



COMPANY: TESLA INC

Equity Research Report on TSLA

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*Target Price: \$450 , Investment Horizon: 1–3 years

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Introduction

This Equity Research Report on Tesla Inc. (TSLA) provides a forward thinking approach on equity research by integrating traditional financial analysis with advanced quantitative modeling. It caters to diverse investors, offering deep fundamental insights into Tesla's financial stability and strategic directions alongside novel quantitative analyses that refine performance forecasts. This dual approach not only sets new standards for investment analysis but also equips investors with essential insights for decision-making in a tech-driven market. By merging classic and modern techniques, the report showcases Tesla's potential and charts the future of investment research, where thorough data analysis supports strategic investment decisions.

Key words:

Geopolitical Risks, Supply Chain, EV (Electric Vehicle) Infrastructure, Competitive Analysis, Financial Leverage, Monte Carlo Simulations, Geometric Brownian Motion (GBM), Dynamic Regression, Kalman Filters

Core Proposition

Tesla Inc. represents a compelling investment opportunity driven by its dominant position in the electric vehicle (EV) market, innovative business model, and diversified revenue streams in energy storage and renewable solutions. The company's robust financial performance, global expansion strategy, and technological advancements position it as a leader in the transition to sustainable energy, while its ability to scale production and adapt to market dynamics strengthens its long-term growth prospects.

Key Drivers of Growth

1. Market Leadership in EVs

- **Global EV Dominance:** Tesla holds an 18% share of the global Battery Electric Vehicle (BEV) market, maintaining its leadership despite intensifying competition.
- **Product Diversity:** A comprehensive lineup, including the affordable Model 3, the best-selling Model Y, and upcoming innovations like the Cybertruck and Semi, ensures Tesla's competitive edge across market segments.

2. Strategic Global Presence

- **Localised Production:** Tesla's network of Gigafactories (e.g., in the US, Europe, and China) optimises production costs, reduces supply chain risks, and capitalises on regional incentives like the US Inflation Reduction Act (IRA).
- **Expansion into High-Growth Markets:** Plans to establish a Gigafactory in India signal Tesla's ambition to penetrate emerging markets, leveraging government incentives and burgeoning EV demand.

3. Revenue Diversification

- **Energy Storage and Solar Solutions:** With products like the Powerwall and Megapack, Tesla is capturing a growing share of the renewable energy market, which contributed approximately \$6 billion in revenue in 2023.
- **Software and Services:** High-margin offerings, including Full Self-Driving (FSD) subscriptions and insurance products, provide steady recurring revenue streams.

4. Technological Innovation

- **AI and FSD Leadership:** Tesla's investments in artificial intelligence and autonomous driving solidify its technological advantage, with potential monetisation through a future robotaxi

network.

- **Battery Technology:** Continuous advancements in battery efficiency and cost reduction enhance Tesla's competitiveness in both automotive and energy markets.

Quantitative Validation

1. Financial Strength

- **Revenue Growth:** A 5-year compound annual growth rate (CAGR) of approximately 33% demonstrates Tesla's ability to scale production and meet rising demand.
- **Profitability:** Industry-leading operating margin (9.19% in 2023) and a declining debt-to-equity ratio (from 1.78 in 2019 to 0.074 in 2023) underscore Tesla's operational efficiency and financial discipline.

2. Advanced Quantitative Analysis

- **Monte Carlo Simulations:** Probabilistic modeling projects a 1-year price target of \$450, with robust upside potential despite market volatility.
- **Kalman Filters:** Dynamic regression analysis highlights Tesla's increasing beta (~ 1.0) and market correlation, providing a blend of high-growth potential and diversification for tech-heavy portfolios.

3. Margin Resilience

Despite price reductions in 2023 to counter competition, Tesla's gross margin (18.25%) remains competitive, reflecting operational flexibility and economies of scale.

Macroeconomic and Competitive Position

1. Favorable Policy Tailwinds

- **EV Incentives:** The US IRA and EU Green Deal provide direct subsidies and infrastructure support, bolstering Tesla's market penetration.
- **Renewable Energy Focus:** Governments worldwide are incentivising grid-scale battery solutions, aligning with Tesla's energy product portfolio.

2. Competitive Differentiation

While BYD edges Tesla in gross margin (21.9% vs. 18.25%), Tesla outperforms in operating margin and technological leadership, underscoring its premium pricing strategy and innovation pipeline.

Risks to Thesis

- **Market Volatility:** Tesla's high beta (~ 1.0) reflects sensitivity to macroeconomic conditions, which could amplify stock price fluctuations.
- **Intensifying Competition:** Global automakers (e.g., Volkswagen, GM) and emerging players like Rivian challenge Tesla's market share, especially in China.
- **Supply Chain Constraints:** Reliance on critical materials (e.g., lithium, cobalt) and geopolitical risks could impact production and profitability.

Conclusion

Tesla's combination of financial robustness, market leadership, and technological innovation makes it a strong contender for long-term portfolio growth. While challenges such as rising competition and supply chain risks exist, Tesla's ability to scale production, diversify revenue streams, and capitalise on renewable energy trends underscores its intrinsic value.

Market Profile

Company Overview

Founding and Evolution

Tesla, Inc. (NASDAQ: TSLA) was founded in 2003 with the mission to accelerate the world's transition to sustainable energy. Initially focused on electric vehicles (EVs), the company has since expanded into energy storage and solar solutions. Headquartered in Austin, Texas, Tesla operates a global network of manufacturing facilities, including Gigafactories in the U.S., China, and Europe, supporting its vertically integrated business model.

Key Products and Services

Electric Vehicles (EVs): Tesla's core automotive lineup includes the luxury Model S sedan, the affordable Model 3 sedan, the Model X SUV, and the compact Model Y SUV. The company recently launched the Cybertruck, marking its entry into the electric pickup segment, alongside the Tesla Semi, designed for commercial freight transport. Tesla's Full Self-Driving (FSD) software remains a key focus, aiming to achieve full autonomy through AI-powered advancements (Tesla, 2025a).

Energy Solutions: Beyond EVs, Tesla has positioned itself as a major player in the energy sector. The Powerwall provides residential energy storage, while the Megapack is designed for large-scale grid applications, helping utilities and businesses integrate renewable energy more efficiently.

Solar Products: Tesla's solar division, bolstered by the acquisition of SolarCity in 2016, offers Solar Roof tiles and solar panels. These solutions complement its energy storage products, enabling a fully integrated clean energy ecosystem for residential and commercial users.

Leadership and Strategic Vision

Elon Musk, Tesla's CEO since 2008, has been instrumental in shaping the company's strategy (Tesla, 2025b). His vision emphasises innovation, cost efficiency, and vertical integration, allowing Tesla to control key aspects of production—from battery manufacturing to software development. Musk's leadership has propelled Tesla to the forefront of the EV market, driving advancements in battery technology, autonomous driving, and AI integration.

Looking ahead, Tesla continues to invest in AI, autonomous driving, and robotics, with plans to launch a robotaxi service and further develop the Optimus humanoid robot (AI Root, 2025). With a strong foothold in both the automotive and energy sectors, Tesla remains a key player in the global shift toward sustainable technology.

Market Position

Tesla maintained its position as the global leader in the battery electric vehicle (BEV) market in 2024, holding an 18% market share, a slight decline from 19% in 2023. Close behind, Chinese automaker BYD saw significant growth, increasing its market share by 9 percentage points between 2021 and 2024. However, both Tesla and BYD experienced a 1 percentage point decline in their respective shares between 2023 and the first nine months of 2024 (Yahoo Finance, 2025).

Legacy automakers have also strengthened their presence in

the BEV sector. Volkswagen and the Geely-Volvo alliance secured 7% and 8% of the market, respectively, while SAIC, including its joint venture with Wuling and General Motors, maintained an 8% share (InsideEVs, 2024). These companies are intensifying competition within the industry, challenging Tesla and BYD's dominance.

Global electric vehicle sales reached 14 million units in 2023, with BEVs comprising 70% of this total. Despite this growth, internal combustion engine (ICE) vehicles and other non-electric fuel sources still accounted for 84% of all light vehicle sales. China remained the dominant force in the sector, responsible for 65% of hybrid and 59% of BEV sales worldwide (IEA, 2024).

Market dynamics suggest a clear divide in strategic approaches. Tesla's premium pricing strategy contrasts with BYD's focus on affordability, a distinction that may be further influenced by the increase in tariffs on Chinese-made cars from 25% to 100% in August 2024 (Reuters, 2024). Meanwhile, BYD's recent emphasis on plug-in hybrid electric vehicles (PHEVs) could limit its BEV market share growth in 2025.

The BEV industry is evolving rapidly, with established automakers expanding their electric portfolios and emerging players gaining traction. As competition intensifies, global manufacturers must navigate shifting consumer preferences, regulatory changes, and technological advancements to secure long-term market leadership.

Global Presence

Manufacturing and Distribution Hubs

Tesla's global presence is anchored by its network of Gigafactories, which serve as both manufacturing and distribution centres. These facilities enhance supply chain efficiency by enabling localised production, reducing shipping costs, and ensuring compliance with regional regulatory requirements.

In the United States, Tesla operates several key facilities. The Fremont Factory in California, Tesla's first major production site, manufactures the Model S, Model 3, Model X, and Model Y. Gigafactory Nevada specialises in battery production and energy storage solutions, while Gigafactory Texas in Austin plays a crucial role in Cybertruck production and Model Y assembly.

In Europe, Gigafactory Berlin-Brandenburg was established to supply European markets, reducing dependence on imports from the US and China. Meanwhile, in Asia, Gigafactory Shanghai—Tesla's first Gigafactory outside the US—serves as a crucial export hub for European and Asian markets. Additionally, Tesla is considering building a Gigafactory in India to tap into the growing EV market and benefit from government incentives.

Regional Production and Export Dynamics

Tesla's production strategy optimises regional supply chains while minimising exposure to tariffs and trade restrictions. In North America, the Inflation Reduction Act (IRA) incentivises Tesla's local production through a \$7,500 federal EV tax credit, while state-level programmes like California's Clean Vehicle Rebate Project (CVRP) and the Zero Emission Vehicle (ZEV) mandate further boost demand.

In Europe, Gigafactory Berlin supports localised production, reducing reliance on imports from the US and China. Tesla also benefits from EU subsidies, such as Germany's €4,500 EV incentive

and France's €5,000–€7,000 grants. In China and the Asia-Pacific region, Gigafactory Shanghai enables Tesla to capitalise on China's New Energy Vehicle (NEV) quotas and tax exemptions. Although China is phasing out direct EV subsidies, Tesla benefits from lower operational costs and favourable regulatory policies. Expansion into Southeast Asia and India aims to diversify production capabilities and reduce dependence on China.

Role in Supporting EV Adoption Globally

Tesla's extensive global footprint significantly contributes to accelerating EV adoption by increasing accessibility to its vehicles. Beyond vehicle production, Tesla invests in charging infrastructure and energy solutions to support the transition to sustainable transportation.

The company's Supercharger network benefits from government-backed EV infrastructure initiatives, such as the US National Electric Vehicle Infrastructure (NEVI) programme and the EU's Green Deal. The deployment of Supercharger V4 stations enhances charging efficiency and supports a wider range of EVs. Tesla also advances renewable energy solutions, with its solar panels and Powerwall battery systems leveraging incentives like the EU's Fit for 55 package and feed-in tariffs in countries such as Germany. Additionally, Tesla generates revenue through carbon credit sales, benefiting from programmes such as California's ZEV initiative and the EU's Emissions Trading System (ETS). Tesla Energy Ventures is also expanding into grid-scale battery storage projects to facilitate renewable energy integration.

Tesla's global presence through its network of Gigafactories strengthens its ability to meet growing demand while optimising production and distribution. By strategically placing manufacturing hubs in the US, Europe, and Asia, Tesla reduces costs and aligns with regional regulatory requirements, driving supply chain efficiency. Regional production incentives, such as the Inflation Reduction Act in North America and EU subsidies in Europe, further enhance Tesla's competitive edge. Additionally, Tesla's global network of Superchargers and energy solutions supports EV adoption by improving vehicle accessibility and integrating sustainable energy infrastructure. Through this expansive presence, Tesla is positioned as a key player in accelerating the global transition to electric vehicles.

Financial Performance

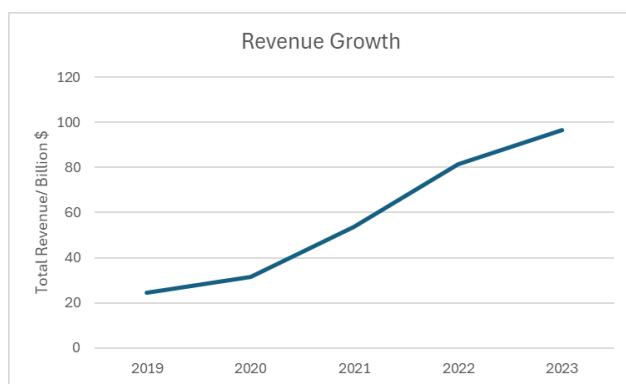


Figure 1. Total revenue growth from 2019–2023

Revenue and Profitability Trends

Tesla's revenue growth over the years from 2019 to 2023 indicates a strong upward trend, demonstrating the company's successful expansion and increasing market penetration.

2019 to 2020

From 2019 to 2020, there was a revenue growth of 28.3% as shown in Figure 1, reflecting Tesla's improved production capacity, growing demand for its electric vehicles (EVs) and advances in scaling its Model 3 production during this period.

2020 to 2021

Then from 2020–2021 revenue jumped from \$31.54 billion to \$53.82 billion, a staggering 70.6% growth. This sharp increase can be attributed to significant growth in EV adoption globally, the launch and ramp-up of the Tesla Model Y, and Tesla's expansion into new markets, particularly in China, where Gigafactory Shanghai became operational and drove substantial sales volume.

The 51.3% growth from 2021 to 2022 marks record deliveries of Tesla vehicles, continued expansion of production facilities (Gigafactories in Texas and Berlin started operations) and strong demand for Tesla's full self-driving software subscriptions (FSD) and energy solutions.

2023

The lowest growth rate of 18.8% in 2023 suggests that Tesla may be reaching market saturation in some regions or facing stiff competition. Economic factors such as a global slowdown or supply chain disruptions may have further dampened growth.

Segment Performance

Automotive Sales Growth

Tesla's automotive sales have shown remarkable growth, with 1.81 million vehicles sold globally in 2023, marking a 38% year-over-year increase from 2022. This growth is driven by the popularity of the Model Y, which accounted for 66% of total sales with 1.2 million units sold, making it the world's best-selling EV. The Model 3 followed with 529,287 units sold, further cementing Tesla's dominance. Regionally, the United States and China were Tesla's largest markets in 2023, with 654,888 and 603,304 vehicles sold, respectively, while Europe also performed strongly, with the Model Y leading EV sales at 155,219 units by September 2024. Looking ahead, Tesla aims to deliver 2.3 million vehicles by 2025, supported by Wall Street projections of 2.1 million vehicles. The

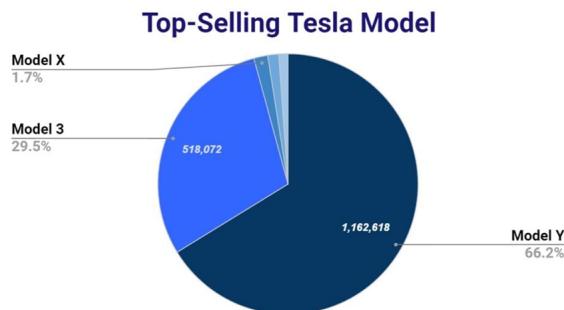


Figure 2. Performance of TSLA models 2023

company's growth is underpinned by increasing global EV demand, competitive pricing of the Model 3 and Y, and strategic expansion of manufacturing facilities like the Gigafactories in Berlin, Texas, and Shanghai. These factors reinforce Tesla's leadership in the rapidly growing EV market.

Energy Generation and Storage

Tesla's energy generation and storage segment has experienced significant growth, primarily driven by its Powerwall and Megapack products. In 2023, this division generated approximately \$6 billion in revenue, accounting for about 6% of Tesla's total revenue.

Diversification of Revenue Streams

The Megapack, designed for utility-scale applications, and the Powerwall, tailored for residential use, have been pivotal in this expansion. In the third quarter of 2024, Tesla's energy generation and storage revenue reached nearly \$2.4 billion, marking a 52% increase from the previous year. This growth underscores the rising demand for energy storage solutions, driven by factors such as extreme weather events, electrification laws, and the increasing strain on municipal energy grids.

Beyond its core automotive and energy products, Tesla has diversified its revenue streams through various services and other offerings. In 2023, the company reported over \$8 billion in revenue from services and other segments.

This category encompasses multiple streams, including sales of trade-in vehicles, repair and maintenance services, insurance products, and merchandise sales.

These diversified services not only provide additional revenue but also enhance customer loyalty and brand engagement, contributing to Tesla's overall financial performance.

Regional Revenue Breakdown

Tesla's revenue distribution in 2023 was as follows:

- United States: \$45.24 billion (46.7% of total revenue).
- China: \$21.75 billion (22.5%).
- Other Countries: \$29.79 billion (30.8%) (Stock Analysis, 2024; Bullfincher, 2024).

The United States remains Tesla's largest market (as seen in Fig 3), contributing nearly half of the company's total revenue. This

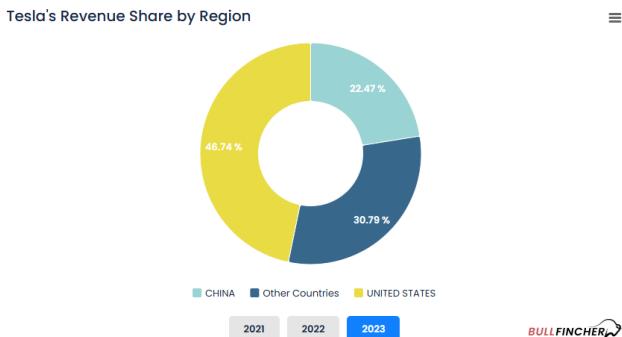


Figure 3. Revenue share of TSLA by region

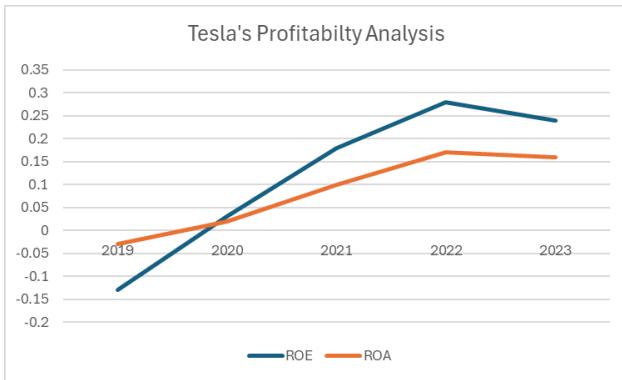


Figure 4. ROE and ROA for 2019–2023

strong domestic performance underscores Tesla's solid foothold in its home country, driven by high brand loyalty and government incentives supporting electric vehicles (Stock Analysis, 2024; Bullfincher, 2024).

China, accounting for 22.5% of Tesla's revenue, is the company's second-largest market. However, Tesla faces increasing competition from local electric vehicle manufacturers such as Nio and BYD, which sold over 1.8 million EVs in 2022. This intensifying competition could impact Tesla's market share and profitability in the region, particularly as the Chinese government continues to promote domestic manufacturers (Third Bridge, 2024; Bullfincher, 2024).

The remaining 30.8% of revenue comes from other countries, highlighting Tesla's expanding global presence. While specific profitability data for these regions is limited, the diverse revenue base suggests that Tesla is successfully penetrating various international markets and reducing dependence on the U.S. and Chinese markets (Stock Analysis, 2024; Bullfincher, 2024).

In summary, while Tesla's revenue remains concentrated in the United States and China, the company is making significant strides in diversifying its income streams across other regions. Maintaining and enhancing profitability in these key markets will be crucial for Tesla's sustained growth, especially considering increasing competition and evolving market dynamics.

Key Financial Ratios and Metrics

ROE and ROA

The relationship between ROE and ROA, shown in Fig 4, provides valuable insight into Tesla's financial structure and performance. ROE measures the company's ability to generate returns for its shareholders by utilising equity, while ROA shows how effectively the company is using its assets to produce profits.

In 2019, Tesla's ROE was negative at -0.13, indicating that the company was unable to generate positive returns for its shareholders as Tesla faced challenges in scaling production and managing costs. Similarly, the ROA was also negative at -0.03, suggesting that Tesla was not effectively utilising its assets to generate profits. The negative values for both ROE and ROA reflected the difficulties Tesla encountered in turning its investments into meaningful returns.

In 2020, Tesla's financial situation began to improve and a positive trend emerged, by 2022 Tesla's ROE reached 0.28, reflecting the company's ability to leverage its equity base effectively,

improve profitability and improve operational efficiency. The ROA also increased to 0.17, the rise in both metrics in 2022 signaled that Tesla was not only generating strong returns for shareholders but also making efficient use of its assets to achieve this profitability.

In 2023, Tesla's ROE decreased slightly to 0.24 and ROA also decreased marginally to 0.16. Despite this, the company continued to perform well and both ROE and ROA remained at healthy levels, suggesting that Tesla's profitability and asset management were still relatively strong.

Interest Coverage

The interest coverage ratio shown in Fig 5, is a key measure of a company's financial health, specifically its ability to pay interest on outstanding debt. A higher ratio indicates that a company is more capable of covering its interest payments, while a lower ratio suggests potential difficulty in managing debt obligations.

In 2019, the very low ratio of 0.03 indicated that Tesla's earnings were insufficient to cover its interest expenses, signaling the challenges the company faced in terms of profitability and debt management. The ratio suggests that Tesla had a high level of debt relative to its earnings, making it highly vulnerable to potential financial strain.

In 2021, Tesla's interest coverage ratio surged to 18.1, a remarkable improvement. This jump reflected the company's continued growth in profitability and its increasing ability to generate earnings from its core operations. The 18.1 ratio showed that Tesla could comfortably cover its interest expenses multiple times over, signaling that the company had become much more financially stable and less reliant on external financing. Tesla's ability to generate operating income had reached a point where debt was no longer a major concern, and the company's cash flow was strong enough to support its growth and operations without being heavily burdened by interest payments.

In 2023, while Tesla's interest coverage ratio decreased slightly to 64.93, it remained extremely strong. The company continued to be in a very healthy financial position, with its ability to cover interest payments remaining well above average. The decrease could reflect changes in debt levels or interest rate fluctuations, but it does not signal a significant deterioration in Tesla's ability to manage its financial obligations.

PEG ratio

Tesla's Price/Earnings to Growth (PEG) ratio (Fig 6) from 2019 to 2023 reveals interesting insights into how the market has valued

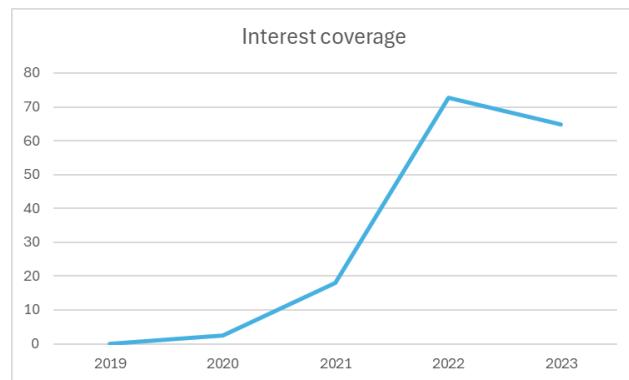


Figure 5. Interest Coverage for 2019–2023

the company's growth potential relative to its earnings. The PEG ratio is a valuation metric that takes into account a company's price-to-earnings (P/E) ratio and adjusts it for the company's earnings growth rate. A PEG ratio of 1 is generally considered to indicate that the stock is fairly valued in relation to its growth. A PEG ratio lower than 1 suggests that the stock is undervalued relative to its earnings growth potential, while a PEG higher than 1 suggests that the stock might be overvalued.

In 2019, Tesla's PEG ratio was 0.67, this low ratio reflected the market's skepticism about Tesla's future growth prospects during that time, despite the company's potential in the electric vehicle (EV) market. At the time, investors were uncertain about Tesla's ability to scale production, maintain profitability, and navigate the competitive pressures in the automotive industry. The low PEG ratio suggested that, even though Tesla was not yet fully profitable, the market believed its growth potential outweighed the risks.

However, in 2020, the PEG ratio rose to 1.19, indicating that the market began to view Tesla as a more promising investment. Despite the global economic challenges posed by the COVID-19 pandemic, Tesla's financial performance improved, and the company showed strong resilience and growth. The increase in the PEG ratio during this period suggests that investors started to price in more aggressive growth expectations for Tesla, as the company continued to expand its production capacity and reach new milestones in profitability.

In 2021, Tesla's PEG ratio surged to 2.32, reflecting an even more pronounced market optimism about the company's growth. Investors appeared to be pricing in very high future growth for Tesla, possibly driven by excitement surrounding the company's dominance in the EV market, expansion into new markets, and innovations in autonomous driving technology. This overvaluation, as indicated by a PEG ratio significantly above 1, could also reflect broader market trends in tech stocks, where high growth expectations sometimes lead to inflated valuations.

In 2022, the PEG ratio decreased to 0.81, returning to a more reasonable level. This decline reflected a market recalibration, as Tesla's earnings growth continued, but the stock's price became more aligned with its earnings growth rate. The drop in the PEG ratio suggested that investors were factoring in more realistic growth expectations, which could have been influenced by competition in the EV sector and concerns over supply chain issues.

In 2023, Tesla's PEG ratio skyrocketed to 4.61, the high PEG ratio suggests that the market was placing extremely high growth expectations on Tesla. This could be a reflection of both Tesla's continued success in the EV market and investor enthusiasm for

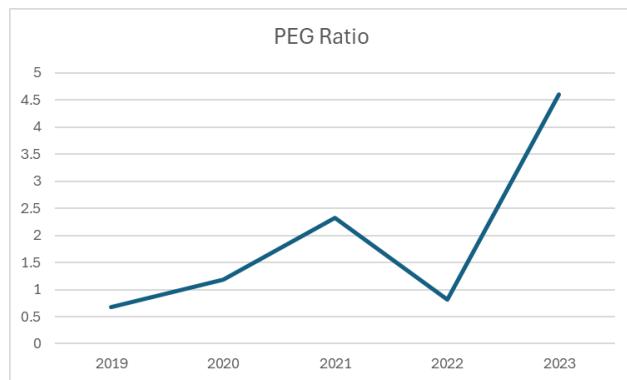


Figure 6. PEG Ratio from 2019-2023

the company's future plans. The steep increase in the PEG ratio also indicates that investors may have been overly optimistic about Tesla's growth prospects, potentially inflating the stock price beyond a reasonable reflection of its earnings growth rate.

Margin Ratios and Profitability Analysis

Margin ratios are essential indicators of a company's profitability and operational efficiency. The gross profit margin measures the efficiency of production by comparing revenue to the cost of goods sold (COGS). The operating margin evaluates management's efficiency by comparing revenue to operating expenses. Finally, the net profit margin assesses overall profitability by calculating the percentage of revenue remaining after all expenses, taxes, and interest are deducted.

The steady improvement in the gross profit margin (Table 1) from 2019 to 2022 reflects Tesla's growing operational efficiency, economies of scale, and higher production volumes driven by the success of the Model 3 and Model Y. The company's ability to manage manufacturing costs and leverage higher-margin software offerings (e.g., Full Self-Driving packages) likely contributed to this upward trend. In 2022, Tesla maintained a strong balance between revenue growth and production efficiency. The drop in gross profit margin in 2023 signals challenges: increased competition in the EV market forced Tesla to reduce vehicle prices. Margins partially recovered in the third quarter through reduced production costs.

The operating margin showed significant improvement from a negative -0.28% in 2019 to 16.76% in 2022, demonstrating better operational efficiency and cost management. In 2023, the operating margin declined to 9.19% due to increased expenses associated with the Cybertruck launch and investments in artificial intelligence.

The net profit margin, which was negative at -3.51% in 2019, turned positive in 2020 and rose steadily to 15.45% in 2022, reflecting strong profitability and effective cost control. The margin remained stable at 15.50% in 2023.

EV Industry Market Share

Competitive Landscape

Tesla's position as a global leader in electric vehicles (EVs) is deeply intertwined with its ability to leverage government policies, navigate international trade dynamics, and adapt to renewable energy regulations. This analysis explores the influence of EV incentives, trade policies, renewable energy initiatives, labor trends, and geopolitical factors on Tesla's operations, offering a detailed perspective on the challenges and opportunities the company faces.

EV Incentives and Emissions Standards

Tesla's success is significantly influenced by EV incentives and emissions standards in its key markets. In the United States, the

Table 1. Historic Margin Ratios 2019–2023

Year	2019	2020	2021	2022	2023
Gross Profit Margin	16.6%	21.0%	25.3%	25.6%	18.25%
Operating Margin	-0.28%	6.23%	12.12%	16.76%	9.19%
Net Profit Margin	-3.51%	2.19%	10.26%	15.45%	15.50%

Inflation Reduction Act (IRA) of 2022 reinstated the \$7,500 federal EV tax credit for vehicles assembled in North America, provided battery components and critical minerals are sourced domestically or from U.S. free-trade partners. Tesla's extensive manufacturing footprint in the U.S., including its Gigafactories in Nevada and Texas, enables it to fully capitalise on these incentives.

In Europe, Tesla benefits from robust subsidies and stringent CO₂ emission standards. Countries like Germany offer up to €4,500 for EV purchases, while France provides €5,000–€7,000, depending on income levels. The European Union's requirement for automakers to maintain average fleet-wide CO₂ emissions of 95g CO₂/km aligns with Tesla's all-electric portfolio, giving it a competitive advantage. Meanwhile, **China's New Energy Vehicle (NEV) quotas** and tax exemptions ensure Tesla remains competitive despite the ongoing phase-out of direct EV subsidies. These policies, combined with Tesla's localisation efforts at its Shanghai Gigafactory, position the company as a dominant player in the Chinese market.

However, Tesla also faces increasing competition in accessing these incentives. Chinese automaker BYD benefits from strong government support, including research and development subsidies and favorable trade policies. Rivian, a U.S.-based competitor, qualifies for similar IRA credits but focuses on localised production to maintain compliance.

Trade Policies and Tariff Impacts

Tesla's global operations are deeply affected by U.S.–China and U.S.–EU trade policies, particularly tariffs and trade deficits. The U.S. imposes a 25% tariff on Chinese-made EVs, which restricts Tesla's ability to export vehicles from its Shanghai Gigafactory to North America. While this tariff does not apply to Shanghai exports to Europe, geopolitical tensions between China and Western nations pose risks to Tesla's reliance on its Chinese supply chain.

Furthermore, the U.S. trade deficit with China, driven in part by reliance on Chinese-linked critical materials like lithium, cobalt, and nickel, underscores the need for Tesla to diversify its sourcing strategy.

Tesla's Shanghai Gigafactory plays a vital role in the company's export operations, shipping vehicles to Europe and other Asian markets. However, over-reliance on the Shanghai facility makes Tesla vulnerable to geopolitical risks, such as potential trade restrictions or sanctions on Chinese-made goods. In Europe, favourable trade policies have allowed Tesla to import vehicles tariff-free, though the U.S. emphasis on domestic manufacturing under the IRA could strain relations with EU nations seeking similar incentives.

Renewable Energy and Emission Reduction Policies

Tesla's renewable energy divisions, including solar panels and battery systems, benefit from favourable government incentives worldwide. In the U.S., federal tax credits under the IRA and other programs encourage adoption of Tesla's Powerwall and grid-scale energy storage solutions. Similarly, the European Union's **Fit for 55** package offers funding for renewable energy projects, while feed-in tariffs in countries like Germany incentives the adoption of solar installations.

Government investment in EV charging

infrastructure, such as the U.S. **National Electric Vehicle Infrastructure (NEVI)** program, further supports Tesla's Supercharger network expansion. The EU's Green Deal, which mandates EV chargers every 60 kilometres along major routes, aligns with Tesla's infrastructure strategy, enabling it to secure subsidies while enhancing consumer adoption.

Labor and Fiscal Policy Considerations

Labor trends and fiscal policies also shape Tesla's operations across regions. Rising labor costs in the U.S. and Europe, driven by inflation and high-tech skill shortages, create challenges for Tesla's profitability. Germany's stringent labor regulations further contrast with China's cost-efficient workforce, leading to regional cost disparities.

Geopolitical and Supply Chain Risks

Geopolitical tensions and supply chain constraints present significant risks to Tesla's operations. U.S.–China relations, characterised by tariffs and restrictions on key technologies, could disrupt Tesla's reliance on its Shanghai Gigafactory and Chinese suppliers. Similarly, the EU's emphasis on local EV production under initiatives like the Fit for 55 package may compel Tesla to further expand its European operations.

Tesla also benefits from government on-shoring investments, such as the Biden Administration's funding for domestic EV battery plants. These initiatives provide tax breaks and other incentives, allowing Tesla to strengthen its U.S. supply chain. Meanwhile, global efforts to diversify material sourcing and reduce reliance on China align with Tesla's long-term sustainability and localisation goals.

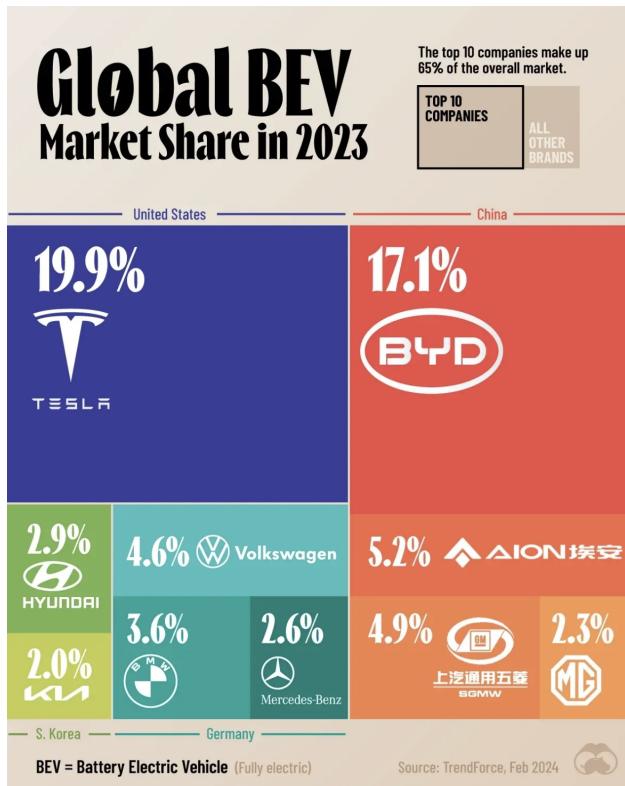


Figure 7. EV Market share for 2023

Competitive Analysis

Margin Comparison

BYD leads in gross profit margin at 21.90% (Table 2), indicating better production cost efficiency compared to Tesla's 18.25%. However, Tesla demonstrates superior operational efficiency with the highest operating margin of 9.19%, outperforming BYD (6.38%), VW (7.00%), and GM (5.41%). In terms of net profit margin, BYD edges ahead at 20.21%, followed by Tesla at 15.50%, while VW and GM trail significantly at 4.97% and 5.84% respectively.

Tesla's performance overall is commendable, particularly in operational efficiency and profitability. To maintain its competitive edge, Tesla could focus on further reducing production costs through advanced technologies and renewable energy solutions, enhancing operational efficiency through continuous improvement strategies, and expanding into new markets while investing in innovation to drive revenue and profitability growth.

Liquidity Analysis – Current Ratio

The current ratio measures a company's ability to meet short-term liabilities with its short-term assets. A ratio above 1 indicates strong liquidity.

Tesla's current ratio improved from 1.1x in 2019 to 1.7x in 2023 (See Table 3), demonstrating stronger liquidity management compared to competitors. BYD's consistently low current ratio of 0.7x in 2023 indicates potential difficulties in managing short-term liabilities. VW and GM maintained relatively stable ratios around 1.1x–1.2x, reflecting balanced liquidity.

Tesla's liquidity position can be further strengthened by optimising cash flow, inventory, receivables, and payables management while investing in advanced financial technologies to maintain its competitive advantage.

Financial Leverage – Debt-to-Equity Ratio

The debt-to-equity ratio measures a company's reliance on debt compared to its shareholders' equity. Lower ratios indicate reduced financial risk and a stronger equity position.

Tesla's debt-to-equity ratio significantly decreased from 1.78 in 2019 to 0.074 in 2023 (shown in Table 4), showcasing financial discipline and reduced reliance on debt. BYD and VW maintained higher leverage, with BYD's ratio increasing to 1.61 in 2023. GM had the highest reliance on debt, with a ratio of 1.91 in 2023.

Table 2. Competitive Margin Ratios 2019–2023

Company	Gross Profit Margin	Operating Margin	Net Profit Margin
TSLA	18.25%	9.19%	15.50%
BYD	21.90%	6.38%	20.21%
VW	18.75%	7.00%	4.97%
GM	18.23%	5.41%	5.84%

Table 3. Liquidity analysis 2019–2023

Year	2019	2020	2021	2022	2023
TSLA	1.1x	1.9x	1.4x	1.5x	1.7x
BYD	1.0x	1.0x	1.0x	0.7x	0.7x
VW	1.1x	1.2x	1.2x	1.2x	1.2x
GM	0.9x	1.0x	1.1x	1.1x	1.1x

Tesla's continued focus on disciplined debt management, strategic investments, and expanding equity through sustained profitability will help further solidify its financial health and maintain its strong market position.

Monte Carlo Simulations

The Monte Carlo simulation is a method used to model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables. In this report, we apply the Monte Carlo simulation to forecast TSLA stock price movements. The simulation accounts for randomness in stock price behavior, generating potential future price distributions for different time horizons.

Preliminaries

In preparing our Monte Carlo simulation to forecast Tesla's stock price movements, we utilise the Geometric Brownian Motion (GBM) model, a fundamental stochastic process widely applied in financial mathematics for modeling stock prices and other assets. This model effectively incorporates the randomness inherent in financial markets, offering a robust framework for our analysis.

The GBM model is represented by the following stochastic differential equation:

$$dS = \mu S dt + \sigma S dW \quad (1)$$

Where:

- S is the stock price.
- μ is the drift (average return).
- σ is the volatility (standard deviation of returns).
- W is a Wiener process (also known as Brownian motion).

Model Setup

For practical implementation, we translate the continuous GBM into a discrete approximation to facilitate our simulations. This approach allows us to model the day-to-day fluctuations in Tesla's stock price over various time horizons. The discrete version of the GBM is formulated as follows:

$$S_{t+1} = S_t \cdot \exp \left(\left(\mu - \frac{1}{2} \sigma^2 \right) \Delta t + \sigma \sqrt{\Delta t} \cdot Z \right) \quad (2)$$

Where:

- Z is a random variable drawn from a normal distribution.
- Δt is the time step.

This setup facilitates the execution of 10,000 iterative simulations to project future price distributions for Tesla over the

Table 4. Debt-To-Equity Ratio analysis 2019–2023

Year	2019	2020	2021	2022	2023
TSLA	1.78	0.46	0.18	0.046	0.074
BYD	1.59	1.08	0.87	1.31	1.61
VW	1.65	1.60	1.46	1.24	1.32
GM	2.50	2.47	1.85	1.71	1.91

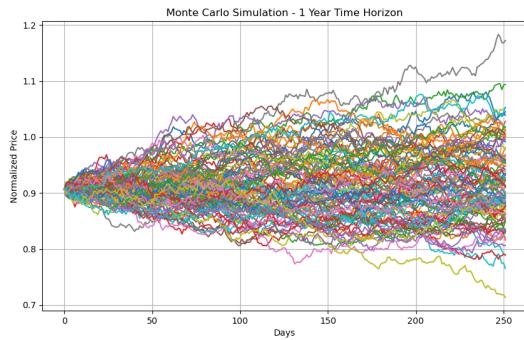


Figure 8. 1-Year price simulation

next 3 months, 6 months, 1 year, and 5 years (an example of the simulation is shown in a 1-year price simulation on Fig 8). The choice of these time horizons is designed to capture both short-term volatilities and long-term trends, providing a comprehensive overview of potential future trajectories under various market conditions.

By applying the Monte Carlo simulation method using the GBM model, our analysis does not merely speculate on single-point future values but rather develops a probability distribution of potential outcomes. This method acknowledges and incorporates the inherent uncertainties and dynamics of the stock market, offering a more nuanced tool for risk assessment and investment strategy development for Tesla's stakeholders.

Results

Sensitivity heatmap

Monte Carlo simulations underscore a generally optimistic forecast for Tesla's stock over the coming one to five years, albeit shadowed by increasing uncertainty with extended timeframes. These projections indicate a rising trajectory for TSLA's share price, intertwined with significant volatility that escalates the risk of fluctuations, particularly over shorter spans such as one to three months. While these models offer valuable insights, they rely on the assumption of steady volatility—a simplification that may not

hold against the complex dynamics of real-world markets.

Our sensitivity analysis, visualised through a detailed heatmap (Fig 9), meticulously evaluates how variations in market conditions could influence Tesla's key financial indicators, specifically the standard deviation affected by drift and volatility. This analysis illuminates the nuanced interplay between drift—the expected return minus random shocks—and volatility—the range of price variations over time—across various scenarios. The heatmap vividly delineates a risk-return gradient, providing investors with a clear depiction of potential financial outcomes under different market conditions.

The findings reveal that Tesla's financial health is more susceptible to changes in market volatility than to shifts in drift. This insight is pivotal for investors, as it underscores the inherent risks associated with Tesla's high-volatility sectors, including electric vehicles and renewable energy technologies. An increase in volatility correlates with an elevation in the standard deviation of returns, indicating both a higher potential for substantial gains and an amplified risk profile, which aligns with Tesla's bold market strategies.

Such market sensitivity suggests that Tesla's investment allure could vary significantly with shifts in global economic conditions and investor sentiment. For instance, in times of heightened market volatility, Tesla's shares could witness substantial price swings. These periods may offer lucrative opportunities for gains but also necessitate comprehensive risk management strategies to mitigate potential losses.

Moreover, the detailed granularity of this analysis emphasises the necessity for adaptable investment strategies that can swiftly respond to market changes. This might include employing derivatives for risk management and leveraging advanced, real-time data analytics for informed decision-making. By capitalising on Tesla's characteristic volatility, investors can potentially optimise returns while minimising adverse impacts.

Integrating this analysis into an equity research report enhances the narrative around Tesla's financial robustness and investment potential, offering investors a well-rounded view that aids in making informed decisions in a volatile and evolving market. This strategic insight is indispensable for navigating the complexities of investing in a transformative sector like that of electric vehicles and renewable energy.

Distribution of simulated prices

The Monte Carlo simulation offers a probabilistic forecast of potential Tesla stock prices, depicted in Figure 10. This analysis confirms a \$450 target price as reasonable, residing within one standard deviation of the mean, highlighting its attainability within the current financial year given the existing market dynamics.

The presence of fat tails in the price distribution suggests the likelihood of achieving prices as high as \$480 or as low as \$380 is minimal, though such extremes are possible. This observation is crucial for investors who base their decisions on the normal distribution and might overlook the risks associated with less probable outcomes.

Setting a target price at \$450 is supported by the probabilistic models used, with the \$380–\$390 range acting as a practical risk management threshold. This insight allows investors to fine-tune their market entry and exit strategies, maximising gains while protecting against significant losses.

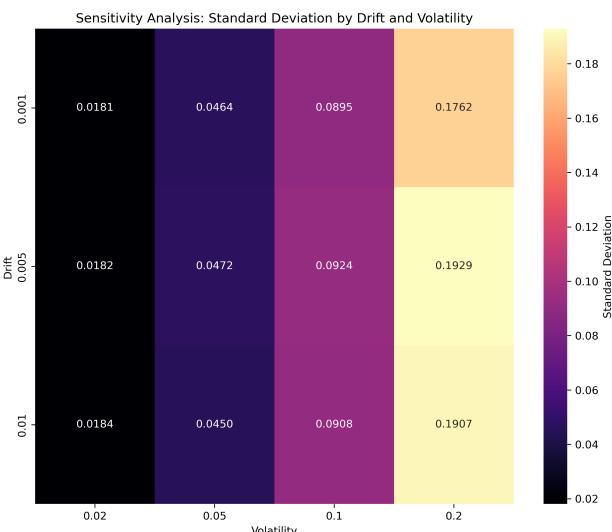


Figure 9. Sensitivity heatmap for μ , σ

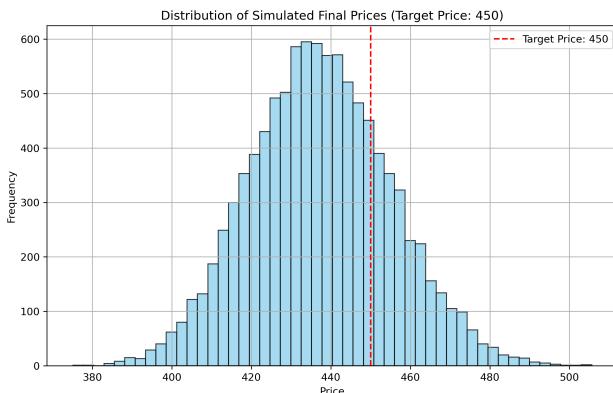


Figure 10. Baseline Simulation - Distribution of Simulated Final Prices

However, the case of NVIDIA's recent stock performance serves as a poignant example of the market's volatility and the rapid shifts that can occur due to external factors. Following the backlash over its involvement with DeepSeek, NVIDIA's stock experienced a sharp decline, underscoring the impact of market sensitivity on stock values. This incident illustrates how quickly investor sentiment can shift, affecting stock prices and highlighting the need for robust risk mitigation strategies in volatile sectors like technology and electric vehicles.

For investors prioritising stability or seeking to diversify within less volatile sectors of the electric vehicle market, Tesla's susceptibility to sharp market movements may represent a significant deterrent. The detailed analysis provided here should assist investors in making informed decisions, recognising both the opportunities for substantial gains and the risks of abrupt value fluctuations in a rapidly evolving market landscape.

Validity of model

While the Monte Carlo simulation provides useful insights, there are several assumptions and limitations to be aware of:

- The assumption of constant volatility σ is often unrealistic in the real world, as market conditions change over time.
- The model assumes that returns are normally distributed, which may not fully capture extreme market movements (fat tails).
- The simulation does not account for real-world events such as market shocks or policy changes, which can significantly impact stock prices.
- The drift parameter μ is estimated based on historical data, and there is a risk that the future will deviate from historical trends.

These limitations should be considered when interpreting the results of the simulation.

Kalman Filter Model & Dependency analysis

Preliminaries

This section introduces the Kalman Filter Model, utilised for its adeptness in real-time predictive analysis of Tesla's stock. The model thrives in managing the volatility characteristic of Tesla's market by dynamically adjusting to changes, offering an insightful perspective into Tesla's stock behavior through rigorous time series analysis.

Our model integrates daily trading data from Tesla and a composite index (NDXL) crafted from several market indices: Nasdaq 100 (NDX), Global X Autonomous & Electric Vehicles ETF (DRIV), Consumer Discretionary Select Sector SPDR Fund (XLY), and Global X Lithium & Battery Tech ETF (LIT).

The preprocessing steps include normalisation and scaling of the data using MinMaxScaler, ensuring that the inputs into the Kalman Filter are consistent and comparable. This careful preparation is essential for the detailed analytical work in the following sections, where market dynamics and stock sensitivity are explored further.

Model Setup

Market Proxy

The composite index, referred to as NDXL, is derived from a weighted combination of four major indices: NASDAQ (NDX), Consumer Discretionary (XLY), Autonomous & Electric Vehicles (DRIV), and Global X Lithium & Battery Tech (LIT). Each index was chosen based on its relevance to Tesla's business model and sector. NDX provides a broad market exposure, reflecting general market trends that affect tech giants like Tesla. XLY covers consumer spending behaviors that directly impact Tesla's core products. DRIV focuses on the specific niche of electric and autonomous vehicles, directly correlating with Tesla's industry. LIT is included to account for the critical raw materials involved in battery production, which are central to Tesla's manufacturing capabilities.

Theoretical framework

The model's foundation is built on a dynamic regression approach, utilising the Kalman Filter to refine our estimates continually.

Inputs

In our analysis, we developed two distinct models using the Kalman Filter for dynamic regression to estimate rolling alpha and beta values, capturing the relationship between Tesla (TSLA) and a composite index (NDXL). These models help in understanding Tesla's stock responsiveness to market changes from different analytical perspectives.

Model 1: Price-Oriented Dynamic Regression

This model integrates VWAP, volatility, and close prices, offering a comprehensive view of the market influences on Tesla's stock prices. By incorporating multiple price-related features, Model 1 provides a detailed snapshot of how Tesla's price dynamics correlate with broader market movements, allowing for nuanced insights into price behaviors and risk assessment.

Model 2: Return-Focused Dynamic Regression

Utilising only the logarithmic returns, Model 2 offers a streamlined analysis that focuses on the rate of return over time. With minimal feature engineering, this model emphasises the pure financial return aspect of Tesla's relationship with market indices, providing a clearer view of the stock's performance relative to market fluctuations.

Both models are crafted to highlight different facets of Tesla's market behavior, with Model 1 delivering a multi-dimensional

perspective through various financial indicators, and Model 2 concentrating on the fundamental return metrics. Together, these models equip investors with a robust framework to gauge Tesla's stock sensitivity and adapt their investment strategies accordingly. Below all the equations used and their applications are listed.

VWAP (Volume-Weighted Average Price): This metric gives us a more accurate reflection of Tesla's stock price, weighted by volume, ensuring that our analysis considers the price points where substantial volumes have been traded. In this formula, P_i and V_i represent the price and volume at time i , respectively.

$$\text{VWAP}_t = \frac{\sum_{i=1}^t (P_i \cdot V_i)}{\sum_{i=1}^t V_i} \quad (3)$$

Volatility: We calculate rolling standard deviations of the logarithmic returns of the stock, which provides us with a measure of how wildly the stock price can swing, an essential factor in risk assessment. Here, σ_t is the standard deviation of returns over a window of N days, r_{t-i} is the return at time $t - i$, and \bar{r} is the mean return over the window.

$$\sigma_t = \sqrt{\frac{1}{N} \sum_{i=1}^N (r_{t-i} - \bar{r})^2} \quad (4)$$

Close Prices: The daily closing prices of Tesla's stock are used to assess its market valuation at the end of each trading day.

Logarithmic returns: This formula helps normalise the percentage changes in prices, making them more manageable for statistical analysis. The use of logarithmic returns is especially common in cases where the comparison of returns over multiple periods is required, or when the returns are used in subsequent multiplicative calculations, such as in the calculation of the overall return of a portfolio over time. Below P_t and P_{t-1} represent the stock price at time t and $t - 1$, respectively.

$$r_t = \log\left(\frac{P_t}{P_{t-1}}\right) \quad (5)$$

DYNAMIC REGRESSION COMPONENTS: Rolling Alpha α (Intercept): This component of the model signifies the part of Tesla's return not explained by market movements. It's crucial for understanding how Tesla's stock behaves independently of the market.

Rolling Beta β (Market Sensitivity): Beta measures Tesla's stock price volatility relative to the swings in the market. A higher beta indicates greater volatility relative to the market, while a lower beta indicates less.

MODEL OPERATIONS: In the model, the Kalman Filter is employed to dynamically estimate the regression coefficients—alpha and beta—between Tesla's stock returns and a composite index of related assets. The coefficients are recalculated at each time step, reflecting the evolving relationship between Tesla and the market proxies, thus providing insights that are crucial for an investment strategy.

Prediction Phase

The model first predicts the next state (alpha and beta) and the error covariance:

- Predicted State Estimate:

$$\hat{\mathbf{x}}_{k|k-1} = \mathbf{F}_k \hat{\mathbf{x}}_{k-1|k-1} + \mathbf{B}_k \mathbf{u}_k$$

Here, $\hat{\mathbf{x}}_{k|k-1}$ represents the predicted state vector (alpha and beta), \mathbf{F}_k is the state transition matrix assumed to be the identity matrix, implying that the previous state is the best prediction of the current state in the absence of new data, and \mathbf{u}_k represents any control inputs which, in this case, are typically absent.

- Predicted Covariance Estimate:

$$\mathbf{P}_{k|k-1} = \mathbf{F}_k \mathbf{P}_{k-1|k-1} \mathbf{F}_k^\top + \mathbf{Q}_k$$

$\mathbf{P}_{k|k-1}$ is the predicted covariance matrix that quantifies the estimate's uncertainty, and \mathbf{Q}_k represents the process noise covariance, indicating the expected noise in the prediction model.

Update Phase

The model then refines these predictions based on new market data:

- Kalman Gain:

$$\mathbf{K}_k = \mathbf{P}_{k|k-1} \mathbf{H}_k^\top (\mathbf{H}_k \mathbf{P}_{k|k-1} \mathbf{H}_k^\top + \mathbf{R}_k)^{-1}$$

The Kalman Gain, \mathbf{K}_k , balances the prediction and the measurement, optimising the weight given to new data versus old data.

- Updated State Estimate:

$$\hat{\mathbf{x}}_{k|k} = \hat{\mathbf{x}}_{k|k-1} + \mathbf{K}_k (\mathbf{z}_k - \mathbf{H}_k \hat{\mathbf{x}}_{k|k-1})$$

This equation updates the state estimate with the new market data (\mathbf{z}_k), where \mathbf{H}_k translates the state estimates into the measured space.

- Updated Covariance Estimate:

$$\mathbf{P}_{k|k} = (\mathbf{I} - \mathbf{K}_k \mathbf{H}_k) \mathbf{P}_{k|k-1}$$

Finally, the covariance of the estimate is updated, reducing the uncertainty in the state estimate if the measurement is considered accurate.

These equations collectively allow the model to adapt to changes in Tesla's price behavior relative to the market, quantifying the strength and bias of the relationship via rolling estimates of beta and alpha. The rolling beta assesses the sensitivity of Tesla's stock returns to movements in the composite index, while alpha provides an intercept term, suggesting Tesla's performance relative to the market independent of market movements.

Using the Kalman Filter, the model updates its estimates of alpha and beta dynamically. This process involves calculating the expected state of these parameters given past information and then updating these expectations with new daily data on VWAP, volatility, and close prices.

The observation matrix in this model typically aligns the changes in Tesla's returns (in model 1) or prices (in model 2) with the returns of a market index, weighted by the previous estimations of alpha and beta, to adjust the model continuously based on incoming data.

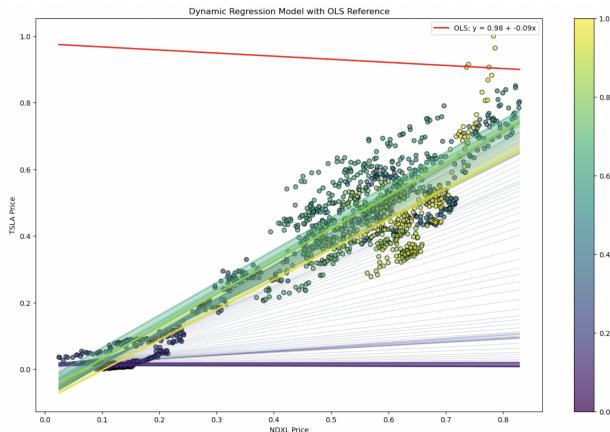


Figure 11. Scatterplot with OLS reference for prices model

OUTPUTS: The primary outputs of this model are the updated values of alpha and beta. These outputs help in understanding how closely Tesla's stock movements are tied to the market (beta) and how it performs relative to the market's expectations (alpha).

Results: Prices model

The provided scatter plot (in Fig 11) exemplifies a dynamic regression model that meticulously tracks the interaction between Tesla's stock prices and the NDXL index, a composite representing pertinent market proxies. The progression of colors from purple to yellow, transitioning from historical to more recent data, illustrates the evolution of Tesla's responsiveness to changes in the NDXL index. This analysis reveals the fluctuations in Tesla's stock sensitivity to broader market trends over time, offering a granular view of its market behavior.

The analysis of rolling beta and alpha (Fig 12) between Tesla (TSLA) and the composite index (NDXL) provides significant insights into the stock's market behavior and individual performance nuances. The rolling beta reveals a pronounced rise from early 2021, reaching near unity by late 2022 and persisting through to 2025. This trend indicates that Tesla's stock movements are almost perfectly correlated with the broader market movements typically seen in technology-heavy indices like the NASDAQ-100. Also Tesla price movements are very correlated with the evolution of battery tech in the LIT ETF. This synchronisation implies that Tesla, despite its unique position within the automotive and energy sectors, is heavily influenced by the same macroeconomic factors that drive the technology sector. Such a high beta typically denotes high volatility and, consequently, higher risk and return, which can be attractive in bullish market conditions but requires caution during downturns.

The rolling alpha presents a different perspective, showcasing a significant decline into negative territory starting from early 2019 and deepening in 2021. This negative alpha is indicative of Tesla's returns failing to meet the expectations set by its market risk level. Despite Tesla's aggressive expansion and technological innovation, the negative alpha suggests that these factors have not translated into excess returns over the market. This could reflect operational challenges (with the Gigafactory in Shanghai), increased competition, or market saturation impacts that may not be immediately visible through traditional financial analysis.

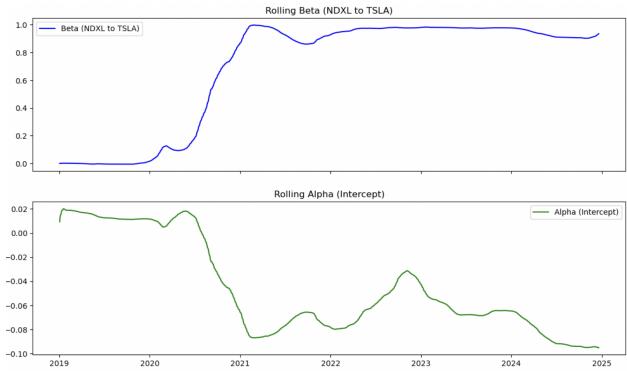


Figure 12. α & β plot for prices model

Results: Returns model

This visual analysis (Fig 14) underscores the increasing beta of Tesla's stock, reflecting a stronger correlation with market movements as time progresses. For investors, this pattern suggests that Tesla's stock is becoming progressively reactive to the fluctuations of the tech-heavy index NDXL, emphasising the need for vigilant market trend monitoring. The alignment of Tesla's stock behavior with market trends can offer predictive insights for strategic investment decisions, particularly for those looking to leverage market cycles. Investors should consider the implications of this heightened correlation in their portfolio strategy, potentially adjusting their risk management and diversification tactics to accommodate the increasing volatility associated with Tesla's shares. This detailed temporal analysis is crucial for understanding the broader implications of Tesla's market dynamics and formulating robust investment strategies.

The investigation of rolling beta and alpha using log returns between Tesla (TSLA) and the composite index (NDXL) as shown in Fig 14, offers valuable insights distinct from those derived through the price model. In this analysis, the rolling beta progressively ascends from early 2021, stabilising around 0.4 by the study's end. This moderate beta value suggests that while Tesla's stock movements are influenced by broader market trends typical of tech-heavy indices, they retain a substantial degree of independence due to specific company or industry factors.

This moderate correlation might imply that Tesla shares only partially reflect broader market fluctuations, thus providing a buffer against widespread market downturns while also potentially not fully capitalising on general market upswings. The strategic implication for investors is the potential benefit of including Tesla in a diversified portfolio, where its partial market correlation could serve as a hedge against more volatile tech stocks, potentially reducing overall portfolio risk.

Conversely, the rolling alpha presents an initially positive trend that sharply declines, stabilising near zero and occasionally dipping into the negative. This trajectory indicates that Tesla initially outperformed market expectations but increasingly aligned with or underperformed against these expectations over time. The transition to a consistently low or negative alpha highlights potential concerns about Tesla's ability to sustain outperformance relative to market-adjusted risk. It suggests that while Tesla may have previously leveraged unique innovations or market conditions to generate superior returns, these advantages may be diminishing as the company and market dynamics evolve.

For investors, these findings underscore the importance of closely monitoring Tesla's ongoing business strategies, competitive

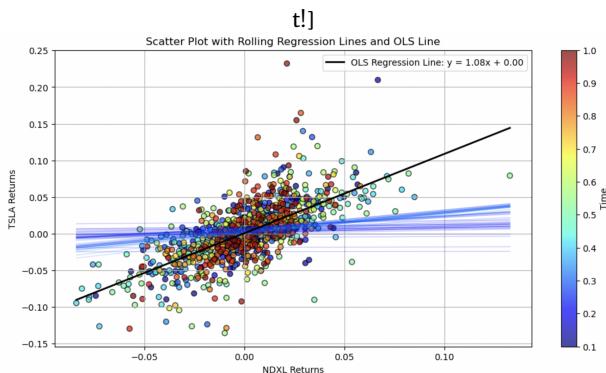


Figure 13. Scatterplot with OLS reference for returns model

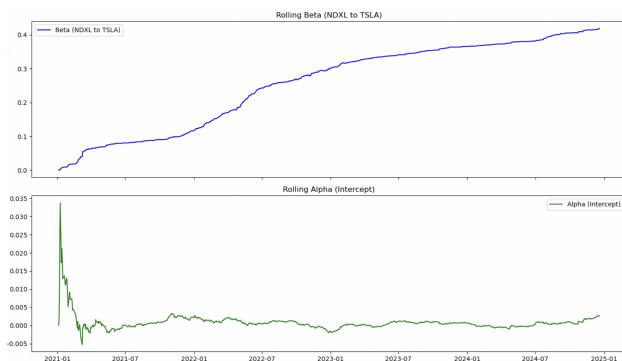


Figure 14. Alpha & Beta plot for returns model

position, and market developments. Maintaining vigilance on how Tesla's specific actions—such as new product launches, market expansion, and operational efficiencies—impact its financial performance relative to the broader market will be crucial. Furthermore, the need for periodic reassessment of Tesla's role within investment portfolios becomes apparent, particularly if its ability to surpass market expectations continues to wane.

Strategic Recommendations

The analysis from the two models employing the Kalman Filter dynamic regression to track Tesla's relationship with the composite index NDXL (comprised of LIT, DRIV, NDX & XLY) reveals insights that are pivotal for forming strategic investment recommendations. The first model, which considers VWAP, volatility, and close prices, suggests that Tesla's stock movements closely mimic those of the broader market, as evidenced by the rising beta reaching near unity. This alignment indicates Tesla's susceptibility to broader economic forces, particularly those affecting the tech sector. While this high beta suggests potential for significant returns during bullish conditions, it also implies greater risk during market downturns.

Conversely, the second model, focusing on logarithmic returns, shows a moderate but increasing beta, indicating a nuanced correlation with the market. Tesla shows some resilience against broad market swings, suggesting underlying factors at play that might buffer against market downturns or prevent full gains during upswings. This partial correlation is ideal for diversification strategies, offering a blend of market-driven returns and unique company-specific outcomes.

However, both models show an overall declining trend in alpha, particularly notable in the first model where it dips into negative

territory. This trend is concerning as it suggests Tesla's market returns are not commensurate with its risk profile, potentially pointing to operational inefficiencies or competitive pressures not fully captured by market movements alone.

Strategically, investors should consider the following:

- **Dynamic Portfolio Adjustment:** The shifting nature of beta and alpha necessitates a responsive investment strategy. Investors should adjust their Tesla holdings based on ongoing assessments of these metrics, potentially reducing exposure if alpha continues to lag or if beta suggests excessive market sensitivity.
- **Enhanced Market Analysis:** Given Tesla's high beta, an understanding of broader market trends, particularly in the tech and automotive sectors, is crucial. This analysis should inform the timing of buy or sell decisions, aiming to capitalise on anticipated market movements.
- **In-depth Operational Review:** The negative alpha trend invites a deeper look into Tesla's operational strategies and market positioning. Investors should scrutinise Tesla's operational efficiencies, innovation pipeline, and market expansion efforts to pinpoint areas that could either be contributing to underperformance or might signal potential for future outperformance.
- **Risk Management:** The volatility implied by a high beta and the concerns raised by a negative alpha suggest a need for robust risk management strategies. This could involve using financial derivatives to hedge against downside risks or reallocating investments to balance Tesla's potential high returns with investments in lower-risk assets.

In summary of this section, while Tesla's stock offers significant market-aligned growth opportunities, its fluctuating beta and alpha underscore the importance of agile, informed portfolio management to mitigate risks and capitalise on potential gains. By continuously monitoring these metrics and aligning investment strategies accordingly, investors can more effectively navigate the complexities of investing in a high-profile, high-volatility company like Tesla.

Strategic Analysis

Porter's Five Forces Analysis

1. Threat of New Entrants: Low

Capital Investment: The automotive and energy industries require significant capital for infrastructure, research and development (R&D), and manufacturing capabilities. Tesla's Gigafactories, such as those in Fremont, Shanghai, and Berlin, are massive investments in EV production. For instance, the Tesla Gigafactory in Shanghai represents a \$2 billion investment, and the Gigafactory in Berlin is estimated at over \$5 billion (Reuters).

Technological Leadership: Tesla is a leader in EV technology, including its Autopilot and Full Self-Driving (FSD) capabilities, which are considered some of the most advanced in the industry. Tesla's proprietary battery technology and supercharging network offer a competitive edge that is difficult for new entrants to replicate.

Brand Recognition: As of 2024, Tesla commands approximately 17% of the global BEV market share.

Evaluation: The capital requirements, technological expertise, and brand loyalty make it exceedingly difficult for new entrants to successfully challenge Tesla. Therefore, the threat of new entrants remains low.

2. Bargaining Power of Suppliers: Moderate

Raw Materials: Tesla depends on a range of suppliers for materials such as lithium, cobalt, and nickel. Lithium alone has seen price increases due to higher demand for EV batteries, pushing up the cost of production (Statista).

Vertical Integration: Tesla's strategy of vertical integration—including in-house battery production at its Gigafactories—has reduced dependency on external suppliers. However, battery cell production still relies on partnerships with companies like Panasonic and CATL (Tesla's 2023 Annual Report).

Supplier Leverage: Despite Tesla's efforts to reduce supplier dependence, the increasing cost of essential materials such as lithium creates vulnerability. In 2024, lithium prices surged by over 200% over the past five years, which could impact Tesla's margins (Statista).

Evaluation: While Tesla's vertical integration gives it a degree of autonomy, it is still exposed to material shortages and cost fluctuations, especially with critical resources. This places the bargaining power of suppliers at a moderate level.

3. Bargaining Power of Buyers: Moderate

Competitors: Tesla faces increasing competition from established automakers like Volkswagen, Ford, and General Motors, which have ramped up their EV production. Additionally, new entrants like Rivian and Lucid Motors are offering competitive models.

Technological Differentiation: Tesla's Autopilot, Supercharger network, and vehicle software updates are key selling points that offer unique features that many competitors lack. This strengthens customer loyalty, reducing buyer bargaining power.

Price Sensitivity: Customers may be drawn to more affordable options from competitors like BYD and Ford's Mustang Mach-E, which offer comparable performance. Tesla's average selling price (ASP) remains above the industry average, which may limit price-sensitive consumers.

Evaluation: While Tesla has a loyal customer base and technological differentiation, alternatives in the EV market are growing rapidly. This means buyers have options, but Tesla's innovation reduces the extent of their bargaining power. As a result, buyer power remains moderate.

4. Threat of Substitute Products: Moderate

Hydrogen Fuel Cell Vehicles (FCVs): Companies like Toyota and Hyundai are investing heavily in hydrogen fuel cell vehicles. However, the infrastructure required for FCVs, such as fueling stations, remains less developed than Tesla's Supercharging network, posing a significant barrier for large-scale adoption (Statista).

Public Transport and Ride-sharing: Increasing interest in ride-sharing and autonomous public transportation solutions could reduce the demand for personal vehicles, including EVs. However, Tesla's long-term commitment to autonomous driving could offer an edge in this scenario (Tesla's Autonomy).

Energy Storage: Tesla's energy storage solutions (e.g., Powerwall, Megapack) provide a degree of diversification from traditional automotive substitutes. This further mitigates the threat of substitutes by offering a broader product portfolio (Tesla Annual Report 2023).

Evaluation: The threat of substitutes is moderate as alternatives such as hydrogen-powered vehicles and shared transportation models continue to grow. However, Tesla's diversified product range and strong technological edge in EVs and autonomous driving limit the overall risk.

5. Industry Rivalry: High

Automotive Rivals: Tesla competes with giants such as Volkswagen, General Motors, and Ford, who are increasingly moving toward EV production. BYD has also become a major competitor in the EV space, especially in China, Tesla's second-largest market.

Innovation Race: The pace of innovation in the EV market is rapid. Companies are focusing on battery efficiency, autonomous driving, and charging infrastructure, creating intense competition. Tesla, however, maintains an edge due to its early mover advantage and established Supercharging network.

Market Saturation: The EV market is expected to grow at a CAGR of 25-30% from 2024 to 2030 (Statista). However, as the market matures, rivalry will intensify, and Tesla's market share could be pressured by well-funded competitors.

Evaluation: Due to the increasing number of competitors and high levels of innovation, the intensity of rivalry in the EV market remains high. Tesla's technological lead and brand loyalty help mitigate this, but the competitive environment will continue to evolve.

Porter's Five Forces analysis shows that Tesla faces moderate to high challenges across several dimensions of its competitive environment. While the threat of new entrants remains low, and Tesla's technological advantages reduce buyer power and the threat of substitutes, it must navigate moderate supplier power and high industry rivalry. The expanding competition, particularly from traditional automakers and new entrants in the EV space, presents ongoing challenges that could affect Tesla's market position in the coming years.

Evaluative Analysis of Tesla Stock

Tesla, Inc. (NASDAQ: TSLA) remains a dominant force in the electric vehicle (EV) and renewable energy industries. A thorough SWOT analysis, incorporating company initiatives, statistical data, and market dynamics, provides insight into the company's current positioning and future trajectory.

Strengths

Tesla's greatest strengths lie in its brand value, market capitalisation, and innovative capabilities. It is one of the world's most valuable automakers, having delivered over 1.3 million vehicles in 2022, contributing to a reduction of 13.4 million metric tons of CO emissions (Tesla, 2023). This commitment to sustainability enhances its brand reputation and consumer trust. The company also prioritises talent over traditional academic credentials, fostering an environment where innovation thrives (Business Model Analyst, 2023).

Tesla's Supercharger network, which achieved 99.97% uptime and was powered entirely by renewable energy in 2023, provides a significant infrastructure advantage over competitors by ensuring reliable and sustainable charging access (Tesla, 2023). This aligns with the company's broader strategy of vertical integration, as its in-house battery production reduces reliance on external suppliers, enhancing efficiency and mitigating supply chain risks (Edraw-Mind, 2023). Combined with its strong marketing strategies and unique brand positioning, Tesla continues to solidify its leadership in the EV market, reinforcing both its competitive edge and long-term growth potential (Business Model Analyst, 2023).

Weaknesses

Despite its strengths, Tesla continues to grapple with operational challenges. Persistent manufacturing delays and overly ambitious production targets have raised concerns about its ability to consistently meet demand, an issue compounded by its high employee turnover rate, which threatens organisational stability (Business Model Analyst, 2023; EdrawMind, 2023). A workforce in constant flux can further strain production efficiency, making it even harder for Tesla to achieve its ambitious goals and maintain long-term growth.

Financially, Tesla faced a significant downturn in 2024, experiencing a 53% decline in profits, generating \$7.091 billion in earnings, while revenue remained stagnant at \$97.690 billion. This decline was further exacerbated by a 6% drop in vehicle sales, driven in part by discounts and price adjustments aimed at maintaining market share. However, the high cost of Tesla vehicles remains a barrier to broader consumer adoption, limiting its reach in an increasingly competitive EV market (EdrawMind, 2023).

Beyond financial challenges, CEO Elon Musk's controversial public persona has contributed to stock price volatility, raising concerns over corporate governance and leadership stability (AP News, 2025). A notable example of this occurred in 2020, when Musk tweeted, "Tesla stock price is too high imo," causing a \$14 billion drop in the company's market value (Market Realist, 2020). Such incidents highlight the impact of executive actions on investor confidence, reinforcing the risks associated with Tesla's leadership dynamics.

Opportunities

Tesla has numerous avenues for growth. Expanding into new markets and producing affordable EVs could allow the company to attract a broader customer base. Tesla plans to begin production of lower-cost vehicles in 2025, a move that could significantly increase market penetration (Cinco Días, 2025). The company is also investing heavily in autonomous driving technology, with plans to launch a driverless ride-hailing service in Austin within the next six months and introduce "cybercabs" by 2026 (Financial Times, 2025).

Beyond EVs, Tesla continues to expand in renewable energy solutions, aligning with global sustainability initiatives. The company's five-step plan for transitioning to sustainable energy includes solar power, wind energy, and battery storage solutions, positioning Tesla as a leader in the green energy revolution (Tesla, 2023).

Threats

Tesla faces increasing competition from both traditional automakers entering the EV market and emerging EV startups (Business Model Analyst, 2023). Supply chain disruptions, particularly concerning rare earth metals and semiconductor shortages, pose risks to Tesla's production capabilities (EdrawMind, 2023). Furthermore, tariffs on imported components could lead to increased manufacturing costs, impacting Tesla's profit margins (Barron's, 2025).

Economic downturns present another significant threat. Given Tesla's premium pricing model, a recession could weaken consumer demand for high-end EVs, leading to potential revenue declines (Business Model Analyst, 2023). Additionally, regulatory challenges surrounding self-driving technology could delay Tesla's efforts to commercialise autonomous vehicles, affecting its long-term growth strategy (EdrawMind, 2023).

Tesla's stock remains a compelling yet volatile investment. The company's strengths in brand value, innovation, and sustainability initiatives position it well for continued growth. However, challenges such as financial instability, supply chain risks, regulatory barriers, and CEO-related controversies must be carefully consid-

ered. While the long-term outlook remains optimistic, investors should remain cautious of external threats and market volatility when evaluating Tesla's stock.

Policy and Regulatory Impacts

EV Incentives and Emission Standards

U.S. Inflation Reduction Act (IRA): Tax Credits and EV Subsidies:

The Inflation Reduction Act (IRA) of 2022 restructured the \$7,500 federal tax credit, requiring North American vehicle assembly, stricter battery and mineral sourcing standards, and price/income caps. Tesla's North American Gigafactories ensure compliance, making the Model 3 and Model Y eligible for the full credit. State-level incentives, like California's Clean Vehicle Rebate Project and Zero Emission Vehicle (ZEV) mandate, further enhance Tesla's competitiveness and provide additional revenue streams through ZEV credit sales. Compared to competitors like Rivian and GM, Tesla's scale and localised supply chain give it a significant advantage under IRA policies.

EU Carbon Emission Policies and Renewable Energy Mandates:

In Europe, Tesla benefits from substantial EV subsidies, such as Germany's €4,500 and France's €5,000–€7,000 incentives, as well as Norway's VAT exemptions. These policies reduce ownership costs, boosting demand for Tesla's Model 3 and Model Y. Tesla's all-electric fleet meets the EU's strict CO₂ emissions target (95g CO₂/km), avoiding penalties that burden competitors like Volkswagen and Stellantis. Through the Emission Trading System (ETS), Tesla also generates revenue by selling surplus carbon credits to non-compliant automakers, strengthening its financial and operational position in Europe.

Chinese New Energy Vehicle (NEV) Quotas and Incentives:

China's NEV quotas and tax exemptions drive EV adoption, with Tesla's Shanghai Gigafactory offering critical advantages such as tariff avoidance and access to local subsidies. Tesla's local production enables competitive pricing against domestic leaders like BYD and NIO. While rivals benefit from government support, Tesla's global brand, high production scale, and compliance with NEV policies solidify its leadership in the Chinese EV market.

Trade and Tariff Dynamics

The U.S.–China trade relationship heavily influences Tesla's global operations, particularly in electric vehicles (EV) and critical raw materials like lithium, cobalt, and nickel. The U.S. trade deficit with China is substantial, with a growing focus on EV-related components. Recent tariffs imposed by the U.S. on Chinese EVs, batteries, and semiconductors, ranging from 25% to 100%, aim to protect domestic manufacturers like Tesla but increase production costs. For example, Tesla's Model 3 relies significantly on Chinese battery components, making tariffs a financial challenge. These tariffs also signal the U.S. strategy to reduce dependence on Chinese EV imports and prioritise domestic supply chains.

Exchange rates between USD, CNY, and EUR significantly affect Tesla. A strong dollar increases export costs from the U.S., while a weak yuan reduces manufacturing costs at Tesla's Chinese facilities. Similarly, fluctuating wages in high-tech manufacturing hubs, especially with increasing minimum wages in the U.S. and EU, add financial pressure. Furthermore, potential unionisation in the U.S., driven by the United Auto Workers (UAW), poses risks to

Tesla's labor model.

Tesla's global strategy must navigate the complexities of trade policies, fiscal measures, and labor dynamics. Balancing U.S., EU, and Chinese interests is crucial to maintaining its competitive edge in the rapidly evolving EV market.

Macroeconomic Factors:

Interest Rates and Tesla's Financing:

Interest rates are a critical determinant for capital-intensive companies like Tesla, which relies heavily on debt and equity financing to sustain growth and innovation. During the Trump administration, interest rates were relatively low, largely due to the Federal Reserve's accommodative monetary policy, which aimed to support economic growth following the Great Recession.

In the short term, these low interest rates provided Tesla with an opportunity to secure affordable financing for its ambitious expansion plans, such as the construction of Gigafactories and advancements in battery technology. This financial environment enabled Tesla to scale production capacity, which was essential for meeting the growing demand for electric vehicles.

However, in the long term, Tesla's reliance on borrowed capital exposed it to potential risks associated with future interest rate hikes. If rates were to increase significantly, Tesla could face higher debt-servicing costs, which would strain profitability. Moreover, higher interest rates could dampen consumer demand for electric vehicles by making auto loans more expensive, potentially slowing Tesla's revenue growth.

Central Bank Policy and Tesla's Market Valuation:

The Federal Reserve's monetary policy under Trump's tenure had profound implications for Tesla's valuation. By maintaining low rates and engaging in quantitative easing, the Fed stimulated liquidity in financial markets, leading to increased investor appetite for growth-oriented stocks like Tesla.

In the short term, Tesla benefited from a surge in speculative investment driven by abundant liquidity and the company's perceived potential to disrupt the automotive and energy sectors. This speculative enthusiasm was reflected in Tesla's soaring stock price, which reached unprecedented levels during the Trump era.

Over the long term, however, such market exuberance carries risks. If central bank policies tighten, reducing liquidity in the market, speculative investments could decline. Tesla's valuation, which many analysts argue is heavily based on future growth expectations, could face downward pressure. A shift in investor sentiment could result in increased volatility and potentially harm the company's ability to raise capital through equity markets.

Trump Administration Policies and Tesla:

The Trump administration's policies had mixed effects on Tesla. On one hand, Trump's tax reforms, including corporate tax cuts, provided a short-term boost to Tesla's profitability. Additionally, the administration's deregulation efforts reduced some operational burdens, though many of these measures were more beneficial to

traditional automakers than to Tesla.

On the other hand, Trump's withdrawal from the Paris Agreement and promotion of fossil fuel industries posed challenges for Tesla's long-term vision of a sustainable energy future. The administration's lack of support for renewable energy initiatives contrasted sharply with Tesla's mission, potentially hindering broader adoption of EVs in the United States.

In the short term, Tesla managed to navigate these challenges by focusing on international markets and leveraging consumer interest in sustainable products. Over the long term, however, the absence of robust governmental support for clean energy during the Trump years may have slowed the pace of EV infrastructure development in the U.S., impacting Tesla's domestic growth potential.

Technological and market risks:

Tesla faces technological and market risks, including competition from alternative technologies. Hydrogen fuel cells, solid-state batteries, and autonomous driving systems from rivals like Toyota, Waymo, and Cruise could challenge Tesla's dominance. Additionally, Tesla's reliance on lithium-ion batteries may become a disadvantage if newer, more efficient chemistries are commercialised. Market saturation poses a significant risk in key regions like North America, Europe, and China. As competition grows, Tesla may struggle to maintain high growth rates. Price reductions to drive sales could erode profit margins, and overcapacity risks arise if demand fails to match production expansion in these mature markets.

Financial Valuation: DCF Analysis

Revenue Projections

This report presents a discounted cash flow (DCF) analysis for Tesla (TSLA) as of December 24, 2024 (you may find the DCF in the appendix), based on a set of key assumptions regarding the company's financial performance and market conditions. The DCF model is employed to estimate Tesla's intrinsic value, taking into account its projected cash flows, cost of capital, and future growth prospects.

The analysis is based on two primary assumptions: a Weighted Average Cost of Capital (WACC) and a Terminal Growth Rate (TGR). The WACC is used as the discount rate to calculate the present value of future cash flows (Fig 15), considering both the cost of equity and debt for the company. A WAAC of 15.1% reflects a relatively high risk profile for Tesla, consistent with its status as a growth company in a volatile industry. The Terminal Growth Rate represents the expected long-term growth rate for Tesla's free cash flows beyond the forecast period (2033E onwards) and significantly influences the terminal value calculation. TGR has been set at 2.5%, aligning with long-term economic growth expectations and providing a conservative basis for estimating Tesla's value in perpetuity.

Cash Flow Projections

Cash flow projections are driven by key factors such as depreciation and amortisation (D&A), capital expenditures (CapEx), and changes in net working capital (NWC). D&A is forecasted to remain at approximately 6% of revenue, consistent with Tesla's historical patterns, while CapEx is assumed to stabilise at 9% of revenue. These levels reflect Tesla's continued investment in production

WACC	
Market Cap	1,319,000,000
% of Equity	100.00%
Cost of Equity	15.13%
Risk Free Rate	4.62%
Beta	2.3
Market Risk Premium	4.57%
Debt	2,468
% of Debt	0.00%
Cost of Debt	2.97%
Tax Rate	7.00%
Total	1,319,002,468
WACC	15.13%

Figure 15. WACC report for TSLA

capacity and technological innovation. Improvements in working capital management, evidenced by negative NWC values, further support Tesla's ability to generate free cash flow over time.

Unlevered free cash flow (FCF) is forecasted to grow from \$7,213M in 2024 to \$27,337M in 2033. The present value of these cash flows is significantly impacted by the high WACC, emphasising the sensitivity of Tesla's valuation to its risk profile. The terminal value, calculated using the 2.5% terminal growth rate, contributes \$221,859M to the valuation, discounted to \$192,703M. This highlights the long-term growth potential embedded in Tesla's business model, though it underscores the sensitivity of the valuation to terminal growth and discount rate assumptions.

The analysis yields an enterprise value of \$276,179M. After adjusting for cash and debt, Tesla's equity value is estimated at \$286,407M. With 1,650M diluted shares outstanding, the implied price per share is calculated at \$173.58. This valuation is broadly consistent with Tesla's current trading range, suggesting that the market has already priced in much of the company's growth potential and associated risks.

The results of this DCF analysis highlight both the opportunities and challenges facing Tesla. The company's ability to sustain strong revenue growth and operational efficiency will be critical to achieving the projected valuation. However, the high WACC reflects the market's perception of risk, driven by Tesla's exposure to competitive pressures, macroeconomic uncertainties, and potential disruptions in supply chains.

EBITDA Margin Forecast

The EBITDA margin forecast (Fig 16) offers a comprehensive comparison of Tesla's anticipated profitability relative to its key competitors, including BYD, General Motors (GM), and Volkswagen (VW), over the 2024E to 2026E period. This analysis sheds light on Tesla's position within the rapidly evolving electric vehicle (EV) market, highlighting areas of strength and potential challenges based on competitor performance.

BYD demonstrates consistently strong EBITDA margins throughout the forecast period. Its margin exceeds 20% in 2024E,

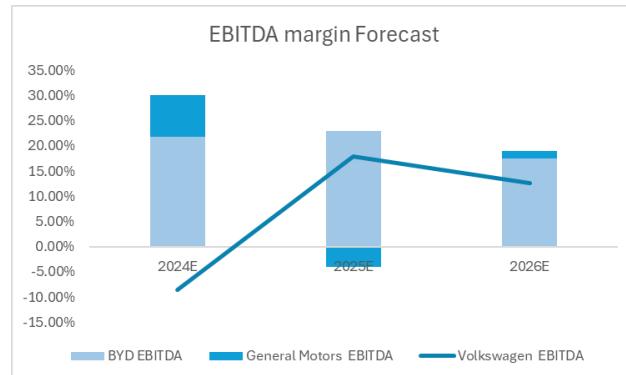


Figure 16. EBITDA Margin Forecast for TSLA & Competitors

showing further improvement into 2025E, before stabilising slightly in 2026E. This performance reflects BYD's ability to leverage economies of scale and expand its market presence effectively. It also underscores BYD's position as a leader in cost efficiency within the EV space, capitalising on its vertically integrated production model.

In contrast, General Motors exhibits a more volatile EBITDA margin profile. Its 2024E forecast shows a significant negative margin, likely influenced by restructuring costs or challenges associated with its EV transition. However, GM is expected to recover strongly by 2025E, achieving a margin above 20% before tapering slightly in 2026E. This rebound indicates the potential success of GM's electrification strategy but also highlights the challenges of sustaining consistent profitability in the face of a rapidly changing automotive landscape.

Volkswagen, meanwhile, shows a steady EBITDA margin across the forecast period. While its performance appears more predictable compared to its peers, it lags behind BYD and GM in terms of growth potential. This stability may point to slower adoption of high-margin EV products, as VW focuses on balancing its internal combustion engine (ICE) and EV portfolios. While commendable for its reliability, VW's relatively modest margin profile suggests limited competitive edge in the high-growth EV sector.

While Tesla's margins are not explicitly depicted in this forecast, the trends observed in its competitors provide valuable context for assessing Tesla's position. Tesla's ability to maintain industry-leading profitability depends on outpacing BYD's efficiency and capitalising on high-margin opportunities like autonomous vehicles and energy storage. GM's volatility underscores the importance of consistent execution in the EV transition, a challenge Tesla has managed well historically. Meanwhile, Volkswagen's steady but modest margins emphasise the need for Tesla to continue innovating in high-growth segments to retain its competitive edge.

Key Risks and Mitigation Strategies

Geopolitical tensions and supply chain constraints pose significant challenges to Tesla's operations. U.S.-China relations, marked by tariffs and restrictions on key technologies, threaten Tesla's dependence on its Shanghai Gigafactory and Chinese suppliers. Similarly, the EU's push for local EV production, under initiatives like the "Fit for 55" package, could pressure Tesla to further expand its European operations. Meanwhile, critical mineral policies in the U.S. and EU focus on reducing reliance on Chinese suppliers by incentivising domestic mining and processing of key materials, such as lithium and nickel. Tesla's partnerships, like the one with

Piedmont Lithium, align with these goals, ensuring compliance with government sourcing requirements and mitigating supply chain risks.

Tesla also benefits from onshoring initiatives, such as the Biden Administration's funding for domestic EV battery plants, which provide tax breaks and incentives to bolster U.S. manufacturing. These efforts strengthen Tesla's North American supply chain while global sanctions on cobalt suppliers in regions like the Democratic Republic of Congo remain a concern for battery production. To address these risks, Tesla is exploring alternative sources and diversification strategies, aligning with long-term sustainability and localisation goals that reduce dependence on China and promote resilience across its operations.

Contributions

This section outlines the individual contributions made by each team member to the equity research report. The team collaborated under the leadership of **Jiven Chana**, who oversaw the project, provided direction, and ensured seamless integration of all sections and analyses.

- **Saad:** Conducted market positioning and strategic analysis, focusing on a micro-level view of Tesla's competitive landscape and identifying key differentiators in the EV market.
- **Sarah:** Developed the valuation models, including Discounted Cash Flow (DCF) and Weighted Average Cost of Capital (WACC), and performed an in-depth analysis of key financial metrics such as Return on Equity (ROE), liquidity, EBITDA margins, and other financial ratios critical to Tesla's performance.
- **Shreya:** Researched Tesla's Shanghai Gigafactory operations and analysed China's trade dynamics, integrating these insights into the broader investment thesis for Tesla's growth in the Chinese market.
- **Gursahib:** Provided a macroeconomic perspective by analysing trade and tariff wars, Trump-era policies, ESG ratings, interest rate trends, and government policies incentivising EV adoption. These insights contextualised Tesla's strategic opportunities and risks on a global scale.
- **Fatema:** Designed and implemented the GBM-based Monte Carlo simulation, providing probabilistic insights into Tesla's financial projections. Additionally, Fatema created heatmap visualisations to summarise the simulation's outcomes.
- **Jiven (Team Leader):** Directed the entire team, ensuring cohesion and alignment of all sections within the report. Also provided technical leadership in developing advanced quantitative models. Specifically:
 - Developed a **multi-feature dynamic regression Kalman filter model** for price analysis, which incorporated three key features: Volume-Weighted Average Price (VWAP), price volatility, and historical price data. This model allowed for real-time tracking of Tesla's stock price dynamics in relation to a given market proxy and improved accuracy in dependency analysis by combining multiple market indicators.
 - Built a **singular feature Kalman filter model** focused on Tesla's stock returns, simplifying the analysis to evaluate patterns and forecast short-term price changes effectively.
 - Integrated these models into the broader quantitative analysis, providing actionable insights for price forecasting and volatility trends.

The code and supporting programs for the Monte Carlo simulation and the dynamic regression Kalman filter models are hosted on GitHub and can be accessed at the following link:

<https://github.com/Jiven-Chana/TSLA-Quantitative-Research>

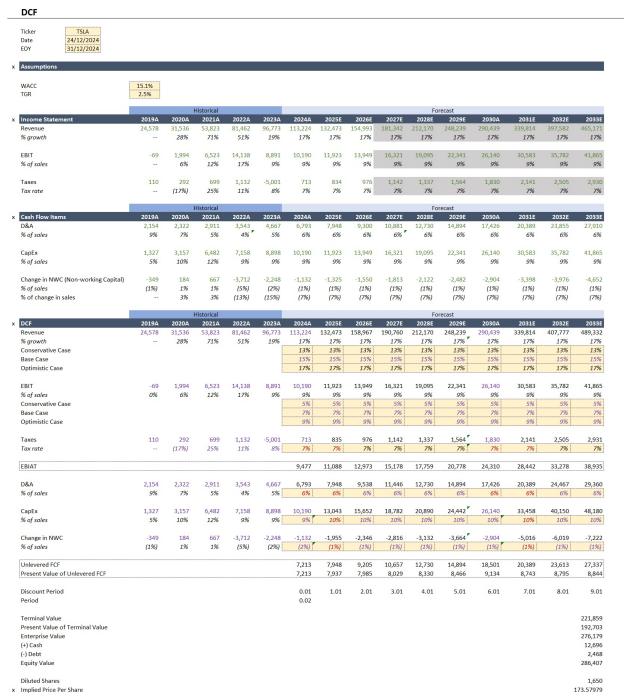


Figure 17. DCF report for TSLA, showing projected cash flows and intrinsic valuation

Discounted Cash Flow Analysis (DCF) appendix

This appendix presents the Discounted Cash Flow (DCF) analysis conducted for TSLA. The DCF model estimates the intrinsic value of Tesla by forecasting future cash flows and discounting them to present value.

The DCF methodology involves the following key steps:

- Free Cash Flow Estimation: Projecting Tesla's future free cash flows based on revenue growth, operating expenses, and capital expenditures.
- Discount Rate Application: Discounting future cash flows using Tesla's Weighted Average Cost of Capital (WACC) to determine present value.
- Terminal Value Calculation: Estimating the value of Tesla beyond the forecast period using the Gordon Growth Model.
- Enterprise and Equity Value Computation: Summing the discounted cash flows and terminal value to estimate Tesla's intrinsic stock price.

The report in Figure 17 visualises the computed intrinsic value of Tesla based on the DCF methodology. For further details on the calculations, refer to the valuation assumptions and projections used in the model.

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