

Assessing the External Impact on the Egyptian Automotive Market

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Abstract:

In Egypt, the automotive sector—which comprises distributors, supply chains, feeder industries, and service facilities—is regarded as a significant economic sector. Egypt led the region for decades and was one of the first countries in Africa and the Middle East to develop a domestic automobile industry, but its economic contribution to the country is still modest and falls short of expectations. The yearly vehicle market volume has not surpassed 300,000 units, falling behind nations with much more developed automotive industries, such as Morocco, Turkey, South Africa, and Iran.

Using information from national institutions, international organizations like the World Bank and the IMF, and AMIC, this study examines the external factors influencing Egypt's automobile market between 2009 and 2024. The results show that the most important factors influencing yearly sales volumes are economic indicators, particularly inflation, unemployment rates, and economic growth. The COVID-19 pandemic had less of an impact than anticipated. Furthermore, the market size was not significantly impacted by free trade agreements.

The results suggest expanding vehicle replacement programs to modernize the fleet, securing domestic raw materials, increasing the proportion of local manufacturing, and taking economies of scale into account when setting up new factories.

Keywords: Feeding industries, Exchange rate, Local content, COVID-19, market shocks, Automobiles

" دراسة وتحليل تأثير العوامل الخارجية على سوق السيارات المصري "

الملخص:

صناعة السيارات وما يرتبط بها من صناعات مغذية وسلاسل الامداد وشبكة الموزعين ومراكز البيع والصيانة تمثل قطاع هام ورافد لاقتصاد الدولة. وكانت مصر من أوائل الدول في افريقيا والشرق الأوسط التي لديها صناعة سيارات واستمرت لعقود تتقدم منطقة الشرق الأوسط وافريقيا في هذا المجال.

ولكن ما زال حجم مساهمة هذا القطاع في الاقتصاد القومي محدود وقل من المتوقع حيث ان أقصى حجم مبيعات سنوي لم يتجاوز ٣٠٠٠٠٠ سيارة تشمل المستورد والمجمع محليا سواء سيارات الركوب الخاصة او سيارات النقل بأنواعها وفقا للتقارير السنوية لمنظمة AMIC (2009: 2024) AMIC دول عديدة في منطقة الشرق الأوسط وأفريقيا نجحت في تحقيق خطوات متقدمة في تطوير صناعة السيارات ومساهمتها في دعم اقتصادها الوطني مثل المغرب تركيا جنوب افريقيا وإيران.

هناك عوامل متعددة وراء تعثر هذه الصناعة وضعف مساهمتها في الاقتصاد الوطني منها أسباب داخلية تتعلق بميزانيات البحث والتطوير واللوائح والقوانين المنظمة لهذا القطاع وهناك عوامل وأسباب خارجية تتعلق ببعض النزاعات الإقليمية وتأثيرها على سلاسل الامداد وبعضها يتعلق بكوارث عالمية مثل جائحة فيروس كورونا.

تهدف هذه الدراسة الي تحليل تأثير العوامل الخارجية على حجم المبيعات السنوي للسيارات في مصر وتقديم مقترحات لتقليل الجانب السلبي لهذا التأثير. تم تجميع المعلومات والبيانات لسوق السيارات المصري في الفترة من ٢٠٠٩ حتى 2024 حسب بيانات AMIC بالإضافة الي بيانات المؤسسات الدولية مثل صندوق النقد والبنك الدولي والمؤسسات الرسمية المصرية مثل الجهاز المركزي للمحاسبات والبنك المركزي.

وقد بينت الدراسة ان نسبة نمو الاقتصاد ونسبة التضخم ونسبة البطالة لها التأثير الأعظم على حجم الإنتاج السنوي ويأتي بعد ذلك العوامل السياسية. وقد بينت الدراسة ان جائحة كورونا كان لها تأثير محدود على حجم المبيعات السنوي علي عكس المتوقع وان اتفاقيات التجارة الحرة لم تؤثر في حجم سوق السيارات المصري.

وتوصي الدراسة بدعم تعميق التصنيع المحلي مع التركيز على توفير الخامات اللازمة للإنتاج محليا والتوسع في برامج إحلال السيارات القديمة. كما توصي الدراسة على مراعاة قاعدة الاقتصاد الحجمي عند انشاء مصانع جديدة.
كلمات مفتاحية :

الصناعات المغذية للسيارات - المكون المحلي -جائحة كورونا - صدمات السوق -
سعر الصرف – قطاع السيارات

1. Introduction

1.1 Background

One of the biggest and most significant manufacturing sectors in the world is the automobile industry. It started in Europe, expanded through mass production in the US, and then advanced with inventions from South Korea, Japan, and most recently, China, which is currently the world's largest producer. The industry is frequently referred to as the "industry of industries" because of its size and complexity. Its economic footprint is exceptionally broad, supporting not only auto part manufacturers but also a vast network of sales, servicing, financing, repairs, and insurance sectors.

The industry has proven to be extremely resilient over the years to significant global shocks like economic downturns, the COVID-19 pandemic, and geopolitical conflicts like the conflict between Russia and Ukraine. But these issues are growing more common and intricate, driving the sector to a turning point. Global economic growth accelerated more in emerging economies than in developed ones in 2024. Despite the fact that inflation started to decline, it was still high in the service sector,

which led central banks to gradually adopt policies that would promote growth. In light of this, the global auto industry showed a range of patterns. SUV demand persisted, regional production projections varied, and China and India saw strong growth. At the same time, there was a significant acceleration of the global shift to electric vehicles (EVs).

Tighter environmental laws—like the impending European ban on internal combustion engines (ICEs) and higher emissions standards—are the driving force behind this change, which is changing the competitive environment. For developing countries, these changes also create new export barriers. The economic situation in Egypt has been unstable. In the fiscal year 2023–2024, political unrest and dwindling revenue caused GDP growth to slow to 2.4%. While unemployment fell to all-time lows, inflation soared. Political unrest and currency devaluations have repeatedly shocked the nation's automobile industry since 2009. Egypt has persisted in encouraging local car assembly and the slow uptake of EVs in spite of these obstacles. However, structural issues still exist. These include unstable regulations, high production costs, and shallow local supply chains. Although Egypt wants to establish itself as a regional center for automobile manufacturing, the industry still faces many obstacles due to both internal economic instability and a shift in the global industry.

1.2 Research Problem and Importance

Considering its population and regional counterparts, Egypt's yearly automobile volume (90,000–300,000 vehicles) is still modest. Political crises and currency devaluations have occurred in tandem with significant production declines. Even after short-lived recoveries from aftershocks like COVID-19, the industry is still extremely vulnerable to outside disturbances. Egypt's production scale and global competitiveness are far lower than those of top African producers like South Africa and Morocco. Policymakers looking to increase industry resilience and economic contribution must have a thorough understanding of external influences on the sector. Egypt's automobile industry has expanded and is now one of the leading domestic sectors, but it is still not very competitive internationally. Exports are small but growing, especially for buses and related components.

1.3 Research Objectives and Questions

- Analyze the relationship between economic indicators and total market volume.
- Examine the effects of global disruptions (e.g., environmental rules, electrification).
- Assess correlations among vehicle segments.
- Investigate the dynamics between local assembly and imports.
- Develop a regression model to quantify impacts.
- Propose strategies to strengthen growth and resilience.

Research Questions

Research Question One: To what extent do economic indicators impact the automotive sector?

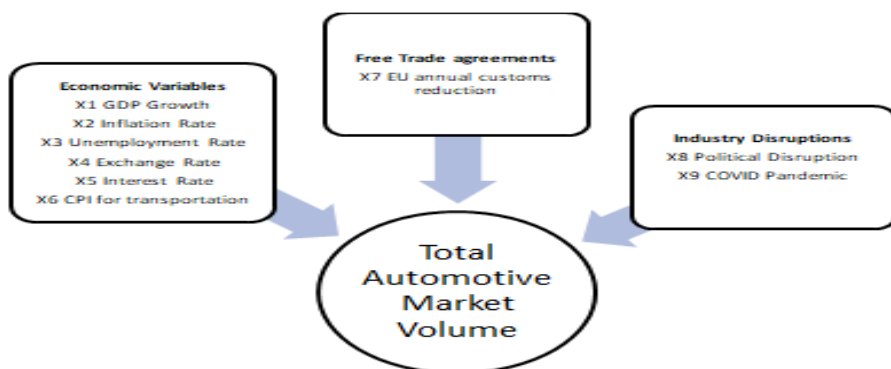
Research Question Two: Had Free trade agreements affected Egypt's total volume?

Research Question Three: What is the impact of recent industry disruptions on the automotive sector?

1.4 Research Model and Structure

Economic indicators (GDP growth, inflation, unemployment, exchange rates, interest rates, CPI for transportation), free trade agreements, and industry disruptions (political events, COVID-19) are all included in the research model as independent variables that have an impact on the overall volume of automobiles and their sub-segments.

Figure 1.1 Research Model



2. Literature Review

The following section will overview the main determinants for the study.

2.1 Exchange Rate Fluctuations and the Automotive Sector

Because the automotive industry depends on intricate global supply chains and price-sensitive markets, exchange rate volatility has a significant effect on its profitability, pricing strategies, and competitiveness. According to the Mundell-Fleming model, currency depreciation benefits local producers by making imports more expensive and exports less expensive, improving a nation's trade balance (Mundell, 1963; Fleming, 1962). However, according to Dornbusch's (1976) overshooting model, exchange rates may initially overreact to shocks, benefiting exporters in the short term but creating long-term uncertainty that deters investment.

Exchange rate pass-through (ERPT) to domestic car prices is usually insufficient, according to empirical research. Instead of completely altering retail prices to preserve market share, automakers in oligopolistic markets frequently absorb exchange rate fluctuations within their margins (Krugman, 1987; Goldberg & Knetter, 1997). Falk and Heinesen (1995) and Knetter (1994) demonstrate that while importers face higher prices and a decline in market share, local producers may profit from currency depreciation through lower production costs. Diversified supply

chains and localization are essential for reducing exchange rate risks. According to Campa and Goldberg (1995), multinational corporations use multi-currency production strategies and local sourcing to control costs. Furthermore, flexible global supply chains help businesses better control price fluctuations, promoting competitive stability, according to Goldberg and Campa (2010).

Recent empirical data support these theoretical insights. Higher ERPT was discovered in South Africa by Mothibi and Mncube (2020) as a result of erratic and volatile currency fluctuations. Additionally, Wang (2023) showed how changes in exchange rates affect pricing strategies and global value chains, which in turn affect domestic sales and trade balances. Furthermore, to preserve market share, businesses in competitive markets often absorb more currency fluctuations, whereas differentiated products enable higher price pass-through (Salman et al.2022; Krugman, 1987; Goldberg & Knetter, 1997). El Mokri (2023) and Sturgeon and Florida (2023) demonstrate that localized production and diversified supply chains balance costs with revenues and lessen exposure to currency fluctuations, which further mitigates these effects. In conclusion, even though theoretical models indicate that depreciation helps exports, these benefits are frequently restricted by strategic pricing and insufficient pass-through. According to Goldberg and Campa (2010), localization and supply chain diversification are therefore crucial tactics for preserving competitiveness in the face of exchange rate volatility.

2.2. Free Trade Agreements and the Automotive Industry

By modifying trade flows, production structures, and market dynamics, free trade agreements (FTAs) have radically changed the global automotive industry. FTAs allow businesses to attain economies of scale and grow internationally through product differentiation, according to Krugman's (1981) New Trade Theory. According to Melitz's (2003) framework, trade liberalization drives out less competitive local manufacturers from the market while disproportionately benefiting highly productive firms.

These theoretical claims are supported by empirical research. According to Tybout (2003) and Melitz and Ottaviano (2008), businesses that are exposed to global competition are forced to innovate and increase efficiency or risk losing customers. However, competing with global automakers that have more robust supply chains frequently presents significant obstacles for local producers in developing nations (Olper & Raimondi, 2020; Li et al., 2021). Research indicates that under trade agreements like NAFTA and CPTPP, Japanese and North American automakers greatly expanded their market share, placing additional pressure on domestic producers (Brown et al., 2020; Kang & Lee, 2022).

When deciding which products are eligible for tariff exemptions under free trade agreements (FTAs), rules of origin (RoO) and local content requirements (LCRs) are crucial. According to Krishna (2006), RoO influences supply chain choices by promoting local sourcing to satisfy requirements. Although LCRs can raise production costs and decrease overall efficiency, Falvey and Reed (2002) contend that they also safeguard domestic industries and generate jobs locally. According to recent data from the USMCA, significant supply chain changes were caused by more stringent North American content requirements (Thompson & Yu, 2023). Likewise, Mercosur's LCRs raised local production costs while decreasing imports from abroad (Smith & González, 2021). These dynamics are best illustrated by the EU-Egypt Free Trade Agreement. The deal put pressure on domestic producers even as it expanded imports and consumer choice (Hassan & Mahmoud, 2022). In order to improve their technological capabilities, some businesses adjusted by collaborating with European suppliers (El-Sayed, 2021). However, overall domestic production fell. Egyptian policymakers strengthened local content requirements and implemented incentives to promote foreign direct investment in order to address these issues (Abdel-Fattah, 2023; Said & Ahmed, 2022). Therefore, FTAs present serious obstacles for domestic producers, even though they create opportunities for economies of scale and efficiency. To guarantee that

liberalization promotes sustainable industry development, flexible tactics and strong legislative frameworks are necessary (Krishna, 2006; Falvey & Reed, 2002).

2.3. Political Uncertainty, Environmental Regulations, and the Automotive Industry

The automotive industry's investment decisions, competitive dynamics, and innovation trajectories are significantly impacted by political instability and environmental regulations. Political unpredictability, according to Rodrik (1991), deters investment by fostering unpredictable business environments, particularly in capital-intensive industries like the automobile manufacturing sector. Additionally, Bloom (2009) discovers that increased policy uncertainty causes business volatility and postpones strategic choices like technology advancements and capacity expansion.

These worries are supported by empirical research. For instance, according to Becker and Chen (2022), European automakers' capital expenditures and projects were delayed as a result of the uncertainty surrounding Brexit. Similarly, the US-China trade war weakened global trade flows, decreased production efficiency, and disrupted supply chains, according to García et al. (2021). As demonstrated by Rojas and Martinez (2023), who discovered that Latin American consumers postponed car purchases because of economic and policy uncertainty, political instability also reduces consumer demand.

Even though they are expensive, environmental regulations can spur technological development. The Porter Hypothesis (Porter & van der Linde, 1995) states that strict but thoughtfully crafted environmental laws can boost competitiveness by encouraging innovation. Johnson and Patel (2022) provide evidence in favor of this theory by showing that the EU's 2020 CO₂ standards financially pressed smaller businesses while encouraging larger businesses to develop electric vehicles (EVs). Further evidence that emissions regulations encourage more R&D expenditures in clean propulsion systems and battery technologies comes from Lee and Nakamura (2020) and Wang et al. (2022).

Adopting international environmental standards presents unique challenges for developing nations, such as high technology costs and lax enforcement of laws. According to Ahmed and Ibrahim (2023), insufficient infrastructure and financial limitations made it difficult for North African automakers to upgrade their production technologies. González and Torres (2021) discovered that the efficacy of environmental policies in South America was weakened by a lack of support and inconsistent policies. Singh et al. (2022) draw attention to India's reliance on imported EV components, which drives up costs and exposes businesses to supply chain risks related to geopolitics.

In general, environmental regulations encourage businesses to adopt cleaner technologies but raise costs, while political

unpredictability discourages investment and stifles demand. To successfully manage these transitions, developing economies need targeted capacity building, financial incentives, and robust policy support.

2.4. Exchange Rate Pass-Through to Vehicle Prices and Sales (Empirical Studies)

ERPT calculates how much domestic car prices and sales volumes reflect changes in exchange rates. According to empirical data, developing markets have higher ERPT because their currencies are more erratic and volatile, as is the case in South Africa (Mothibi & Mncube, 2020). Additionally, Wang (2023) emphasizes how changes in exchange rates impact international value chains and trade balances, influencing domestic pricing policies and sales patterns.

The degree of ERPT depends on a number of variables, such as pricing tactics, product differentiation, and market structure. While businesses with more distinctive products can pass costs on to customers, businesses in competitive markets typically absorb currency fluctuations to preserve market share (Krugman, 1987; Goldberg & Knetter, 1997). ERPT is also impacted by cost structures and localization. According to El Mokri (2023) and Sturgeon and Florida (2023), local production lowers exchange rate exposure by balancing costs and revenues in various

markets. The crucial role of intermediate goods trade, which is frequently disregarded but has a big impact on cost pass-through, is highlighted by Hellerstein (2023). Businesses with significant market power are better able to modify prices and absorb changes in costs, as demonstrated by Grieco et al. (2023). Overall, the degree of ERPT depends on a firm's competitive environment, strategic pricing, and localization choices. Firms with robust supply chains and market power can better manage exchange rate impacts, stabilizing prices and sustaining demand.

2.5. Empirical Evidence on Policy Uncertainty and Investment

The detrimental effects of political unpredictability on investment choices in the automotive industry are supported by empirical data. According to Julio and Yook (2012), businesses cut back on capital expenditures when there is a lot of uncertainty, particularly during election seasons. Similarly, Baker, Bloom, and Davis (2016) found that a higher level of policy uncertainty is associated with lower investment and employment growth, according to the Economic Policy Uncertainty (EPU) index. According to the Porter Hypothesis, environmental regulations can boost innovation and increase competitiveness. According to Ambec et al. (2013), companies that make early investments in green technologies gain a competitive edge. This is supported by empirical data from Popp (2006) and Jaffe, Newell, and Stavins (2002), which demonstrate

that increased patent activity in clean technologies occurs in response to more stringent emissions regulations. Lightweight materials, turbocharged engines, and alternative fuel systems have all advanced in the automotive industry as a result of laws like the Corporate Average Fuel Economy (CAFE) standards. (Jaffe et al., 2002; Popp, 2006).

Developing nations, however, encounter institutional and financial obstacles to compliance. Hufbauer et al. (2013) and Lall (2000) contend that strict environmental regulations serve as trade barriers for businesses that are unable to comply with certification requirements. However, targeted policies and international collaboration can lead to progress. Gallagher (2006) emphasizes how China has advanced clean vehicle technologies through the effective use of technology transfers and subsidies. In a similar vein, Dasgupta, Laplante, and Mamingi (2001) stress the significance of foreign financial aid in facilitating environmental improvements in developing nations. **In conclusion**, political and environmental uncertainties profoundly shape the investment landscape and innovation trajectory of the automotive industry. Addressing these challenges requires comprehensive policy frameworks, strong institutional support, and investment in technology transfer and capacity building, particularly in emerging markets.

3. Research Design and Methodology

The framework for collecting and evaluating data to solve the research problem is provided by the research design. It may be conclusive or exploratory. While conclusive research uses structured methods to validate hypotheses, exploratory research aims to understand poorly defined problems. In order to identify and analyze the dynamics of Egypt's automotive market, this study uses a conclusive, descriptive design. It seeks to investigate the relationship between specific global, political, and economic factors and the overall market volume. To show these relationships and provide practical suggestions for the industry, a regression model is created.

The study takes a quantitative approach, testing hypotheses and extrapolating results using quantifiable data and statistical methods. Finding causal relationships, testing hypotheses, and conducting objective analysis are all made possible by quantitative research. This strategy was selected in order to create a research model appropriate for the Egyptian context, and after a review of the literature on the global automotive market factors. To guarantee accurate and trustworthy results, data are analyzed using objective metrics.

The study examines data from 2009 to 2024 using a cross-sectional time frame. Important occurrences during this time

include the COVID-19 pandemic (2019–2021), currency devaluations, and the 2011 revolution in Egypt. This range enables the impact of global, political, and economic disruptions on the automotive industry to be captured.

The study makes use of secondary data gathered from governmental and official sources, such as national and international organizations for economic indicators and AMIC for market data. From 2009 to 2024, the data spans quarterly intervals, yielding roughly 40 data points for thorough statistical analysis. Regression modeling quantifies these relationships and finds important predictors, whereas correlation analysis gauges the direction and strength of relationships between variables. Minitab 19 software is used for the analysis, guaranteeing accurate model development and validation.

Research Hypotheses

- **H1:** There is a significant positive relationship between economic factors and automotive market volume in Egypt.
 - Sub-hypotheses test GDP growth, inflation rate, unemployment rate, exchange rate, interest rate, and CPI for transportation individually.
- **H2:** There is a significant relationship between Free Trade Agreements and automotive market volume, with a focus on the EU–Egypt agreement.

- **H3:** There is a significant relationship between political and global disruptions and market volume, considering both COVID-19 and local political disruptions.

Research Variables

The key variables include:

- **Total Market Volume:** Overall vehicle sales in Egypt.
- **GDP Growth, Inflation Rate, Interest Rate, Exchange Rate, CPI for Transportation, Unemployment Rate:** Core economic indicators.
- **COVID-19 Pandemic:** Represents global crisis impacts.
- **EU–Egypt Free Trade Agreement:** Represents trade policy effects on imports and local assembly.

In summary, this chapter presented the research design and quantitative methodology used to analyze Egypt's automotive market. It described the data sources, time frame, statistical methods, hypotheses, and variables. The chosen approach ensures comprehensive analysis to support informed decisions and strategic recommendations for the industry.

4. Research Results

4.1 Descriptive analysis

Following the descriptive analysis for 4 main variables, which were concluded in the final regression model, Total volume, GDP Growth, inflation rate, and Unemployment rate.

4.1.1 Total Volume

Table 4.1 Total sales descriptive analysis

| Variable | Total | | | | SE | | | | | |
|-------------|-------|--------|-------|---------|-------|-------|--------|------------|-----------|---------|
| | Count | N | N* | Percent | Mean | Mean | TrMean | StDev | Variance | Minimum |
| Total sales | 64 | 64 | 0 | 100 | 53109 | 2144 | 53403 | 17155 | 294309267 | 17855 |
| Variable | Q1 | Median | Q3 | Maximum | Range | IQR | Mode | N for Mode | | |
| Total sales | 41006 | 56496 | 65824 | 84012 | 66157 | 24818 | * | 0 | | |

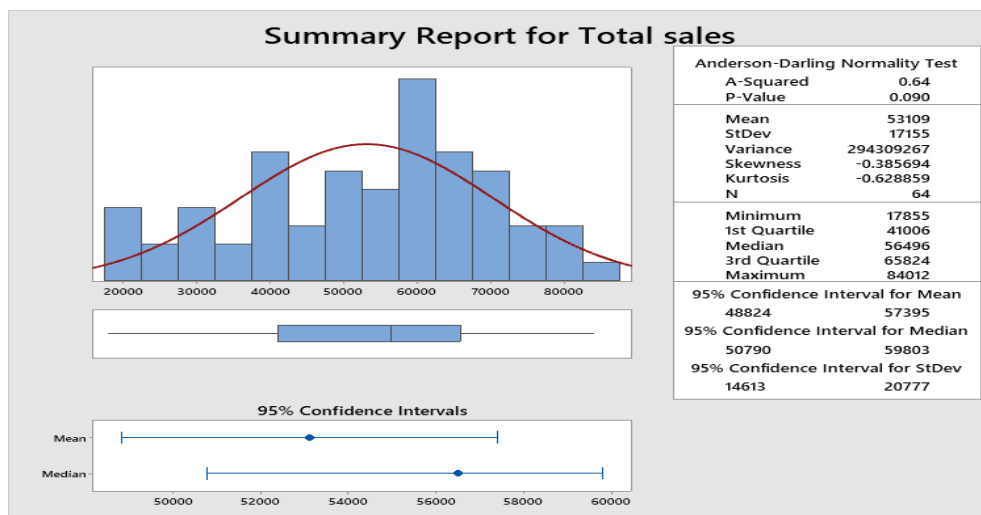


Figure 4.1 Total sales descriptive analysis

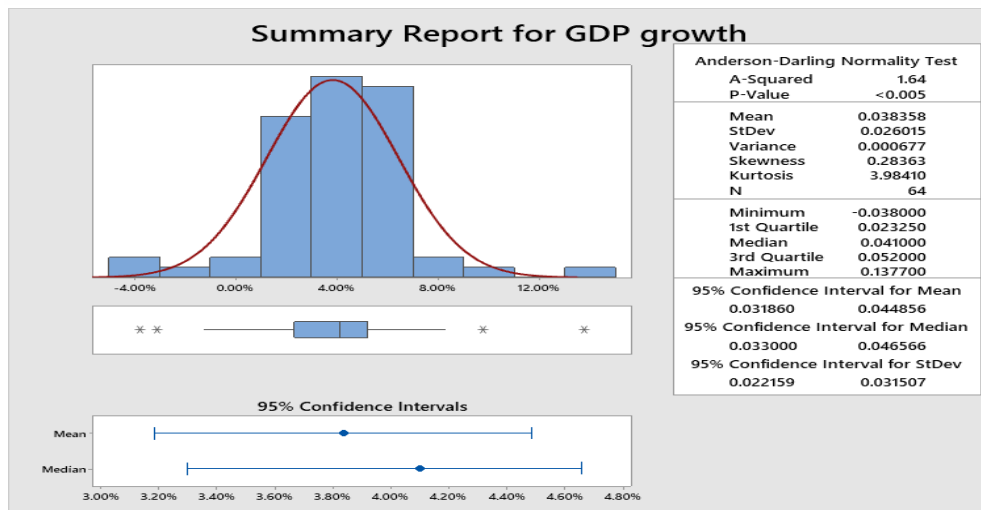
Based on the analysis of 64 data points, the results indicate that the maximum quarterly volume was 84,012 units, while the minimum was 17,855 units, with a mean of 53,109 units. These findings suggest that over the past 16 years, annual sales volumes have fluctuated around 200,000 vehicles per year.

4.1.2 GDP Growth

Table 4.2 Total sales descriptive analysis

| Variable | Total Count | N | N* | Percent | Mean | SE Mean | TrMean | StDev | Variance |
|------------|-------------|---------|---------|---------|---------|---------|---------|---------|------------|
| GDP growth | 64 | 64 | 0 | 100 | 0.03836 | 0.00325 | 0.03824 | 0.02601 | 0.00068 |
| Variable | Minimum | Q1 | Median | Q3 | Maximum | Range | IQR | Mode | N for Mode |
| GDP growth | -0.03800 | 0.02325 | 0.04100 | 0.05200 | 0.13770 | 0.17570 | 0.02875 | 0.05 | 5 |

Figure 4.2 GDP Growth descriptive analysis



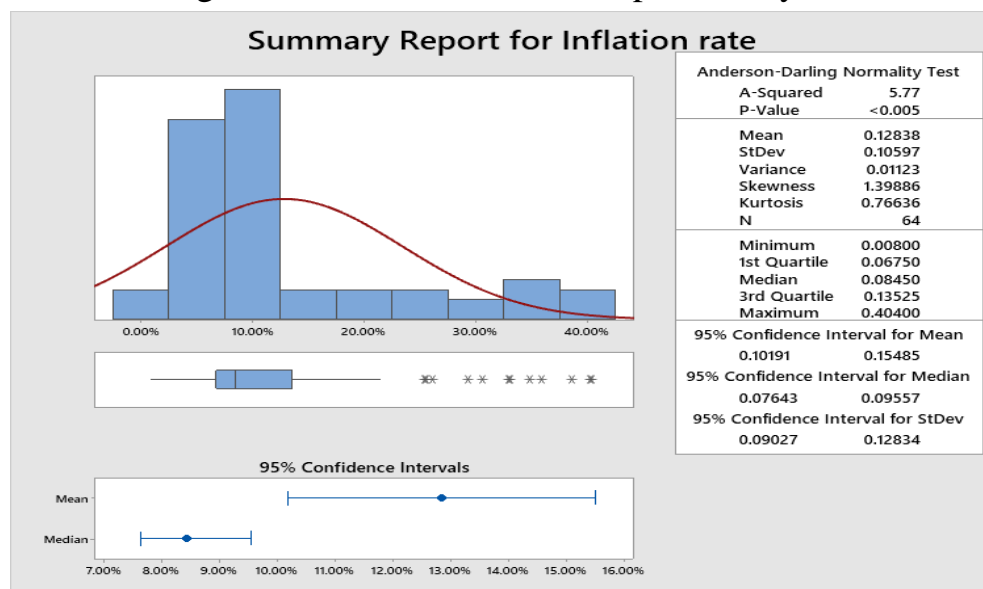
Over the past 16 years, Egypt's GDP growth has generally fluctuated around 4%. However, there were notable deviations, including a negative growth rate during the COVID-19 pandemic and a surge to over 8% during the post-pandemic recovery period.

4.1.3 Inflation Rate

Table 4.3 Inflation Rate Descriptive Analysis

| Variable | Total Count | N | N* | Percent | SE | | | | |
|----------------|-------------|--------|--------|---------|---------|--------|--------|--------|------------|
| | | | | | Mean | Mean | TrMean | StDev | Variance |
| Inflation rate | 64 | 64 | 0 | 100 | 0.1284 | 0.0132 | 0.1203 | 0.1060 | 0.0112 |
| Variable | Minimum | Q1 | Median | Q3 | Maximum | Range | IQR | Mode | N for Mode |
| Inflation rate | 0.0080 | 0.0675 | 0.0845 | 0.1353 | 0.4040 | 0.3960 | 0.0678 | 0.078 | 3 |

Figure 4.3 Inflation Rate descriptive analysis



Egypt's inflation rate has experienced significant fluctuations driven by economic reforms, currency devaluation, and external shocks such as the COVID-19 pandemic. The highest inflation rate was recorded at approximately 29.5% in 2017, following the flotation of the Egyptian pound in late 2016. The lowest rate was around 4 % in 2010. On average, inflation hovered around 11% during this period.

4.1.4 Unemployment Rate

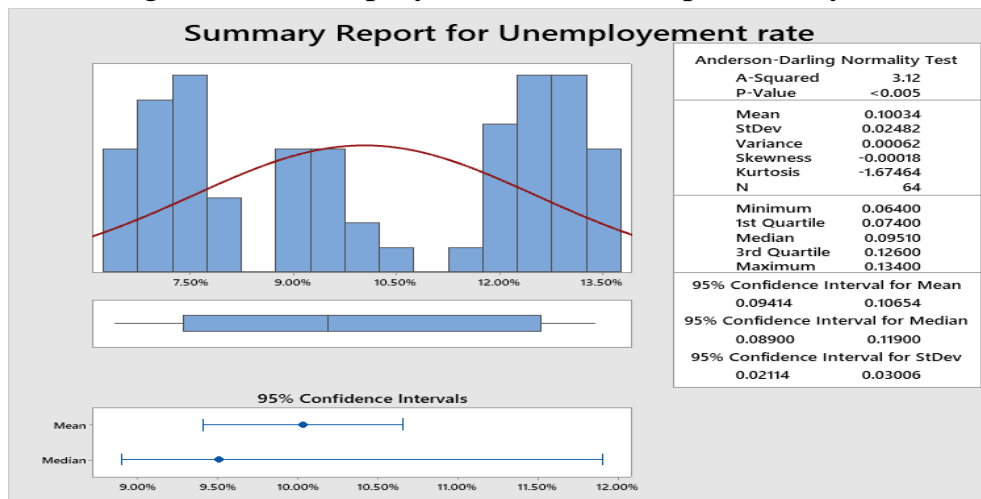
Table 4.4 Unemployment Rate descriptive analysis

| Variable | Total Count | N | N* | Percent | Mean | SE Mean | TrMean | StDev |
|-------------------|-------------|----|----|---------|---------|---------|---------|---------|
| Unemployment rate | 64 | 64 | 0 | 100 | 0.10034 | 0.00310 | 0.10041 | 0.02482 |

| Variable | Variance | Minimum | Q1 | Median | Q3 | Maximum | Range | IQR |
|-------------------|----------|---------|---------|---------|---------|---------|---------|---------|
| Unemployment rate | 0.00062 | 0.06400 | 0.07400 | 0.09510 | 0.12600 | 0.13400 | 0.07000 | 0.05200 |

| Variable | Mode | N for Mode |
|-------------------|-------|------------|
| Unemployment rate | 0.072 | 4 |

Figure 4.4 Unemployment Rate descriptive analysis

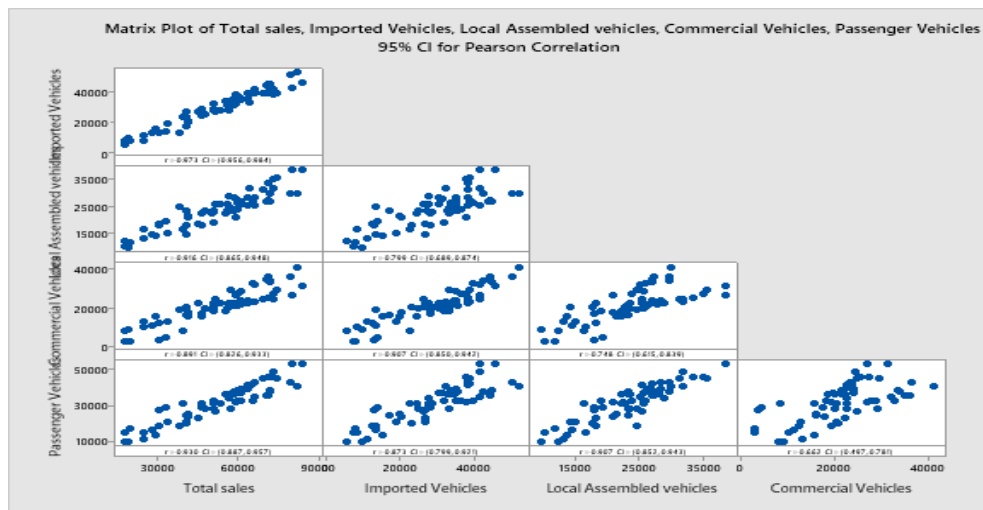


The highest unemployment rate was recorded at approximately 13.2% in 2013, following the political instability during that period. The lowest rate was around 7.2% in 2022, reflecting gradual economic recovery and growth efforts. On average, the unemployment rate over this period was about 10%.

4.2 Dependent Variables Identification and Correlation

The study found a strong positive correlation between the total number of vehicles sold and its primary categories, passenger and commercial sales, when taking into account the primary dependent variable, which is the total volume, along with related sub-variables. Additionally, when comparing the overall sales volume to both imported SUP vehicles and locally assembled vehicles.

Figure 4.5 Matrix Plot of Total volume vs Sub variables



Analyzing the correlation between Total volume and Dependent sub-variables showed.

- Strong positive correlation Between Total sales and passenger vehicle sales.
- Strong positive correlation Between Total sales and commercial vehicle sales.
- Strong positive correlation Between Total sales and imported vehicle sales.
- Strong positive correlation Between Total sales and locally assembled vehicles sales.

So in this research, I will use the total sales volume as the only dependent variable representing all dependent variables to be studied versus identified independent variables.

Table 4.5 Total sales, Passenger, commercial, imported, and local correlation

Method

Correlation type

Pearson

Rows used

64

Correlations

| | Total sales | Imported Vehicles | Local Assembled vehicles | Commercial Vehicles |
|--------------------------|-------------|-------------------|--------------------------|---------------------|
| Imported Vehicles | 0.973 | | | |
| Local Assembled vehicles | 0.916 | 0.799 | | |
| Commercial Vehicles | 0.891 | 0.907 | 0.748 | |
| Passenger Vehicles | 0.930 | 0.873 | 0.907 | 0.662 |

4.3 Total volume and Independent variables correlation GDP Growth

Figure 4.6 Total sales and GDP correlation

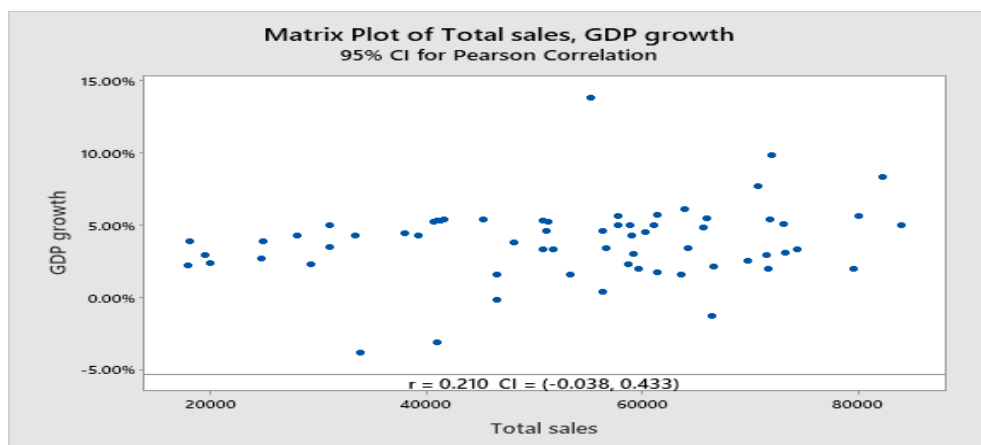


Table 4.6 Total Sales and GDP Growth Correlation

Method

| | |
|------------------|---------|
| Correlation type | Pearson |
| Rows used | 64 |

Correlations

| | |
|------------|--------------------|
| | Total sales |
| GDP growth | 0.210 |

- Results indicated a **weak positive** correlation between Total Volume and GDP Growth

Inflation Rate

Figure 4.7 Total sales and Inflation Rate correlation

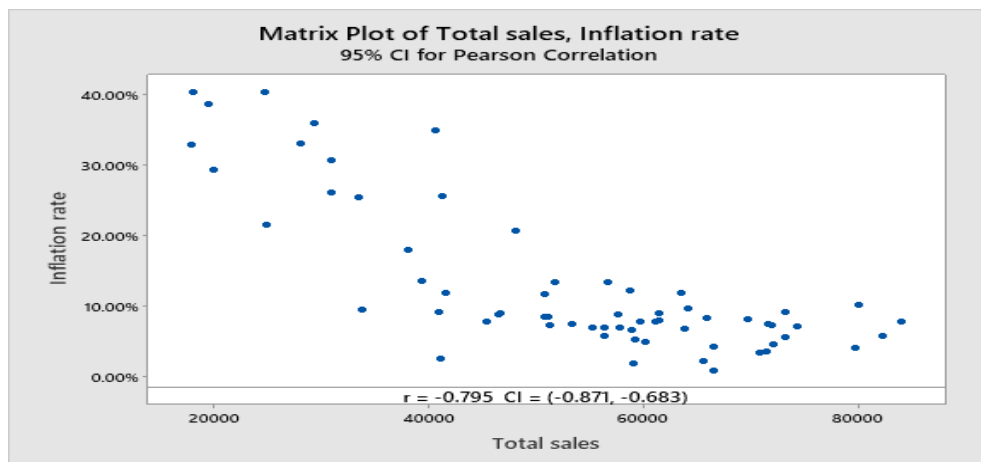


Table 4.7 Total sales and Inflation rate Correlation

| | |
|------------------|-------------|
| Method | |
| Correlation type | Pearson |
| Rows used | 64 |
| Correlations | |
| | Total sales |
| Inflation rate | -0.795 |

- Results indicated a **Strong Negative** correlation between Total Volume and inflation rate

Unemployment Rate

Figure 4.8 Total sales and Unemployment Rate correlation

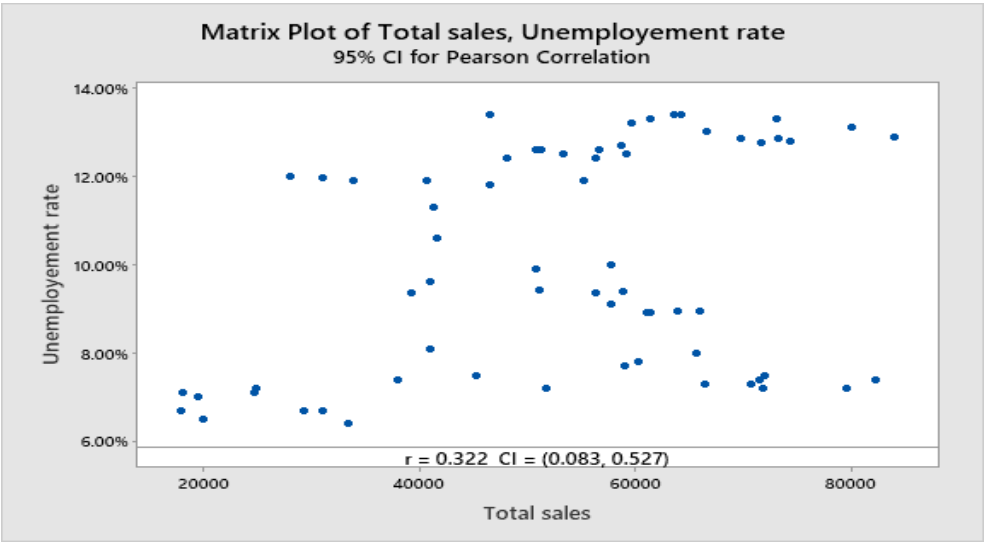


Table 4.8 Total sales and Unemployment rate Correlation

| Method | |
|-------------------|--------------------|
| Correlation type | Pearson |
| Rows used | 64 |
| Correlations | |
| | Total sales |
| Unemployment rate | 0.322 |

- Results indicated **Weak Positive** correlation between Total Volume and inflation rate

4.4 Total volume regression model

The preliminary and final statistical analyses yielded the following findings. The researcher first included all of the variables that were found, using categorical coding (1, 0) as needed. The variable with the highest variance inflation factor (VIF), which indicates multicollinearity, was methodically eliminated in each iteration. Until multicollinearity was reduced, this process persisted. To guarantee the statistical significance of the remaining predictors, variables with p-values higher than 0.05 were then removed. The statistical analysis eliminated the following variables: Interest Rate, Exchange Rate, and CPI for Transportation, the EU Free Trade agreement, and the COVID-19 Pandemic.

Below is the final statically analysis and regression model

Method

Categorical predictor coding (1, 0)

Regression Equation

P.D

| | | | |
|---|-------------|---|---|
| 0 | Total sales | = | 47962 + 119130 GDP growth - 125563 Inflation rate + 185763 Unemployment rate |
| 1 | Total sales | = | 38402 + 119130 GDP growth - 125563 Inflation rate + 185763 Unemployment rate |

Coefficients

| Term | Coef | SE Coef | T-Value | P-Value | VIF |
|-------------------|---------|---------|---------|---------|------|
| Constant | 47962 | 6252 | 7.67 | 0.000 | |
| GDP growth | 119130 | 45917 | 2.59 | 0.012 | 1.06 |
| Inflation rate | -125563 | 11469 | -10.95 | 0.000 | 1.10 |
| Unemployment rate | 185763 | 54218 | 3.43 | 0.001 | 1.34 |
| P.D | | | | | |
| 1 | -9560 | 3336 | -2.87 | 0.006 | 1.36 |

Model Summary

| S | R-sq | R-sq(adj) | R-sq(pred) |
|---------|--------|-----------|------------|
| 9211.41 | 73.00% | 71.17% | 66.89% |

Analysis of Variance

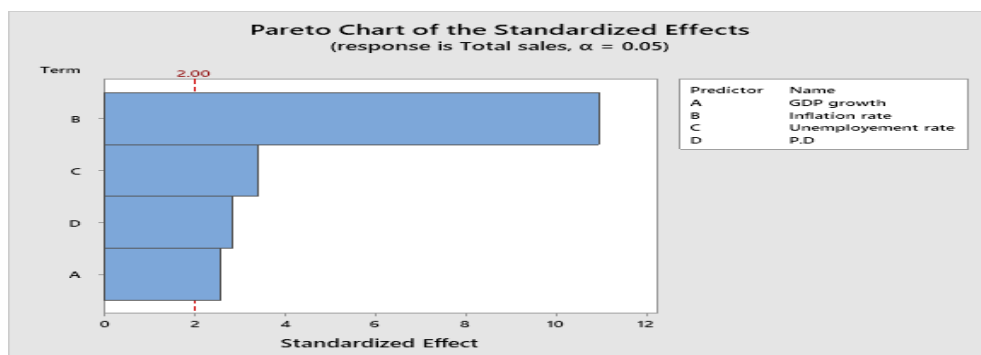
| Source | DF | Adj SS | Adj MS | F-Value | P-Value |
|-------------------|----|-------------|-------------|---------|---------|
| Regression | 4 | 13535326234 | 3383831558 | 39.88 | 0.000 |
| GDP growth | 1 | 571147825 | 571147825 | 6.73 | 0.012 |
| Inflation rate | 1 | 10169686724 | 10169686724 | 119.85 | 0.000 |
| Unemployment rate | 1 | 996050023 | 996050023 | 11.74 | 0.001 |
| P.D | 1 | 696923538 | 696923538 | 8.21 | 0.006 |
| Error | 59 | 5006157592 | 84850129 | | |
| Total | 63 | 18541483826 | | | |

Fits and Diagnostics for Unusual Observations

| Obs | Total sales | Fit | Resid | Std Resid | |
|-----|-------------|-------|--------|-----------|---|
| 11 | 55240 | 68123 | -12883 | -1.77 | X |
| 46 | 41059 | 58913 | -17854 | -2.14 | R |
| 48 | 79596 | 58697 | 20899 | 2.36 | R |
| 52 | 82165 | 64313 | 17852 | 2.02 | R |

R Large residual

X Unusual X



4.4 Conclusion and Final regression model.

After 8 iterations starting with 9 independent variables, the final model included 4 correlated independent variables which are

- Growth GDP Positive correlation.
- Inflation rate negative correlation.
- Unemployment rate positive correlation.
- Political Disruption

The model generated 2 regression models, one with political disruption and the other in the absence of this variable. As listed below:

Regression Equation:

- **Political Disruption 0**

Total Sold = 47962 + 119130 GDP growth - 125563 Inflation rate + 185763 Unemployment rate.

- **Political Disruption 1**

Total Sold = 38402 + 119130 GDP growth - 125563 Inflation rate + 185763 Unemployment rate

R-Square 73 %

R-Square Adj. 71.17%

5. Analysis, Discussion, and Recommendation

The research findings are presented in this chapter along with an analysis of the variables influencing Egypt's automobile market and an explanation of their effects. It also highlights the Egyptian government's efforts to assist the industry and contrasts these findings with evaluations from other countries. Lastly, based on the findings and industry experience, useful suggestions are given.

5.1 Local Manufacturing vs Imported Vehicles

The research results indicate that sales of locally assembled and imported vehicles are positively correlated, suggesting they are influenced by similar external factors rather than direct

competition. This contradicts government efforts to promote domestic production and reduce imports.

Low Vehicle Ownership per Capita

By 2023, there will be 87 cars per 1,000 people in Egypt, compared to 208 in South Africa. Both domestic and foreign car prices have increased as a result of the rapid expansion and construction of road infrastructure, which has increased demand for vehicles beyond supply. Total car sales increased to almost 278,000 units in 2021 before falling to 175,000 units in 2022, despite a decline in domestic production volumes. Dependency on imports has grown as a result of the spike in demand and the lack of local production capacity. Egypt was ranked third in MENA by the Automotive Production Risk/Reward Index, indicating that it is a moderately attractive place to produce. Despite having a low-skilled workforce and limited technical capabilities, the nation has a strong labor cost advantage. Due to these problems, local operations are primarily limited to simple assembly tasks rather than complete manufacturing.

Low Actual Localization Ratio

Actual local content is estimated to be about 17%, even though the official calculation method classifies components as fully local if 45% of materials are sourced locally. Most of them run below capacity even though they house assembly plants for well-known brands like GM, Nissan, BMW, and Mercedes-Benz.

Individual plants only produce 5,000 to 20,000 units per year, while the highest local assembly volume ever recorded was 140,000 units (in 2014 and 2022). The cost of local components rises due to this small scale, making it harder to compete with high-volume imports that enjoy economies of scale. Additionally, the variety and quality of cars assembled in Egypt are impacted by the challenges faced by local suppliers who are unable to keep up with the latest developments in automotive technology, such as smart systems and sophisticated manufacturing techniques.

5.2 Automotive Market Growth and Inflation Rate

The results of the study demonstrate that inflation, which impacts both domestic and foreign car sales, is a significant impediment to Egypt's automotive market's expansion. Vehicle sales hit a 20-year high of over 300,000 units in 2014, when inflation averaged 9%. Similarly, with a 7.5% inflation rate, sales in 2021 were close to 297,000 units. In contrast, when inflation rose to 40% in 2023, sales fell precipitously to roughly 91,500 units.

Vehicle prices in Egypt are shaped by numerous cost factors, including raw materials, components, customs duties, logistics, storage, labor, financing costs, and after-sales services. This makes the market highly complex and volatile. The research also revealed a significant negative correlation between exchange rate fluctuations and total vehicle sales. However, due to its strong

link with inflation, the exchange rate was not included in the final regression model.

Achieving a trade balance is also challenging for the automotive industry, which is especially susceptible to changes in the availability of hard currency. The industry imported about \$2.9 billion worth of automobiles and parts in 2022, which led to a significant trade deficit. Due in part to COVID-19 disruptions and worldwide shortages of semiconductors and parts, automotive exports in 2021 remained low at \$53.6 million, a nearly 40% decrease from 2019.

The industry was further affected by the two rounds of currency devaluation in 2022, which resulted in an estimated 42% decrease in imports that year. Similar drops occurred in 2016, when imports fell by more than 40% as a result of the pound's devaluation.

5.3 Automotive Market Growth and Free Trade Agreements

According to the study's findings, the EU free trade agreement had a brief and insignificant impact on Egypt's automobile industry; as a result, it was eventually left out of the final regression model.

In order to improve collaboration, the partnership agreement with the EU was implemented in 2004. It gradually reduced customs on

European automobiles by 10% a year until it reached complete exemption in 2019 (World Trade Center, 2023). In return, duty-free initial access to EU markets was granted to Egyptian exports.

Due to duty-free imports from Europe, this arrangement boosted competition for locally assembled cars; however, it also resulted in a notable increase in EU imports of vehicles and parts, which increased by roughly 74.1% between 2010 and 2021 and then sharply after 2019. However, due to shortages of foreign currency, imports from the EU later decreased. Egypt's automobile exports to the EU, on the other hand, fell precipitously from over \$49 million in 2012 to just \$4.8 million in 2022 (World Trade Center, 2023). In conclusion, the automotive sector in Egypt has not significantly benefited from free trade agreements. Their effects have remained limited, mainly because of strong exchange rate fluctuations and currency availability challenges.

5.4 Automotive Market Growth and GDP Growth

The study developed a regression model linking total automotive sales volume to key economic variables, achieving an R-squared value of 73%, indicating a strong explanatory power. The model showed that GDP growth is a primary positive driver of sales. For example, in 2014, Egypt's GDP grew by 4.7%, and vehicle sales reached over 300,000 — the highest in two decades. Similarly, in 2021, GDP growth was 7.18%, and sales were close to 300,000

vehicles. Conversely, in 2023, GDP growth slowed to 2.94%, and sales dropped to around 91,500 vehicles — the lowest in 20 years.

5.5 Automotive Market Growth and Unemployment Rate

Remarkably, the regression model also showed a positive correlation—which seems counterintuitive at first—between the volume of automobile sales and the unemployment rate. The swift expansion of Egypt's shared mobility sector explains this outcome. In order to meet company requirements, many jobless people have resorted to ride-hailing and taxi services as alternate sources of income, frequently financing the purchase of new vehicles.

The shared mobility market in Egypt is projected to generate revenues of around US\$3.55 billion by 2024, while the taxi segment is expected to reach US\$0.22 billion. The ride-hailing market alone is forecast to grow at an annual rate of 15.49%, reaching US\$527.5 million by 2029, with user penetration rising to 35.1% (Statista, 2024).

These trends suggest that shared mobility and related services will continue to create new job opportunities and stimulate vehicle sales. A separate, detailed study is recommended to better understand the specific impact of shared mobility on Egypt's automotive sector once more data are available.

5.6 Major Challenges

The competitiveness and expansion potential of Egypt's automotive sector are constrained by a number of operational and structural issues. Manufacturers find it challenging to compete on price in both domestic and international markets due to fragmented local production, which leads to low localization rates (17–25%) and underutilized economies of scale. Additionally, the supplier base is dispersed and does not have solid relationships with OEMs. High costs and inefficiencies result from many local suppliers' poor R&D capabilities and inability to meet international standards. Each assembly plant frequently has to source necessary components like glass, frames, and interiors separately, which raises the cost even more.

Limited production capacity, high part tariffs, export barriers to COMESA markets (because of right-hand-drive vehicle requirements), and low labor productivity are some of the main challenges noted by the World Bank (2020). The infrastructure for transportation and logistics is also inadequate, functioning at about one-third of Turkey's level of efficiency.

Fitch Solutions (2023) highlighted additional risks:

- Skilled labor shortages limit activities to basic assembly and hinder the introduction of high-tech vehicles.
- Political instability and foreign currency shortages restrict imports of equipment and components.

- Free trade agreements reduce incentives for local manufacturing due to competition from Algeria and Morocco.
- High inflation, driven by currency depreciation and rising food prices, negatively impacts sales.
- Electric vehicle (EV) adoption is slow due to low income levels, limited charging infrastructure, and a lack of government incentives.

Egypt scores low on the Auto Sales Risk/Reward Index, with a total score of 42.1/100 and a short-term economic risk index score of 20.2. Although Egypt has a long history of assembly, recent trends indicate a decline, according to JICA (2022). The number of local assemblies decreased from 119,000 in 2015 to 75,000 in 2019. Following tariff reductions, imports, particularly from the EU and Turkey, increased significantly, further undermining local competitiveness.

Egypt's small domestic market makes it difficult for producers to compete with larger exporters, according to N Gage Consulting (2019). Sales are further hampered by import restrictions, high inflation, and currency depreciation. In contrast to Morocco and Turkey, Egypt's exports of auto parts have not increased substantially in spite of trade agreements. But there is still hope for the future, particularly with EV prospects and a possible new automotive directive to establish Egypt as a regional center. Lastly, Deloitte (2020) emphasized the following

opportunities: enhancing the business climate, establishing special economic zones, taking advantage of Egypt's advantageous location in the Mediterranean, and providing incentives that are specifically targeted. If they are in line with international trade commitments, these elements could boost Egypt's automobile industry.

5.7 Egypt Automotive Forecast Based on Economic Indicators

Real GDP growth is predicted to reach 4.2% in 2025, 4.5% in 2026, and 5.0% in 2027 as Egypt's economy gradually recovers (International Monetary Fund, 2024; World Bank, 2024). Supportive fiscal and monetary policies, reduced inflationary pressures, and increased domestic consumption are all factors in this improvement.

With the aid of monetary tightening and stabilization measures, inflation rates, which peaked recently, are expected to gradually decline, reaching 25.0% in 2025, 18.0% in 2026, and 12.0% in 2027. (IMF, 2024; World Bank, 2024). The unemployment rate is expected to remain stable, around 7.2% in 2025, declining slightly to 7.0% in 2026, and further to 6.8% in 2027. This reflects gradual economic recovery and job creation supported by Egypt Vision 2030 initiatives (IMF, 2024; World Bank, 2024).

Table 5.1 Egypt Economic Main Indicators Forecast

| Indicator | 2025 (Forecast) | 2026 (Forecast) | 2027 (Forecast) |
|-----------------------|-----------------|-----------------|-----------------|
| GDP Growth (%) | 4.2% | 4.5% | 5.0% |
| Inflation Rate (%) | 25.0% | 18.0% | 12.0% |
| Unemployment Rate (%) | 7.2% | 7.0% | 6.8% |

Source: IMF; World Bank, 2024.

According to the regression model developed in this research, if Egypt achieves these macroeconomic targets, the automotive market volume is forecast to gradually recover:

Table 5.2 Egypt Automotive Volume Forecast

| Year | 2025 (Forecast) | 2026 (Forecast) | 2027 (Forecast) |
|---------------------|-----------------|-----------------|-----------------|
| Total market volume | 101,559 | 136,660 | 167,691 |

These figures suggest that annual sales will progressively increase, assuming inflation continues to decline and GDP growth remains strong. Historically, the highest sales volumes were in 2014 and 2021 (around 300,000 vehicles each year), supported by GDP growth of 4.78% and 7.18%, inflation rates of 13.17% and 4.33%, and unemployment rates of 9.18% and 7.4%, respectively. The 2021 surge reflected a post-COVID-19 recovery phase with favorable economic conditions.

To achieve comparable high volumes again, Egypt would need to maintain inflation rates below 10% and GDP growth above 5%. Future sales may also surpass projections as a result of potential vehicle replacement programs and pent-up demand from customers who have postponed purchases in recent years. Nissan Motors Egypt's successful exports to South Africa are another encouraging development that may encourage local production and market expansion.

5.8 Egyptian Government Recent Measures to Develop the Automotive Sector

Over the past five years, the Egyptian government has implemented a comprehensive set of measures to strengthen and modernize its automotive sector, aiming to establish Egypt as a regional manufacturing hub. It introduced the National Automotive Industry Development Program (AIDP) and the Automotive Industry Development Strategy in 2022. This approach offers incentives to support exports, encourage local assembly, and encourage the use of electric vehicles (EVs). Cash rebates for locally built EVs, exemptions from customs and taxes, and expedited customs clearance for registered manufacturers are important policies (State Information Service [SIS], 2022; Business Monthly Egypt, 2023a).

To oversee operations and coordinate policy, the Ministry of Trade and Industry established a dedicated Automotive Industry Unit and a Supreme Council for the Automotive Industry (Business Monthly Egypt, 2023a). For fiscal year 2024/25, the government allocated approximately LE 1 billion to support local manufacturing, setting a minimum local content requirement of 45%, with plans to raise it to 60% in future phases (Egypt Today, 2024). The government also established export-burden refund programs to assist manufacturers in covering the costs of importing raw materials and introduced the "Golden License" to streamline land acquisition for strategic projects. When taken as a whole, these incentives and reforms demonstrate Egypt's dedication to developing a sustainable and competitive automotive sector (Business Monthly Egypt, 2023b).

5.9 Recommendations

As discussed in Section 5.6, the fragmentation of local production is one of the primary problems Egypt's automotive industry is currently facing. Low localization rates and unrealized economies of scale have resulted from this. Without scale economies, manufacturers are less able to compete on price both domestically and internationally. At the moment, any local assembler in Egypt is eligible for customs reductions if they assemble as few as 5,000 vehicles annually. In stark contrast, Saudi Arabia's Vision 2030 stipulates that 600,000 electric

vehicles must be produced annually at a maximum of four or five plants. Most automakers worldwide concur that a minimum annual production volume of 100,000 units is necessary to establish a business case. This suggests that incentives and support should be directed towards manufacturers committed to producing at least 150,000 vehicles annually to ensure competitiveness and sustainable growth.

Raw Material and Upstream Component Supply Chain

Although official reports indicate a localization ratio of 45%, the actual localization ratio in Egypt is not higher than 17%, as explained in Section 5.1. This disparity results from the fact that all raw materials are imported, including lead, steel, copper, and plastics, which collectively account for 50–70% of the cost of certain car parts. The government should make a concerted effort to entice international raw material suppliers to set up shop in Egypt to address this. This would establish Egypt as a regional export hub for raw materials and intermediate automotive components in addition to helping to meet local demand.

Main Economic Indicators

Key economic indicators that are associated with larger automotive market volumes were identified by the researcher. Achieving GDP growth above 5% and keeping inflation below 10% are crucial goals. In other words, achieving a stable exchange rate and controlling interest rates—which are key

drivers of inflation—are essential. Stabilizing these indicators would enable investors to plan confidently for expansion and the introduction of new products to the market.

Shared Mobility and Vehicle Replacement Programs

The shared mobility and ride-hailing markets can create new demand in the automotive sector. Encouraging and supporting programs aimed at replacing older vehicles and promoting shared mobility initiatives would stimulate automotive sales and contribute to a more modern and environmentally friendly vehicle fleet.

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