength

The strength of the Swedish Krona hampered exports of many Swedish corporations from 2010 to 2014 with the highest corporate exposure encountered to the EUR and USD prompting increased hedging efforts – refer to Figure 7. The temporary weakening of the Swedish krona against the USD and CNY followed up by trend reversal as a result of CNY depreciation and USD weakening. The multi-year downtrend in SEK/EUR rate also showed signs of altering in late 2015. Euro currency trends against USD and CNY show similar tendencies of development. Despite unfavourable currency headwind throughout most of the period under observation, Volvo’s gross margins consistently improved from 2011 to 2016 through due diligence in costs management, operational restructuring, and hedging strategy. The krona weakening period during 2014 and early 2015 coincided with the peaked interest and increased

demand from cosmetic and equipment upgrades and the introduction of XC90 benefiting the bottom line. Considering the substantial amplitudes of currency fluctuations with 20% SEK/EUR, 47% SEK/USD and 54% SEK/CNY volatility range over a period of six years, spreading the risks through geographic differentiation makes good sense for the company (Siers, 2013; The Telegraph, 2013; Danske Bank Markets, 2016) and (Manager I, 2016).

Figure 7 Exchange Rate Fluctuations – SEK and EUR 2010 - 2016



Source: compiled by author based on (FXTop, 2016)

With the Chinese factories introduction into the internal flow dynamics the currency outflows in CNY gradually increased over the years – refer to Table 10 Volvo Cars Currency Inflows and Outflows 2012-2015. The trend is likely to continue given the targeted switch to 25% global sourcing from China by 2020 voiced against the ultimatum to Swedish suppliers to “provide 20% price cuts or else” in 2012. Some models are designed to potentially have up to 75% components of Chinese origin starting with Volvo S60L. Group finance flows shift is further stimulated by shipments of assembled S60L vehicles from China to the USA since 2014 to counter the effects of the home currency strength putting the company at a disadvantage against premium car brands such as BMW, Mercedes and Audi. It is also influenced by a potential capacity expansion in China if the company growth strategy towards the 800,000 mark, built on new vehicles range, materializes. The CNY inflows and outflows increase is accompanied by a simultaneous decrease of the functional currency SEK. The balance of currencies will shift substantially once again as soon as the USA factory starts operating in

2018 with increased USD outflows (Reuters, 2015; Gubskiy, 2014; Agence France-Presse, 2012).

Table 10 Volvo Cars Currency Inflows and Outflows 2012-2015

Currency		2012	2013	2014	2015
CNY	Inflow	11%	15%	31%	24%
	Outflow	4%	5%	16%	17%
EUR	Inflow	23%	25%	24%	24%
	Outflow	50%	47%	62%	61%
GBP	Inflow	5%	6%	9%	9%
	Outflow			3%	4%
JPY	Inflow			3%	3%
	Outflow	4%	5%	6%	6%
USD	Inflow	18%	13%	13%	20%
	Outflow			5%	6%
SEK	Inflow	18%	19%		
	Outflow	29%	30%		
RUS	Inflow	5%	4%		
	Outflow				
Other	Inflow	20%	18%	20%	20%
	Outflow	13%	13%	8%	6%

Source: (Volvo Car Group, 2015; Volvo Car Group, 2014; Geely Sweden AB, 2013)

4.4.3 Proportion of Foreign Sales to Total Revenue and Geography of Operations

The foreign sales to total sales ratio is consistent at 86-88% (with 39-48% outside Western Europe) from 2010 to 2015. However, up until 2013, the company production was concentrated in Western Europe with 38% manufactured in Sweden and 60% in Belgium, This left the company substantially exposed to exchange rate fluctuations against the core production and procurement currencies, SEK and EUR. Manufacture and sourcing footprint relocation appeared a necessary step to reduce currency exposure by netting revenue and cost streams in the major sales markets of China and the USA covering in excess of 30% total unit sales (Volvo Car Group, 2015; Geely Sweden AB, 2013; Volvo Car Corporation, 2011). The policy focus is summarised by Manager I as follows: *“One of the strategies to get away from needing to hedge so much is to have more natural hedging, which means you really need to have industrial presence in every major continent”* (Manager I, 2016). The strategy replicates the BMW and Mercedes earlier moves to the USA to manufacture a single model (BMW X5 and Mercedes GL SUV) for use within the country and for export. The Volvo is aiming to use the US factory for multiple models using shared platform design to shift production subject to market needs. With the introduction of the USA plant in 2018, the overall global capacity will exceed 900,000

unit per annum allowing the company to flexibly manage production schedules between the sites (Volvo Car Group, 2015; Geely Sweden AB, 2013; Volvo Car Corporation, 2011). The move was described by Manager I as “*strategic to meet operational demand by region, reduce costs through global supplier network and potentially take advantage of the temporary exchange rate differentials*” (Manager I, 2016).

4.4.4 Operational Flexibility and Financial Indicators

The expansion plans within the group came at a cost to the parent company: in June 2015, Zhejiang Geely’s debts were reported to total CNY 100 billion (from CNY 8.6 billion in 2008) predominantly in the form of short-term loans. The 0.7 debt to assets ratio is well in excess of the industry mean value of 0.33 as per *Table 7 Effect of Foreign Currency Exposure and Financial Indicators*. Analysts raise concerns with regards to possible financial distress in the event of a sales slump in the next few years which could have negative repercussions for Volvo Cars due to refinancing costs being based on high leverage (Yu, 2016; Zhiming, 2016).

Operational flexibility of the company has gradually improved through consistent management efforts with gross profit margin increasing from 16% in 2012 to 22% in 2015. Taking into account superior assets turnover and assets tangibility reliably above the “industry average” over the last five years, the company is well positioned to absorb unexpected adverse fluctuations in exchange rates. Despite gradual upsurge of working capital due to increased accounts receivables and short term provisions understandable in view of the production expansion and higher volumes, short term company liquidity is guaranteed by a healthy fund of cash and cash equivalents and a revolving credit facility for EUR 660 million which remains untouched (Volvo Car Group, 2015; Geely Sweden AB, 2013; Volvo Car Corporation, 2011).

“*An unprecedented level of success in 2015...*”, “*strong continuing sales growth in the first quarter of 2016...*” and a range of “*technological upgrades*” anticipated in 2017 (Manager I, 2016) show promising development potential or competitive edge for the company, reducing susceptibility to foreign currency risks. With technology and intellectual platforms being shared within the group and annual contribution aimed to reach in excess of 1.5 billion USD in 2016, Volvo makes the 5% R&D budget work for them and remain at the forefront of the technology. Considering the recent U-turn remarkable for a niche player, the company’s focus on high-end expertise like self-drive and advances analytics reflects a potential for holding a competitive advantage based on unique product characteristics such as quality and safety to name a few (Yu, 2016).

According to Manager I smaller company size in comparison with direct competition “*does not prevent Volvo from hedging activities*” in principle (Manager I, 2016). However, the company indicates a preference for selective hedging due to some instruments being inaccessible based on costs or in some specific geographies like China. There is also acceptance of hedging risks in foregoing potential benefits of favourable rates fluctuations (Volvo Car Group, 2015).

4.4.5 Hedging Approach

Volvo Cars use a combination of hedging mechanisms as displayed in *Figure 1 Foreign Currency Exchange Rate Management* including pass-through and invoicing strategies, natural and financial instruments hedging (Manager I, 2016). The rate of exchange rate effects on cash and cash equivalents exceed $\pm 10\%$ in 3 out of 5 observed years – refer to *Table 11*. In 2011 and 2014 exchange gains considerably improved cash flow results.

Table 11 Volvo Annual Cash Flow and Exchange Rate Effects 2011 - 2015

Details / Year, M SEK	2011	2012	2013	2014	2015
Cash flow for the year	4732	-4473	5786	-1125	8679
Exchange differences on cash and cash equivalents	459	-554	-21	594	-58
% Loss or Gain	10%	-12%	-0.4%	53%	-0.7%

Source: (Volvo Car Group, 2015; Volvo Car Group, 2014; Geely Sweden AB, 2013; Volvo Car Corporation, 2011)

Volvo Car’s foreign currency exposure and hedging strategy are managed by the corporate treasury and overseen by the Audit Committee and Board of Directors through monthly status reports and quarterly and annual reviews. The focus of the strategy is on minimising the risks from foreign currency fluctuations. The risk calculations for transaction exposure are carried out using Cash Flow at Risk model with 95% confidence over one year period estimated at SEK 8 billion excluding hedges and including CNY 682 million for the Chinese industrial entities. In terms of future cash flows up to 80% could be covered over 24 months period and 60% over 48 months period with financial instruments such as forwards, options and currency swaps. The fair value of cash derivative instruments in EUR, GBP, USD, CNY, NOK AUD, CHF, CAD, and PLN amounted to SEK 1,133 million at year end 2015. The company refrains from hedging against the transaction exposure for its Chinese entities due to regulatory framework complexity with regards to derivative instruments and exposure primarily due to material purchases viewed as “relatively small” on a global scale. In 2015, the sensitivity for transaction exposure was calculated at SEK 437 million on comprehensive income due to 1% change in SEK against major currencies (Volvo Car Group, 2015).

Based on the total net assets in foreign operations of SEK 11,524 million in CNY (51%), EUR (40%), GBP, AUD, USD and other currencies, 1% shift in SEK against major currencies generates an estimated SEK 115 million net translation exposure in 2015. The risk is managed through natural hedging with debt and derivative instruments for assets and liability items and financial derivatives and liquidity control for operational items in the balance sheet. The multi-currency debt portfolio adds to SEK 21,440 million with bank loans in EUR (36%), USD (31%), CNY (24%) and SEK (7%). A fair value of the hedge reserve is SEK -186 million and liquidity is secured through a revolving credit facility for the value of up to EUR 660 million with 12 major banking groups. In 2015, the translation effect on net foreign investments was equal to SEK -175 million (Volvo Car Group, 2015).

The primary reasons for the global footprint alterations include the management focus on “*produce and source where you sell*” principle to “*match competitive moves (in production coverage), reduce transit time and improve profitability*” (Manager I, 2016). Additionally, creating a “natural currency hedging” advantage is the recurring theme running across many publications (Bolduc, 2015; The Economist, 2014; Gubskiy, 2014; Shirouzu, 2014; Tovey, 2015). This secondary goal of “*creating a natural hedge*” is reiterated by Manager I (Manager I, 2016). Constructive cooperation on group procurement and operations within the automotive group allowed Volvo to reposition the company towards developing regions by opening direct access to the mainland China. The factory locations are “*within the manufacturing clusters close to other producers and suppliers with easy transportation links*” (Manager I, 2016). Colocation with suppliers is a large part of currency hedging. Thus, Volvo’s developments in China coincided with Magna International setting up Volvo dedicated workshop in Taizhou to provide just in time production of car seating for the new platform models (NewsWire, 2016).

According to Manager I, in recent years, the company has made a consistent effort in addressing the “*predominant causes of the exposure to reduce currency risks*”. Strong emphasis was made with regards to “*long term planning*” on exposure reduction which could be achieved through operational hedging and company repositioning towards a diverse global footprint with local production to match sales revenue. Emphasis is also made on “*integrated risk awareness and management*” throughout the whole organization from sourcing through to production, logistics, and sales (Manager I, 2016).

4.4.6 Summary of Findings

Summary of Manager I's responses is shown in *Table 12*. The overall perception of currency exposure globally was established at "medium" level. The Manager I's assessment of currency exposure determinants generally coincided with other interviewed respondents' evaluations presented in Section 4.3.6 with regards to the validity of most of the proposed determinants. The two exceptions included for the company size viewed as "irrelevant" and stock volatility and stock growth potential as "not applicable to Volvo Cars due to ownership structure".

Table 12 Interview Respondent's Responses

Item	Manager	I
4.3	Perception of Currency Risk	M
4.3.1	Competition Intensity	Y
4.3.2	Functional Currency Strength	Y
4.3.3	Foreign Sales / Total Sales	Y
	Geography of Operational Portfolio	Y
4.3.4	Financial Strength (Debt Ratio)	Y
	Flexibility (Gross Profit, Assets Tangibility/Turnover)	Y
	Short-term Liquidity (Dividend Payout, Quick Ratio)	Y
	Stock Growth Potential/Volatility	N/A
	Company Size	
	Competitive Advantage	Y
4.3.5	Currency Risk Hedging Undertaken	Y

Notes: 1) H = high / M = Medium / Y = Yes / N/A = Not applicable

2) Respondents list:

I - Volvo

Source: compiled by author

This section analyses the empirical findings presented in the preceding section connecting them to the theoretical framework outlined in Section 2. The analysis addressed the determinants of foreign currency exposure. The conceptual framework is revisited in an attempt to generalize the deductions.

5. ANALYSIS AND CONCLUSIONS

5.1 ANALYSIS

The review includes the data analysis of 21 automotive companies covering 90% of the global passenger and commercial vehicle production with the purpose of identifying major determinants of foreign currency exposure. The focus is on transaction risks benchmarked against the FX effects on cash flows. The validity of the theoretically suggested determinants is carried out by analysing the reasons why seven companies shortlisted in *Table 1 Effect of Exchange Rate Changes on Cash Flows – Selected Companies in the Automotive Sector* exhibit a higher effect of foreign currency exposure of cash flows in comparison with the remaining companies in the sample. The seven companies are GM, Daimler, FCA, Honda, Mazda, Nissan and Hyundai. The data is triangulated against interview responses on individual determinants collected from nine managers specialising in or dealing with FX risks in the automotive sector. The Volvo Car Group case study provides a closer insight into the phenomenon. The sequence of the determinants analyses is retained from the preceding sections:

5.1.1 Intensity of Automotive Industry Competition

The automotive industry review carried out in Section 4.2.1 points out to the automotive sector to be “intensely competitive” based on “low concentration” CR4 ratio, “competitive” Herfindahl-Hirschman and Porter’s Five Forces assessment. With minimum movements in the top 21 list over 2 decades and 40 car producing nations, companies under review go head in most global locations. The industry profits are under fire due to regulatory, consumer and market forces so far fended off through aggressive marketing, technological and efficiency improvements, geographic diversification and product portfolio readjustment. The competitive environment is exacerbated as a result of excess capacity, cyclical industry development and unfair benefits revealed by PCW study in the form of preferential credit, subsidies, and tax reduction schemes (PWC, 2014).

As an example on an individual country level, intensely competitive situation aggravated by production overcapacity, state intervention and CNY currency devaluations is also evident in the strategically important Chinese market providing nearly a third of global sales and production. These industry features, namely competition intensity and unfair advantages gained by some competitors, are cited as prerequisites for higher currency exposure as evaluated by Bergbrant et al. (2014), Dominguez and Tesar (2006) and Bartram & Karolyi (2006) (Bergbrant, et al., 2014; Dominguez & Tesar, 2006; Bartram & Karolyi, 2006). In conditions of intensive competition the higher exposure is triggered due to restricted availability of hedging mechanisms, such as invoice currency selection and pass-through, to adjust profit margins to cover for exchange rate differentials (Dominguez & Tesar, 2006). In China, severe competition from foreign and local producers not only prevents companies from switching invoice currency to functional or passing some costs of currency devaluation onto end user, but instead prices are declining, putting extra pressure on the profit margins and further increasing the exposure. Out of the seven shortlisted companies, China is as an important source of global revenue by GM, Daimler, Honda, Mazda, Nissan and Hyundai. With the exception of Daimler exhibiting built in higher exposure due to exporting preference, the remaining five companies have established sufficient operational hedges in the form of local production facilities to withstand price adjustments for minimum impact on global operations.

The competitive environment is confirmed as an important determinant of currency exposure by five out of eight interview respondents (Managers A/D/F/G/H, 2016) as well as in the assessment made by Volvo manager based on the company's portfolio with 84% of sales in the highly competitive markets of Europe, the USA and China (Manager I, 2016). However, whilst the competition intensity explains the overall market trend, this factor in isolation does not provide an obvious answer to why the seven shortlisted companies are more effected by currency fluctuations. These companies are all mature OEMs with extensive global sales networks covering in excess of 120 countries, comfortably positioned within the top 21 industry list since 1998. On a group scale (without considering market segments), other mature companies in the top 21 sample encounter "similar" level of competition across the globe without displaying effects of currency exposure on cash flows.

5.1.2 Functional Currency Strength

The functional currency selection for the corporate entities reviewed is driven by the currency at the HQ location for consolidated statements and regional financial infrastructure surrounding

individual geographic entities (BAIC, 2014; BMW, 2014; Changan, 2014; Daimler, 2014; Dongfeng, 2014; FCA, 2015; Ford, 2014; Geely, 2014; General Motor, 2014; Honda, 2015; Hyundai, 2014; Mazda, 2015; Mitsubishi Motor, 2015; Nissan, 2015; PSA, 2015; Renault, 2014; SAIC, 2014; Suzuki, 2015; TATA, 2015; Toyota, 2015; Volkswagen, 2014). Subject to accounting practices in recording transactions in currencies other than the functional currency, the possible instantaneous impact of currency fluctuations could be drawn from the illustration FX chart of major currencies against USD presented in Section 4.2.2. Fifteen companies in the top 21 list use currencies associated with “hard” or prestigious status as a currency for consolidated financial reports. However, taking into account an imminent possibility of competitive devaluations, the strength of the functional currency against the basket of currencies within the group geographic portfolio could be considered to be an element of exposure (Clinch, et al., 2016; Bird, 2015; Thomas Jr, 2016). Also based on the CNY settlement argument, there are certain financial benefits in facilitating the use of local currencies for entity transactions within the realm of large territories with options for netting cash flows. Furthermore, the balance sheet effects could be altered using a different functional currency for subsidiary operations as accomplished by the Hyundai subsidiary (Hyundai, 2014).

Four out of eight interview respondents cited functional currency as a determinant of currency exposure during translation procedures (Managers A/E/G/H, 2016) with Managers A referring to the relationship as complex due to some groups accumulating multiple currencies as a result of mergers and acquisitions (Manager A, 2016) and Manager F pointing out the need for focus on currency portfolio optimisation instead (Manager F, 2016). The determinant is also viewed as valid by the Volvo representative (Manager I, 2016). The case study also reiterates the transitional nature of functional currency use within the company with SEK currency flows eliminated over a period of 4 years predominantly in favour of CNY, GBP, JPY and USD. However, despite theoretical predictions related to the importance of currency strength for currency exposure (Bartram & Karolyi, 2006), there appears to be no direct link between the choice of the functional currency for corporate reporting and the severity of exposure with regards to cash flow variations affecting 1 USD, 2 EUR, 3 JPY and 1 KRW companies. The remaining companies in the top 21 sample originating in the same region and operating with the same functional currencies are not affected to the same extent.

5.1.3 Proportion of Foreign Sales to Total Revenue and Geography of Operations

Empirical evidence presented in Section 4.2.3 suggests that many mature companies within the automotive sector increased their export ratios and altered geographic sales and production networks between 2004 and 2014. Some market participants achieved a good match between production footprint and sales around regional hubs. Some others like Daimler, Mazda, Mitsubishi and Toyota transformed coverage by focusing production in the domestic region while expanding sales network with potentially higher built-in currency exposure. Whereas perfect netting opportunities are impossible to achieve due to economic, regulatory, structural, and technological constraints, the diversification process is eased through widespread globalization of suppliers and learning curve in operating in local environments (Roland Berger, 2014; Crain Communications Inc, 2015; Franjicevic, 2015). Also in line with theoretical propositions that exposure is a function of net foreign sales (Jorion, 1990; Bergbrant, et al., 2014; Williamson, 2001; Dominguez & Tesar, 2006; He & Ng, 1998; Bartram & Karolyi, 2006), higher firm internationalization exhibited through export ratio tends to increase foreign currency risks based on comparison between mature players and relatively recent market entrants from India and China with smaller footprints.

Proportion of foreign sales against total sales and geographic footprint of sales and production were both considered to be vital ingredients of currency exposure being selected by all nine interview respondents (Managers A/B/C/D/E/F/G/H, 2016). The factors are viewed as equally important by Volvo representative taking into account exchange rate effects exceeding $\pm 10\%$ of cash flows during three out of the five years under review with over 85% in non-domestic sales. Nevertheless, the connection between the export ratio and geographic portfolio match and exposure severity is not straightforward if considered in isolation. There is no clear link between the severity of foreign exchange effect on cash flow for the seven companies and high variance between sales and production breakdowns by region. It coincides for Daimler, Honda, Mazda, and Hyundai, but is not so much relevant for GM, FCA, and Nissan. However, other companies relatively unaffected by the exposure also display substantial mismatch, namely BMW, Mitsubishi, Toyota, and Tata.

5.1.4 Operational Flexibility and Financial Indicators

Following the interpretation of financial indicators in *Table 7 Effect of Foreign Currency Exposure and Financial Indicators*: statistical analysis was conducted in IBM SPSS. The combination of financial parameters reviewed in Section 4.3.4 could in principle be considered

indicative of foreign currency exposure depth as they in some form define the overall operational flexibility in managing risks. However, in contravention to theoretical suggestions (Chen, et al., 2016; Smith & Stulz, 1985; Wei & Starks, 2013; Bergbrant, et al., 2014; Dominguez & Tesar, 2006; He & Ng, 1998; Aggarwal & Harper, 2010), the analysis does not indicate statistically significant correlation between the above-listed determinants and effects of foreign currency exposure on cash flow. In principle, the outcome negates the possibility of a statistical relationship (not causality) between the variables. However, the small sample size of 21 companies (or 20 adjusted for missing data) could preclude from achieving significance unless the effects are very large. There are some further problems with regards to statistical analysis of small samples. Firstly, the sample size is insufficient to test statistical assumptions (for instance, normality) which would undermine the credibility of results. Secondly, removing some observations from a small sample could result in a different outcome, which complicates extrapolating the results onto a larger population and also carries ethical implications (Bryman & Bell, 2015; Button, et al., 2013). At the same time it should be noted that test results could be affected by the selection of particular financial indicator in measuring a certain category such as a test assumption that R&D rate covers the notion of competitive advantage.

The interview respondents confirmed the importance of financial strength (Managers A/B/D/F/H, 2016), operational flexibility (Managers A/C/D/F/G/H, 2016), short term liquidity (Managers A/B/D/E/G, 2016) and competitive advantage through R&D (Managers A/B/D/F/H, 2016) in providing a safety cushion to make flexible adjustments during periods of severe currency fluctuations. Company size as impediment or impetus to hedging is viewed as irrelevant by the majority of respondent due to the popularity of derivative instruments leading to cost reduction and ease of availability, except for Managers B and C who referred to smaller companies being constrained in financial resources, experience and know-how. With the exception of Managers C and E marking it within the label “could”, stock growth potential and volatility connection to exposure is deemed too complex to establish an explicit dependence (Managers A/B/C/D/E/F/G/H, 2016). Manager I’s perspective on the operational flexibility was similar: once again financial strength, operational flexibility and comparative advantage are cited as important determinants shaping the exposure. Company size is viewed as irrelevant as niche positioning does not prevent from efficiently competing with major brands on the international arena and utilizing hedging methods like many other companies. Stock growth and volatility does not apply due to ownership structure (Manager I, 2016).

In any case, the analysis of the financial variables is not entirely indicative of why the seven shortlisted companies experience higher effects of currency fluctuations. Other companies in the top 21 sample show selected figures “inferior” to industry averages without being affected. It is hard to pinpoint the influence of particular determinants on foreign exchange exposure as discussed throughout Section 4.3.4.

5.1.5 Hedging Approach

There appears to be a disparity between the effects of FX risks and theoretical propositions on the importance of determinants discussed in Sections 6.1.1 to 6.1.4. Whilst some of the factors are exhibiting characteristics and are viewed as critical parameters in impacting the exposure, there is no clear reasoning line why the seven shortlisted companies experience the higher impact of foreign currency fluctuations on the cash flow in comparison with the remainder of the top 21 sample. There is no clear pattern emerging to enable extrapolation of results or prediction of economic risks to protect future cash flows. For instance, Mazda, a mature OEM ranked 16 in terms of unit production rates in 2014 and with sales companies in 144 countries, is sensitive to foreign currency fluctuations. The company goes head to head with other multinational operators within the intensely competitive environment. The functional currency JPY is the most volatile against the USD out of all the functional currencies reviewed, but other Japanese companies are not affected. The footprint mismatch between domestic production and sales is the highest in the sample at 53% in 2014. Although production facilities are spread across the globe in Japan, China, Thailand, Mexico, South Africa, Ecuador, Taiwan, Vietnam, Malaysia and Russia, the built-in currency exposure to USD and EUR is apparent with 30% North American and 32% European sales with minimum 8% netting configuration in North America. The company has above industry averages for debt ratio (0.35/0.33), market to book (1.82/1.43) and beta coefficients (1.671/1.27) and below industry figures for assets tangibility (0.48/0.50), quick assets ratio (0.87/0.90) and market value (9242/34813) which could shape the depth of currency exposure. However, other parameters such as gross margin (22.9/18.56), assets turnover (1.16/0.83), dividend payout (0.01/0.21) and R&D (0.04/0.03) do not ring alarm bells. There is evidence the company actively hedges against currency risks including financial hedging using Forwards against USD, EUR, CAD, AID, GBP, RUB and THB. However, there is no precise equation how the determinants shape higher sensitivity to FX fluctuations for Mazda. Some of the other companies share similarities with these metrics without displaying volatility of cash flows (Mazda, 2015). What warrants such outcome?

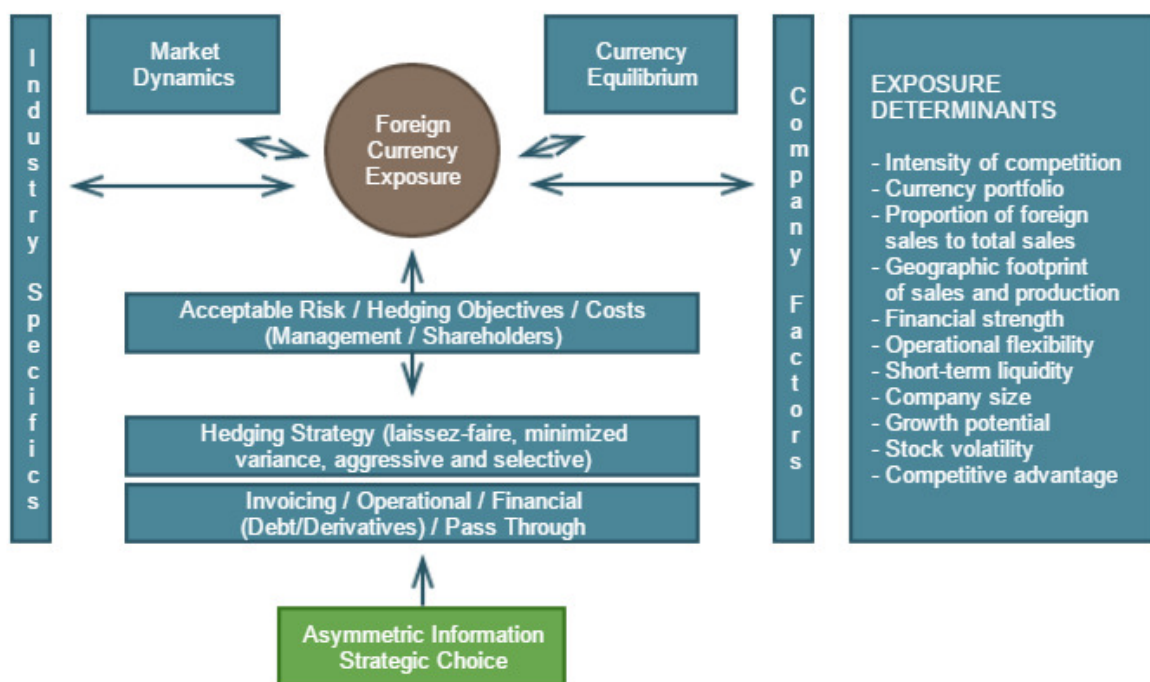
Whilst the list of the currency exposure determinants evaluated in this project might not be exhaustive... given the gap between the determinants discussed in Sections 5.1.1 to 5.1.5 and the result of FX exposure, the potential reasoning could be in the different approaches towards hedging as suggested by Bartram et al and Bodnar et al (Bartram, et al., 2010; Bodnar, et al., 2002). As indicated in the empirical section, all the companies under review utilize some form of hedging to mitigate currency fluctuations. However, in addition to differing hedging objectives, risk profiles and resources, there are elements of tactical strategic moves coupled with asymmetric information. In this context, calculated strategic decision making implies that some companies intentionally utilize selective hedging or limiting risk mitigation measures due to giving priority to other business issues despite the threat of increased foreign currency effects. Additionally, the notion of asymmetric information is used in the broad sense and encompasses imperfect information possessed by individual companies, varying expertise in assessing, forecasting and hedging risks, internal structural and implementation issues and difficulties in adopting turnaround policies. This could be illustrated by the Lexus' reluctance in establishing production facilities in China (Section 4.2.5), Volvo's delayed decision in opening manufacturing plant in the USA (Section 4.4) and Daimler's production footprint concentration in Europe (Section 4.2.3) despite sales being affected by currency fluctuations. In essence, information asymmetry and strategic decision making are natural phenomena, taking into account the multifaceted priority aspects in corporate reality from social responsibility to ethical compliance and financial performance. However, under certain circumstances, asymmetric or/and tactical decisions could be detrimental to the company in terms of negative foreign currency effects... if... these are viewed as a benchmark for corporate performance.

5.2 REVISITING THE CONCEPTUAL FRAMEWORK

In principle, the model of corporate foreign currency exposure as devised in *Figure 2* works to explain major determinants prompting the occurrence of currency risks, a basic mechanism of decision-making to reduce the risk through hedging as well as a hedging scope. However, taking into account the assessment in Section 5.1 the model requires revision. There is a considerable flaw in the design which does not address asymmetric information and deliberate strategic inclinations which shape the hedging strategy and in turn define the depth of the exposure. Decisions based on “incomplete” details and “calculated risk” are likely to result in irregular outcomes which could not be fully explained by the shortlisted determinants. This

discrepancy is likely to clarify the difficulty in establishing an explicit link between the determinants under review and the severity of effects of foreign currency fluctuations on annual cash flow for the seven shortlisted companies. Whilst the list of determinants explored and additional asymmetry parameters might not complete the picture on currency exposure phenomenon due to its complexity, a better understanding of the supplementary exposure ingredients could improve forecasting of economic currency risks. Consequently, a revised conceptual framework is presented in *Figure 8*.

Figure 8 Revisited Model of Corporate Foreign Exchange Exposure and Hedging Determinants



Source: created by author

Despite some pros and cons put forward in Section 5.1 with regards to individual drivers of exposure as applicable to the automotive industry, in conditions of a relatively stable financial situation, the degree of the exposure is shaped by market dynamics and industry and firm specifics. These encompass competition intensity, functional currency selection, the proportion of foreign sales to total sales and geographic footprint match between sales and production, financial strength, operational flexibility, short-term liquidity, growth potential resulting from comparative advantages. Some doubts are cast over the impact of company size and stock growth potential and volatility, but these are retained within the model due to potential applicability for other economic sectors or requiring further research. However, in addition to the risk acceptance, hedging objectives and costs, the scope of the hedging strategy and

consequently the depth of the exposure are in part defined by the information asymmetry and strategic choices of corporate decision makers. The selected hedging mechanism aims to protect the company in the short run and also shapes the exposure and provides coverage for economic risks few years down the line. In turn, the altered exposure of individual companies also influences industry and market dynamics and financial infrastructure based on industry importance globally. In the event of extreme currency swings, the disequilibrium will temporarily increase corporate currency exposure and hedging strategies will need to be adjusted accordingly. For reviews of individual companies, the determinants of exposure and mitigating measures should be considered altogether as these covariate to continuously alter the effects of exposure.

In this section the summary of the thesis and the main findings drawn from the analysis in Section 5 are presented. Managerial implications are followed up by suggestions for further research.

6. CONCLUSIONS

The purpose of the project is to assess the automotive industry and test theoretical propositions on the determinants of corporate foreign currency exposure assessed against FX effects on cash flow. Whilst the phenomenon of foreign currency exposure attracted much attention from academic and business researchers, there is a lack of empirical evidence with regards to the impact of exposure determinants on particular industry segments. This work evaluates 21 automotive manufacturers covering 90% of passenger and commercial vehicle production over a period of 5 years between 2010 and 2015. The study adopts predominantly external perspective with the analysis of industry features and company indicators triangulated against interview material with representatives of relevant organizations and the case study on Volvo Cars. The currency exposure determinants identified as valid as a result of the relevant literature review are tested against the seven companies shortlisted as exhibiting a higher effect of currency exposure as displayed in *Table 1 Effect of Exchange Rate Changes on Cash Flows – Selected Companies in the Automotive Sector*.

Findings

With reference to the research question, the findings could be summarised as follows:

What are the determinants of foreign currency exposure in the automotive industry?

The evaluation confirms the assessment by Ito et al. (2013) with regards to the automotive industry being sensitive to currency fluctuations. In the relatively stable period between 2010 and 2015, the majority of the companies inspected are subject to the FX impact with foreign currency effect for seven out of 21 shortlisted firms exceeding $\pm 10\%$ of operational cash flows. The findings suggest that currency exposure is shaped by industry and company specific factors as well as ongoing hedging measures taken by market participants. Although none of the factors are identified as “defining” in explaining currency exposure, in combination, the exposure determinants identified within the theoretical framework are relevant for the automotive sector. Automotive companies operate in an intensely **competitive environment** exacerbated by

unfair advantages gained by some participants which limits the scope of hedging practices. Sales presence requirements and strategic goals dictate the **functional currencies selection, export ratio** and **geography of sales and production footprints**. Although not statistically proven but confirmed by interview respondents, the exposure is also defined by **operational flexibility driven by financial strength, relative operational freedom, short-term liquidity and R&D investment as a proxy for competitive advantage**. The **firm size and stock growth potential and volatility** factors analysis is inconclusive and requires further evaluation.

The combination of the above factors does not provide an explicit justification for why some companies are more affected than others to allow for the prediction of economic currency risks, based on the benchmark against the seven shortlisted companies exhibiting higher exposure. Given the gap between the theoretical determinants and the result of FX exposure, it appears, the exposure is minimized by businesses **actively hedging** using a variety of mechanisms including invoicing and pass through techniques, operational and financial strategies (Ito, et al., 2013). The depth of the hedging strategy is shaped by a combination of hedging objectives, internal resources and risk profile. Additionally the information asymmetry phenomenon and strategic decision making should be taken into account. Imperfect information reflected in varying risk management expertise, structural and implementation issues as well as calculated tactics in withholding hedging measures could have a substantial impact on company performance. The resulting repercussions for the automotive companies in terms of FX exposure are valid for both imminent and long-term economic results.

Contribution and Managerial Implications

Whilst the list of the determinants is not necessarily exhaustive, the model devised as part of the analysis allows individual companies to identify crucial elements of the exposure against the checklist and compare performance to effective competition relevant to the brand. The existing hedging mechanism could then be fine-tuned to address the vital causes of company exposure from a long-term strategic perspective. The modern mantra of building products where they are sold as a primary hedging mechanism against currency risks might not be suitable for all to protect their brand identity. In conditions of increased currency volatility, more dynamic hedging strategies might be more beneficial. Alternative mechanisms through the netting of global supplier and customer invoices, currency debt portfolio, and financial

hedging could be utilized instead. A deeper understanding of exposure drivers would allow to tactically redistribute corporate hedging budgets.

The realistic outlook suggests that the review of foreign currency risks is just one of the many managerial functions for a multinational organization and potentially could be very low on the list of management priorities. However, the deeper awareness of asymmetric outcomes resulting from poorly calculated tactical solutions and imperfect information should prompt a more thorough evaluation throughout strategic planning by striving to obtain industry intelligence on the market and competitive moves and make comprehensive risk assessments.

Limitations and Further Research Suggestions

Corporate currency exposure is a viable and diverse field for further research. In addition to the project limitations addressed in the methodology section, the discussion would benefit from a further insider perspective to provide a better understanding of managerial decision reasoning on the depth of application and combination of hedging methods, historical changes in the hedging behaviour and practices and other endogenous factors. Furthermore, the focus could be directed to the evaluation of hedging strategies success in efficiently mitigating the exposure. Additionally, expanding the project sample could potentially shed some further light towards the understanding of the foreign currency risk determinants in the automotive sector.

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Manager E (2016, April 12) Dongfeng Motor, Telephone Interview
Manager F (2016, May 3) Honda, Telephone Interview
Manager G (2016, March 31) Changan, Telephone Interview
Manager H (2016, April 26) Ford, Telephone Interview
Manager I (2016, May 4) Volvo Cars, Telephone Interview

Annex 1. Semi-structured Interview Template – Automotive Companies

What are the major determinants of foreign currency exposure for your company (more than one could apply):

- intensity of competition
- functional currency strength
- proportion of foreign sales to total sales
- geographic footprint in terms of sales and production
- financial strength
- operational flexibility
- short term liquidity
- company size
- growth potential
- other (please specify)

Your company assessment of global foreign currency risk in view of recent wave of currency devaluations:

- non-existent
- low
- medium
- high
- other (please specify)

What are the main reasons for your company hedging strategy?

- dampening income and cash flows volatility
- reducing costs of financial distress
- tax advantages
- hedging used to boost internal finance when external debt is costly
- risk averse strategy expected by investors
- other (please specify)

What hedging mechanisms does your company use? Could you provide further details?

- invoice currency
- operational hedging (diversification, risk shifting/sharing, price adjustment clauses, netting)
- foreign currency debt
- derivative instruments
- pass through pricing to customers

Do you consider that your company has a substantial exposure to China and Chinese Yuan Renminbi? Do you use Chinese Yuan Renminbi for transactions inside China?

Has the internationalization of Chinese Yuan Renminbi influenced your foreign currency risk measures? In what way?

Does your company consider using Chinese Yuan Renminbi for transactions outside China? Is this likely to increase or decrease foreign currency risks?

Annex 2. Semi-structured Interview Template – Business Support Organizations

Many automotive companies have a substantial exposure to China. Do you feel the business environment is improving with the internationalization of Chinese Yuan Renminbi?

In your experience are many companies seeking advice or switching to settlement of invoices in Chinese Yuan Renminbi?

Are there any financial or administrative benefits of switching to settlement of transactions in Chinese Yuan Renminbi?

Is the internal financial infrastructure well developed to ease the switch over decision?

Does the size of the company matter? Are there any other prerequisites?

Are corporations using Chinese Yuan Renminbi for transactions outside China? Is this likely to increase or decrease foreign currency risks?

How do you rate foreign currency risk in view of recent wave of currency devaluations:

- non-existent
- low
- medium
- high
- other (please specify)

What are the major determinants of foreign currency exposure for multinational companies operating in China (more than one could apply):

- intensity of competition
- functional currency strength
- proportion of foreign sales to total sales
- geographic footprint in terms of sales and production
- financial strength
- operational flexibility
- short term liquidity
- company size
- growth potential
- other (please specify)

Annex 3. Semi-structured Interview Template – Bank

How do you rate global foreign currency risk in view of recent wave of currency devaluations:

- non-existent
- low
- medium
- high
- other (please specify)

What are the major determinants of foreign currency exposure for multinational companies (more than one could apply):

- intensity of competition
- functional currency strength
- proportion of foreign sales to total sales
- geographic footprint in terms of sales and production
- financial strength
- operational flexibility
- short term liquidity
- company size
- growth potential
- other (please specify)

Many automotive companies have a substantial exposure to China. Are there any benefits of switching to settlement of transactions in Chinese Yuan Renminbi?

Do you see an increase in Chinese Yuan Renminbi for transactions inside China?

Does the bank provide services for clearing transactions in Chinese Yuan Renminbi?

Is the internal financial infrastructure well developed to ease the switch over decision?

Does the size of the company matter? Any other conditions need to be met?

Has the internationalization of Chinese Yuan Renminbi influenced foreign currency risk measures for companies operating in China? In what way?

Are corporations using Chinese Yuan Renminbi for transactions outside China? Is this likely to increase or decrease foreign currency risks?