FACULTY OF ECONOMICS TUL

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The Effect of Foreign Exchange Rate Fluctuations on the Financial Performance of Multinational Corporations

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THE EFFECT OF FOREIGN EXCHANGE RATE FLUCTUATIONS ON THE FINANCIAL PERFORMANCE OF MULTINATIONAL CORPORATIONS

Annotation

This diploma thesis examines the influence of changes in the EUR/USD exchange rate on the financial outcomes of multinational car manufacturers. It focuses on companies like Volkswagen, BMW, Mercedes-Benz Group, Stellantis, and Renault, using data collected between 2012 and 2023. The analysis studies how fluctuations in currency values relate to revenues, profits, return on assets, and return on equity. Through correlation analysis, the research identifies which companies are more vulnerable to exchange rate changes. The results show that firms with a greater dependence on international sales, especially those in the luxury segment, are more exposed to currency risks. The thesis also highlights the role of diversification and financial strategies in reducing these impacts.

Key Words

automotive sector, currency risk, exchange rate, financial analysis, multinational enterprises, profitability, revenue fluctuation.

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List Of Abbreviations

COGS – Cost of Goods Sold

ECB – European Central Bank

EUR/USD – Euro to US Dollar Exchange Rate

EVA – Economic Value Added

FRED – Federal Reserve Economic Data

FX – Foreign Exchange

IRP – Interest Rate Parity

MNCs – Multinational Corporations

MVA – Market Value Added

NOPAT – Net Operating Profit After Tax

Pdomestic = Price of a good in the domestic country

PPP – Purchasing Power Parity

p-value – Probability Value (Statistical Significance Indicator)

Pforeign = Price of the same good in the foreign country

ROA – Return on Assets

ROE – Return on Equity

id = Domestic interest rate

if = Foreign interest rate

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Introduction

Managing financial performance has become increasingly complex for multinational corporations operating in multiple currency environments.

Exchange rate volatility directly affects revenues, production costs, asset values, and overall profitability. As these firms engage in cross-border transactions, monitoring currency risks becomes critical for maintaining stability and competitiveness.

Foreign exchange exposure is typically categorized into three types. Transaction exposure involves gains or losses from payments in foreign currencies. Translation exposure affects how subsidiaries' financial statements are consolidated into the parent company's currency. Economic exposure refers to the broader, long-term impact on a company's market value and cost competitiveness due to exchange rate changes.

A well-informed understanding of these exposures is crucial not only for financial managers but also for investors and analysts. Firms that manage foreign exchange risks effectively tend to enjoy more predictable earnings and stronger investment appeal. On the other hand, companies without proper hedging strategies may face sharp fluctuations in performance.

To examine the influence of exchange rate changes, financial tools like trend analysis and correlation analysis help identify meaningful patterns and relationships. These techniques allow researchers to observe whether exchange rate movements are associated with shifts in financial outcomes.

The goal of this thesis is to investigate the impact of exchange rate fluctuations on the financial performance of multinational automotive companies. By examining the euro to US dollar exchange rate, the study seeks to identify measurable relationships between currency movements and key financial indicators—total revenue, net profit, return on assets, and return on equity.

The research evaluates four core financial indicators: total revenue, net profit, return on assets, and return on equity. By using financial data from 2012 to 2023, the study aims to uncover measurable links between exchange rate trends and company

performance. Rather than presenting abstract theory, this thesis applies real-world data and statistical methods to offer insights into how exchange rate volatility influences multinational financial results—and what strategies might help mitigate its effects.

1 Theoretical Concepts of Business Financial Performance Evaluation

Business financial performance evaluation is rooted in a conceptual framework that examines a company's financial health, operational efficiency, and long term sustinability. This framework draws upon principles of accounting, finance, and economics to assess how effectively a business utilizes its resources to achieve profitability, maintain liquidity, and create shareholder value. Central to this evaluation is the interpretation of financial statements such as the balance sheet, income statement, and cash flow statement along with the application of financial ratios and advanced analytical tools.

These analyses enable stakeholders to gain insights into a company's current financial condition, historical trends, and future growth potential. The theoretical foundation also considers the broader economic, industry, and market contexts that influence a firm's performance, ensuring a comprehensive and strategic assessment of financial outcomes (Penman, 2013).

1.1 The Development of Performance Evaluation Techniques

According to various scholars, performance measurement methods have evolved significantly over time, driven by changes in business operations and societal needs. The origins of performance measurement can be traced back to double-entry bookkeeping, developed in the 13th century as the first formalized method of recording financial transactions (Ammar and Stone, 2017). It remained dominant until the 19th century when the Industrial Revolution began reshaping business environments, introducing new practices like mass production, and highlighting the need for more complex performance evaluation methods (Bititci, 2015). The rise of salaried positions and organizational hierarchies during this time marked a shift in how performance was managed, with greater emphasis on control and efficiency (Kaplan and Norton, 1992).

In the mid-20th century, during the early stages of globalization, methods to regulate productivity became more sophisticated. Approaches like quality control and

operational efficiency were introduced, reflecting the growing need to manage and measure production in expanding markets (Micheli and Manzoni, 2010).

Despite these advancements, the primary focus was still on profitability, with businesses seeking to maximize output volume and reduce costs (Wagner, 2009). However, by the 1980 s, performance assessment began shifting towards a more comprehensive approach, emphasizing not only profitability but also quality, customer satisfaction, and adaptability (Bititci, 2015).

This period saw a reorientation of business strategies, with a stronger focus on long-term sustainability and competitive advantage rather than short-term profit maximization (Kaplan and Norton, 2001).

1.2 Fundamentals of Financial Analysis

Financial analysis involves reviewing and interpreting a company's financial data to assess its performance, financial condition, and growth prospects. This process typically includes analyzing critical financial statements such as the income statement, balance sheet, and cash flow statement to evaluate aspects like profitability, solvency, and liquidity. Common methods used in financial analysis are ratio analysis, which compares financial indicators like Return on Equity for profitability and the Current Ratio for liquidity, and trend analysis, which looks at changes in financial figures over a period.

Additionally, vertical and horizontal analyses are applied to compare financial information across multiple periods or against industry standards.

1.3 Significance of Data in Financial Analysis

Data is essential in financial analysis as it helps businesses track performance, manage risks, and make informed decisions. Without accurate data, companies cannot assess profitability, plan investments, or identify financial risks.

One key role of data is in decision-making analyzing revenue and expenses helps businesses spot trends and adjust strategies. It also supports risk management by detecting potential financial threats like cash shortages or rising costs, allowing companies to take action.

Financial data also improves efficiency by helping businesses cut unnecessary costs and optimize resources. Additionally, it guides long-term planning, ensuring companies make smart investment and expansion decisions.

In summary, data is a powerful tool that helps businesses stay financially stable, reduce risks, and grow successfully in a changing market.

1.4 Methods for Measuring Performance

Performance measurement methods have transformed into flexible and dynamic systems to address the growing complexity and competitiveness of global markets. Modern businesses are under constant pressure to enhance their operations and gain a strategic advantage by adopting advanced assessment techniques (Kaplan and Norton, 1996).

These methods integrate theoretical principles with practical applications, enabling organizations to align their goals with evolving market demands. As external factors such as economic fluctuations, technological advancements, and social trends emerge, businesses must adapt their performance frameworks to identify opportunities and mitigate risks effectively (Neely, 2007). This, adaptability ensures organizations remain competitive and capable of achieving long-term success.

1.4.1 Financial Ratio Analysis

Financial Ratio Analysis is a powerful method used to evaluate a company's financial strength, operational effectiveness, and overall performance by interpreting key figures from its financial statements. This approach equips stakeholders—such as investors, creditors, and company leaders—with the insights needed to make well-informed decisions regarding the business's financial standing.

By analyzing and comparing financial data over time, ratios uncover trends and relationships that reflect how the company has performed historically. While they primarily provide a look at past performance, their value often lies in guiding expectations and strategies for future outcomes.

1.4.2 Sources for Financial Ratio Analysis

Financial ratio analysis relies on accurate and reliable financial data. The main sources for this data include a company's published financial statements, such as the balance sheet, income statement, and cash flow statement. Additional information can be found in annual reports, investor presentations, and regulatory filings submitted to authorities like the SEC. Financial databases such as Bloomberg, Thomson Reuters, and Morningstar also provide comprehensive financial data for ratio analysis. Internal company reports, industry benchmarks, and audited accounts further enhance the depth and credibility of the analysis (Eiteman, Stonehill, and Moffett, 2016).

Balance Sheet

The **Balance sheet** is a financial statement that captures a company's financial position at a given moment, based on the principle that assets are equal to the sum of liabilities and equity. Assets represent the resources a company controls, liabilities reflect its financial obligations, and equity signifies the owners' stake in the business after settling debts.

This document is essential for evaluating a company's financial stability, its ability to meet obligations, and the efficiency of its resource utilization, providing stakeholders with a clear understanding of its overall financial health (Eiteman, Stonehill and Moffett, 2023).

$$Assets = Liabilities + Equity \tag{1}$$

Income Statement

The **Income statement**, also known as the profit and loss statement, summarizes a company's financial performance over a defined period. It shows the total revenues

earned, the expenses incurred, and the resulting profit or loss. This financial report is crucial for evaluating the company's ability to generate profit, manage costs, and sustain operations.

It offers a clear picture of the company's financial outcomes from its operations and other business activities, providing stakeholders with insights into its financial health and operational efficiency (Bekaert and Hodrick, 2017).

Cash Flow Statement

A **Cash flow statement** is a financial report that illustrates the movement of cash within a company over a specific period. It breaks down into three key categories: **operating activities, investing activities, and financing activities**. The operating activities section highlights the cash flows related to the company's day-to-day business operations, revealing how effectively it generates cash through its core activities. The investing activities section captures the cash flow tied to the purchase and sale of long-term assets, such as property and equipment.

Lastly, the financing activities section reflects cash transactions related to borrowing, repaying debt, issuing stock, or distributing dividends.

This statement is crucial for evaluating a company's liquidity, ability to fulfill financial obligations, and overall financial stability, providing an insightful view into its cash flow management (Eun and Resnick, 2014).

1.4.3 Vertical Analysis

Vertical analysis is a technique used in financial statement analysis where each item is shown as a percentage of a key figure. On the income statement, this base figure is usually total revenue, while on the balance sheet, it is typically total assets.

This method simplifies comparisons between companies of varying sizes by converting financial data into a standardized form. It helps in understanding how different elements of a company's financials contribute to its overall performance,

offering valuable insights into cost structure, profitability, and financial health (Wild, Subramanyam And Halsey, 2007).

1.4.4 Horizontal Analysis

Horizontal analysis focuses on evaluating the changes in financial data over multiple periods. By calculating the percentage change of each line item from one period to another, horizontal analysis helps identify trends, growth rates, and potential financial issues. This method is particularly useful for spotting long-term patterns in revenue, expenses, and profitability, and it is effective for forecasting future financial performance based on historical data (Fraser and Ormiston, 2010).

1.5 Financial Ratios

Financial ratios are simple but powerful tools that help evaluate a company's financial health. They take information from the company's financial statements and turn it into meaningful numbers that show how well a business is doing. According to (Bekaert and Hodrick 2017), financial ratios are essential for understanding profitability, liquidity, efficiency, and risk.

They help compare a company's performance over time or against other businesses. Eiteman, (Stonehill, and Moffett 2023) also highlight that ratios give quick insights into whether a company is using its assets effectively and whether it's a safe investment.

Without ratios, it would be much harder to spot trends, risks, or areas needing improvement. Ratios like return on assets and return on equity are especially important because they show how well a company uses its resources to make profits (Eun and Resnick, 2014).

1.5.1 Liquidity Ratios

A company's capacity to settle its debts when they become due is measured by liquidity ratios. A corporation that lacks sufficient funds may not be able to take advantage of its economic customers or fulfill its financial obligations, which could

result in insolvency or, worse, bankruptcy. As a result, liquidity and solvency are explicitly related. More specifically, a company's liquidity is a critical component of its solvency. In the long run, a solvent business has no trouble repaying its debts, and it is evident that it can continue as is.

The idea of solvency demonstrates in detail if a business can pay out its obligations as they become due. Liquidity ratios can also be used to assess how well a business handles unforeseen cash requirements. Liquidity shouldn't be too high because financial resources are invested in non-returning assets, nor should it be too low because a company may not be able to pay its debts. The following factors need to be considered while assessing the liquidity ratio. First off, assets and liabilities that are more liquid can be changed more readily over time.

As a result, it is easy for the ratios to become obsolete. Second, future cash flows to the business, which are overlooked while calculating the ratios, have a significant impact on the degree of liquidity. (Kaldybekova, 2018) liquidity ratio is a ratio that describes a company's ability to meet short-term (debt) obligations. This implies that the business will be able to pay the debt, especially the one that is due, if it is billed. declared differently, the liquidity ratio is used to demonstrate or measure the company's capacity to meet its responsibilities, including those payable to external parties (business entity liquidity) and internal company (company liquidity). As a result, it may be said that this ratio is helpful in assessing the company's capacity to finance and pay off debt when it becomes due. (Ali et al., 2018)

$$Quick\ Ratio\ =\ Current\ Assets\ -\ Inventory\ Current\ Liabilities \tag{2}$$

1.5.2 Solvency Ratios

The ability of a business to pay off its long-term debt is determined by financial leverage ratios. By using financial leverage ratios, we can determine whether a business can manage debt interest costs with regular operations or if it will need to look for more funding to cover them. If this responsibilities is not fulfilled, bankruptcy or at the very least a significant shift in business practices may result. To determine a company's long-term solvency. (Brooks, 2015)

$$SolvencyRatio = \left(\frac{Net\ income + Depreciation}{Total\ Liabilities}\right) \times 100 \quad (3)$$

1.5.3 Efficiency Ratio

Efficiency ratios are important tools used in financial analysis to help businesses understand how well they are using their resources to generate revenue and manage day-to-day operations. These ratios measure key aspects of a company's performance, showing how efficiently it operates in areas like asset usage, inventory management, and receivables collection. In today's fast-paced business environment, keeping track of these ratios is essential for staying competitive and achieving long-term growth. Monitoring efficiency ratios helps businesses improve their operations and make informed decisions. (Majka, 2024)

$$Inventory\ Turnover\ Ratio = \frac{Cost\ of\ Goods\ Sold\ (\ COGS\ )}{Average\ Inventory} \quad (4)$$

$$Receivables\ Turnover = \frac{Net\ Credit\ Sales}{Average\ Account\ Receivables} \quad (5)$$

1.5.4 Market Value Ratio

Market value ratios create a relationship between a company's book value per share, cash flow, and earnings and its stock price. The value of one company's shares in relation to another can be determined using market value ratios. (Brigham and Ehrhardt, 2016)

1.5.5 Profitability Analysis

Profitability analysis is a key component of financial performance evaluation that focuses on assessing a company's ability to generate profit relative to its revenues, assets, equity, or other financial metrics. The purpose of profitability analysis is to measure the efficiency with which a company turns its resources into profits, helping stakeholders understand the company’s financial health and its capacity to generate value (Fraser and Ormiston, 2010).

Net Profit Margin

By dividing net income by sales, one may identify the net profit margin, commonly known as the profit margin on sales or simply the profit margin. The profit per dollar of sales is displayed.

Net income, often called the "bottom line" is the profit left after subtracting all expenses, including costs, taxes, and interest, from total revenue. It reflects the actual earnings for a period and is a key measure of a company's profitability. In sectors like retail and e-commerce, net income is especially important as revenue increases don't always mean higher profit.

$$Net\ Profit\ Margin\ =\ Net\ Income\ Revenue\ x\ 100 \tag{6}$$

Gross Profit

Gross profit measures a company's financial health by subtracting the costs directly tied to producing goods and services (known as the cost of goods sold or COGS) from its total revenue. It reflects the profitability of a company's core operations before considering other expenses like marketing, administrative costs, or taxes. The gross profit margin, calculated as the percentage of sales remaining after deducting COGS, helps assess how effectively a company controls its production costs. A higher gross profit margin typically signals better cost efficiency, as more of the revenue is available to cover other operating costs and contribute to net profits (Brigham & Ehrhardt, 2016).

$$Gross\ Profit\ Margin =\ Gross\ Profit\ Revenue\ \ x\ \ 100 \tag{7}$$

Return On Assets

Return on Assets measures how effectively a company is utilizing its assets to generate profit. It helps assess the efficiency of a company in using its asset base to produce earnings. A higher ROA suggests that the company is making good use of its assets to generate profits, while a lower ROA may indicate that the company's assets are not being fully utilized to create value.

For Multinational Corporations the ROA is affected by the asset structure in different regions, as well as by the fluctuations in foreign exchange rates. These variations can influence both the value of assets and the income generated from them, making ROA an important indicator for evaluating the performance of MNCs across different markets. (Brigham And Ehrhardt, 2016)

$$Return\ on\ Assets = \frac{Net\ Income}{Total\ Assets} x100 \tag{8}$$

Return on Equity

Return on Equity measures how well a company can generate profit using the equity invested by its shareholders. It’s generally calculated using average equity over a period to adjust for any discrepancies between the income statement and balance sheet. The formula compares a company’s net income to its equity, providing insight into how much profit is generated from the shareholders’ investment.

ROE reflects the ability of a company to use its equity to generate earnings. A higher ROE indicates better use of invested capital, suggesting efficient management. A lower ROE may signal that the company isn't using its equity effectively, which could lead to lower profitability (Brooks, 2015).

$$Return\ on\ Assets = \frac{Net\ Income}{Share\ Holder's\ Equity} x100 \tag{9}$$

For MNCs, ROE is impacted by FX fluctuations because the translation of foreign earnings and the movement of currency values can distort reported equity values and profits.

1.6 Benchmarking

Benchmarking is the process of comparing a company's current performance to either its competitors' or its own past performance. It offers a measurable standard of comparison. [6] Comparisons are a part of ratio analysis. The ratios of a business are compared with those of other businesses in the same sector, or with industry averages. Like most businesses, MicroDrive's managers take it a step further, though, by comparing their ratios to those of a more select group of the top computer

companies. This method is known as benchmarking, and the businesses that are compared are known as benchmark companies. (Brigham And Ehrhardt, 2016)

1.7 Market Value Added

Market Value Added is a measure of shareholder wealth that represents the difference between the market value of a company's stock and the total equity capital invested by shareholders. It indicates the value a company has created (or destroyed) for its shareholders over time. A positive MVA means the company has generated value beyond the capital invested, while a negative MVA suggests the opposite (Brigham and Ehrhardt, 2016)

1.8 Economic Value Added

Economic Value Added concentrates on managerial effectiveness in a particular year, while MVA evaluates the impact of managerial decisions since the company's founding. A company's actual economic profit for the year is estimated by economic value added, which is very different from accounting profit. (Brigham & Ehrhardt, 2016)

$$EVA = NetOperatingProfitAfterTaxes(NOPAT) - (CapitalEmployed \times CostofCapital). \quad (10)$$

1.9 Balance Scorecard

In order to assist organisations in transforming their vision and strategy into practical measures, Robert Kaplan and David Norton created the Balanced Scorecard in the early 1990 s. With the goal of improving performance and outcomes, it enables businesses to evaluate their progress by providing feedback on both internal and external processes. The BSC provides a more comprehensive viewpoint by covering four important areas, in contrast to previous systems that primarily concentrate on financial metrics:

- Financial Perspective: Indicators of an organization's financial success, such as cash flows and financial ratios.
- Customer perspective: emphasises client satisfaction by examining data such as survey results and customer service time.
- Internal Procedures: Evaluates important corporate procedures to make sure they satisfy shareholders' and customers' needs.
- Learning and Growth: Assesses elements such as staff training and development to provide continuous enhancement and flexibility.

The BSC's primary benefit is that it helps employees at all levels concentrate on the key factors that contribute to success by coordinating an organization's strategy with quantifiable objectives. The time and dedication needed to completely incorporate it into the organisation, however, can make implementation difficult. It frequently takes more than two years.

In conclusion, by linking performance indicators to long-term objectives, the BSC assists organisations in realising their strategy; yet, for optimal efficacy, consistent work at all levels is necessary. (Akbarzadeh, 2012)

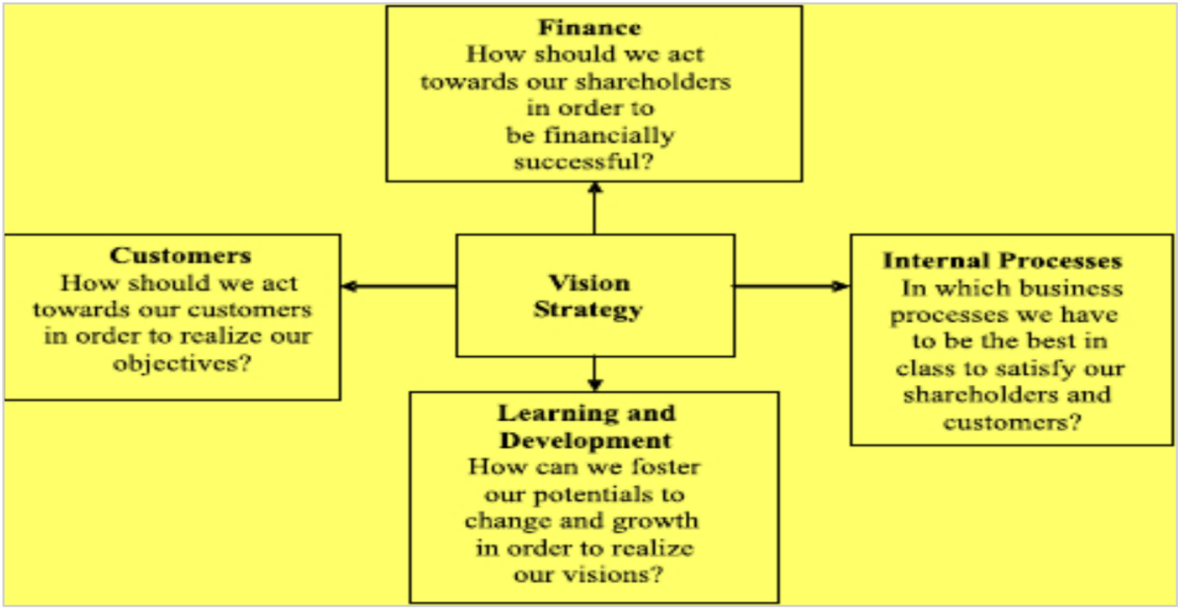

Figure 1: The methodology of the Balanced Scorecard
Source: Akbarzadeh, 2012

1.10 Cash Flow Analysis

Cash flow analysis involves reviewing a company’s incoming and outgoing cash to assess its financial health and liquidity. This process helps determine the company’s ability to meet its financial commitments, cover day-to-day operational expenses, and invest in future growth opportunities. It offers valuable insights into the company's financial stability, operational effectiveness, and capacity to generate cash (Eiteman et al., 2023; Bekaert And Hodrick, 2017).

2 Foreign Exchange Rate

Every nation in the world issues currency for use in business operations. The pound sterling (symbol ₤) is used in England, The yen (¥) in Japan, the peso in Mexico, and so forth. Almost every nation on the planet has its own currency. The exception is the euro (€), which is now used by 18 EU members and six states that do not participate in the EU. Nine EU countries still use their own currencies, including Sweden, Denmark, and the United Kingdom. The euro, which was first introduced in 1999, is currently the second most traded currency globally, after the US dollar When traveling abroad, exchanging your home currency for the local currency is necessary. However, the exchange is not always equal in value. (Brooks, 2015)

2.1 Organization of the Foreign Exchange Market

The forex market often evokes images of bustling trading floors filled with networks, computers, and animated discussions.

The interbank market, the wholesale sector of forex trading, handles large currency transactions of $1 million or more, primarily among banks. In contrast, the retail forex market operates at a slower pace, catering to institutional investors and multinational corporations involved in international trade. Rather than a physical marketplace, the interbank market is a vast, decentralized, over-the-counter system where traders communicate via phone or computer.

With financial hubs spread globally, forex trading runs 24/7, beginning in Sydney and continuing across time zones. (Bekaert and Hodrick, 2017)

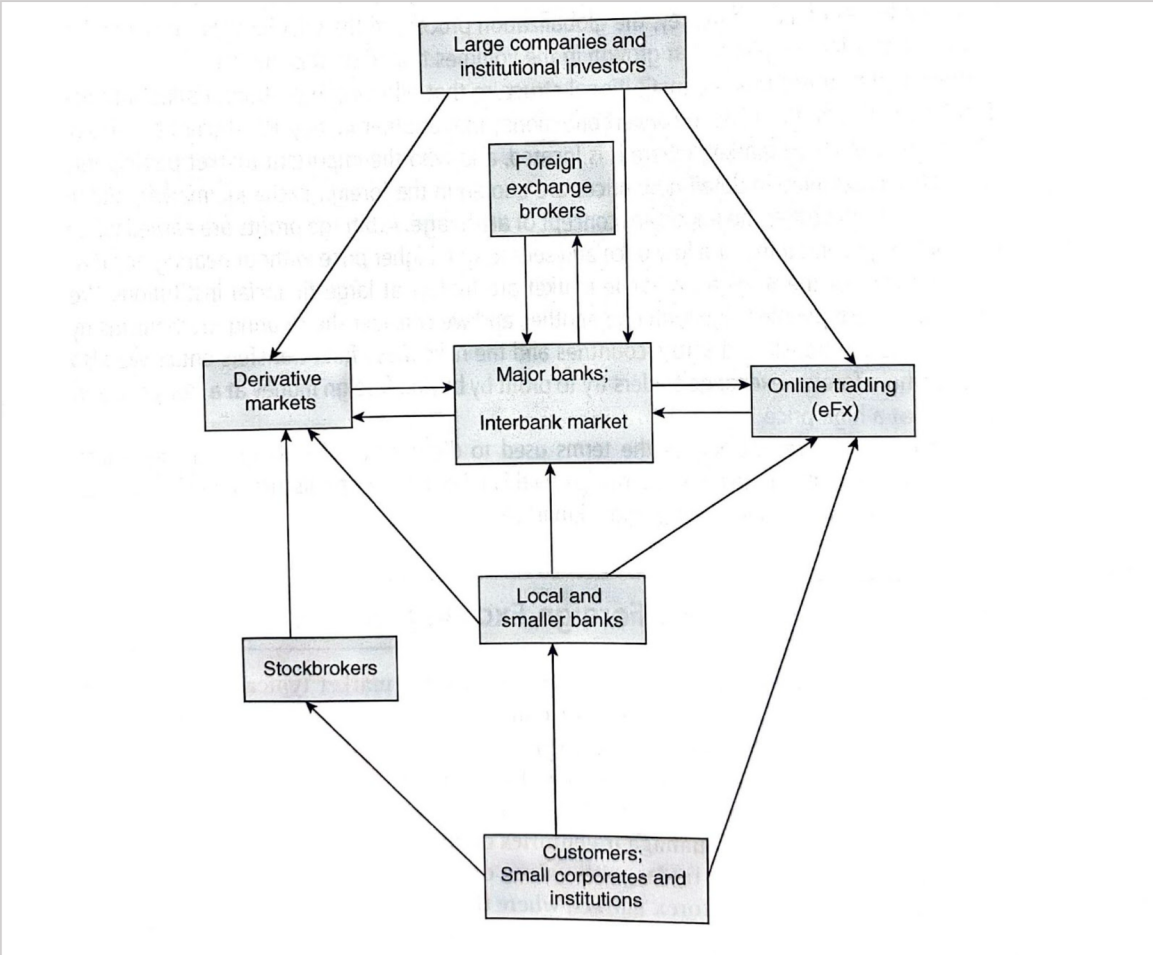

Figure 2: The structure of the foreign exchange market
Source: Bekaert and Hodrick, 2017

Then, around hour four, which is lunchtime in those markets, there is a sudden drop in trade. As Hong Kong and Singapore shut and Frankfurt and London open, the Far Eastern trading session's afternoon sees a resurgence in market intensity. Paris, France; Copenhagen, Denmark; and Zurich, Switzerland, are more European centres. When New York opens and coincides with European activity, trading intensity rises; once New York closes, trading decreases till the Far Eastern markets reopen. Los Angeles, Chicago, and other American cities are also major trading hubs. (Bekaert and Hodrick, 2017)

The majority of small enterprises and retail investors are unable to directly access the foreign currency market. Because of this, many people who require foreign currency deal with small regional banks or money centre bank branches, which offer less favourable rates than those found in the interbank market. Through their

stockbrokers, who have the ability to place orders in derivative markets on futures and options exchanges, retail investors can also take part in the foreign exchange markets. The figure demonstrates that the foreign exchange interbank market is immediately accessible to very large money-management organisations, like the mutual fund company Fidelity, and large multinational corporations, like IBM.

Even some institutional investors and big corporations have their own trading desks for foreign exchange. The explosive expansion of electronic trading is a significant contemporary trend. both on the retail side of the market and in the interbank market via electronic brokering. (Bekaert and Hodrick, 2017).

2.2 Exchange Rate

An exchange rate refers to the value of one currency in relation to another, such as the price of the US dollar in terms of Japanese yen, the value of the euro in British pounds, or the Mexican peso priced in Brazilian reais. To simplify communication in financial and business transactions, standardized abbreviations for currencies are used rather than writing out their full names. It is essential for all parties involved in international banking and business to understand which currencies are being referred to. To ensure consistency, these abbreviations are standardized by the International Organization for Standardization, a global body that establishes guidelines, with "ISO" derived from the Greek word meaning "equal ".

2.2.1 Fixed Exchange Rate

A fixed exchange rate system, also known as a pegged exchange rate, occurs when a country's currency value is tied or "pegged" to another major currency (like the USD) or a basket of currencies. The central bank actively intervenes in the foreign exchange market to maintain this fixed value. (Bekaert and Hodrick, 2017)

2.2.2 Floating Exchange Rate

In a floating exchange rate system, the value of a currency is shaped by the forces of supply and demand within the foreign exchange market. This system operates without direct intervention from governments or central banks, allowing the currency's value to fluctuate naturally, either appreciating or depreciating based on market conditions (Eun and Resnick, 2014).

2.2.3 Pegged or Managed Floating Rate

A pegged or managed floating exchange rate combines elements of both fixed and floating systems. While the currency is allowed to fluctuate in response to market forces, central banks intervene periodically to stabilize it within a certain range or to achieve specific economic goals. (Eiteman et al., 2023)

2.3 Purchasing Power Parity

Purchasing Power Parity is a fundamental concept in international finance that compares the prices of identical goods across countries to explain exchange rate movements. It states that in an efficient market, the cost of equivalent goods should be the same when expressed in a common currency (Eiteman, Stonehill, and Moffett, 2023). In this framework, **P domestic** represents the price of a good in the home country, while **P foreign** refers to the price of the same good abroad. Comparing these prices helps determine if a currency is undervalued or overvalued relative to another.

Under **absolute PPP**, the exchange rate should adjust so that purchasing power remains equal between two countries. This means converting the home currency into a foreign one, assessing the goods that can be bought abroad, and comparing it to domestic purchasing power, which is inversely related to local price levels (Bekaert & Hodrick, 2017). Overall, PPP suggests that exchange rates move toward a level where identical goods cost the same globally, ensuring fairness in international trade (Brooks, 2015).

$$Exchange\ Rate = \frac{P\ domestic}{P\ foreign} \tag{11}$$

Where:

P domestic - Price of a good in the domestic country,

P foreign - Price of the same good in the foreign country.

2.4 Interest Rate Parity

Interest Rate Parity (IRP) is a crucial concept in international finance, highlighting the link between interest rates and exchange rates. It posits that the difference in nominal interest rates between two countries is offset by the expected change in their exchange rates. Eun and Resnick (2014) explains that, according to the IRP principle, arbitrage opportunities are eliminated because any discrepancies between the interest rate differential and exchange rate expectations are rapidly corrected in the market. The theory is mathematically expressed as

$$F = S\ x\ (\frac{1+id}{1+if}) \tag{12}$$

Where,

- F - Forward exchange rate,
- S - Spot exchange rate,
- Id - Domestic interest rate,
- if - Foreign interest rate.

(Bekaert and Hodrick 2017) distinguish between covered IRP, where forward contracts hedge currency risk, and uncovered IRP, where future spot rates are uncertain. Violations of IRP can create arbitrage opportunities, a concept also explored by Eiteman, (Stonehill, and Moffett 2023), who emphasize IRP's role in maintaining equilibrium in international financial markets. The theory is particularly significant for multinational firms managing currency risk and for investors analyzing foreign investment returns.

2.5 Exchange Rate Exposure

The possibility that a shift in exchange rates would affect a company's profitability, net cash flow, and market value is known as foreign exchange exposure. Measuring and managing foreign exchange exposure is a crucial responsibility of the financial manager in order to optimise the firm's profitability, net cash flow, and market value.

When foreign exchange rates fluctuate, what happens to a company? The firm's foreign exchange exposure falls into two different categories: those resulting from economic competitiveness and those based on accounting. Contracts and accounts denominated in foreign currencies give rise to accounting exposures, which are more precisely defined as **transaction exposure** and **translation exposure.** The possible change in the firm's worth due to its shifting worldwide competitiveness as measured by currency rates is known as **economic exposure,** or **operating exposure** as we will refer. (Eiteman et al., 2023)

2.5.1 Transaction Exposure

The possible decline in the value of future foreign currency payments in one's home currency is known as transaction exposure. (Brooks, 2015). Transaction exposure measures how much a change in currency rates affects the value of contractual obligations between the time they are created and booked and the time they are settled. As a result, it analyses adjustments to projected cash flows brought on by current contractual commitments, sometimes known as on balance sheet obligations (Eiteman et al., 2023).

2.5.2 Translation Exposure

Translation exposure is the possibility that changes in owner's equity or consolidated income resulting from accounting will take place as a result of the requirement to "translate" foreign subsidiary financial statements into a single reporting currency in order to prepare global consolidated financial statements.

2.5.3 Operating Exposure

Operating exposure, sometimes referred to as economic or competitive exposure, refers to the potential long-term effects of exchange rate fluctuations on a multinational company's overseas operations. It assesses how unexpected changes in currency rates can alter a firm's future operating cash flows and affect its current value. The impact of exchange rate fluctuations is determined by factors such as changes in sales volumes, pricing strategies, and costs (Eiteman et al., 2023).

2.6 Risk Management in FX Context

FX risk management is a strategy used by companies to avoid or minimize potential losses that could result from fluctuations in exchange rates. It involves assessing the type and level of risk, measuring it, and deciding on appropriate methods to manage the risk.

2.7 Hedging Strategies

Multinational corporations oversee a variety of cash flows that are extremely susceptible to changes in interest rates, commodity prices, and exchange rates. Taking a position (derivative, contract, or asset) that balances the value fluctuations of current exposures is known as hedging, and it is frequently used to manage foreign currency risk. Hedging diminishes possible benefits from favourable developments, but it also lowers risk by reducing the variability of predicted cash flows.

By hedging against currency rate risks, one may minimise uncertainty by lowering the variability (or variance) in these cash flows. Hedging does, however, only add value to the company if the advantages outweigh the costs, which essentially raises the projected value of cash flows (Eiteman et al., 2023).

2.8 Natural Hedging

Natural hedging is a risk management technique in which a business structures its activities to naturally offset risks, independent of financial derivatives, so lowering its exposure to financial hazards, such as changes in the price of commodities or the exchange rate.

By aligning cash inflows and outflows in the same currency or costs and revenues with the same underlying risk variables, natural hedging is achieved. By doing this, the negative effects of changes in interest rates, exchange rates, or other market factors are lessened (Eiteman et al., 2023).

3 International Trade and Specifics Of Multinational Corporations

International trade refers to the exchange of goods and services across national borders, allowing countries to specialize in industries where they have a comparative advantage. This process enhances global economic efficiency and fosters economic growth. **Multinational corporations** play a critical role in international trade by operating in multiple countries, facilitating capital flows, technology transfer, and global supply chains (Bekaert and Hodrick, 2017).

3.1 International TradeTheories

International trade involves the exchange of goods, services, and financial resources between countries, enabling them to access products and services that might not be available locally. This helps nations to expand their markets and drive economic growth by creating closer economic ties globally (Krugman, 2009).

Nations participate in international trade to acquire goods and services they cannot produce domestically or to access resources that are too expensive or unavailable at home. This system of global interdependence ensures that countries rely on each other to meet demands for various products and services (Baldwin, 2016).

The development of international trade has been significantly influenced by technological advances, improved transportation systems, and better communication tools. These factors have reduced trade costs, made international business operations easier, and decreased the barriers to cross-border trade (Hummels, 2007).

Government policies, including tariffs, quotas, and subsidies, can influence international trade by protecting domestic industries or promoting exports. Trade liberalization aims to reduce these restrictions, thus fostering the flow of goods and services between countries (Krugman and Obstfeld, 2009).

The rise of global supply chains, where components of a product are sourced from various countries and assembled elsewhere, has been driven by international trade. This interconnectedness allows companies to reach wider markets and use cost-effective production processes (Gereffi, 2018).

3.1.1 Absolute Advantage Theory

Adam Smith's theory of absolute advantage, introduced in 1776, explains how nations can improve their economic performance through specialization and trade. According to Smith, if a country can produce a certain product faster or more efficiently than others, it makes sense for that country to focus on producing it. For example, if one country has ideal conditions for growing coffee and another for producing steel, both countries can benefit by trading these goods instead of trying to make both on their own. This idea of concentrating on strengths allows resources to be used effectively, increasing total production and creating economic gains for everyone involved (Smith, A. (1776).

3.1.2 Comparative Advantage Theory

In 1817, David Ricardo expanded this idea by introducing the concept of comparative advantage. Ricardo's approach was different because it showed that even if a country is not the best at making any product, it can still benefit from trade. The key is to focus on producing goods where the opportunity cost is lowest. Take this example: one country might be slightly inefficient at producing wine but very inefficient at producing textiles. If it specializes in wine and trades for textiles, both countries can end up with more goods overall. Ricardo's theory highlights that trade works because of relative advantages, not just absolute ones, making it a powerful explanation for the benefits of economic cooperation.

3.1.3 Heckscher-Ohlin Theory

The Heckscher-Ohlin Theory, proposed by Eli Heckscher and Bertil Ohlin in 1933, explains how countries trade based on their available resources. According to the

theory, countries will produce and export goods that use their abundant resources—like labor, capital, or land—while they will import goods that require resources they don't have enough of. For example, a country with a large labor force might focus on making products that need lots of labor, such as textiles, while importing goods that need more capital, like machines, from a capital-rich country.

This theory builds on Ricardo's idea of comparative advantage but shifts the focus to the resources a country has. It also suggests that trade between nations can lead to the equalization of resource prices, meaning that wages and capital returns should eventually become more similar between countries. However, the theory has faced challenges, such as the Leontief Paradox, which found some trade patterns that didn't match its predictions. Despite these issues, the Heckscher-Ohlin theory is still widely used to understand and analyze global trade (Heckscher and Ohlin, 1933).

3.1.4 New Trade Theory

Paul Krugman's New Trade Theory, introduced in 1980, redefines traditional views of trade by focusing on factors like economies of scale and network effects. Rather than countries needing to produce a wide variety of goods, Krugman argued that nations can specialize in a small range of products and still benefit from international trade. This specialization allows countries to reduce costs and increase efficiency through economies of scale. The theory also emphasizes how imperfect competition plays a role in global trade, where companies can gain an edge by offering unique products or innovating in ways that set them apart from others (Krugman, 1980).

3.1.5 Porter's Diamond Theory

Michael Porter's Diamond Theory, introduced in The Competitive Advantage of Nations (1990), explains why some industries in specific countries become globally competitive. Porter identifies four key factors that interact to give a country a competitive edge. First, factor conditions like skilled labor, infrastructure, and resources play a crucial role. Second, demand conditions suggest that a country's sophisticated local consumers push companies to innovate and offer high-quality products. Third, related and supporting industries—including efficient supplier

networks—help companies reduce costs and foster innovation. Finally, firm strategy, structure, and rivalry point to how intense domestic competition drives firms to improve and remain competitive internationally. Porter argued that when these factors work together, they create a strong foundation for industries within a country to succeed in the global market (Porter, 1990).

3.1.6 Gravity Model of Trade

The Gravity Model of Trade explains the patterns and volume of trade between two countries by combining economic size and geographic distance as key factors. Developed by Jan Tinbergen in 1962, the model draws an analogy to Newton's law of gravitation, where the trade flow between two countries is directly proportional to their economic size, typically measured by GDP, and inversely proportional to the distance between them. Larger economies are more likely to trade extensively because they produce and consume more goods, while shorter distances reduce transportation and transaction costs, making trade more feasible.

This model also incorporates other variables, such as shared borders, common languages, and trade agreements, which can strengthen trade relationships. For instance, countries within regional trade blocs or with cultural and historical ties often exhibit higher trade volumes than those without such connections. Despite its simplicity, the Gravity Model effectively predicts bilateral trade patterns and is widely used in empirical research to evaluate trade policies, agreements, and barriers (Tinbergen, 1962).

3.2 Specifics of Multinational Company

Multinational corporations (MNCs) are companies that run their operations in more than one country, yet maintain a central management system from their country of origin. What distinguishes MNCs from local firms is their ability to manage a wide network of operations across the globe. These companies have access to various international markets, resources, and labor forces, which allows them to diversify their production and services. Though MNCs operate on a global scale, they make

key decisions at their main headquarters to ensure consistent and efficient management.

Their business strategies often involve integrating production, logistics, and distribution systems across countries, which helps them reduce costs and remain competitive. Additionally, MNCs are adaptable, modifying their products and strategies to fit local markets and cultures, ensuring they can meet the unique demands and regulations of each country. This flexibility, combined with a unified global strategy, allows MNCs to thrive in the international business world (Hill, 2021).

3.2.1 Ownership-Location-Internalization Framework

The Ownership-Location-Internalization (OLI) Framework, also known as the Eclectic Paradigm, was developed by John Dunning in 1988 to explain why companies expand internationally. The first component, ownership advantage, refers to the unique resources that a company holds, such as advanced technology, patents, or a strong brand, which give it an edge in foreign markets. The second element, location advantage, emphasizes the benefits of being in specific countries, such as access to low-cost labor, favorable regulations, or proximity to major markets. The third element, internalization advantage, explains why firms may prefer to manage foreign operations themselves instead of relying on external arrangements like licensing or franchising. By taking direct control, companies can protect their assets, improve efficiency, and safeguard valuable intellectual property. This framework provides insight into the strategic decisions that motivate firms to go global (Dunning, 1988).

3.2.2 Product Life CycleTheory

The Product Life Cycle Theory, developed by Raymond Vernon in 1966, describes the various stages a product experiences from its introduction to its decline, with a focus on how these stages affect international trade. Vernon proposed that initially, a product is designed and manufactured in the country where it was created, capitalizing on local knowledge and market demand during the **introduction phase**. At this stage, production stays within the home country to make the most of available

resources and development efforts. As the product gains traction, the demand for it grows, prompting firms to begin expanding their reach into international markets.

This marks the **growth phase**, where firms start exporting to countries with similar market characteristics. In some cases, businesses establish production facilities in foreign locations to reduce costs and better serve these growing markets. The firm’s competitive advantage at this point is rooted in its innovation and specialized knowledge.

When the product enters the **maturity phase**, it becomes standardized, and production processes become more streamlined. To cut costs, many firms move their manufacturing operations to countries with lower labor costs. This shift allows them to keep prices competitive while continuing to generate profits in markets where the product is widely available.

By relocating production and employing global strategies, firms can continue to meet demand and enhance profitability In the **decline phase**, a product may experience a drop in market share due to innovations or changing consumer preferences. As demand decreases, companies often stop producing the product in the home country and move manufacturing to low-cost regions. This shift helps them keep costs down while maintaining global distribution. The theory suggests that international trade and investment patterns are shaped by where a product is in its life cycle, with firms adjusting their strategies to maximize profits at each stage. Vernon's theory provides valuable insights into how companies adapt as products evolve. It shows that as a product matures, firms shift their focus from innovation and differentiation to cutting costs and improving production efficiency in order to maintain their competitive edge (Vernon, 1966)

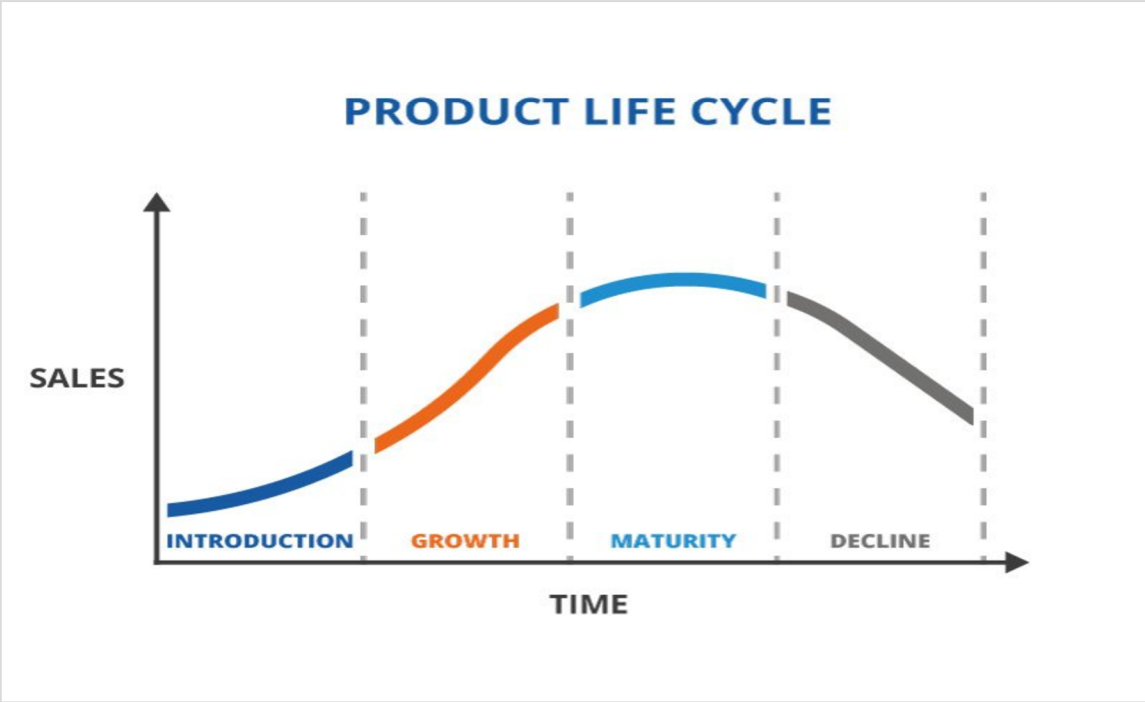

Figure 3: Diagram of product life cycle
Source: (Johanson & Vahlne, 1977)

3.2.3 Uppsala Model

The Uppsala Model of Internationalization, introduced by Johanson and Vahlne in 1977, explains the gradual and step-by-step process firms follow when expanding into international markets. This model suggests that companies typically begin by entering markets that are geographically or culturally similar to their home country.

The familiarity of these markets reduces uncertainty and minimizes risk, making it easier for firms to take their first steps toward internationalization. Initially, companies often choose low-risk strategies such as exporting, as they lack sufficient knowledge about foreign markets. Exporting allows them to explore and test new markets without making significant investments.

As companies gain experience and market knowledge, they tend to increase their commitment by adopting higher-risk strategies. These may include establishing sales offices or manufacturing facilities abroad, which require greater investment and deeper involvement. The Uppsala Model emphasizes that internationalization is an incremental process, with firms gradually increasing their presence in foreign markets as they learn and adapt. This learning process helps them refine their strategies and

reduce perceived risks. The model views internationalization as a series of small, deliberate steps rather than a sudden or drastic expansion. The speed and scope of this process depend on the firm’s ability to acquire market knowledge.

This knowledge can come from direct experience or through collaboration with external partners or competitors. Johanson and Vahlne (1977) argue that this cautious approach allows firms to navigate the challenges and uncertainties of international markets more effectively.

A key concept in the Uppsala Model is psychic distance, which refers to perceived differences between the home country and foreign markets, such as cultural, language, or regulatory disparities. Companies often start their internationalization journey with markets that have lower psychic distances, as these are easier to understand and operate within.

Over time, as firms become more experienced and confident, they expand into markets with greater psychic distances. This model has been particularly useful in understanding how small and medium-sized enterprises (SMEs) approach international expansion. It provides a realistic framework for gradual market entry compared to models that assume rapid or large-scale global expansion. By focusing on learning, reducing uncertainty, and building market knowledge, the Uppsala Model offers valuable insights into the internationalization process of firms (Johanson & Vahlne, 1977)

3.3 Strategic Objectives of Multinational Corporations

Multinational corporations pursue a variety of strategic objectives that enable them to thrive in the global marketplace. These objectives are critical in shaping the direction of the MNCs' operations and long-term growth strategies. Four key strategic objectives that MNCs typically focus on include market expansion, resource and cost optimization, diversification of risk, and economies of scale and scope.

Market Expansion: MNCs enter new markets to access untapped consumer bases, driving revenue growth and brand presence. This is especially vital when domestic markets are saturated. Globalization, digital platforms, and improved logistics have

made it easier for MNCs to connect with customers worldwide and capitalize on emerging market opportunities (Daniels et al., 2019).

Resource and Cost Optimization: MNCs strategically locate operations in regions with lower labor costs, abundant resources, or favorable regulations. This reduces production costs while maintaining quality, enhancing profitability and competitiveness.

Diversification of Risk: MNCs mitigate risks by operating across multiple international markets, reducing dependency on any single region. This approach helps offset challenges like economic downturns, political instability, or natural disasters in one country by relying on revenue from more stable regions. Diversifying operations also enables MNCs to benefit from varying economic cycles, balancing financial performance as some markets grow while others slow down (Hill, 2021). Additionally, this strategy allows MNCs to develop effective contingency plans to adapt to shifting global or local conditions.

Economies of Scale and Scope are critical for the success of MNCs. Economies of scale allow MNCs to lower per-unit costs by increasing production volumes and streamlining operations across countries. This cost efficiency helps them offer competitive prices, boost market share, and attract more customers. On the other hand, economies of scope enable MNCs to save costs by diversifying products or services, leveraging existing resources like distribution networks, branding, and technology to maximize profitability. By combining these efficiencies, MNCs can reduce operational costs while maintaining quality and sustaining their competitive edge (Dunning, 1988).

Together, these strategies form the foundation of MNCs' international growth. They enhance profitability, foster long-term success, and secure a competitive position in the global marketplace.

3.4 Challenges Faced by Multinational Corporations

Operating in diverse international markets presents significant challenges for multinational corporations. These include navigating political and regulatory risks,

managing cultural and ethical differences, addressing exchange rate fluctuations, and handling the complexities of global supply chains. Such challenges demand adaptive strategies to ensure operational success and sustainability.

3.4.1 Regulatory and Political Risks

One major obstacle for MNCs is dealing with varying political and regulatory environments. Countries impose different trade policies, such as tariffs, quotas, or restrictions, which complicate efforts to standardize global operations. Additionally, political instability, such as government changes or unrest, can disrupt operations, impacting profitability and requiring firms to shift strategies. For instance, abrupt changes in taxation or international trade agreements can force MNCs to reassess their plans. To mitigate these risks, companies must closely monitor political developments and remain flexible to adjust to regulatory changes (Moran, 2001).

3.4.2 Cultural and Ethical Differences

Cultural and ethical variations across countries pose another significant challenge for MNCs. Success often depends on adapting global strategies to align with local customs, traditions, and consumer behaviors. For example, practices suitable in one market might not translate well to another due to cultural differences. Ethical challenges also arise as regulations and norms related to labor, environmental practices, and governance vary across regions. Striking the right balance between global standards and local expectations is crucial for maintaining relationships with stakeholders, avoiding conflicts, and protecting the company's reputation (Peng, 2020).

3.4.3 Exchange Rate Volatility

Exchange rate fluctuations present a significant challenge for MNCs operating in various countries. Changes in currency values can directly influence profitability, especially for businesses involved in international trade or dependent on foreign

income. Such volatility complicates financial planning by introducing uncertainty in the costs of imports, exports, and repatriated earnings.

For example, a depreciation of the home currency can increase operational expenses and reduce foreign earnings when converted back to the home currency. To address this, MNCs commonly utilize hedging tools like forward contracts or options to secure exchange rates and minimize the financial impact of currency fluctuations (Krugman et al., 2018).

$$Percentage\ Change\ =\ New\ Exchange\ Rate\ -\ Old\ Exchange\ Rate\ x\ 100 \quad (13)$$

3.4.4 Supply Chain Complexity

MNCs face significant challenges in managing global supply chains, which often stretch across multiple regions and involve many stakeholders, including suppliers and partners. This complexity makes supply chains susceptible to disruptions from factors such as shipping delays, natural disasters, political conflicts, or changes in local regulations. Logistical issues, such as synchronizing production schedules, managing inventory efficiently, and complying with customs requirements, further complicate operations. The international scope also demands effective communication and coordination across different time zones, languages, and organizational systems. To address these issues, MNCs increasingly depend on innovative technologies and strong partnerships to streamline their supply chains and enhance efficiency (Christopher, 2016).

3.5 Role of Multinational Corporation in International Trade

Multinational corporations are crucial players in global trade, as they connect markets, facilitate the transfer of technologies, and contribute significantly to economic growth. These companies support international trade through various activities, including exporting and importing, making foreign direct investments, developing global value chains, and improving operational efficiency.

3.5.1 Export and Import Activities

MNCs engage in international trade through their export and import operations, which allow them to link different national markets. By utilizing their global supply chains, these firms transport goods and services across borders, optimizing their production processes by sourcing raw materials and components from low-cost countries and distributing finished products in markets with higher demand. The trade activities of MNCs play an essential role in the global economy by fulfilling consumer demand worldwide and providing competitive advantages such as reduced costs and economies of scale. In doing so, MNCs are at the heart of international market integration, helping drive cross-border economic exchanges (Rugman and Verbeke, 2001).

3.5.2 Foreign Direct Investment

One of the primary ways MNCs contribute to international trade is through foreign direct investment. By directing capital into businesses in foreign countries, MNCs generate value for both the home and host nations. FDI enables MNCs to set up subsidiaries or joint ventures abroad, thereby expanding their market reach and tapping into growth prospects, particularly in emerging markets. In turn, host countries gain from the transfer of technology, the growth of local industries, and the creation of employment opportunities. Additionally, FDI can drive economic development by enhancing productivity and introducing sophisticated management practices (Buckley & Casson, 2009).

3.5.3 Global Value Chains

Multinational corporations are crucial in the development and management of global value chains, which connect different production stages across various countries. By spreading production across Multinational corporations are central to the formation and coordination of global value chains , where production is spread across multiple countries. By leveraging regional advantages such as lower labor costs or access to specific materials, MNCs are able to streamline production, reduce expenses, and maintain their competitive edge on a global scale.

Furthermore, GVCs help integrate developing countries into the global market by linking them to international supply networks. This facilitates the growth of exports from these countries, supports local suppliers, and enhances the overall competitiveness of the global economy (Gereffi, 2018). MNCs, through their management of these value chains, are instrumental in driving trade growth and improving efficiency in global operations.

3.5.4 Technology Transfer and Knowledge Dissemination

Another significant contribution of MNCs to international trade is the transfer of technology and expertise. Through their global operations, MNCs introduce cutting-edge technologies, management strategies, and operational know-how to local markets. This transfer takes place through various channels, including foreign investments, joint ventures, licensing, and the creation of subsidiaries. By sharing technological advancements, MNCs help host countries establish new industries, boost productivity, and enhance their competitiveness in global markets. This exchange of knowledge is especially beneficial for developing nations, which gain access to improved production techniques and the chance to engage in innovation-driven sectors (Narula, 2004).

3.5.5 Economic Development and Market Expansion

MNCs also play a significant role in boosting international trade by driving economic growth and expanding market opportunities. Their activities create employment, generate tax income, and improve the infrastructure in both home and host countries. As MNCs enter new markets, they open up growth prospects for local businesses and stimulate consumer demand. Additionally, the presence of MNCs encourages competition, which can enhance product quality, reduce prices, and increase consumer choice. Their investments in local economies also contribute to the development of human resources, technological capabilities, and overall national competitiveness. This process fosters the global integration of markets and supports long-term economic prosperity (Aghion and Howitt, 2009).

3.6 Currency Risk Management

Currency risk arises when exchange rate fluctuations affect a company's bottom line during international transactions (Bekaert and Hodrick, 2017).

Forward contracts are agreements where two parties commit to exchanging currencies at a predetermined rate on a future date. These contracts are commonly used by businesses to lock in exchange rates ahead of time, offering predictability in their financial planning (Bekaert and Hodrick, 2017). By reducing the risk associated with unexpected currency fluctuations, forward contracts provide stability and help businesses manage their international trade obligations without the fear of financial disruptions (Eun and Resnick, 2014).

Futures contracts are agreements that allow businesses to lock in currency exchange rates for future transactions. Unlike forward contracts, which are customized, futures contracts are standardized and traded on exchanges, providing increased liquidity and transparency. This makes them a popular choice for larger companies or those requiring frequent hedging activities (Eiteman et al., 2023). While futures contracts ensure that both parties exchange currencies at a specific rate on a predefined date, they offer less flexibility compared to forward contracts. However, this structure makes them a dependable option for managing currency fluctuations (Bekaert and Hodrick, 2017).

Options contracts offer even more flexibility than forwards and futures. These contracts give the holder the right (but not the obligation) to buy or sell currency at a predetermined rate within a specified period. This flexibility allows businesses to benefit from favorable currency movements while limiting losses from unfavorable ones (Eiteman et al., 2023). Options are often used when companies expect significant volatility but want to avoid the risk of being locked into a position (Eun and Resnick, 2014).

3.7 Currency Swaps

Currency swaps are financial agreements in which two parties exchange cash flows, typically involving both principal and interest payments in different currencies. These swaps are particularly valuable for businesses operating across borders, as they help mitigate the risks associated with foreign currency fluctuations over the long term. For example, a company with foreign-denominated loans may use a currency swap to convert its debt payments into its domestic currency, reducing the financial impact of exchange rate changes (Eiteman et al., 2023; Eun & Resnick, 2014).

Involves interest rate parity:

$$F = S\ x\ (\frac{1+id}{1+if}) \tag{14}$$

Where,

- **F** = Forward exchange rate
- **S** = Spot exchange rate
- **id** = Domestic interest rate
- **if** = Foreign interest rate

Spot transactions are the most straightforward and immediate form of currency exchange in the Forex market. These transactions involve converting currencies at the current market price, also known as the spot rate, with settlement typically occurring within two business days.

Companies commonly use spot transactions to meet urgent currency needs, such as paying for goods and services, covering operational expenses, or handling short-term financial commitments (Madura, 2021).

The primary benefit of spot transactions is their simplicity and quick execution, enabling businesses to react rapidly to immediate financial requirements. However, they also carry the risk of exchange rate fluctuations, as the rate is locked in at the moment of the transaction. If the exchange rate is unfavorable, businesses may face higher costs (Shapiro, 2014).

3.8 Operational Costs

Managing operational costs in foreign currencies is a key activity for multinational corporations with international operations.

These costs encompass wages, rent, utilities, payments to suppliers, and other ongoing expenses. The Forex market is essential for these companies, as it allows them to convert their home currency into the required foreign currency at current exchange rates. Additionally, hedging tools, such as forward contracts, are often used to help manage cash flow and reduce the risks associated with currency fluctuations (Shapiro, 2014).

3.9 Liquidity for International Operations

To maintain liquidity and ensure access to necessary foreign currencies for critical operational tasks, such as paying international suppliers, processing payroll for foreign employees, and handling local taxes, multinational corporations rely on the Forex market.

By using the Forex market, these companies can secure the required currencies at competitive exchange rates, avoiding disruptions in their global operations (Butler, 2016).

Spot transactions are commonly used for urgent currency needs, providing rapid access to foreign funds. For more predictable or recurring operational costs, businesses often use forward contracts or currency swaps.

These financial instruments help stabilize cash flows by protecting against the risks of fluctuating exchange rates (Eun and Resnick, 2018). By managing these currency risks, companies can ensure smooth and reliable international operations, making their global financial management more predictable (Rugman and Collinson, 2012).

3.10 Repatriation of Profits

Repatriation strategies are crucial for multinational corporations, as they must adhere to the varying international regulations and tax policies of different countries. Effective planning helps ensure compliance with these rules while also enhancing financial efficiency. In this context, the Forex market offers a reliable mechanism for transferring funds across borders, reducing the risks associated with fluctuations in exchange rates (Butler, 2016).

4 Statistical Evaluation of the Effects of FX Fluctuation on Business Financial Performance

Foreign exchange rate fluctuations can significantly influence the financial performance of multinational corporations, affecting their revenue, profitability, and shareholder returns. Since multinational corporations conduct transactions in multiple currencies, exchange rate volatility can impact their financial stability. Companies operating in highly globalized industries, such as automotive and consumer goods, are particularly exposed to such fluctuations. Changes in currency values can affect financial aspects such as revenue, net profit, return on equity, and return on assets, making it essential to analyze these effects comprehensively.

This chapter presents a detailed statistical analysis of how FX fluctuations impacted the financial performance of 5 multinational corporations over a 12-year period (2012–2023). These companies belong to the automobile industry: Volkswagen, BMW, Mercedes-Benz, Stellantis, and Renault. The companies were selected due to their extensive global operations, reliance on international trade, and exposure to exchange rate risks, particularly the EUR/USD exchange rate.

The study examines whether fluctuations in EUR/USD exchange rates had a measurable impact on key financial indicators, using real financial data obtained from official company reports. To assess this relationship, the research applies correlation tests which help determine the extent to which exchange rate movements influenced these firms' revenues, net profits, ROE, and ROA.

Through this structured financial analysis, this chapter aims to provide empirical insights into the extent to which FX fluctuations affect multinational corporations. The findings will help determine whether these firms were highly sensitive to currency fluctuations or if their financial outcomes were shaped primarily by business operations and market forces.

Ultimately, this chapter seeks to bridge the gap between theoretical concepts and real-world business performance by applying statistical methods to evaluate the effects of FX fluctuations. The results will highlight the influence of exchange rate

movements on corporate financial performance, offering insights into the broader implications of currency volatility on international business operations.

4.1 Data Description

The EUR/USD exchange rate data for the period 2012–2023 was sourced from the European Central Bank and Federal Reserve Economic Data. This exchange rate represents the value of one Euro in U.S. Dollars and fluctuates based on multiple economic factors, including monetary policies, interest rates, trade balances, inflation, and global economic stability. Given that multinational corporations conduct business across multiple regions, exchange rate movements can directly affect their financial outcomes, making it essential to assess their impact.

The financial data used in this study was obtained from official annual reports and financial statements of 5 multinational corporations operating in the automobile industry. The financial variables examined include Revenue (€ million), Net Profit (€ million), Return on Equity %, and Return on Assets %. These indicators were selected as they provide a comprehensive measure of corporate financial performance and allow for an in-depth evaluation of how currency fluctuations may have influenced business outcomes over time.

To ensure consistency in the analysis, financial data for each company was collected annually and aligned with the corresponding EUR/USD exchange rates for the same year. The dataset spans 12 years (2012–2023) to ensure that the study captures long-term trends and variations in financial performance under different economic conditions. The next sections will present the correlation test which will help determine whether FX fluctuations significantly impacted the financial performance of the selected multinational corporations.

Table 1: Fluctuations in the EUR/USD Exchange Rate Over the Years 2012-2014

Year	FX Rate
2012	1.2859
2013	1.3281
2014	1.3297
2015	1.1096
2016	1.1072
2017	1.1301
2018	1.1817
2019	1.1194
2020	1.141
2021	1.183
2022	1.0534
2023	1.0817
2024	1.082

Source: Federal Reserve Economic Data

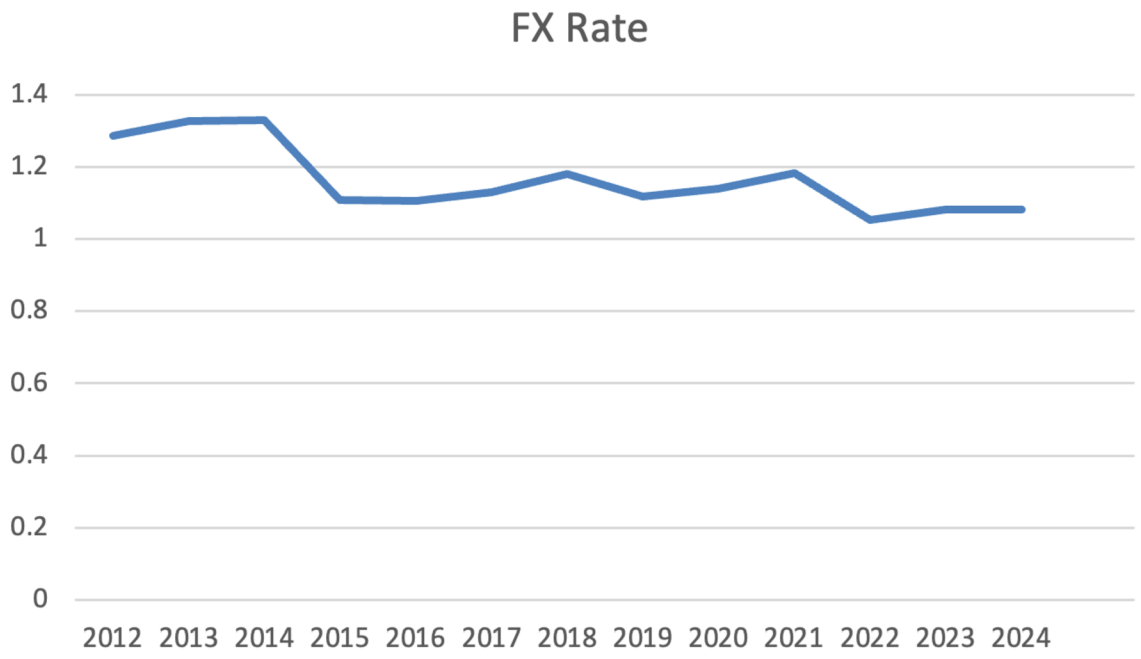

Figure 4: Movement of the Foreign Exchange (FX Rate over Time 2012–2023)
Source: Federal Reserve Economic Data

4.2 Interpretation of FX Change of Percentage Data 2012–2023

From 2012 to 2023, the euro-to-dollar exchange rate moved up and down as the world economy changed. When the euro got stronger, it could buy more dollars, and when it weakened, it could buy less. Many factors caused these shifts, such as

inflation rates, decisions by the European Central Bank, and changes in U.S. interest rates (Mishkin, 2019).

At the start of the period, between 2012 and 2014, the euro stayed fairly stable around 1.32 to 1.33. This reflected Europe's slow recovery after the 2008 financial crisis. Things changed in 2015 when the euro lost value, falling to around 1.10. This was mainly because Europe loosened its monetary policy while the U.S. began tightening (Krugman, Obstfeld, and Melitz, 2018).

There was a short rebound in 2017–2018 when the euro strengthened again, but by 2019, uncertainty about Brexit and slowing global trade pushed the euro down. During the pandemic in 2020, the euro stayed fairly stable despite some short-term swings (Eiteman, Stonehill, and Moffett, 2021).

A major drop happened in 2022 when the euro fell to about 1.05. High energy prices in Europe, along with aggressive interest rate hikes in the U.S., made the euro weaker. By 2023, the euro had recovered slightly to around 1.08 as inflation fears eased (Bekaert and Hodrick, 2017).

For companies doing business worldwide, these changes mattered a lot. When the euro was weaker, European companies could sell goods more easily abroad because their prices were more competitive. But it also meant higher costs for those who paid expenses in dollars. These fluctuations also affected financial statements, forcing companies to use strategies like hedging to manage risks (Eun and Resnick, 2014).

This overview of the euro-dollar trend helps explain why foreign exchange movements are so important for companies like Volkswagen, BMW, Mercedes-Benz, Stellantis, and Renault. The next part of this work will look more closely at how these shifts influenced their financial performance. Important economic theories, such as Purchasing Power Parity and Interest Rate Parity, also help explain how these trends happen (Krugman, Obstfeld, and Melitz, 2018; Bekaert and Hodrick, 2017).

4.3 Financial Performance Data of Multinational Corporations

The automotive industry plays a crucial role in the global economy, with major companies generating a large share of their income from international markets. As a result, manufacturers in this sector are heavily influenced by foreign exchange rate movements, making currency fluctuations a key factor affecting their financial results.

This study focuses on five leading multinational companies in the automotive industry: Volkswagen, BMW, Mercedes-Benz Group, Stellantis, and Renault.

These corporations are characterized by high production volumes, broad product portfolios, and strong positions in global markets. While their operations are primarily based in euros, they conduct extensive trade in regions where other major currencies such as the U.S. dollar, Chinese yuan, and British pound are dominant.

Given their international activities, shifts in exchange rates can have a direct effect on financial performance. A stronger euro may lead to reduced competitiveness in export markets, while a weaker euro can enhance sales abroad and improve profitability. Therefore, understanding the share of exports in total revenue is essential to assess the extent of FX exposure.

To explore the impact of exchange rate movements, the analysis centers on key financial indicators, particularly Return on Assets and Return on Equity. Revenue and Net Profit are also examined to provide background information on the companies' market development, although the primary focus remains on indicators that capture financial efficiency and shareholder value.

It is important to recognize that high revenue figures do not automatically translate into strong profitability.

Factors such as operational expenses, cost structures, and FX risks can reduce net margins even during periods of revenue growth. For this reason, ROA and ROE offer a more precise view of how well companies manage resources and deliver returns in the face of currency volatility.

The practical analysis draws on financial data covering the years 2012 to 2023. By combining trend analysis with correlation testing, the study aims to measure the relationship between FX fluctuations and the financial outcomes of multinational automotive corporations.

The findings are intended to provide practical insights into how currency movements influence company stability and global competitiveness in this sector.

4.3.1 Revenue of Multinational Corporations

The table 2 presents the annual revenues (€ million) of selected multinational corporations in the automotive industry: Volkswagen, BMW, Mercedes-Benz Group, Stellantis, and Renault, covering the period from 2012 to 2023. These companies were chosen for their significant exposure to foreign markets and reliance on international sales.

Revenue figures provide an essential indicator of business growth and market demand, reflecting how effectively each company generates income from its global operations. Given the high volume of exports in the automotive sector, revenues are sensitive to changes in foreign exchange rates, particularly fluctuations in the EUR/USD rate.

As exchange rate volatility can directly affect the pricing competitiveness of vehicles in international markets, analyzing revenue trends is crucial for understanding the extent to which currency movements have influenced corporate top-line performance over time.

By observing the revenue data across multiple years, it is possible to detect patterns of growth, stagnation, or decline that may correspond to periods of favorable or unfavorable currency movements.

This information serves as a foundation for the correlation analysis, which aims to quantify the relationship between exchange rate fluctuations and company revenue.

Table 2: Revenue of Multinational Corporations 2012–2023(€Million)

Automotive Industry					
Year	**Volkswagen**	**BMW**	**Mercedes**	**Stellantis**	**Renault**
2012	192,676	76,848	114,297	139,403	41,270
2013	197,007	76,059	117,982	140,714	40,932
2014	202,458	80,401	129,872	149,697	41,055
2015	213,292	92,175	149,467	165,271	45,327
2016	217,267	94,163	153,261	165,048	51,243
2017	229,550	98,678	164,330	176,144	58,770
2018	235,849	97,480	167,362	184,439	57,419
2019	252,632	104,210	172,745	182,918	55,537
2020	222,884	98,990	154,309	147,410	43,474
2021	250,200	111,239	133,893	149,419	41,659
2022	279,232	142,610	150,017	179,592	46,328
2023	322,284	155,498	153,218	185,000	52,376

Source: Company annual reports (2012–2023)

4.3.2 Profit of Multinational Corporations

The table below displays the net profit figures (€ million) for Volkswagen, BMW, Mercedes-Benz Group, Stellantis, and Renault across the years 2012 to 2023. Net profit represents the final earnings a company achieves after covering all operational costs, taxes, and other expenses.

Analyzing net profit over time provides a clear view of how effectively these firms manage their financial performance, especially in response to external factors such as foreign exchange rate movements.

Since fluctuations in currency values can influence revenues, operating costs, and ultimately profitability, observing how net profit evolves helps assess a company's ability to maintain financial stability under varying market conditions.

This financial overview also forms the groundwork for the upcoming correlation analysis, where the connection between FX rate changes and profitability outcomes will be systematically examined.

Table 3: Profit of Multinational Corporations 2012–2023 (€Million)

Automotive Industry					
Year	**Volkswagen**	**BMW**	**Mercedes**	**Stellantis**	**Renault**
2012	21,884	5,111	6,830	-3,597	1,735
2013	9,145	5,329	8,720	-376	695
2014	11,068	5,817	7,290	-74	1,998
2015	-1,361	6,396	8,711	1,276	2,960
2016	5,379	6,910	8,784	3,952	3,543
2017	11,463	8,706	10,864	5,439	5,210
2018	12,153	7,207	7,582	6,435	3,302
2019	14,029	5,022	2,709	5,901	-141
2020	8,824	3,857	4,009	2,046	-8,046
2021	14,843	12,463	11,085	13,218	967
2022	15,836	18,600	14,809	16,779	-716
2023	17,928	12,200	14,531	17,500	2,315

Source: Company annual reports (2012–2023)

4.3.3 Return on Assets of Multinational Corporations

The table below outlines the Return on Assets percentages for Volkswagen, BMW, Mercedes-Benz Group, Stellantis, and Renault during the years 2012 to 2023.

ROA serves as an important measure of how effectively a company is able to convert its asset base into earnings, offering insight into its operational performance.

Foreign exchange rate changes can indirectly affect ROA by influencing both the valuation of assets and overall profitability, particularly for companies with substantial international exposure.

For this reason, ROA is a useful indicator when assessing the broader financial impacts of currency volatility.a

This data provides the foundation for the subsequent correlation analysis, helping to explore the link between asset efficiency and the risks posed by exchange rate fluctuations.

Table 4: Return on Assets of Multinational Corporations (2012–2023)

Automotive Industry					
Year	**Volkswagen**	**BMW**	**Mercedes**	**Stellantis**	**Renault**
2012	7.1%	3.9%	4.2%	-3.1%	2.3%
2013	2.8%	3.8%	5.2%	-0.5%	1.0%
2014	3.2%	3.7%	3.8%	-0.1%	2.4%
2015	-0.4%	3.7%	4%	0.8%	3.3%
2016	1.3%	3.7%	3.6%	2.4%	3.5%
2017	2.7%	4.5%	4.3%	3%	4.9%
2018	2.7%	3.5%	2.7%	3.5%	2.9%
2019	2.9%	2.0%	0.9%	3.2%	-0.1%
2020	1.7%	1.7%	1.4%	1.9%	-6.7%
2021	2.4%	5.4%	4.3%	5.1%	0.8%
2022	2.7%	7.6%	5.7%	5.8%	-0.3%
2023	2.8%	4.8%	5.5%	6.0%	1.8%

Source: Company annual reports (2012–2023)

4.3.4 Return on Equity of Multinational Corporations

The table below shows the Return on Equity results for Volkswagen, BMW, Mercedes-Benz Group, Stellantis, and Renault across the period 2012 to 2023. ROE reflects how well a company turns the money invested by its shareholders into net income, serving as a vital measure of financial success.

When companies operate internationally, movements in foreign exchange rates can influence their earnings. Shifts in currency values may either boost or weaken the profits that are ultimately returned to shareholders. Observing how ROE changes over time helps uncover whether exchange rate volatility has placed additional pressure on company profitability.

The ROE figures are used later in the analysis to explore how strongly currency shifts are connected to the financial returns delivered to investors.

Table 5: Return on Equity of Multinational Corporations (2012–2023)

Automotive Industry					
Year	**Volkswagen**	**BMW**	**Mercedes**	**Stellantis**	**Renault**
2012	25.7 %	18.2%	17.4%	-21.5%	7.2%
2013	10.2%	17.6%	20.1%	-8.9%	2.8%
2014	12.3%	18.1%	16.4%	-2.2%	7.6%
2015	-1.5%	18.2%	17.9%	5.2%	10.1%
2016	5.8%	18.8%	16.9%	13.2%	11.8%
2017	10.5%	22.6%	18.4%	14.5%	15.6%
2018	10.4%	17.5%	11.5%	16.5%	9.3%
2019	11.3%	11.9%	4.4%	15.0%	-0.4%
2020	6.0%	9.0%	6.4%	10.8%	-32.3%
2021	8.6%	24.0%	15.4%	20.0%	3.2%
2022	8.4%	29.0%	20.6%	22.3%	-1.2%
2023	8.7%	18.0%	20.2%	23.0%	7.6%

Source: Company annual reports (2012–2023)

4.4 Correlation Analysis

When analyzing financial performance, it's important to understand how different factors move together. Correlation analysis helps measure the connection between two elements, showing if they tend to rise and fall in a similar way or move in opposite directions. A positive correlation means both increase together, while a negative one suggests that when one goes up, the other goes down. If the correlation is near zero, there is little to no connection between them.

In financial management, especially for businesses dealing internationally, this method can uncover whether shifts in external factors like currency exchange rates are linked to changes in revenues, profits, or efficiency measures. In this project, correlation analysis is used to explore if changes in the EUR/USD exchange rate could be related to shifts in the financial performance of large multinational companies. While this method highlights patterns, it is important to remember that it does not prove one factor causes the other.

4.5 Correlation Analysis and the Impact of Foreign Exchange Rates on Financial Performance

Companies that operate in several countries often face financial impacts due to currency value changes. A fluctuating exchange rate can influence how much they earn, how much their assets are worth, and how attractive they are to investors.

This study uses correlation analysis to check how closely the movements of the euro against the dollar match changes in key financial measures like total revenue, net profit, return on assets, and return on equity over the period from 2012 to 2023. By studying these links, the goal is to find out whether currency swings had a strong effect on financial performance, or whether other business factors were more influential. In the next sections, the results for each selected automotive company are presented, pointing out important trends and explaining their meaning for business performance.

4.6 Correlation Analysis Overview

Interpreting correlation coefficients accurately is a crucial part of financial analysis, especially when evaluating how foreign exchange rate changes influence company performance. Correlation describes how two variables move in relation to one another. A coefficient greater than +0.7 indicates a strong positive relationship, where both variables tend to rise together. Conversely, a coefficient below -0.7 shows a strong negative link, meaning that as one variable increases, the other typically decreases (Eiteman, Stonehill, and Moffett, 2023). If the coefficient is close to zero, it suggests little to no connection between the variables, meaning that movements in one do not predict movements in the other.

Beyond measuring the strength of correlation, it is equally important to assess whether the relationship is statistically significant. Statistical significance tests whether the observed pattern is likely due to chance. For example, a small correlation, such as 0.03, might still be statistically significant if the sample size is large enough (Helhel, 2015).

This underscores that significance alone does not imply that the relationship is meaningful in practical business terms.

It is also important to recognize that even when a correlation is statistically significant, it might not have major practical relevance if the strength of the relationship is weak. For instance, while a multinational corporation may show a significant relationship between currency movements and profitability, a low correlation value suggests that foreign exchange fluctuations have only a minor impact on its financial outcomes.

Financial analysts must consider both the magnitude and significance of correlations to avoid misleading interpretations. A strong and significant correlation usually indicates a meaningful connection, while a weak but significant result should be approached with caution.

In this research, careful attention is given to both aspects. The aim is not only to identify statistical relationships but also to interpret whether these relationships matter in real-world financial management for multinational corporations dealing with foreign exchange risk. This approach ensures that conclusions reflect the complexity of decision-making in international business.

4.7 Volkswagen AG

Volkswagen AG, based in Wolfsburg, Germany, ranks among the most prominent car manufacturers worldwide. The company operates under several well-known brands, including Audi, Škoda, SEAT, Porsche, Bentley, and Lamborghini, and produces a diverse range of vehicles such as passenger cars, commercial trucks, and luxury automobiles. Volkswagen's production facilities are spread across different continents, allowing it to cater efficiently to a global customer base.

International sales form a major part of Volkswagen's overall business. According to its 2023 Annual Report, over three-quarters of Volkswagen's total vehicle output is sold outside Germany, emphasizing its reliance on export activities. While the company's operating expenses are primarily in euros, it earns significant income in foreign currencies such as the US dollar, the Chinese yuan, and the British pound.

Due to its widespread global operations, Volkswagen is highly exposed to changes in foreign exchange rates. A significant portion of its exports, particularly to North America and parts of Asia, are invoiced in US dollars, making the dollar its key external trading currency. When the euro becomes stronger against other currencies, Volkswagen's vehicles become more expensive for international buyers, often leading to reduced competitiveness and lower demand. On the other hand, a weaker euro tends to support export growth by making Volkswagen's products more affordable abroad.

Managing this currency risk is critical for Volkswagen's financial stability. The company uses various strategies, including natural hedging through diversified production locations and financial hedging instruments, to limit the adverse impacts of exchange rate fluctuations. This approach helps Volkswagen protect its revenues and maintain profitability despite the challenges of operating in multiple currency markets.

Table 6: Correlation Analysis of Foreign Exchange Rate and Financial Indicators for Volkswagen

	Company=Volkswagen AG Correlations (DP._sta) Marked correlations are significant at p < ,0 5000 N= 12 (Casewise deletion of missing data)						
Variables	Means	Std.Dev.	Revenue	FX_Rate	Total Profit	ROA	ROE
FX Rate	1,2	0,10	-0,688190	1,000000	0, 147229	0,500501	0,542013

Source: Compiled from Volkswagen Annual Reports (2012-2023)

The correlation analysis for Volkswagen AG highlights how foreign exchange rate fluctuations have influenced the company's financial performance between 2012 and 2023. The correlation coefficient between the FX rate and revenue is -0.6881, indicating a moderate negative relationship. This suggests that when the euro strengthens, Volkswagen's revenue tends to decline. This outcome is consistent with Volkswagen's strong reliance on exports, where a stronger domestic currency reduces international price competitiveness and lowers sales.

The correlation between the FX rate and total profit is weak at 0.1472, implying that while revenue is affected by currency movements, Volkswagen's profitability remains relatively stable. This stability may be attributed to the company's use of natural hedging, geographical diversification, and strategic cost management, which help reduce exposure to exchange rate risks.

Furthermore, moderate positive correlations are observed between the FX rate and return on assets (0.5005) and return on equity (0.5420). Although these relationships are not strong, they suggest that Volkswagen's financial efficiency and shareholder returns can be slightly influenced by exchange rate movements, possibly through operational adjustments or shifts in regional market performance.

Overall, while Volkswagen's revenue is moderately sensitive to currency fluctuations, its profitability metrics show limited direct impact. This finding underlines that although foreign exchange rates play a role, other factors such as global demand trends, supply chain resilience, and corporate strategy significantly shape Volkswagen's financial outcomes.

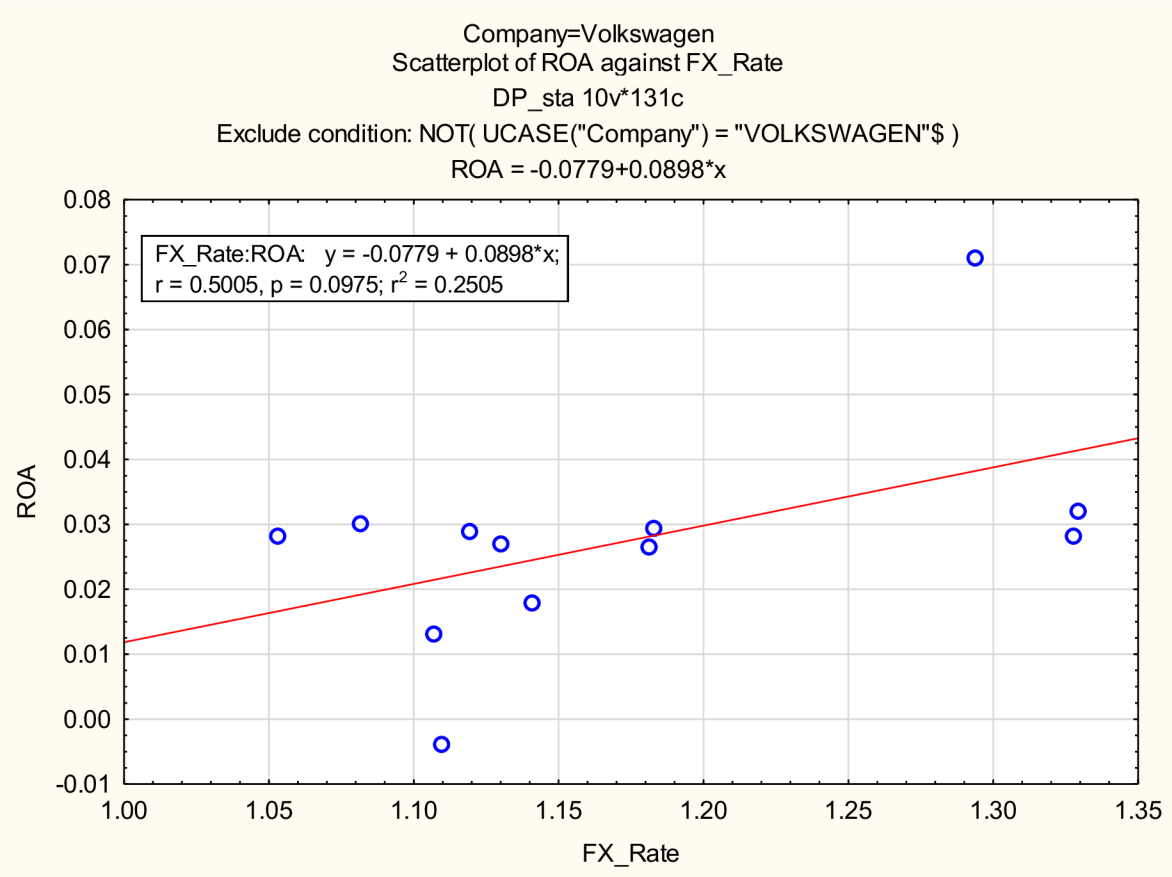

Figure 5: Scatter Plot of ROA Against FX Rate for Volkswagen
Source: Generated using financial data from Volkswagen Annual Reports (2012-2023)

The scatter plot illustrates the relationship between Volkswagen's return on assets and the EUR/USD exchange rate from 2012 to 2023.

The regression equation is

$$ROA = -0.0779 + 0.0898\, x\, FX\ Rate \quad (15)$$

The correlation coefficient (r = 0.5005) suggests a moderate positive relationship, indicating that a strengthening euro is generally associated with an improvement in Volkswagen's return on assets. Although the p-value (p = 0.0975) is slightly above the standard 5% significance level, the positive trend is still relevant from a business perspective.

The coefficient of determination (r^2 = 0.2505) shows that about 25% of the variation in return on assets can be explained by changes in the exchange rate, while the remaining variation is influenced by operational performance, market dynamics, and strategic decisions. This pattern suggests that Volkswagen may have maintained or enhanced operational efficiency during periods of a stronger euro, reflecting solid financial management and adaptability in international markets.

Even though the statistical significance is limited, the business implications are meaningful. This observation aligns with findings from Eiteman, Stonehill, and Moffett (2023), who note that multinational corporations often experience indirect financial impacts from currency movements, particularly when backed by strong internal financial practices. Therefore, foreign exchange rate fluctuations appear to play a supporting role in shaping Volkswagen's financial outcomes.

4.8 Bayerische Motoren Werke GmbH

The BMW Group, with its headquarters in Munich, Germany, is a leading producer of premium vehicles and motorcycles. The company is well known for its strong brand portfolio, which includes BMW, MINI, and Rolls-Royce, offering a wide selection of luxury cars, electric vehicles, and mobility solutions. With a reputation for engineering innovation and product quality, BMW has established a strong presence across the global automotive industry.

BMW's production network spans more than fifteen countries, and its vehicles are sold in over 140 international markets. Based on the company's 2023 Annual Report, approximately 85 per cent of the vehicles manufactured in Germany are exported abroad. This high level of international engagement makes BMW's financial results

highly dependent on global trade flows and currency movements. While the euro serves as the company's reporting and operating currency, significant revenue streams are generated in the US dollar, Chinese yuan, and British pound.

Given its broad exposure to foreign markets, BMW is particularly vulnerable to fluctuations in foreign exchange rates. Variations in currency values can affect the competitiveness of BMW's pricing in overseas markets, influence the value of revenues when converted back into euros, and alter costs depending on where manufacturing inputs are sourced. As a result, managing exchange rate risks is an important part of BMW's financial strategy to ensure steady profitability and competitiveness on a global scale.

Table 7: Correlation Analysis of Foreign Exchange Rate and Financial Indicators for BMW

	Company=BMW Correlations (DP_ _sta) Marked correlations are significant at p<, 05000 N=12 (Casewise deletion of missing data)						
Varibale	Means	Std. Dev.	Revenue	FX Rate	Total Profit	ROA	ROE
FX Rate	1,2	0,10	-0, 735854	1,000000	-0, 508783	-0, 240536	-0, 169707

Source: Compiled from BMW Annual Reports (2012-2023)

The correlation analysis for BMW shows that foreign exchange rate fluctuations have had a significant influence on the company's financial performance between 2012 and 2023. The correlation coefficient between the exchange rate and revenue is -0.7358, which represents a strong negative relationship. This means that when the euro strengthens against other currencies, BMW's revenue tends to decrease notably. As a company that exports approximately 85 percent of its vehicles, BMW's international sales are highly sensitive to changes in currency values, particularly against the US dollar and the Chinese yuan.

The relationship between the exchange rate and total profit shows a moderate negative correlation of -0.5087. This result reflects how foreign exchange volatility affects not only sales volumes but also profitability, likely through increased pricing pressures and reduced competitiveness in major export markets. A stronger euro can lead to reduced profit margins when vehicles become more expensive for customers outside the euro area.

Meanwhile, the correlations between exchange rate fluctuations and operational indicators such as return on assets (-0.2405) and return on equity (-0.1697) are weak. This suggests that although currency changes have some effect, BMW's internal management practices, cost efficiency strategies, and brand resilience play a more dominant role in sustaining operational performance.

From a business perspective, these results align with BMW's profile as a luxury automobile manufacturer with a strong export orientation. Foreign exchange management is critical for BMW, as revenues are directly impacted by euro strength, while profitability and efficiency are somewhat shielded by operational strategies. This highlights the importance of ongoing financial risk management practices, including natural hedging and diversified market presence, in stabilizing BMW's financial outcomes in a volatile currency environment.

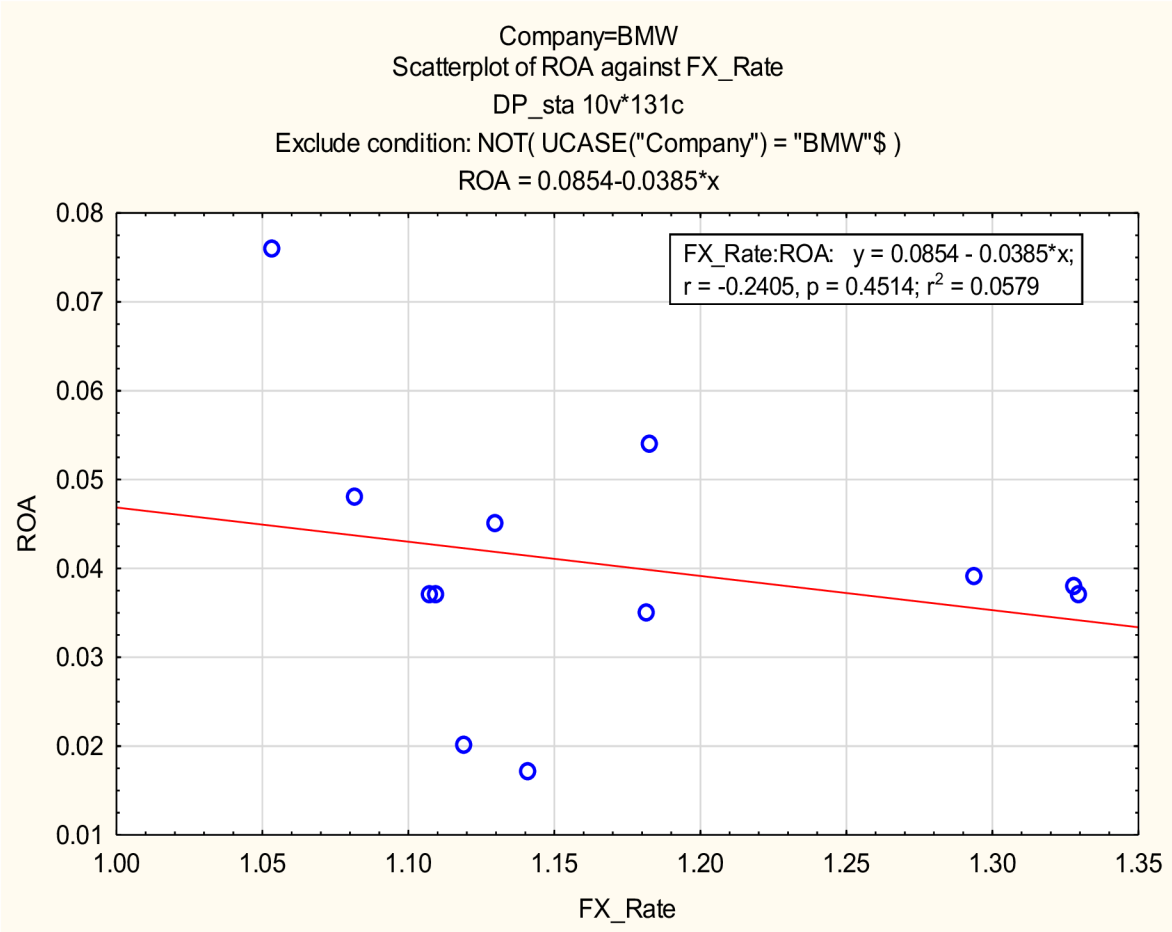

Figure 6: Scatter Plot of ROA Against FX Rate for BMW
Source: Generated using financial data from BMW Annual Reports (2012-2023)

The scatter plot presents the connection between BMW's return on assets and the EUR/USD exchange rate for the period 2012 to 2023.

The derived regression equation,

$$ROA = 0.0854 - 0.0385\ x\ FX\ Rate \tag{16}$$

points to a slight negative trend, implying that a stronger euro may cause a minor decline in BMW's return on assets. The correlation coefficient r = –0.2405 reflects a weak negative relationship, while the high p-value of 0.4514 indicates that this result is not statistically significant.

Although the statistical relationship is weak, the business context provides further explanation. BMW relies heavily on international markets, with a substantial share of its revenue earned outside the euro area, particularly in the United States, China, and the United Kingdom. An appreciation of the euro can make BMW's vehicles more expensive abroad, potentially reducing demand and marginally impacting asset efficiency. However, the low coefficient of determination (r^2 = 0.0579) reveals that most of the variability in return on assets is driven by other factors, such as operational excellence, brand strength, and global market trends.

This interpretation is consistent with the perspectives of international finance theory. As highlighted by Eiteman, Stonehill, and Moffett (2023), multinational companies like BMW often manage exchange rate exposures through natural hedging, geographic diversification, and strategic financial practices. Thus, even though currency fluctuations present external challenges, BMW's strong internal management and strategic approach have likely minimized the overall impact on its asset performance.

4.9 Mercedes Benz AG

Mercedes-Benz Group AG, based in Stuttgart, Germany, is a global leader in the luxury automobile sector. The company specializes in high-end passenger vehicles and vans through its flagship brand, Mercedes-Benz, and is renowned for premium quality, cutting-edge technology, and strong brand prestige. Mercedes-Benz operates on a truly global scale, with a strategic presence in over 150 countries.

Unlike mass-market manufacturers, Mercedes-Benz relies heavily on luxury exports, with approximately 75% of its German production sold abroad (Mercedes-Benz Group Annual Report, 2023). The United States, China, and South Korea are among its most important international markets. The company reports its financial results primarily in euros, but earns substantial revenues in U.S. dollars , Chinese yuan, and South Korean won.

Mercedes-Benz is uniquely sensitive to foreign exchange rate fluctuations because luxury vehicle buyers are more responsive to price changes at the high end of the market. A stronger euro can increase vehicle prices significantly in foreign markets, Directly impacting sales volumes in premium segments where customers expect a balance between price and exclusivity. To limit exposure, Mercedes-Benz has expanded local production, particularly in the United States and China, to better align costs and revenues in the same currencies. Nevertheless, currency volatility continues to play a key role in shaping Mercedes-Benz's global pricing strategy and premium market positioning, influencing the company's profit margins and its ability to sustain a competitive brand image worldwide.

Table 8: Correlation Analysis of Foreign Exchange Rate and Financial Indicators for Mercedes-Benz

	Company=Mercedes Benz group AG Correlations (DP_ _sta) Marked correlations are significant at p < ,0 5000 N= 12 (Casewise deletion of missing data)						
Variable	Means	Std.Dev.	Revenue	FX Rate	Total Profit	ROA	ROE
FX Rate	1,2	0,10	-0,756683	1,000000	-0,201671	0,063855	0,208809

Source: Compiled from Mercedes-Benz Annual Reports (2012-2023)

The analysis of Mercedes-Benz Group AG shows that foreign exchange rate changes have played an important role in shaping the company's financial outcomes between 2012 and 2023. A strong negative correlation of –0.7566 was found between the exchange rate and revenue. This indicates that when the euro becomes stronger, Mercedes-Benz faces a notable decline in its revenue, underlining the company's high reliance on export markets outside the eurozone.

The relationship between the exchange rate and total profit is weaker, with a correlation coefficient of –0.2016. This result suggests that while currency movements have some influence, the company's profitability is largely maintained

through effective cost control, premium pricing strategies, and by increasing local production in key regions such as China and the United States.

In terms of operational indicators, the return on assets shows a minimal positive correlation of 0.0638, while the return on equity has a slightly higher positive correlation of 0.2088. These weak correlations suggest that Mercedes-Benz's efficiency in utilizing its assets and generating shareholder returns is not significantly impacted by foreign exchange volatility. Instead, internal operational strength and strategic positioning appear to provide stability.

Overall, the findings reveal that while Mercedes-Benz's revenues are highly sensitive to fluctuations in the euro's value, its profitability and efficiency are more resilient. This resilience is supported by the company's strategic decisions to localize production, manage costs effectively, and maintain its competitive position in the premium automotive sector despite external financial pressures.

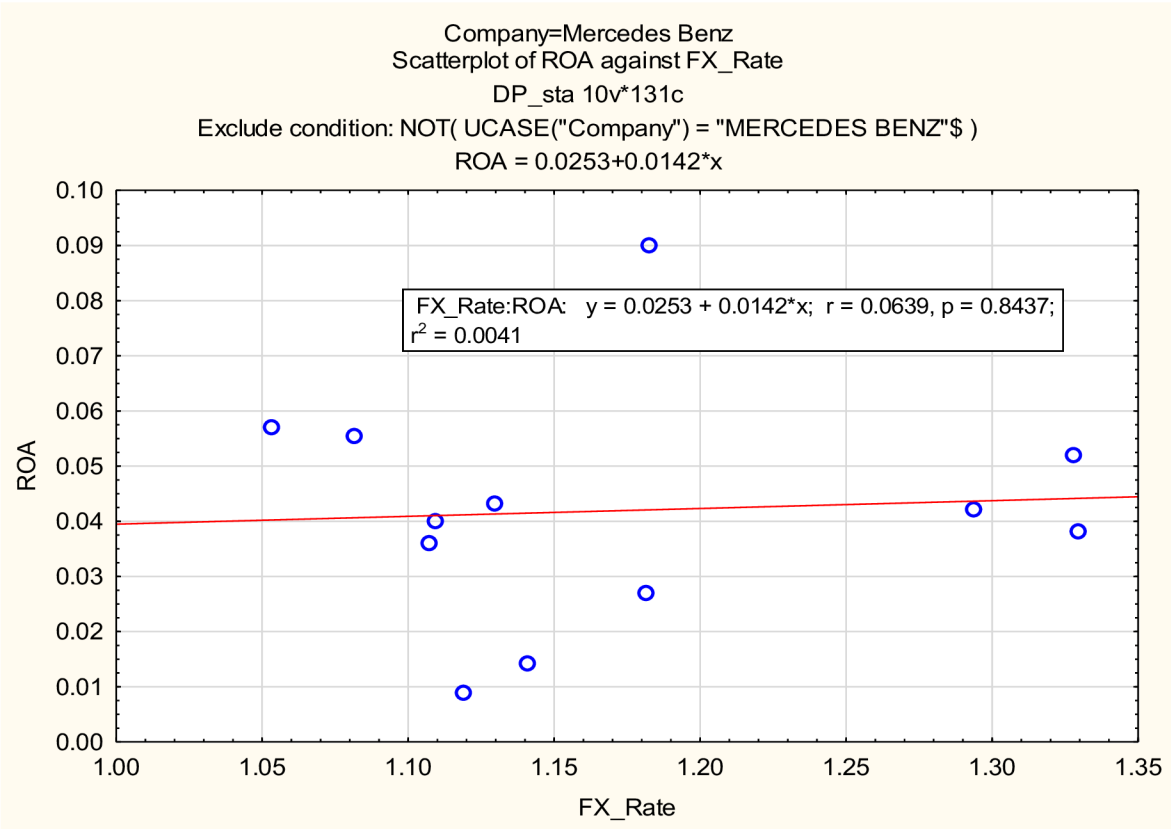

Figure 7: Scatter Plot of ROA Against FX Rate for Mercedes-Benz
Source: Generated using financial data from Mercedes-Benz Annual Reports (2012-2023)

The scatter plot shows the relationship between Mercedes-Benz Group's return on assets and the EUR/USD exchange rate over the period 2012 to 2023. The regression equation for the relationship is

$$ROA = 0.0253 + 0.0142\ x\ FX\ Rate \tag{17}$$

The correlation coefficient (r = 0.0639) indicates a very weak positive relationship, meaning that changes in the exchange rate have almost no direct effect on Mercedes-Benz's asset efficiency. The p-value (p = 0.8437) is much higher than the 0.05 significance threshold, confirming that this relationship is not statistically significant. The coefficient of determination (r^2 = 0.0041) shows that less than 1 percent of the variation in return on assets can be explained by exchange rate fluctuations, suggesting that other operational and market factors are far more influential.

From a business perspective, although the slight positive trend might suggest a minimal benefit from a stronger euro, this effect is practically negligible. Given that Mercedes-Benz operates in the premium automotive segment, its financial performance is more strongly influenced by factors such as brand strength, production localization strategies, and luxury market demand rather than by short-term currency movements. This interpretation aligns with the views of Eiteman, Stonehill, and Moffett (2023), who emphasize that multinational corporations mitigate exchange rate impacts through strategic financial management, diversified operations, and currency hedging practices.

4.10 Stellantis N.V.

Stellantis N.V. is an international automotive manufacturer based in Amsterdam, formed in 2021 following the merger of Fiat Chrysler Automobiles and Groupe PSA. By bringing together multiple well-known brands like Peugeot, Citroën, Opel, Fiat, Chrysler, Jeep, Dodge, and Ram, the company has secured a strong position across both European and North American markets.

The company's production facilities are distributed across Europe, the Americas, and Asia. As reported in 2023, around 65% of its vehicle output from Europe was sold to

destinations outside the eurozone (Stellantis Annual Report, 2023). Financial statements are mainly prepared in euros and US dollars, reflecting its operational presence in both regions. Key international markets include the United States, Canada, China, and various Latin American countries, where transactions are often conducted in currencies like the United States dollar, Canadian dollar, and Chinese yuan.

Although its geographic diversity provides some protection against exchange rate risks, Stellantis still faces currency-related challenges. Earnings generated in the USA are sensitive to exchange rate shifts when converted into euros for reporting purposes. A stronger euro reduces the value of dollar-denominated revenues, while a weaker euro can strengthen reported income. Similarly, volatility in emerging market currencies can create additional risks. Because of this exposure, managing foreign exchange risks remains an important part of Stellantis' financial strategy to ensure consistent performance worldwide.

Table 9: Correlation Analysis of Foreign Exchange Rate and Financial Indicators for Stellantis

	Company=Stellantis N.V. Correlations (DP_ _sta) Marked correlations are significant at p <,0 5000 N= 12 (Casewise deletion of missing data)						
Variable	Means	Std.Dev.	Revenue	FX Rate	Total Profit	ROA	ROE
FX Rate	1,2	0,10	-0,739181	1,000000	-0,667651	-0,754502	-0,811585

Source: Compiled from Stellantis Annual Reports (2012-2023)

The correlation analysis for Stellantis N.V. highlights a strong impact of foreign exchange rate changes on the company's financial performance. A correlation coefficient of -0.7391 between the exchange rate and revenue indicates a strong negative relationship. This means that when the euro appreciates against other currencies, Stellantis' revenues tend to fall sharply, showing its heavy reliance on international sales outside the eurozone.

Similarly, the link between the exchange rate and total profit is -0.6676, which points to a moderate-to-strong negative association. Although this figure is just above the threshold typically considered "strong," it still shows that currency shifts have a significant influence on Stellantis' profitability, particularly given the role of the US dollar in its earnings.

In terms of operational efficiency, a very strong negative correlation exists between the exchange rate and return on assets (-0.7545) as well as return on equity (-0.8115). Both values are well below -0.7, confirming that fluctuations in the euro's value heavily affect how effectively the company uses its assets and generates returns for shareholders. A stronger euro reduces the value of US dollar-denominated profits when translated into euros, impacting both asset productivity and equity returns.

Overall, the results indicate that Stellantis is highly exposed to foreign exchange movements across several financial indicators. Although its structure across Europe and North America provides some natural protection against currency risks, the findings suggest that active foreign exchange risk management strategies, such as financial hedging and operational flexibility, are essential for maintaining steady financial performance and safeguarding profitability

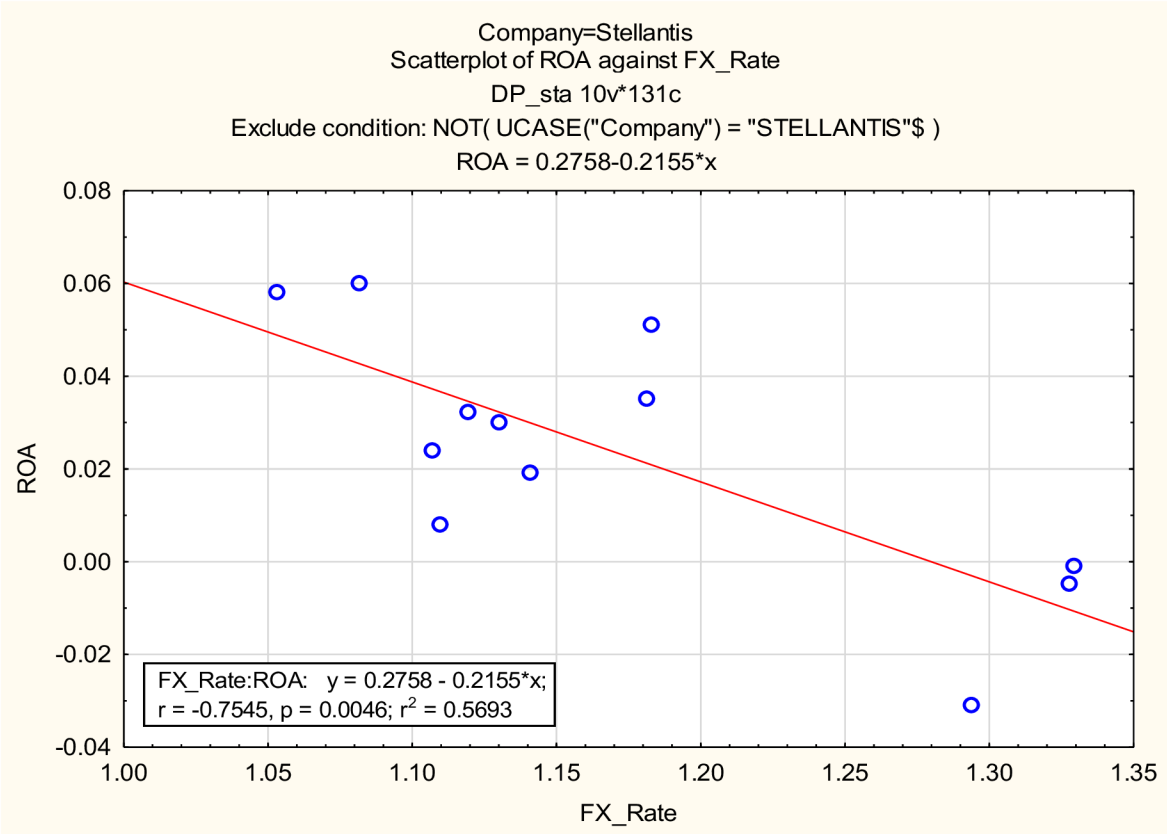

Figure 8: Scatter Plot of ROA Against FX Rate for Stellantis
Source: Generated using financial data from Stellantis Annual Reports (2012-2023)

The scatter plot illustrates the relationship between Stellantis' return on assets and the EUR/USD exchange rate over the period from 2012 to 2023. The regression equation is

$$ROA = 0.2758 - 0.2155\ x\ FX\ Rate. \quad (18)$$

indicating a strong negative slope, which suggests that as the foreign exchange rate increases (the euro strengthens), Stellantis' return on assets tends to decline.

The correlation coefficient r = –0.7545 shows a strong negative correlation between foreign exchange rate fluctuations and return on assets. This means that a stronger euro is associated with a notable decrease in Stellantis' asset efficiency. The p-value (p = 0.0046) is well below the 0.05 threshold, confirming that this relationship is statistically significant and unlikely to have occurred by random chance. Additionally, the coefficient of determination $r^2 = 0.5693$ reveals that approximately 56.93% of the variation in return on assets can be explained by changes in the foreign exchange rate, while the remaining 43.07% is influenced by other internal or market-related factors.

From a business perspective, this significant negative relationship highlights Stellantis' sensitivity to foreign exchange rate movements. Since Stellantis relies heavily on exports outside the eurozone, an appreciating euro likely makes its vehicles more expensive in foreign markets, reducing sales competitiveness and lowering profitability. This finding is consistent with financial theories presented by Eiteman, Stonehill, and Moffett (2023), which argue that export-oriented multinational corporations are particularly vulnerable to adverse currency fluctuations if effective hedging strategies are not in place.

This relationship emphasizes the need for Stellantis to adopt proactive measures such as adjusting pricing strategies, expanding local production facilities abroad, and implementing comprehensive hedging programs to stabilize operational and financial performance.

4.11 Renault Group

Renault Group, a major European car manufacturer located in France, has built a strong presence both within Europe and in overseas markets. Through its partnership with Nissan and Mitsubishi, the company has expanded its operations globally, including leadership in affordable electric vehicles.

Renault's focus on offering cost-effective vehicles makes it more sensitive to shifts in foreign exchange rates. In regions where economic conditions are less stable, even minor currency changes can affect consumer purchasing power and overall sales performance. While steady demand in the European Union provides some balance, exposure to areas with volatile local currencies adds financial risks.

Although a large portion of Renault's exports are outside the Eurozone, only a minor share of revenue appears to be earned in USD, as Renault has limited exposure to the U.S. market compared to other multinational carmakers. The exact percentage of USD denominated revenue is not specified in the company's public reports.

To minimize these risks, Renault has taken steps such as adjusting local production strategies, implementing flexible pricing in key regions, and employing financial instruments to manage exchange rate effects. These actions help Renault maintain competitive prices and safeguard earnings, particularly in markets vulnerable to currency instability.

Table 10: Correlation Analysis of Foreign Exchange Rate and Financial Indicators for Renault

	Company=Renault Group Correlations (DP_ sta) Marked correlations are significant at p <,05000 N=12 (Casewise deletion of missing data)						
Variable	Means	Std.Dev.	Revenue	FX_Rate	Total Profit	ROA	ROE
FX Rate	1,17	0,095	-0,554726	1,000000	0,052504	0,099101	0,084298

Source: Compiled from Renault Annual Reports (2012-2023)

The correlation analysis for Renault Group provides insights into the sensitivity of the company's financial performance to foreign exchange rate fluctuations during the period from 2012 to 2023. The correlation coefficient between the EUR/USD exchange rate and revenue is -0.5547, indicating a moderate negative relationship.

This suggests that when the euro strengthens, Renault's revenues tend to decline, although the connection is not as strong compared to premium automotive manufacturers. The moderate sensitivity reflects Renault's reliance on a mix of mature and emerging markets, where currency impacts can vary significantly.

The correlation between the foreign exchange rate and total profit is very weak at 0.0525. This near-zero correlation suggests that fluctuations in exchange rates have

little to no direct effect on Renault's overall profitability. One possible reason for this could be Renault's limited presence in the U.S. market, where transactions would typically be conducted in U.S. dollars. Instead, Renault primarily generates revenue in other currencies such as the euro, Brazilian real, or British pound. Additionally, its localized production strategies in emerging markets and adaptive pricing policies may help insulate the company's profit levels from exchange rate swings, further weakening any measurable link between foreign currency movements and net earnings.

In terms of operational efficiency, the correlations between the foreign exchange rate and return on assets and return on equity are 0.0991 and 0.0842 respectively. These values also indicate very weak positive relationships, suggesting that foreign exchange rate fluctuations have minimal direct impact on how efficiently Renault uses its assets or generates returns for shareholders. The low sensitivity is likely due to Renault's diverse operational structure and its strategic partnerships, such as the Renault-Nissan-Mitsubishi Alliance, which help to stabilize performance across different currency zones.

Overall, the results indicate that while Renault's revenues are moderately affected by exchange rate movements, its profitability and efficiency indicators remain largely resilient. This resilience highlights the effectiveness of Renault's business model and risk management practices, including localized production, flexible pricing models, and strategic market diversification, in mitigating financial risks and ensuring long-term financial stability across international markets.

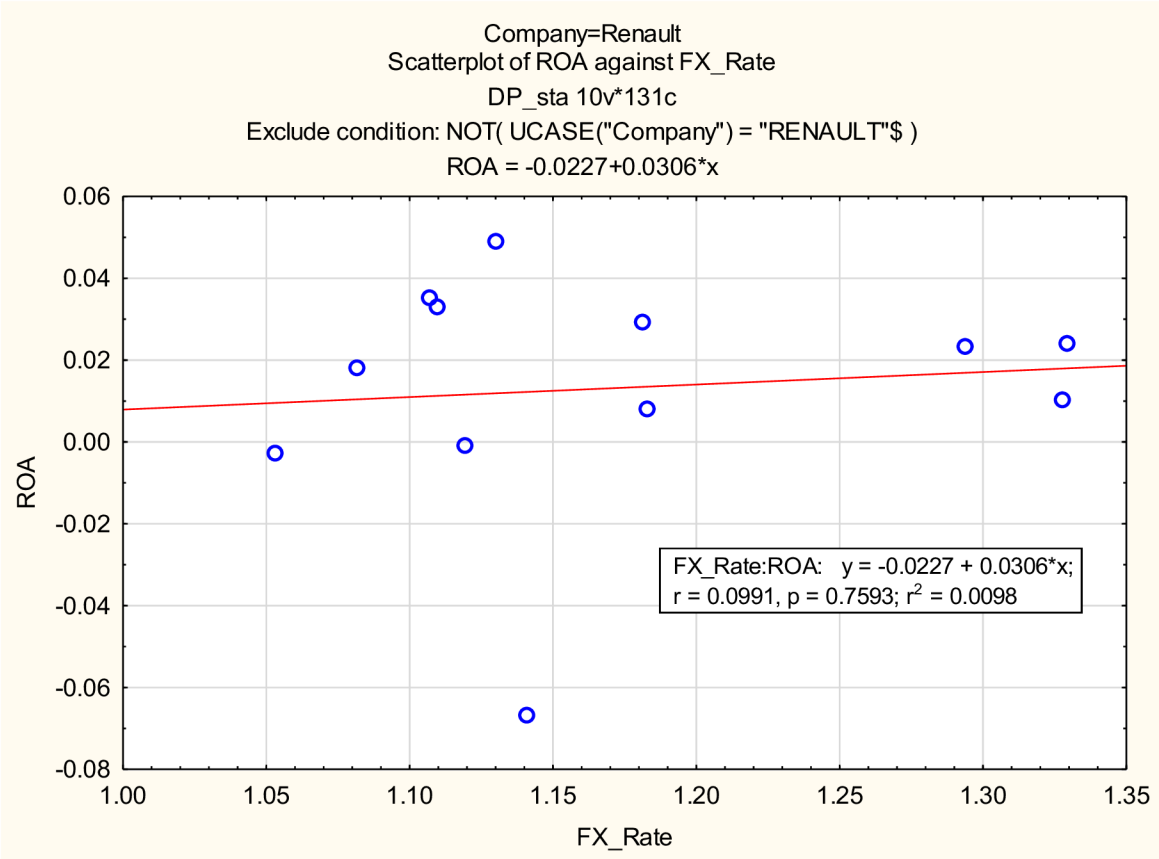

Figure 9: Scatter Plot of ROA Against FX Rate for Renault
Source: Generated using financial data from Renault Annual Reports (2012-2023) and ECB exchange rate data.

The scatter plot shows how Renault's return on assets responded to changes in the EUR/USD exchange rate from 2012 to 2023. The trend line given by the equation

$$ROA = -0.0227 + 0.0306\, x\, FX\ Rate \tag{19}$$

suggests a very mild upward trend. In other words, as the euro gained strength against the dollar, Renault's return on assets increased very slightly.

This extremely weak and statistically insignificant correlation may be explained by Renault's operational structure. The company has a strong focus on cost-efficient, localized production, especially in emerging markets, which helps minimize direct dependence on exchange rate shifts. Moreover, a significant share of its sales and expenditures occurs within the Eurozone, meaning that internal euro-to-euro transactions dominate. As a result, the translation effect on asset efficiency remains limited, and currency volatility plays only a minor role in shaping ROA.

Additionally, Renault’s business model emphasizes volume sales of affordable vehicles, where pricing and operational efficiency may be more influenced by market demand, production scale, or cost control than currency factors alone.

The r-squared value, only 0.0098, confirms this by showing that less than 1% of the variation in return on assets can be linked to shifts in the exchange rate. The remaining 99% must be explained by other factors such as Renault’s internal operations, market strategies, cost structures, or broader economic influences.

Overall, the data suggest that Renault’s asset performance remained steady and was barely impacted by exchange rate changes during the analyzed years. This resilience likely stems from the company's strong operational foundations, diverse market presence, and risk management approaches that shielded it from minor currency fluctuations.

4.12 Impact of Foreign Exchange Fluctuations on Automotive Industry Performance

The automotive sector, which operates across various global markets, is heavily influenced by changes in currency values. When the euro appreciates, European-made vehicles become relatively more expensive in international markets, often leading to a decrease in export demand. Conversely, a weakening euro generally boosts the price competitiveness of these exports, potentially increasing sales volumes abroad.

Exchange rate movements affect multiple financial dimensions, including revenues, operating costs, and profit margins. Firms with significant international sales exposure are particularly vulnerable, while those with diversified operations and localized production facilities manage to absorb some of the shocks more effectively. Overall, currency volatility represents a constant challenge that automotive firms must strategically manage to maintain profitability and competitiveness on a global scale.

4.13 Company-Wise Comparison within the Automotive industry

When examining specific companies, several patterns emerge in how they are affected by exchange rate shifts. Luxury brands such as BMW and Mercedes-Benz show heightened sensitivity to the euro's fluctuations. For these companies, a stronger euro tends to weaken demand overseas due to higher relative pricing, while a weaker euro supports international sales by making their vehicles more affordable.

Volkswagen and Stellantis, which offer a broader range of mid-range and economy vehicles, experience a more moderate impact. Stellantis benefits additionally from its production activities in North America, which create a partial natural hedge against euro movements.Renault presents a unique case: its moderate sensitivity is the result of a balanced presence across developed and emerging markets. By emphasizing localized manufacturing and flexible pricing, Renault reduces its exposure to direct currency-related risks.

In summary, companies focusing on premium markets are generally more affected by foreign exchange fluctuations, while those with wider market strategies and regional diversification tend to withstand currency volatility better.

Table 11: Company-Wise Comparison of Sensitivity to Exchange Rate Fluctuations in the Automotive Industry

Company	Market Focus	FX Sensitivity	Main Strategy
BMW	Premium	High	Export-focused, primarily EU-based production
Mercedes-Benz	Premium	High	Export-focused, EU production
Volkswagen	Mixed (Premium & Midrange)	Moderate	Diversified markets & global production
Stellantis	Mass-market	Strong	Dual base in EU and North America
Renault	Emerging markets & Affordable segment	Low	Localized production & flexible pricing

Source: Prepared by using historical financial data and exchange rate trends (2012–2023).

Conclusions

The primary goal of this Diploma thesis was to evaluate how fluctuations in the euro to US dollar exchange rate have influenced the financial performance of multinational corporations in the automotive sector. Specifically, the objective was to determine the extent to which currency volatility correlates with financial indicators such as revenue, net profit, return on assets and return on equity for selected global car manufacturers namely, Volkswagen, BMW, Mercedes-Benz Group, Stellantis, and Renault over the period from 2012 to 2023.

This goal was successfully achieved through a combination of theoretical exploration and empirical analysis. The theoretical framework addressed key concepts related to foreign exchange exposure, including transaction, translation, and economic risks, as well as the financial strategies companies use to mitigate these risks. This background laid the foundation for a comprehensive data analysis based on real-world financial metrics and correlation studies.

The results of the analysis highlighted distinct patterns. Companies like BMW and Mercedes-Benz, which operate heavily in the premium export segment, showed a strong negative correlation between exchange rate movements and revenue. This indicates that a stronger euro makes their products less competitive in non-euro markets, negatively impacting sales. Similarly, Stellantis demonstrated notable sensitivity in both revenue and profitability, although its diversified global presence provided some protection.

Volkswagen experienced a moderate negative relationship, reflecting its strong export base and global operations. Renault, on the other hand, displayed weaker correlations across most financial indicators. This likely stems from its strategic emphasis on localized production, sales diversification across emerging markets, and reduced dependence on the U.S. dollar.

The findings confirm that while foreign exchange fluctuations do affect financial outcomes, the impact varies considerably depending on each firm's business model, geographic footprint, and operational strategies. Moreover, the analysis revealed that currency risk is just one of many variables influencing company performance. Internal

efficiencies, market conditions, consumer preferences, and strategic positioning also play a critical role in shaping financial results.

In conclusion, the objective of the thesis was clearly fulfilled. By combining theory and data-driven analysis, the study has demonstrated that exchange rate volatility is a significant external factor that multinational automotive corporations must account for particularly those with heavy reliance on exports.

At the same time, it has shown that firms with more balanced or localized operations tend to be more resilient to such fluctuations. These insights reinforce the importance of integrating foreign exchange risk management into broader financial planning and strategic decision-making processes. For future research, exploring additional industries or expanding the timeframe may offer even deeper insights into the long-term financial consequences of currency fluctuations on multinational enterprises.

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Appendix A :Financial Performance Data of Volkswagen AG (2012–2023)

Year	Revenue (€ million)	Net Income (€ million)	ROE (%)	ROA (%)	FX RATE
2012	192,676	21,884	25.7	7.1	1.2939
2013	197,007	9,145	10.2	2.8	1.3281
2014	202,458	11,068	12.3	3.2	1.3297
2015	213,292	-1,361	-1.5	-0.4	1.1096
2016	217,267	5,379	5.8	1.3	1.1072
2017	229,550	11,463	10.5	2.7	1.1301
2018	235,849	12,153	10.4	2.7	1.1817
2019	252,632	14,029	11.3	2.9	1.1194
2020	222,884	8,824	6	1.7	1.1410
2021	250,200	14,843	8.6	2.4	1.1830
2022	279,232	15,836	8.4	2.7	1.0534
2023	322,284	17,928	8.7	2.8	1.0817

Appendix B : Financial Performance Data BMW (2012–2023)

Year	Revenue (€ million)	Net Income (€ million)	ROE (%)	ROA (%)	FX RATE
2012	76,848	5,111	18.2	3.9	1.2939
2013	76,059	5,329	17.6	3.8	1.3281
2014	80,401	5,817	18.1	3.7	1.3297
2015	92,175	6,396	18.2	3.7	1.1096
2016	94,163	6,910	18.8	3.7	1.1072
2017	98,678	8,706	22.6	4.5	1.1301
2018	97,480	7,207	17.5	3.5	1.1817
2019	104,210	5,022	11.9	2	1.1194
2020	98,990	3,857	9	1.7	1.1410
2021	111,239	12,463	24	5.4	1.1830
2022	142,610	18,600	29	7.6	1.0534
2023	155,498	12,200	18	4.8	1.0817

Appendix C : Financial Performance Data of Renault Group (2012–2023)

Year	Revenue (€ million)	Net Income (€ million)	ROE (%)	ROA (%)	FX RATE
2012	41,270	1,735	7.2	2.3	1.2939
2013	40,932	695	2.8	1	1.3281
2014	41,055	1,998	7.6	2.4	1.3297
2015	45,327	2,960	10.1	3.3	1.1096
2016	51,243	3,543	11.8	3.5	1.1072
2017	58,770	5,210	15.6	4.9	1.1301
2018	57,419	3,302	9.3	2.9	1.1817
2019	55,537	-141	-0.4	-0.1	1.1194
2020	43,474	-8,046	-32.3	-6.7	1.1410
2021	41,659	967	3.2	0.8	1.1830
2022	46,328	-716	-1.2	-0.3	1.0534
2023	52,376	2,315	7.6	1.8	1.0817

Appendix D : Financial Performance Data of Stellantis N.V. (2012–2023)

Year	Revenue (€ million)	Net Income (€ million)	ROE (%)	ROA (%)	FX RATE
2012	139,403	-3,597	-21.5	-3.1	1.2939
2013	140,714	-376	-8.9	-0.5	1.3281
2014	149,697	-74	-2.2	-0.1	1.3297
2015	165,271	1,276	5.2	0.8	1.1096
2016	165,048	3,952	13.2	2.4	1.1072
2017	176,144	5,439	14.5	3	1.1301
2018	184,439	6,435	16.5	3.5	1.1817
2019	182,918	5,901	15	3.2	1.1194
2020	147,410	2,046	10.8	1.9	1.1410
2021	149,419	13,218	20	5.1	1.1830
2022	179,592	16,779	22.3	5.8	1.0534
2023	185,000	17,500	23	6	1.0817

Appendix E : Financial Performance Data of Mercedez Benz Group AG (2012–2023)

Year	Revenue (€ million)	Net Income (€ million)	ROE (%)	ROA (%)	FX RATE
2012	114,297	6,830	17.4	4.2	1.2939
2013	117,982	8,720	20.1	5.2	1.3281
2014	129,872	7,290	16.4	3.8	1.3297
2015	149,467	8,711	17.9	4	1.1096
2016	153,261	8,784	16.9	3.6	1.1072
2017	164,330	10,864	18.4	4.3	1.1301
2018	167,362	7,582	11.5	2.7	1.1817
2019	172,745	2,709	4.4	0.9	1.1194
2020	154,309	4,009	6.4	1.4	1.1410
2021	133,893	11,085	15.4	4.3	1.1830
2022	150,017	14,809	20.6	5.7	1.0534
2023	153,218	14,531	20.2	5.5	1.0817