Professional MBA
Automotive Industry

Risk adjusted equity valuation of Tesla Motors A practical application of Monte Carlo simulation to calibrate risk and uncertainty of risk in a Discounted Cash Flow valuation

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by
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Hartford, 28.09.2017

Affidavit

I, **MAXIM ZAITSEV**, hereby declare

1. that I am the sole author of the present Master's Thesis, "RISK ADJUSTED EQUITY VALUATION OF TESLA MOTORS - A PRACTICAL APPLICATION OF MONTE CARLO SIMULATION TO CALIBRATE RISK AND UNCERTAINTY OF RISK IN A DISCOUNTED CASH FLOW VALUATION", 81 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 28.09.2017

Signature

ACKNOWLEDGEMENT

I would first like to thank my thesis supervisor Dr. Dale Lehman, Professor of Business Administration at Loras College, and an author of a "Practical Spreadsheet Risk Modeling for Management". I am thankful for the relentless guidance and many insightful conversations during development of the ideas in this research.
Dr. Lehman consistently allowed this paper to be my own work, but steered me in the right direction whenever I veered off track.

I would also like to thank Irina Zaitseva, a language professor at Emory University for her support and encouragement in pursuing research in this area of interest.

Finally, I must express my very profound gratitude to my family and to my fiancée Anastasia Mazurova for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

Author

Maxim Zaitsev

Chapter I

Motivation and Problem Statement

Financial equity valuation of public companies is a complex and daunting task. In a tech start-up arena, promising companies are generally evaluated against expected future potential of their innovation and/or ability to capitalize on those expectations. In these cases, financial historical data is generally of limited value for evaluating future financial projections, thus analysts often rely on hypothetical inputs to valuate equity. Tesla Inc. (NASDAQ: TSLA) is a notable example in this category- a Silicon Valley “poster child” in the automotive space with a vision to advance the adoption of electric mobility across the world. Though many could argue Tesla Motors is a globally recognized brand, the company is still in the dawn days of mass-production with total output for 2016 at 84,700 units, which fails by comparison to nearly 6.7 million vehicles that Ford produced during the same time. Yet, early in 2017 the electric car-maker’s valuation reached over $51 billion dollars briefly surpassing Ford and General Motors in market-cap to become the most valuable carmaker in the United States. Dunn (2017)

Historically, the automotive industry has been considered rather predictable due to its capital-intense requirements for heavy expenditures for manufacturing, infrastructure, as well as research and development. Founded on these financial variables and levers, along with market outlook reports, analysts have been able to methodically issue valuations and investment guidance to the market. Yet, while Tesla Motors operates in the same industry, the company’s hefty capital outflows, shadowed by consistent annual losses and missed delivery targets (typically a recipe for a financial meltdown) is contrasted by rather exceptional stock performance since its IPO in 2010. This phenomenon draws a fine line between the two opposing investment camps on Wall Street. The bulls, in the optimistic corner are charged by fanatic optimism on Tesla’s hyper-growth and industry-disruption potential. This positive outlook is further galvanized by the charismatic and visionary leader of

Tesla's electrification revolution-Elon Musk. A serial entrepreneur, co-founder and a CEO of Tesla, who is confidently leading charge into the battle for EV survival.

On the other side of the financial ring, conservative bears are considerably less optimistic about Tesla's future and are often appalled by Tesla CEO's often "far-fetched" aspirations. Amongst other speculations, this camp endlessly raises serious concerns about Tesla's overinflated "sentiment valuation" and frequently emphasizes lack of fundamental support for current market valuation. In addition, the bears also stress the dangers of blatantly ignoring substantial down-side risks in Musk's masterplan that could quickly spiral into a financial disaster for its stakeholders.

In 2006 Elon Musk published a corporate manifesto on the company's website often dubbed "The Master Plan" which is surprisingly simple to comprehend, yet remarkably difficult to evaluate financially:

1. *"Build sports car*
2. *Use **that** money to build an affordable car*
3. *Use **that** money to build an even more affordable car*
4. *While doing above, also provide zero emission electric power generation options.*

   Don't tell anyone."

   -Elon Musk, Co-Founder & CEO of Tesla Motors August 2, 2006

For over a decade now, analysts and investment banks worldwide have debated Musk's plan and struggled to quantify and model potential risks of the firm. Historically, equity valuations for companies in the early stages of development, such as Tesla Motors require analysts to resort to hypothetical valuation techniques to model financial circumstances and assess "what-if" scenarios. In fact, one of the most widely used techniques is a Discounted Cash Flow model (DCF). This approach focuses on calculating the present value (PV) of the future cash flows of the firm, which is then discounted by the cost of capital or the discount rate to compute equity valuation in today's terms. However, while the mathematical formula unarguably conveys confidence, these models are often plagued by hypotheticals and analysts' biases at the core of its forecasted inputs.

In other words, the risk of "guestimates" is that even the slightest deviation from these estimations may often lead to significant errors in calculation of the value and consequently impact stock price targets.

As these inputs, such as the discount, growth rates and the cost of goods are typically subjective in nature with no historical basis, valuation results are often questionable at best and often prompt additional analysis of the underlying assumptions. Therefore, these variables should be further evaluated as serious risk factors that could significantly impact the accuracy of the results.

Tesla Motors is certainly no exception to the rule. This "trendsetter" start-up already sent ripple waves across the Automobile industry as firms and analysts struggle to provide valuation and guidance for the young manufacturer. Further, the absence of historical data, as well as the presence of substantial uncertainties around its future contributes to the challenge of financial evaluation and risk management analysis.

This research will be focused on the discussion on readily-available and widely used methods that could be applied to improve the accuracy of financial valuation. These procedures, such as the Discounted Cash Flow model, and the Monte-Carlo simulation of risk factors are both valuable in equity valuation of companies such as Tesla, Inc. Risk analysis portion of the research will focus on identifying critical DCF inputs (Discount rate, Growth rates, CapEx, COGS) and will simulate the probability of expected results within a 95% confidence interval.

Given the hypothetical and speculative nature of many assumptions required for valuing a company such as Tesla, careful documentation and systematic sensitivity analysis should be used if more realistic and dependable valuations are to be obtained.

Aim of the work

The purpose of this study is to determine a risk-adjusted equity valuation of Tesla Motors based on the range of possible financial outcomes of the variables at the root of a Discounted Cash Flow model.

Methodical Approach

The methodical approach will be supported by the following steps:

1. Literature Review
    a. Problems in DCF valuation of public companies
    b. Growth Rate and Discount rate forecasts disadvantages and risks
    c. Monte Carlo simulation techniques for financial modeling
    d. Use of spreadsheets for risk modeling
2. Construction of Discounted Cash Flow financial model
3. Risk-modeling simulation using ModelRisk software and Microsoft Excel

Data Collection

1. Financial data used in the DCF valuation will be obtained from the SEC records
2. Growth rate estimates will be obtained from Nasdaq.com
3. Discount rate estimates will be obtained from Nasdaq.com
4. Beta calculated utilizing CAPM model

Expected Resuls

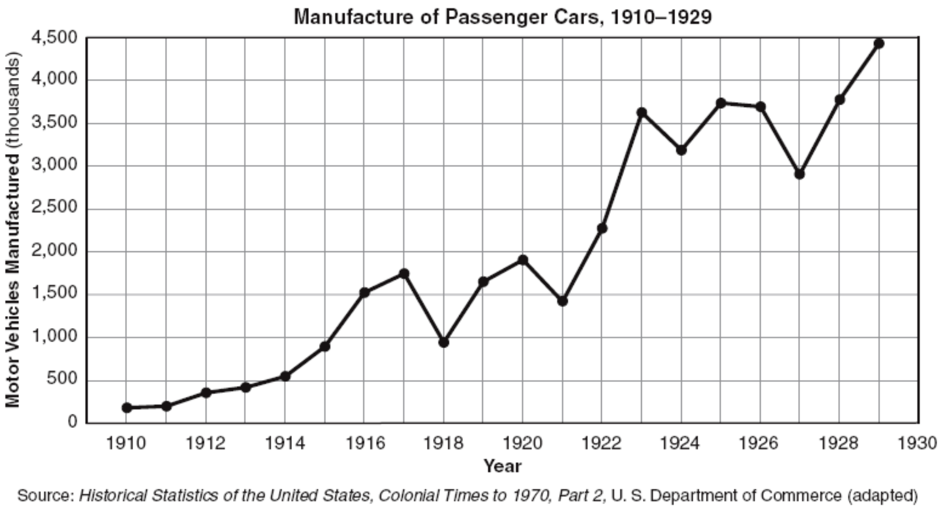
1. The calculation of a Discounted Cash Flow model is expected to yield an equity valuation, as well as, the forecasted stock price based on projected inputs derived from available data.
2. The Application of Monte Carlo simulation in this step will model the risk around the uncertainties in the DCF model and derive a probability distribution with a range of possible outcomes for the variables bearing the highest uncertainty risk. The model is expected to yield a risk-adjusted valuation and stock price that lands within an acceptable confidence interval and is also expected to be lower than current market valuation relying on Discounted Cash Flow valuation alone. The reason for this expectation is attributed to the modeled key risk factors that adjust the probability of the expected outcomes of the inputs at the core of the DCF model.

Structure of the Master Thesis

a. Motivation

Last decade Henry Ford transformed the Automotive Industry and successfully optimized the manufacturing process to deliver high-quality, low cost internal combustion vehicles that shaped the automotive world as we know it today. However, he did not reinvent the automobile, but rather designed and optimized a manufacturing process. Henry’s vision to deliver an affordable car for the “great multitude” required an unprecedented innovation capable of improving manufacturing and assembly from several hundreds to millions of units, all at a price a factory worker could afford. (Gross, 1996) The graph of Passenger Car manufacturing from the US Department of Commerce below (Census, 1975) highlights the triumph of Ford’s revolutionary concept of the “assembly line”. Ford’s manufacturing methodology where semi-finished vehicles where assembled as they moved along the factory line on a conveyor belt, unprecedentedly modernized production of the Model T reaching nearly 4.5 million units at the dawn of 1930s.

Fig. I – U.S. Department of Commerce historical passenger vehicle manufacturing trend 1910-30.



Fast forward more than a century and the landscape of the current global automotive arena is rapidly changing. The road from high-octane to high-tech in the era of digital transformation has been influenced by a new generation of consumers that are better informed, environmentally conscious and generally technologically inclined. This rapidly spreading shift in the consumer realm exerts significant pressure on the OEMs (Original Equipment Manufacturers) to swiftly transform product roadmaps and align strategy in response to market trends.

The Dawn of Electrification

The inevitable shift towards affordable, innovative and eco- friendly mobility solutions is of critical importance for OEM's survival. Advancements in technology and manufacturing capabilities will drive progress towards electric and digital revolution in the automotive domain.

"Progress happens when all the factors that make for it are ready, and then it is inevitable" (Collier, Horowitz, 2002, p. 39).

Coincidentally, the mark of the new millennium became the political, socio-economic, as well as, the technological accelerant that fused the atoms to spark an overdue innovation in the eco-friendly "green" mobility sector. Unsurprisingly, soon after the US Department of Energy rolled-out a multi-billion-dollar budget focused on renewable energy, several states emerged to embrace the ambitious strategy for a greener world. California a state plagued by heavy traffic, smog and highly populated areas with less than desirable mobility solutions was adamant to quickly join the "eco-friendly" momentum. As corporate state tax incentives and "electrification" credits for consumers poured in, the funds influenced a favorable environment to spark innovation and advance public interest in the field of electric mobility. This monumental shift in perception set the wheels in motion that later inspired a new Era in the North American EV market. Precisely during this period, a small Silicon Valley start-up, later incorporated under the name of TESLA Motors (*TSLA*) was already working on a "secret" master plan and a vision to develop an all-electric vehicle for the masses and consequently reduce world's dependency on foreign oil.

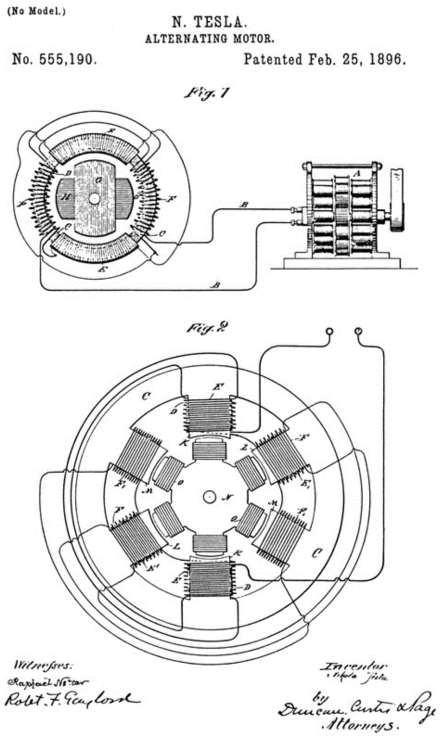


Fig. II – N. Tesla Alternating Motor Patent 1896

drivetrain solution consisted of a combination of an electromagnetic motor developed based on Nicola Tesla's electromagnetic AC (Alternating Current) induction engine patented in 1896 (Fig. II/Appendix A) and a proprietary lithium ion battery stack. The fusion of these elements gave life to an all-electric, zero emissions vehicle that will forever redefine the EV industry world-wide and mark the beginning of the inevitable decline of the internal combustion engine (ICE) that powered world's mobility for over a century.

Tesla Motors, empowered by the freedom to declare independence from traditionally complex gasoline engines, requiring seamless integration of thousands of individual and unique components as you can see in Fig. III, was now able to significantly reduce complexity of the design, development and the assembly of its vehicles.

Fig. III – U.S. Department of Commerce historical passenger vehicle manufacturing trend 1910-30.

General Motors 6.2 Liter V8 Supercharged LS9 Engine (Source: GM Authority, 2016)

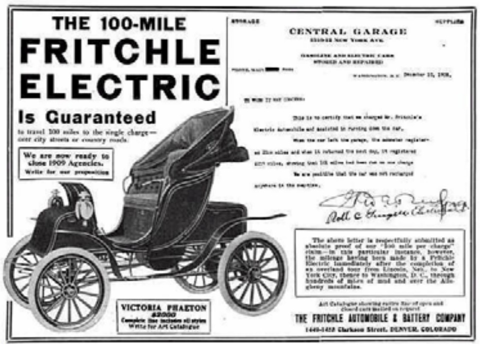
The "secret-sauce" behind Tesla's game-changing performance rests on a powerful, yet efficient long-range proprietary battery pack platform (Appendix C). This radical energy powerhouse is then "married" with a responsive and dependable AC motor that is smaller, lighter and is 100% eco-friendly.

Fig. IV – Tesla Model S60 Powertrain Module on Chassis

(Source: Car and Driver, 2014)

Unsurprisingly, the minimalistic and ergonomically positive design translated into significant gains in aerodynamics and performance, improved ride comfort and most importantly delivered safety improvements that
earned the Model S the "safest sedan on the planet" crown based on NHTSA ratings. Nevertheless, it is also important to note that just like in the case of Henry Ford, the vision for electric mobility for the masses that infected Elon Musk for years, was certainly not a novel idea. From the early days of the electric carriage, electric motors were prototyped and piloted throughout automotive history (Appendix B).

Fig. V – 1909 Fritchle Advertisement



(Source: Colfax Ave, 1970)

"Not an invention of modern times, the electric car has a long and storied history. It's hard to pinpoint the invention of the electric car to one inventor or country. Instead it was a series of breakthroughs -- from the battery to the electric motor -- in the 1800s that led to the first electric vehicle on the road".
-Matulka (2014)

Furthermore, some of the more recent attempts by Honda, GM, Toyota and others have teased the market with futuristic and "techy" all-electric prototypes, but until recently have not been well received. In the meantime, while OEM's continued to focus on the "profitable" and "familiar" gas-powered "chariots", electric mobility revolution was quickly spreading in the shadows. The "electrification" movement lingered from the shores of the Pacific to the beaches of Normandy, where the "EV-bug" was quickly spreading and gaining momentum.

This socio-economic development opened a window of opportunities, a niche, for smaller companies like Tesla Motors to dominate the EV mobility space, a luxury historically only reserved for the titans of the automotive industry.

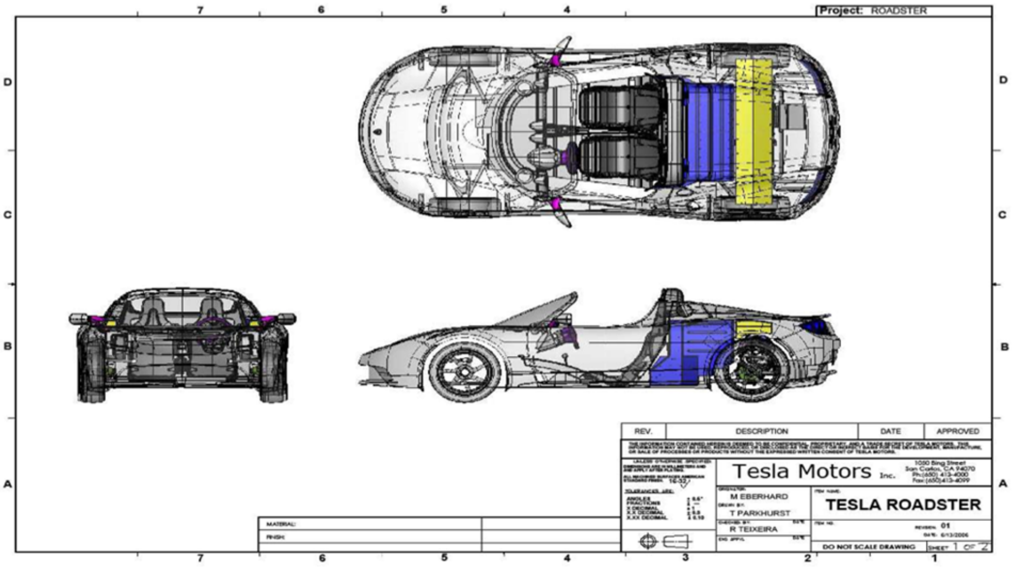
However, Tesla's simple and empathetic vision to deliver a disruptive, innovative, high-powered sports car with zero emissions could not be ignored. The company further pushed the notion that its EV could not only compete, but quickly surpass its gasoline-powered contenders in all categories from performance to safety.

Project Dark Star

Generally, "early adopters" segment of the target market assigns a higher degree on novelty in technological innovation, performance, as well as design, so unsurprisingly Tesla's first ground-breaking EV Roadster was an easy choice for this segment to quickly put a deposit on a vehicle sight unseen, years ahead of its estimated delivery.

Nevertheless, while innovation and technological superiority is of key importance for these early buyers, all other benchmarks such as safety, reliability and resale value are of equal significance. However, achieving excellence in these categories alone seldom produce the "wow" effect Musk hoped to generate to spread the Tesla frenzy. The company's success is often said to have been deeply rooted in innovation, technology and design. Yet it is also customer-centric experience at the heart of every Tesla that inspired a movement. And the charm is a relatable, emotional connection between a human and a high-performance machine that invokes excitement and satisfaction in Tesla's experience.

Fig. VI – Tesla Roadster wireframe, June 2006 (Designer: Martin Eberhard)



(Source: Martin Eberhard)

However, under the wraps it was no easy task for Tesla to design and develop its first Roadster (Appendix D). Fueled by hopes and dreams of an electric world, but lacking critical experience in automotive manufacturing, Tesla struggled to lift the project dubbed “Dark Star” off the ground on its own. Luckily, by calling Lotus to the rescue, the company only had to focus on the drivetrain, as the legendary British OEM supplied Tesla with an all-around ultra-sleek and modern body soon to become the world’s first EV supercar.

Unfortunately, stardom days of the new Roadster were short-lived, as the young OEM struggled with a myriad of production issues. Tesla’s CEO later admitted that the Roadster was an absolute “manufacturing disaster” that almost bankrupted the company scrambling to integrate all the parts. Amidst all the turbulence, Tesla’s investors led by the CEO, Elon Musk himself, who nearly sunk his entire net-worth into keeping a struggling electric car maker afloat, remained optimistic. Long and painful three years later, as the company submerged from countless mishaps on missed delivery targets, a serial production

Fig. VII – 2009 Tesla Roadster, (Appendix E, Tesla Motors)

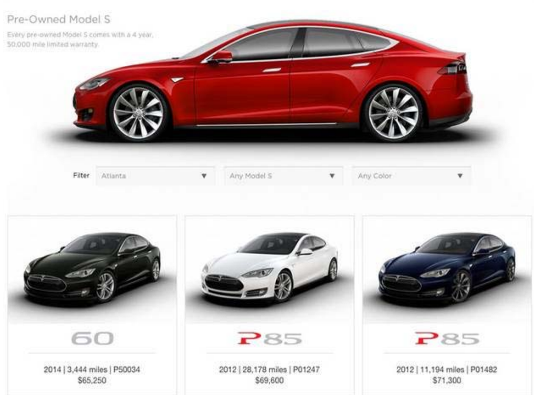
Tesla roadster as you can see in Fig.VII (Appendix E) finally arrived. Despite all the software bugs and glitches that hindered early production models, new owners could not be happier with the vehicle and the vision of electric future it represented.

"This much-anticipated all-electric roadster code name Dark Star was unveiled just after three years and swept the crowds off its feet". CNET (2009)

Fast forward 5 years from the inception of the Roadster and production battle scars began to heal, while valuable lessons learned were applied to continuous improvement philosophy. From product enhancements and improved process efficiencies in manufacturing, procurement and logistics the company managed to fundamentally transform the way we imagine and most importantly experience an electric vehicle.

In less than a decade, Tesla Motors shifted the social paradigm and foretold a vision of an electric future that inspired a following. Tesla's major accomplishment was to shift the paradigm of (EVs) that were no longer perceived as awkwardly shaped, slow and uncool "tin-cans".

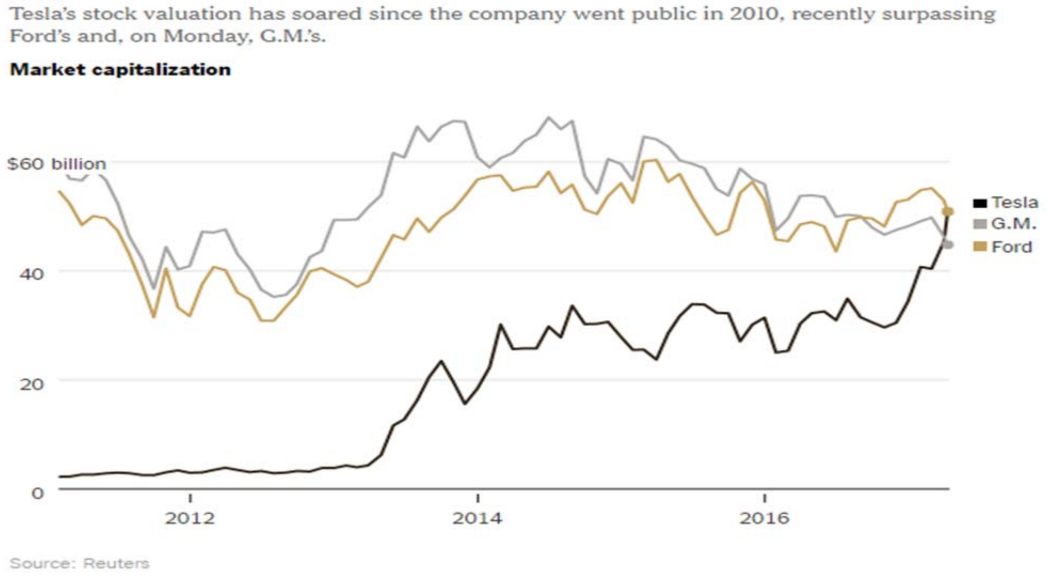
Fig. VIII 2015 Tesla Model S Configurator (Tesla, Inc.)



By 2013, the company chartered a new era of cool, sexy and most importantly safe electric vehicles. The newly designed Model S was user-centric, efficient, and stylish. Powered by unparalleled technology stack designed to deliver record-setting performance, the model S quickly became the symbol of the electrification movement. A 2015 Model S P85D with Ludicrous mode was a technological marvel the world has never seen. Per Clean Technica (2014), a full-size, 7-passenger family sedan achieved 0-60mph acceleration in less than 3 secs, while delivering unparalleled battery range of 250+miles. (nearly 170 miles ahead of competition). Further, it ranked the highest in safety and claimed the title of the fastest mass-production sedan on the planet. Gallagher (2013).

The craftsmanship, design and performance of a Tesla sedan, is often compared by experts to a $200K+ sports-car. The Model S skyrocketed company's growth trajectory and galvanized consumer confidence in the EV market worldwide.

Fig. IX – Market Capitalization trend for three leading U.S. Automakers *(TSLA, GM, F)*



Unsurprisingly, by early 2017 Tesla surpassed the veterans of the Automobile industry (Appendix F) such as GM and Ford as *TSLA* blew right past conventional manufacturers in growth and market capitalization in less than a decade.

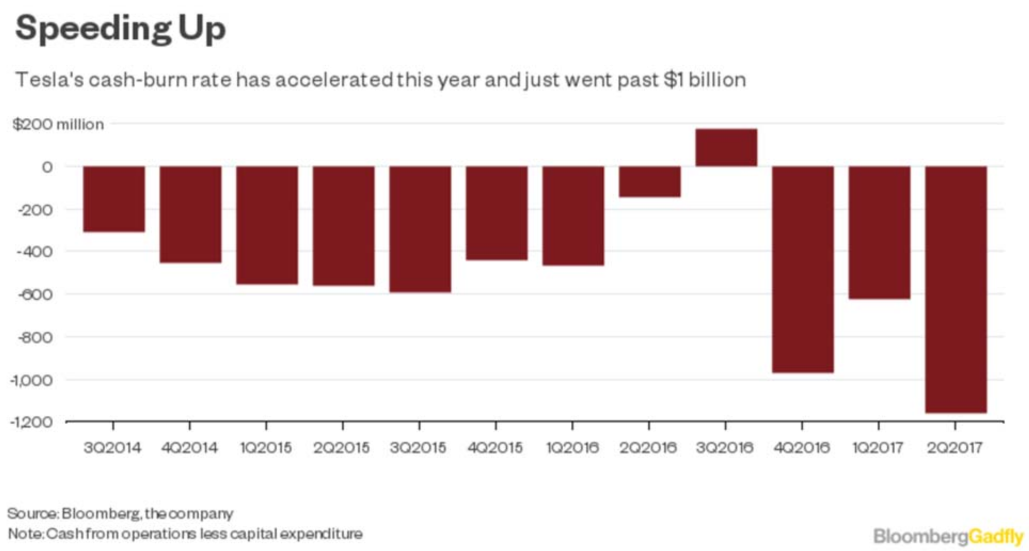
"With over 30,000 employees across the world and with market capitalization now bigger than Ford 's and General Motors, TESLA is not only considered one of the pioneers in the BEV (Battery Electric Vehicle) sector, but is often considered one of the most valuable U.S. Automaker in its segment". - Lienert (2015)

The Ultimate Cash Burning Machine

Unfortunately, when the music stops and the dust of excitement settles investors are faced with a gloom reality in a journey towards profitability. The economic and financial burdens of disruptive innovation trailed by hyper-growth take a serious toll on the income statement. In this growth stage, the company is haunted by heavy capital expenditures, intense R&D spending and year after year losses, pushing Tesla’s bottom line further in the red as it continues to gain momentum.

According to Dana Hull with Bloomberg Technology- “In the first quarter, Tesla burned through $622.4 million -- about half the amount raised in equity and debt offerings earlier this year. The company expects to roughly triple capital expenditures in the second quarter compared with the first three months.” -Hull (2017)

Fig. X – *TSLA* Cash Burn rate table (Flow Operations less capital expenditures)



As you can see from the cash burn chart above by Bloomberg, Tesla’s race to become the fastest and the safest sedan on the planet, summed to a steep price tag over the years to shareholders, adding $10Billion in both debt and equity to its balance sheet in the process. These numbers directly signal the thinning margin of error as Tesla sets-out to navigate through another battle for survival with the third and final part of the master plan-the Model 3.

The Model 3

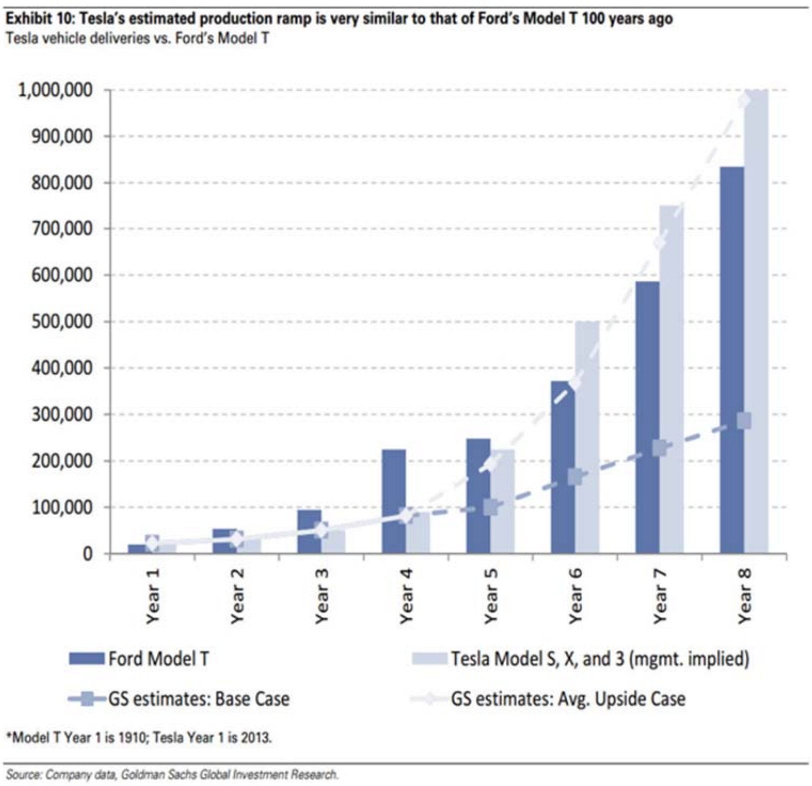
Elon’s magnetic charisma and unshaken optimism rarely fails to ignite the crowd. The introduction of the Model 3 concept was no exception- as an affordable, electric vehicle for the masses was unveiled with a mesmerizing success, resulting in a familiar frenzy with over $500 million dollars in pre-orders. “All eyes are on the

Model 3, and reaffirming the July guidance is great," said Joe Dennison, associate portfolio manager of Zevenbergen Capital Investments in Seattle. Yet, in the financial arena, analysts are generally less impressed by daring and "over-optimistic" announcements that often stretch the fabric of reality too thin even for the most optimistic observer. Many even argue that Tesla's existence hangs in the balance on its ability to successfully scale and execute the Model 3 rollout and in the process, manage to significantly reduce costs to offset the astonishing cash burn on its books.

"We're at an inflection point where we'll see just how big of a company Tesla may ultimately be." -Dana Hull (AutoNews, 2017)

Tesla's financial stability and future projections are further degraded by concurrent requirements to deploy substantial charging infrastructure across the world and expand its direct-to-consumer sales channel capable of supporting a mass-market roll-out of a new model. These factors amongst others, highlight weaknesses in the plan and signal significant risks around sustainability and insolvency during the company's most critical ramp-up of the "EV for the masses".

Fig. XI Tesla's production ramp-up compared to Ford's Model T



Tesla's ambitious target of 500,000 units by 2020 is certainly questionable, but not unprecedented. After all Henry Ford achieved a similarly unfathomable momentum over a

100 years ago… As you can see in Fig. XI management implied production guidance closely aligns with milestones achieved for the Model T. Hence, Tesla's guidance to produce half a million units at its Fremont facility seems more reasonable as it is contrasted by historical data from nearly a decade ago

Tesla's Fundamentals

Clearly there is no shortage of "doomsday scenarios" in Tesla's story and the long-term "bears" have plenty of tangible evidence to state their case. However, to substantiate the abstracts and solidify Tesla's current financial position in preparation for equity valuation-a consolidated income statement below (2013-2016) is a great start.

Fig. XII – Consolidated TSLA Income Statement for the Year Ending, Dec 31st (in Thousands)

TESLA MOTORS

TESLA (*TSLA*) Motors designs, develops, manufactures and sells high-performance fully electrics vehicles, advanced electric powertrain components and stationary energy storage systems. The most recent financial statements are shown below.

Income Statement for the Year Ending Dec., 31 (in Thousands)				
Revenue	**2013**	**2014**	**2015**	**2016**
Automotive Sales	$1,997,786	$3,192,723	$3,740,973	$5,589,007
Dev Services/Leasing/E	$15,710	$5,633	$305,052	$1,411,125
Total Revenues	$2,013,496	$3,198,356	$4,046,025	$7,000,132
Cost of Goods				
Automotive Sales	$1,543,878	$2,310,011	$2,823,302	$4,750,081
Development sales	$13,356	$6,674	$299,220	$178,332

At first glance, the Revenue portion of the Income Statement stands out and implies spectacular growth momentum. Consistent year-over-year growth sets an impressive baseline, hitting a record high mark of $5B in revenue for 2016.

Fig. XIII – Revenue snapshot of the Income Statement for the Year Ending, Dec 31st (in Thousands)

Revenue	2013	2014	2015	2016
Automotive Sales	$1,997,786	$3,192,723	$3,740,973	$5,589,007

However, under closer review, it is evident that while revenue skyrocketed COGS (Cost of Goods Sold) and OpEx (Operating Expenses) trailed closely behind and continued to bloat as new models were added to the product mix.

Fig. XIV – Total Operating expense of TSLA Income Statement for the Year Ending, Dec 31st

Total operating expense	$517,545	$1,068,360	$1,640,132	$2,266,597

Unsurprisingly the botom line is quite disappointing as well. Due to hefty expenditures and high costs of production, total operating expenses eclipse gross profit, consistently delivering a discouraging net loss to the shareholders.

Fig. XV – Net Loss portion of TSLA Income Statement for the Year Ending, Dec 31st

Net loss	-$74,014	-$294,040	-$888,663	-$773,046

While it is often expected for companies in this growth phase to report losses the cumulative total over the last four years' totals over $2 Billion dollars. A result that could serve a detrimental blow to even established automotive players in the industry.

However, these fundamentals alone rarely tell an entire story of any enterprise, let alone Tesla Motors, a company wrapped by all the intricacies and complexities of a tech start-up operating in a heavy regulated Automotive EV space.

Furthermore, as we factor in previously discussed concerns of staggering cash burn, production delays and Tesla's ramp-up risks and uncertainties to the astounding $2 Billion net loss to date, the bulls' strong optimism becomes significantly harder to digest. Yet, clearly with a market cap of over $50 Billion dollars company's long-term investors remain confident that Tesla can deliver on its promises.

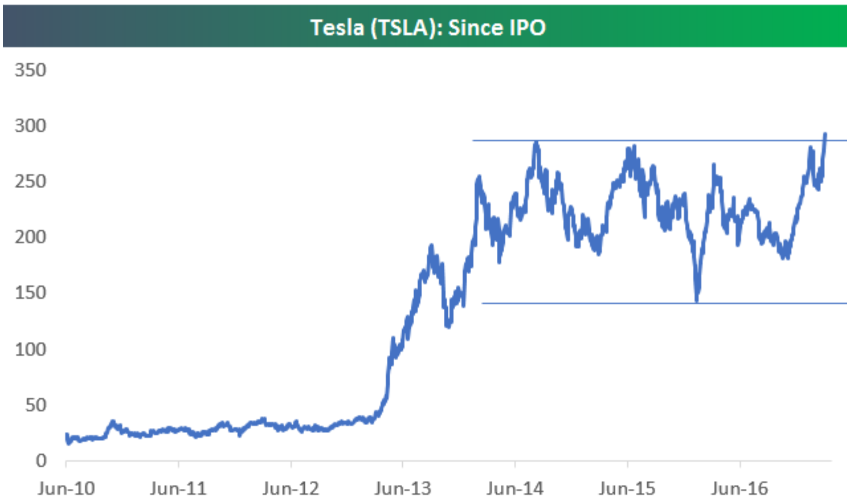
The rise of TSLA stock

How do we measure equity and valuate a company that's disruptive and promising, yet hasn't cleared a profit in over a decade, simultaneously burning through more than $10B in cash? A company with a historical "punctuality problem"- failing to deliver on target for both the Model S and X, as it struggled with a myriad of technical and supplier issues. Yet again, despite delivery delays and missed guidance along the way capital markets tell a different story. Tesla's share price managed to rally over 50% in 2017 YTD, posting a record high share price of $**325.22** on May

10th, 2017. Company's stock journey all the way from its' humble IPO in 2010 to current market valuation is often considered as a strong pledge of support and confidence from loyal investors in the face of adversity.

> *"In June 2010, the company sold 13.3 million shares at $17 per share during its IPO. If you had purchased $1,000 worth of stock, you would have 58 (whole shares only) shares worth just over $19,000 today, for a return of nearly 1,600%."*- 24/7 Wall Street (2016)

Fig. XVI – TSLA Nasdaq historical data from 6/10-6/16

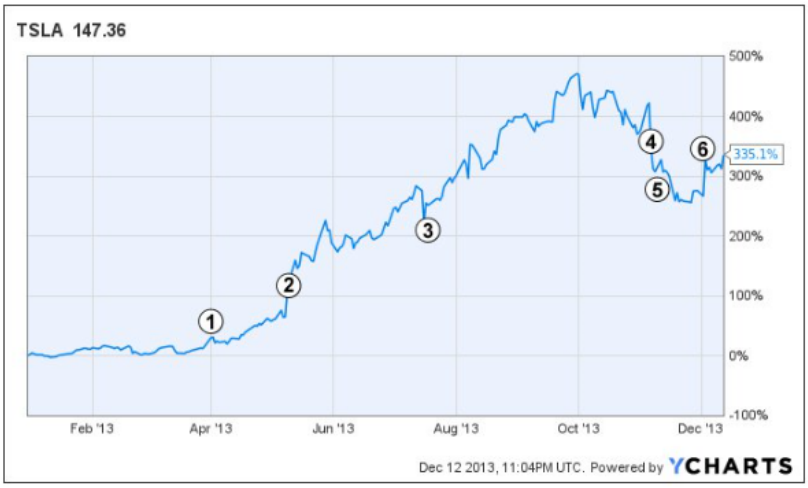


Source: Veracruz Post, April 2017

TSLA fueled by investor confidence and long-term commitment from the bullish stakeholders, stock price steadily peaked new record-highs throughout most of 2017, despite negative predictions and "sell" signals from major Wall St. firms.

At times, these daily spikes lacked any fundamental business reason or explanation to articulate the momentum, but were rather considered to be driven by "investor's sentiment". For example, chart below captures widest *TSLA* stock price movements:

Fig. XVII – TSLA outlier daliy moving averages TSLA stock



1. ***Apr. 1:*** *Fool's Day brings mid-double digit spike of nearly 16%.*
2. ***May 9****: Biggest one-day jump in TSLA stock, with shares accelerating with the velocity of an Elon Musk-powered SpaceX Falcon 9 rocket. Tesla stock landed up 24.4% by that day's closing bell.*
3. ***July 16:*** *14.3% single day drop, reflecting a significant sell-off.*
4. ***Nov. 6:*** *This day sets an-all time TSLA losing day as shares dropped 14.5%.*
5. ***Nov. 18:*** *Tesla stock continued its slide with a 10.2% decline a week and a half later.*
6. ***Dec. 3:*** *End of the year single day rally jumped Tesla stock 16.5% in one day.*

As we see substantial volatility on these days with daily averages in double digits on highlighted days, it is also important to note total upward rally of over 335% for the year. Unpredictable stock behavior is certainly not a rarity on Wall Street and generally explained as a positive emotional response to media and market momentums.

Fig. XVIII Elon Musk's Twitter Post April 30, 2015

However, in the case of Tesla Motors, these erratic stock swings are also frequently correlated with CEO's arbitrary social media posts. Messages often range from product updates to Musk's solutions to solve human existential dilemmas with plans to colonize Mars. In several instances, analysts have been able to capture a short-lived but nevertheless significant impact on the stock price, as well as, delta in trading volumes in the wake of these posts. For example, in one of the tweets (as shown in Fig. XVIII) on Apr. 30th, 2015 the CEO shared a company update on the product line reveal in the evening, triggering share price upward momentum of almost 4% at its daily high price of $192.25 per share. Nasdaq (*TSLA* 2015)

Per Rebecca Ungarino, an Associate Producer with CNBC this phenomenon of "investor sentiment" has played a crucial role in contributing to the "baseless" share price rally and skeptics are convinced more than ever that a self-correction to Tesla's fundamentals is inevitable. (Ungarino, 2017)

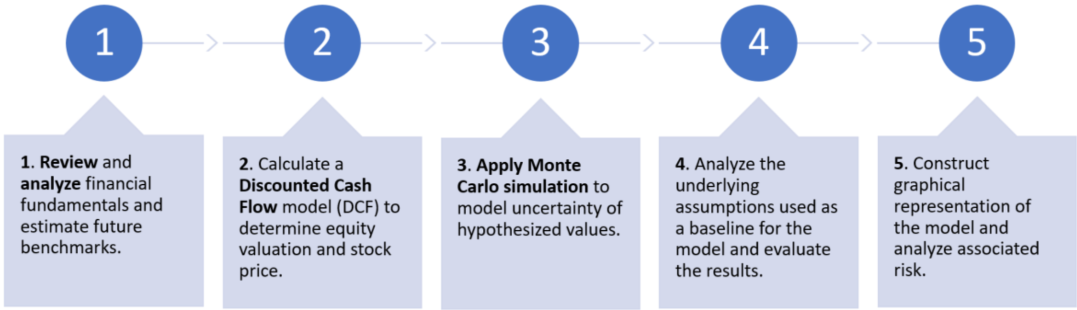
Undeniably, the challenge in financial valuation of a "unicorn", such as Tesla, Inc. (a start-up company disrupting an industry against all odds) is deeply rooted in the uncertainty and the volatility of common financial inputs that are often used to determine enterprise valuation. These assumptions about the future outcomes of the company often have no historical basis and thus require additional research and analysis to yield meaningful equity valuation results.

In the following chapters, we will discuss several valuation techniques in detail and complete a quantitative financial analysis based on the most appropriate method for this research. The financial results will also be enhanced with a Monte-Carlo simulation modeling to address challenges discussed earlier around risk and uncertainties of Tesla Motors' future.

b. Hypothesis

A probabilistic risk-adjusted assessment of the equity value for Tesla, Inc. can be obtained using a Discounted Cash Flow model combined with Monte Carlo simulation of key uncertain inputs.

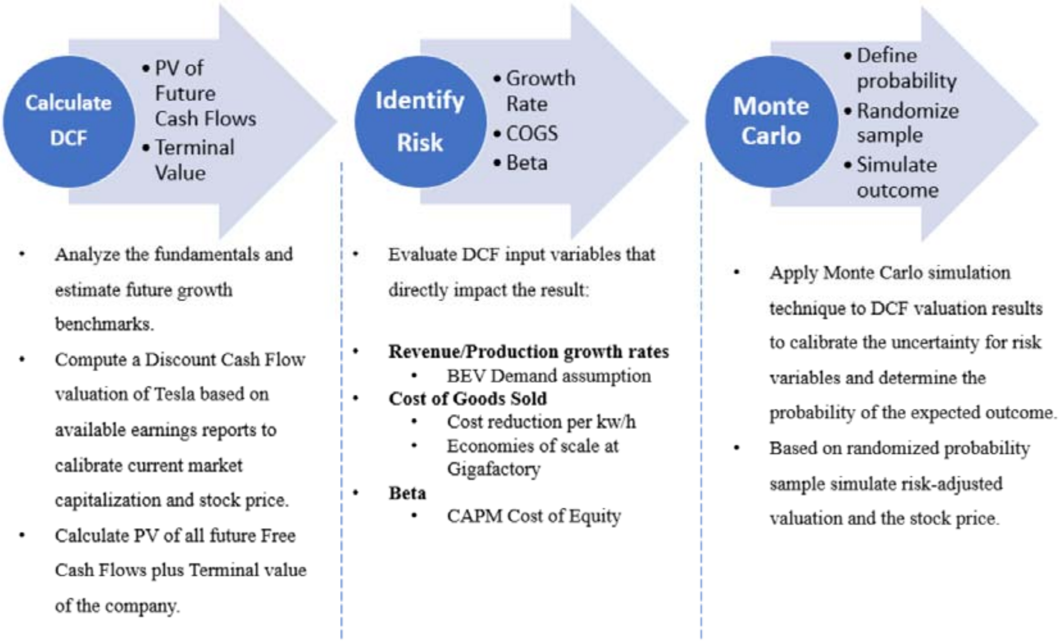
Methodical approach & own scientific inputs



In the following chapter, commonly available financial models for equity valuation (state-of the-art) will be presented and a Discounted Cash Flow Model will be created based on Tesla Motors fundamentals and SEC filings (Appendixes H-K). Following chapters will identify and analyze underlying assumptions and select critical variables with the highest degree of risk and uncertainty. These inputs will be further modeled by applying Monte Carlo simulation software (Model Risk) to analyze the outcome by simulating a range of all possible scenarios in a distribution range. The result of the risk adjusted valuation, as well as, the stock price will be presented in the conclusion.

The following table represents key milestones of each step from DCF:

Financial valuation	Critical risk factors	Monte-Carlo simulation



Chapter II **State of the Art**

a. Current Equity valuation methods available

b. Shortcomings of standard DCF

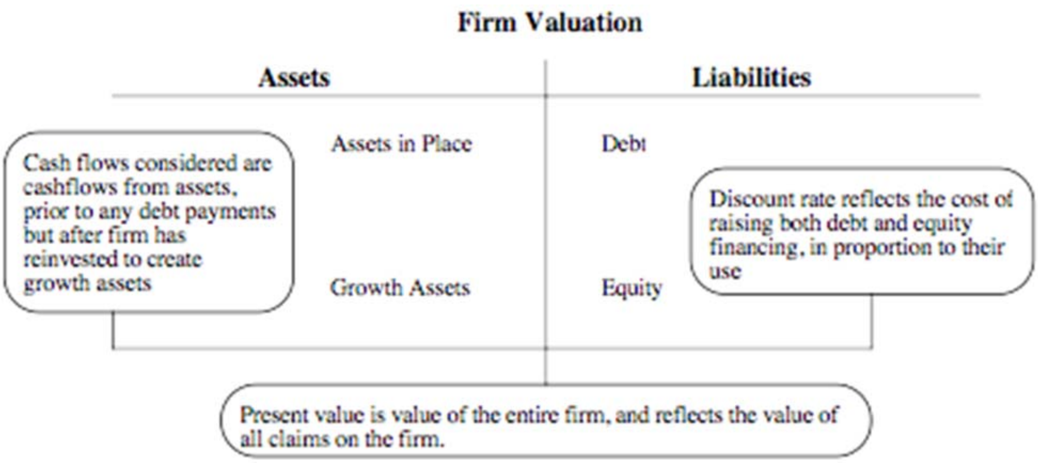
Current Equity valuation methods

The main purpose of enterprise valuation is to estimate a value of a firm or security based on readily available public information (such as SEC K-10 filings) at the time of the analysis and valuation. A key assumption of any fundamental valuation technique is that the value of the security (an equity or a stock) at the end of the day is determined by the business fundamentals. Equity or firm valuation is the basis for making informed estimates that allow investors to make decisions based on intrinsic values that may be forecasted years into the future.

Firm Valuation or Equity Valuation?

In choosing to apply DCF principles there are two ways in which we can construct the model. The first approach evaluates the entire business including current assets, as well as, future cash flows based on the growth opportunities and investments to yield a total enterprise valuation.

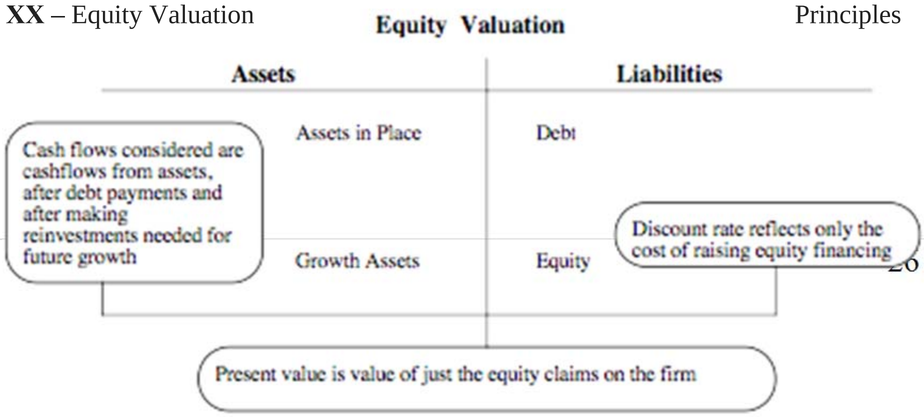
Fig. XIX – Firm Valuation Principles



Source: Kapitalust, February,

The second approach is focused on estimating a value of total equity in the business.

Fig. XX – Equity Valuation Principles



Source: Kapitalust, February, 2017

sThe main difference between two approaches is that Free Cash Flows to Equity are calculated by deducting debt and reinvestment payments. In the case of Tesla Motors, we will focus on Equity valuation approach as we will examine the cost of raising equity (Cost of Capital). The weighted cost of capital will then be used to calculate the Weighted Average Cost of Capital (WACC) as one of the key drivers used in the DCF Model.

Most common valuation models

There are three most commonly seen equity valuation models that are utilized by appraisers and financial analysts to estimate firm's market capitalization, as well as the stock price:

1. *Cost Valuation Model*
2. *Peer Valuation Comparison*
3. *Discounted Cash Flow*

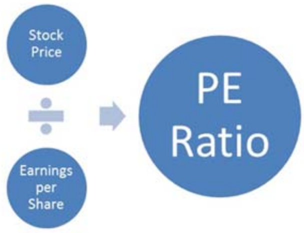
First method is the *Cost valuation model* and is based on research and analysis of historic sales data across the industry where samples share comparable fundamentals, as well as company characteristics.

However, this approach may present serious challenges for companies that are less mature and have fewer benchmarks, and as such may hinder selection of an appropriate precedent to establish sufficient baseline for comparison analysis and

Fig. XXI P/E Ratio Formula

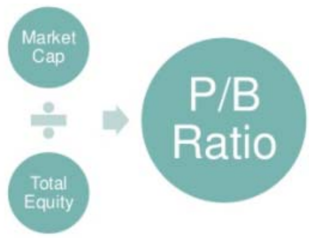
valuation. Generally, disruptive trends and revolutionary technologies render comparative analysis meaningless as these “pioneers” often redefine entire industries and consequently have very little in common with conventional competitors in the marketplace.

Second approach, *Peer valuation comparison,* is based on categorizing analogous company in the industry and evaluating the fundamentals, drawn from public financial instruments, such as the income statement and balance sheet. The valuation conclusions are then derived from peer benchmarks in interrelated areas.



In comparative peer valuation analysis, analysts often leverage financial ratios such as P/E (price to earnings) or P/B (price per book) ratios to further standardize outcomes that serve as indicators of equity value.

Fig. XXII P/B Ratio Formula



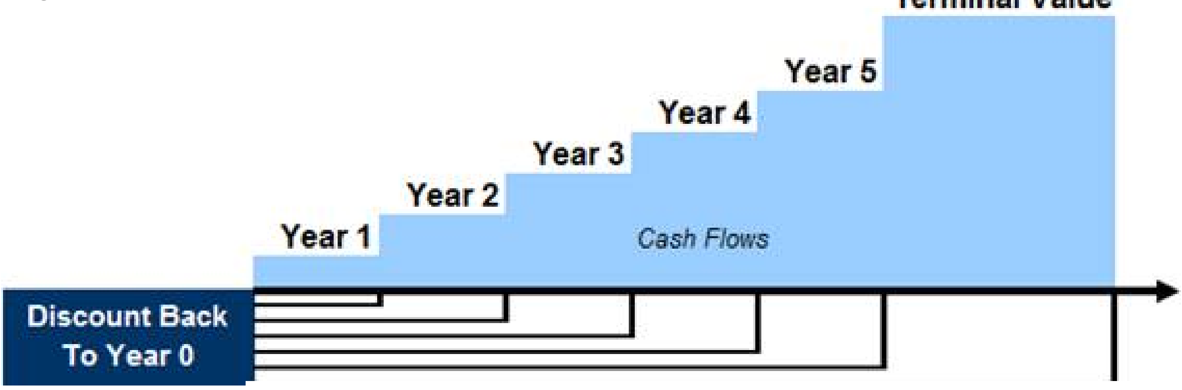
Nonetheless, while this method potentially provides additional tools for intrinsic valuation and contrasts “peer company’s” benchmarks, it is challenging to land relevant comparable samples nonetheless; leaving much room for debate and scrutiny of the results. Hence, this approach would also introduce additional intricate layers of uncertainty, as there hasn’t been a comparable entrant in the automotive domain in the last 100 years worldwide. Besides, the industry is saturated with mature, high volume and well-established manufacturers, which have long achieved economies of scale, optimized production and established dependable logistics channels. Therefore, these “stability” benchmarks, solidified by the leading OEMs over the years, just aren’t versatile enough in the valuation of a unicorn company. Plus, Tesla Motors is often considered a technology first and an energy second company, while operating in the automotive realm. Thus, this exclusive market position renders the peer evaluation method inappropriate due to lack of relevant contestants. In addition, multi-faceted complexity around valuating intangibles such as Tesla’s infrastructure network, as well as its future ability to successfully deploy a proprietary ecosystem technology would best fit a financial model that provides the most flexibility.

"Tesla is, and does, have an ecosystem, with its software that runs the car, [its Superchargers and its] autonomous driving network with machine learning and over-the-air updates. When was the last [time] Ford, GM or Daimler pushed out an autonomous driving update over the air?" Indeed. Tesla's emphasis on tech allows them key advantages throughout their ecosystem. For one, Tesla's self-driving leadership position has (in and of itself) significant value. – Wood (2017)

Third and generally most utilized method deployed by investment banks and financial analysts in the field is a Discounted Cash Flow model.

This approach, as previously discussed, is a quantitative valuation model that follows a fundamental concept on the time value of money tenet that most individuals prefer to postpone immediate consumption of resources to gain a benefit or profit later in the future. Hence, the Net Present Value (PV) of an asset is then is the current worth of all future streams of income given the discount rate or the expected reimbursement rate to delay resource consumption

Fig. XXIII Discounted Cash Flows Model Table



Source: Street of Walls: A Conceptial Overview of Investment Banking, 2013

to earn an incentive. Street Walls (2013)

The mathematical representation behind the DCF model is below:

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \ldots + \frac{CF_n}{(1+r)^n}$$

CF = Cash Flow

r = discount rate (WACC)

Source: Investopedia: Introduction To Discounted Cash

Another way to look at the formula is

$$PV = CF / (1+d) + CF_x / (1+d)^2 + (TV / (d - g)) / (1+d)^{n-1}$$

where:

PV = present value

FCF = free cash flow

d = discount rate

TV = Terminal Value

g = hypothesized growth rate

n = the number of periods in the valuation model including the terminal year

Fig. XXIV– Free Cash Flows Calculations of the Discounted Cash Flow Analysis (TSLA)

	Actual	Projected				
	2016	2017	2018	2019	2020	2021
Free cash flow		$ (10,041,205.0)	$ (13,553,040.5)	$ (145,096,598.9)	$ (228,819,080.8)	$ 45,747,386.5
Long-term constant growth in FCF					3.5%	3.5%
Weighted average cost of capital (WAC	11.7%	11.7%	11.7%	11.7%	11.7%	11.7%
Horizon value						$ 577,370,865.5
FCF in Years 1-4 and FCF5 + horizon value in Year 5		$ (10,041,205.0)	$ (13,553,040.5)	$ (145,096,598.9)	$ (228,819,080.8)	$ 623,118,252.0
Value of operations (PV of FCF + HV)	87,391,743.5					
Operating capital	4,228,725.0					
Market value added (MVA=Market value of company - book value of company = Value of operations - Operating capital)	83,163,018.5					

Key Inputs to Discounted Cash Flow Models

There are several fundamental inputs required to compose a DCF model- expected cash flow, the timing of the cash flow, as well as, the discount rate appropriate given the riskiness of these cash flows.

K = discount rate

CF_i = cash flow in year 1

TCF = the terminal year cash flow

g = growth rate

n = the number of periods in the valuation model including the terminal year

a. Discount Rates (K)

In valuation, we generally begin with the fundamental notion that the discount rate is reducing values of all future cash flows or returns by the pre-defined "opportunity cost", yielding present value of the asset, which is equal to firm's cost of capital. Additionally, the discount rate could be further broken down into risks of default, illiquidity and other potential threats to safety of the investment. Hence, the following formula for WACC is composed of its two components, the cost of equity and the cost of debt:

Weighted Average Cost of Capital = *(E/V) x Ce + (D/V) x Cd x (1-tax)*

where:

Capital = Equity + Debt and Debt stands for bank debt

and

Cost of Equity = Risk-Free Rate + β x Equity Risk Premium

Similarly, WACC formula above could be represented using this formula as well:

$$\text{WACC} = \frac{E}{D+E}(r_e) + \frac{D}{D+E}(r_d)(1-t)$$

Where:

E = market value of equity

D = market value of debt

r_e = cost of equity

r_d = cost of debt

t = corporate tax rate

Source: Investopedia: Introduction To Discounted
Cash Flow Valuation, 2013

It is important to note that the cost of both equity (E), as well as market value of debt (D) are interconnected and tied to the uncertainty around "estimated" future cash flows. In other words, the rates at which lenders or investors are willing to fund the company highly depends on the perceived risk of the cash flows. Thus, the result of WACC calculation should be consistently aligned with the uncertainty of future cash flows.

"As a practical matter, WACC cannot simply be chosen before modeling the uncertainty – once the cash flow uncertainty is modeled, the WACC needs to be reviewed for consistency with the uncertainty."-Dale Lehman (2012)

b. Projected Free Cash Flows

The cashflow to the firm is the cumulated influx of cash from its operations and serves as a financial performance benchmark which is calculated by subtracting capital expenditures (Cap. Ex) from the operating cash flow. It is often one of the most critical variables to analyze in DCF valuations, as it is the "surplus" cash that that company is free to allocate for growth initiatives.

FCF (Free Cash Flows) =EBIT (1-tax rate) + (depreciation) + (amortization) – (change in net working capital) - (capital expenditure)

***c.* Expected Growth**

Growth rate (g) is a judgement base valuation input that is hypothesized and partially based on historical data, as well as, future revenue and demand projections. It is important to remember that this variable is highly subjective and often is a matter of opinion, but nevertheless serves as a cornerstone benchmark to forecast future growth. In the Tesla's valuation however, Henry Ford's ramp-up trajectory to 500,000 units is correlated to Tesla's Model 3 roll-out plan.

However, it is important to note that since this growth is applied to cash flows in perpetuity, valuation experts frown upon using growth rates substantially in excess of the expected growth of the world economy. In other words, over the long run, sustainable competitive advantages (which would permit higher growth rates) are not considered realistic.

d. Terminal Value

The next crucial input into the model is the Terminal value, which is essentially a residual value of the firm at the end of the free cash flow projection year, assumming that the growth rate (g) will not remain constant where the firm is expected to continue operations into the future.

Since we expect the business to continue its operations well past the forecasted period of the valuation model the terminal value variable can be defined as follows below:

$$T = \frac{CF_n(1+g)}{(d-g)}$$

Source: Investopedia: Introduction To Discounted Cash Flow

where CF_n is the initial Cash Flow that is expected, d is the discount rate, and g is the expected growth of the business's cash flows annually.

e. WACC

Every company typically has several sources to fund its operations and growth. One is equity debt or sometimes also called capital debt which is essentially a process of raising capital by the means of issuing public stock. A second option is debt equity which entails borrowing money from a financial institution. Since most companies vary significantly in the proportions of their equity to debt ratios, WACC is a helpful formula to evaluate company's cost of Capital by assigning a weighted value to each source of capital influx based on the company's financial metrics. In other words, WACC provides an average cost of raising money for the company:

Weighted Average Cost of Capital = **E/V** x Ce + **D/V** x Cd x (1-tax)

where:

Source: Investopedia: Introduction To Discounted Cash Flow Valuation, 2013

- Ce = portion of equity
- Cd = portion of debt
- E = equity
- D = debt
- V (Value) =equity + debt

The first step to calculate a firm's WACC is to gauge what proportion of a firm is financed by equity and what proportion is financed by debt by entering the appropriate values into the (E/V) and (D/V) components of the equation. Since both equity channels have a cost associated with it, logically the equity share is multiplied by the cost of equity (Ce) and percentage of company's debt is calculated by multiplying by associated cost of debt (Cd) variable.

Therefore, due to this model's flexibility of determining independent values at the core of a Discounted Cash Flow (DCF) model, components are not restricted by requirements of comparable values in the market. Plus, the need for historical sales data to analyze benchmarks is also eliminated, which was a significant constraint of the previous two methods.

Hence, due to the freedom to adapt these inputs, the DCF model appears to be the most appropriate valuation tool for the analysis of the intrinsic value of Tesla Motors. The model's values are derived from publicly available financial statements and reported earnings and in turn provide an appropriate baseline distribution to simulate the uncertainty in later steps. For example, Veristrat analysts commonly employ this model for equity, as well as, enterprise valuations and are strong supporters of this technique due to its conveniently "built-in" flexibility to account for strategy and improvements in business drivers, such as economies of scale, supplier synergies, as well as other intrinsic variable behavior.

"DCF is arguably the most sound method of valuation as it calculates the closest intrinsic value of the company. It is a forward-looking approach which depends more on future expectations rather than historical results. It is influenced to a lesser extent by volatile external factors because it is an inward-looking process which relies more on the fundamental expectations of the business and explicit estimates of the value drivers. ."-Veristrat (2017)

Nonetheless, while DCF methodology delivers consistent and meaningful forecasted results, the model does not amicably account for the uncertainties of tomorrow. In fact, DCF does not solve any challenges associated with the uncertainty of input variables, they are only made more amenable and transparent. Lehman (2017) These variables often require further calibration of the uncertainty and impact of risk. Thus, in the following chapter, Monte Carlo spreadsheet simulation will be applied and results of DCF's model outcomes simulated to improve the accuracy, as well as derive a probabilistic range of expected outcomes for these uncertainties.

b. Shortcomings of Discounted Cash Flow Model

Although DCF appears to be the most appealing valuation method, it certainly has its limitations as portrayed in the table below. Most importantly, the "quality of the assumptions" that stands out as a critical factor. Therefore, these inputs should be evaluated thoroughly and objectively to increase the degree of confidence in the derived result from the model.

Advantages	Disadvantages
1. This method eliminates the need for historical data and places more emphasis on the future expectations. 2. The DCF method is less dependent on external factors and is more focused on evaluating and forecasting fundamental expectations of business assets or potentials. 3. The DCF analysis targets cash flow generation analysis and forecasting and is less affected by reporting and accounting methodology and guidelines. 4. The flexibility of the model allows hypothetical simulation of different strategies and potential changes to be considered. 5. The DCF analysis also permits individual variables or components of the business to be analyzed as	1. The precision of the valuation model is largely reliant on the **quality of the assumptions.** Variables, such as FCF (Free Cash Flows), TV (Terminal Value) have a tremendous impact on the outcome of the result. Thus, DCF equity valuations are often presented as a range of potential values with certain confidence that portrays a more accurate picture, rather than relying on single variables. Further, analysts often model assorted situations, from best case to worst case, to gauge interdependent relationship and analyze sensitivity of the outcome to hypothesized assumptions. Often variables come from a myriad of different sources, so it is important to “pressure-test” assumptions and objectively before concluding the model. 2. The TV (Terminal Value) often represents a significant percentage of the total DCF valuation. In such models, terminal value accounts for a large portion of the future outcome in comparison to other hypothesized variables.

interdependent variables.

As Paolo Guenzi and Susi Geiger emphasize in the book ***Sales Management: a multinational perspective****, DCF is merely a mechanical valuation tool, which makes it subject to the principle "garbage in, garbage out".* Guenzi and Geiger (221)

Another concern, is the model's sensitivity to analysts' personal array of biases and foundational assumptions. These biases can increase the overall risk of yielding inaccurate results in response to even minimal discrepancy in the hypothesized variable. To minimize this risk and improve the accuracy of the result, assumptions may be required to be "pressure tested" against the following risk-areas identified below:

1. *Estimation Uncertainties*

Analyst sentiment and personal bias can certainly wreak havoc on the results of the DCF model, as baseline variables can be either underestimated or overestimated in accordance with the analyst's personal beliefs. In my case, when I prepared the DCF I attempted to remain neutral in estimating forecasted values and evaluate my personal estimates against leading North American analysts from Nasdaq, Share builder and Morning Star to maintain an objective range of variables in relation to the market.

2. *Firm Specific Uncertainties*

There is rarely visibility into the condition of the firm's internal state in terms of assets, execution, talent or level of unity and coherence amongst the senior leadership team. Corporate governance plays a key role in the company's ability to execute successfully and maintain growth momentum, especially in the technology sector. Moreover, outsiders are limited in the ability to accurately gauge Tesla's level of preparedness to deliver on its guidance, so delivery targets are thoroughly examined and often scrutinized as previously discussed.

In perspective, Tesla has only managed to deliver about 78,000 units in all of 2016, so unarguably internal data or the lack thereof is an important factor to consider amongst other things. From intrinsic factors such as employee morale, supplier consistency, as well as logistics efficiencies are rarely available to the public. Thus, many critical factors are often unaccounted for in the DCF calculation of the enterprise value or its stock price.

It remains true then and is of critical importance that judgements and assumptions about uncertainties are made explicit and transparent.

3. Macroeconomic Uncertainties

The Automotive industry is one of the most heavily monitored and regulated domains. Generally, lawmakers are actively engaged in governance and enforcement of safety compliance, emission standards, dependability, as well as, warranty adherence. Typically, there are countless legislative branches from environmental protection to labor and environment compliance branches.

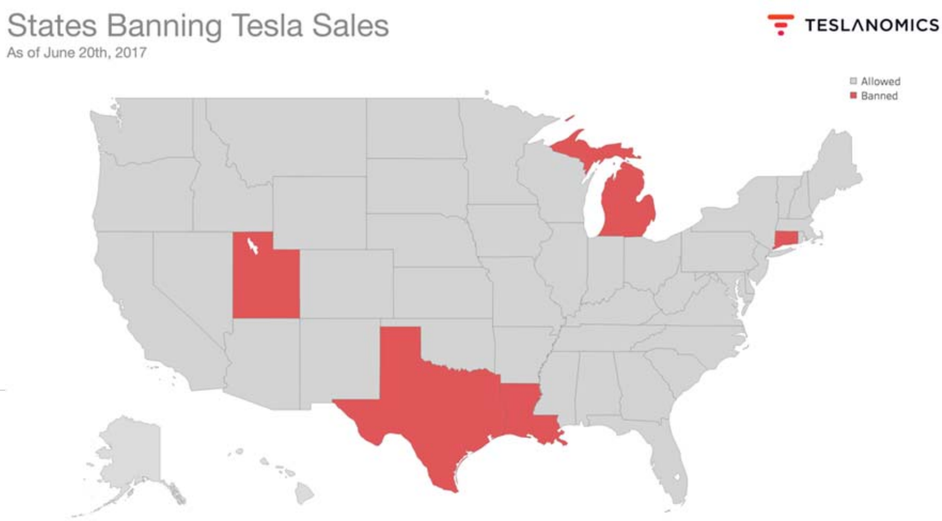
Therefore, it is no surprise that OEMs are often under relentless pressure to comply with hundreds of standards to remain in compliance with federal laws in US. National Research Council (1992) The overarching purpose of these regulations is the assignment of responsibility for environmental and safety enforcement to agencies such as EPA and NHTSA, tasked to safeguard the consumer and minimize environmental impact on the planet. Plus, the government is often responsible for regulating and balancing the playing field between the automakers and encourages competition and minimize monopolistic or cannibalistic practices in the industry.

Undoubtedly, political landscape plays a crucial role in the success or failure of an automotive manufacturer. In the case of Tesla Motors, the role of the US government is even more evident. The US Department of Energy implemented subsidies and tax-deductible provisions to stimulate interest of electric cars (up to $7500.00 per vehicle). The government's tax credit created an incentive for new car buyers to evaluate an EV option, previously quickly discarded as expensive and unfit for most people. Unsurprisingly, these subsidies significantly advanced the early rate of EV adoption and alternative propulsion technology. Another way to look at subsidies for most early EV owners, is essentially as compensation for the early "beta pilots" role they played as their driving habits generated analytics data for Tesla Motors that was used to improve driving pattern algorithms for future models.

On the other hand, state-level government intervention had a negative impact on Tesla's ability to expand its direct-to-owner sales channel and implement a hassle-free ordering system. The issue of this approach has been vigorously criticized by Dealer associations and several states outright refused to allow the "unorthodox", direct-to-consumer sales model.

From Virginia to New York "Tesla battles car dealers over right to sell cars". Dorfman (2017) Tesla was recently banned from several states and forced into litigation to defend its right to deploy a direct to consumer sales strategy, amidst protests from franchise dealers (see map below) that have historically been responsible for distribution of new and pre-owned vehicles in North America.

Fig. XXV – States with Direct-to-Consumer Sales ban for Tesla Motors

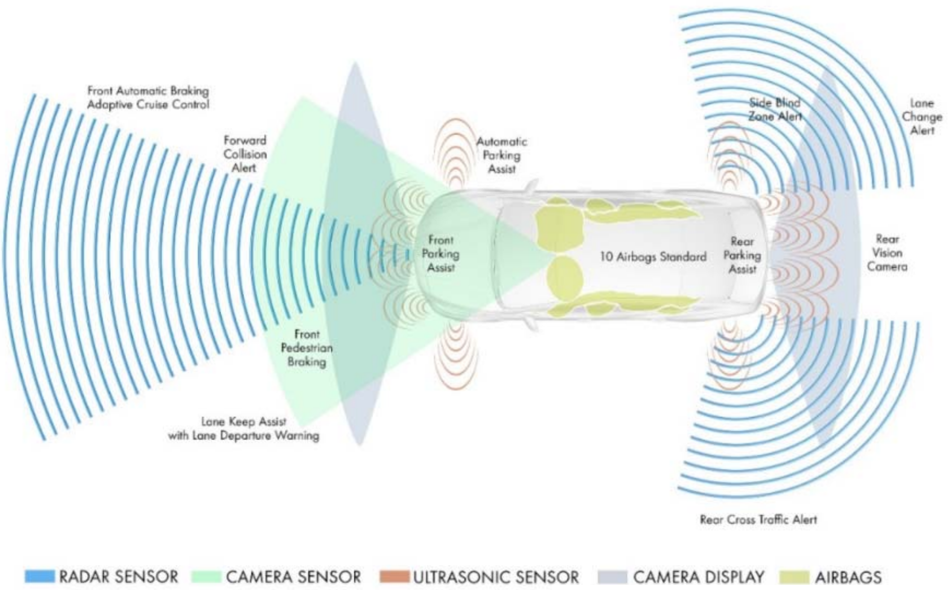


Source: TeslaNomics, 2017

The reason behind Tesla's firm stance on the direct sales model is the company's focus on the opportunity to control delivery, service, as well as purchase experience of every vehicle. Plus, this valuable information could be aggregated, analyzed and "massaged" to derive meaningful data. These results often contain demographics, preferences and consumer behavior trends that are critical in company's strategic positioning of new product offerings. While. several courts have already concluded litigations in Tesla's favor to rightfully maintain control of its own sales channel, others are expected to soon follow suit and succumb to the pressure of the public to purchase Tesla vehicles directly from the manufacturer, thus removing the intermediary.

On another front, Tesla is fighting another socio-economic "regulatory" battle. The friction on this matter revolves around Tesla's unprecedented rapid advancement of Autopilot technology across its product line. From the early stages of driver assist technology on the Model S to full scale cross-country autonomy, soon to debut on the Model 3, Tesla has long been dedicated to the advancement of ADAS (Advanced Driver Assist Systems). For years, the Model S has been equipped with radar and ultrasonic sensors gathering driving behavior data to help analyze the technology (As a pioneer and the largest advocate in the EV space Tesla bet "all-in" on the Autopilot strategy for more than half a decade now.

Fig. XXVI – Autonomous Driving Assist Systems integration blueprint



Source: TeslaNomics, 2017

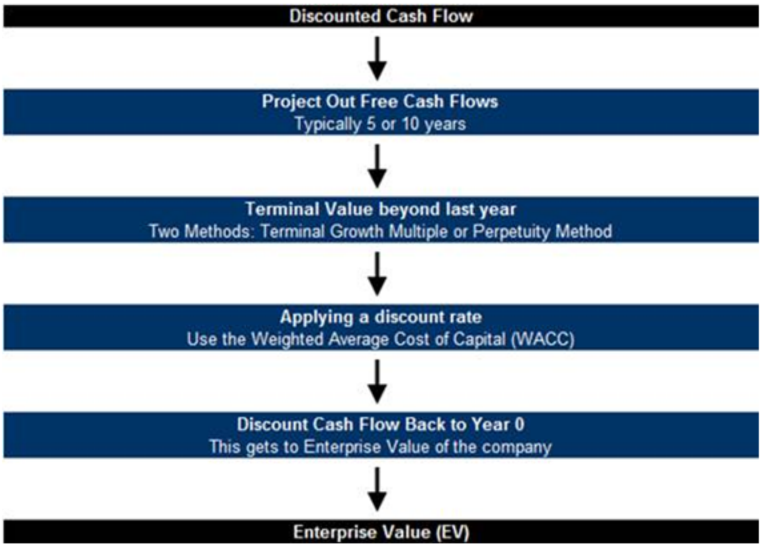
Additionally, Tesla's technology stack is supported and maintained by "over the air" updates that historically have been more associated with tech giants such as Apple, Samsung and Google, so it is not surprising regulators are scrambling to define framework in this new "digital era" of connected mobility. As a result, many legislators are hesitant to remove restrictions and allow Tesla to maintain its trajectory on the roadmap to standardize ADAS technology in all its vehicles.

Clearly, Tesla's future is undoubtedly reliant on a favorable political environment and positive sentiment from Washington. In the meantime, Tesla's legal battles on a road to accelerate advancement of electric mobility and Autopilot is far from over.

From analysts' own biases that plague a myriad of financial estimates, to gruesome macroeconomic factors and regulatory burdens for compliance, equity valuation of a firm is as much art as it is science. A DCF model discussed in the next chapter provides a comprehensive framework to incorporate many of the assumptions into hypothetical inputs that impact the equity valuation result.

Chapter III Construction of Discount Cash Flow financial model

Fig. XXVII – Steps to complete a DCF model



Source: Street of Walls: A Conceptial Overview

Tesla's baseline DCF model is constructed exclusively on historical income and balance sheet data extrapolated from company's annual SEC filings (Form 10-K) for the brief four years (2013-2016). The earnings reports are public records and as such, were obtained from Tesla's company website (http://ir.tesla.com/sec.cfm). All the fundamentals derived from these reports have been incorporated into individual Income Statements, as well as Balance Sheets for each year during this timeframe (See Appendix K). Additionally, I have calculated financial ratios below based on historical financial data (highlighted) which in turn will be used as a factual baseline for forecasting inputs five years in the future (2017-2021).

Fig. XXVIII – Projected ratios and information for the current vs projected years.

Inputs	Actual				Projected				
	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sales Growth Rate	0%	159%	127%	173%	45%	81%	600%	128%	30%
Costs / Sales	77%	72%	77%	70%	73%	73%	61%	58%	55%
Cash / Sales	42%	60%	30%	48%	46%	48%	53%	57%	55%
AR/Sales	2%	7%	4%	7%	7%	6%	5%	5%	4%
Inventories / Sales	17%	30%	32%	30%	28%	25%	24%	20%	19%
Net PPE /		57%	84%	85%	91%	87%	81%	79%	60%
Acct. Pay. / Sales	15%	24%	23%	27%	34%	32%	30%	25%	25%
Tax rate	0.04%	0.03%	0.01%	0.04%	18.00%	19.00%	19.00%	20.00%	24.00%
WACC	N/A	10.4%	10.4%	10.4%	12.5%	12.5%	12.5%	12.5%	12.5%
Total OpEx	25.7%	33.4%	40.5%	32.4%	36.6%	40.3%	32.2%	32.7%	24.0%

Financial ratios that are calculated based on historical data, are critical to determine forecasted projections. These inputs serve as baseline in forecasting the Income Statement and the Balance Sheet five years into the future through 2021. Based on the compiled data, forecasted “estimates” are captured in the highlighted area of the table.

At first glance, as previously noted revenue trend (Net Sales Y/Y) undoubtedly pleases the eye as it maintains its supercharged upward momentum through the years, albeit profitability territory (EBIT) may still be several years away.

Fig. XXIX – Projected values in the Income Statement for the years 2017-2021

	Actual	Projected				
	2016	2017	2018	2019	2020	2021
Net Sales	$ 7,000,132.0	$ 9,768,526.6	$ 18,278,207.0	$ 138,086,628.9	$ 314,230,047.9	$ 408,499,062.2
Costs	$ 5,400,875.0	$ 7,247,098.4	$ 14,066,020.6	$ 85,951,462.4	$ 183,889,041.2	$ 224,674,484.2
Total operating cost	$ 2,266,597.0	$ 3,951,356.2	$ 7,883,357.6	$ 42,790,801.6	$ 96,580,789.4	$ 98,039,774.9
(EBIT)	$ (667,340.0)	$ (1,429,928.0)	$ (3,671,171.2)	$ 9,344,364.8	$ 33,760,217.3	$ 85,784,803.1
	Actual	Projected				
Operating Assets	2016	$ 2,017.0	$ 2,018.0	$ 2,019.0	$ 2,020.0	$ 2,021.0
Cash	$ 3,393,216.0	$ 4,493,522.3	$ 8,773,539.4	$ 73,185,913.3	$ 179,111,127.3	$ 224,674,484.2
Accounts receivable	$ 499,142.0	$ 692,101.6	$ 1,096,692.4	$ 6,904,331.4	$ 15,711,502.4	$ 16,339,962.5
Inventories	$ 2,067,454.0	$ 2,735,187.5	$ 4,569,551.7	$ 33,140,790.9	$ 62,846,009.6	$ 77,614,821.8
Net plant and equipm	$ 5,982,957.0	$ 8,889,359.2	$ 15,902,040.1	$ 111,850,169.4	$ 248,241,737.8	$ 245,099,437.3
Operating Liabilities	$ 5,827,005.0					
Accounts Payable	$ 1,860,341.0	$ 3,321,299.1	$ 5,849,026.2	$ 41,425,988.7	$ 78,557,512.0	$ 102,124,765.6
Current Taxes	$ 26,698.0	$ (257,387.0)	$ (697,522.5)	$ 1,775,429.3	$ 6,752,043.5	$ 20,588,352.7

The Projected Income Statement, as well as the Balance Sheet, serve as the fundamental baseline in the next step of calculating Free Cash Flows (FCF) for each year forecasted. The purpose of this activity is to interpret expected future revenue streams into today’s terms (Present Value of Future Cash Flows).

As a result, Free Cash Flows estimates further support the notion that increasing capital expenditures, as well as a continuous reinvestment trend during the ramp-up period is hindering company’s ability to achieve profitability. While these modeling results signal potential profitability around year 2021, longer term period forecasts would be required to support that notion with high degree of confidence.

Arguably, one of the reasons for Tesla’s substantial annual net losses is a projected reinvestment in operating capital during the years of 2017-2020. Expected outlays to support company’s growth, fund production and ramp-up efforts will be focused on the Model 3 launch. As the company reaches stable and efficient mass-production flow and synchronizes logistics and distribution, expenditures are expected to decline significantly in the years following 2021 ceteris parabus.

Fig. XXX – Projected ratios/ percentages for the change in Net PPE 2017-2021

Inputs	Actual				Projected				
	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sales Growth Rate	0%	159%	127%	173%	43%	80%	571%	123%	30%
Costs / Sales	77%	72%	77%	70%	74%	68%	61%	63%	55%
Cash / Sales	42%	60%	30%	48%	46%	48%	53%	57%	55%
AR / Sales	2%	7%	4%	7%	7%	6%	5%	5%	4%
Sales	17%	30%	32%	30%	28%	25%	24%	20%	19%
Net PPE /		57%	84%	85%	91%	87%	81%	79%	60%
AP/ Sales	15%	24%	23%	27%	34%	32%	30%	25%	25%
Tax rate	0.04%	0.03%	0.01%	0.04%	18.00%	19.00%	19.00%	20.00%	24.00%
WACC	N/A	10.4%	10.4%	10.4%	13.2%	13.2%	13.2%	13.2%	13.2%
Total OpEx	25.7%	33.4%	40.5%	32.4%	40.0%	44.3%	34.9%	30.8%	24.0%

Fig. XXXI – Projected Operating Profitability forecasting (2017-2021)

Actual				Projected				
		2016		2017	2018	2019	2020	2021
Operating profitability		-9.5%		-13.7%	-17.0%	-0.6%	9.0%	16.0%
Capital requirement		60.4%		141.1%	138.0%	133.1%	-133.8%	108.0%
ROIC		na		-32.3%	-23.8%	-2.6%	16.1%	15.5%
(WACC)		na		12.0%	12.0%	12.0%	12.0%	12.0%
Spread ROIC and WACC		na		-44.3%	-35.9%	-14.6%	4.1%	3.5%

The chart provides a glimpse of hope into Tesla's financial future as these ratios in the table above are trending upwards from -2.2% in 2019 to an astounding forecasted jump to over 16% in 2021. This notion is further supported by the decline in CapEx requirements that are diminishing over the years as economies of scale is achieved at the Fremont, CA plant. However, it is important to remember that this achievement is also is heavily dependent on all other interconnected factors of manufacturing. From stabilizing manufacturing and improving assembly process, to logistics tuning and sales channels standardization are all equally relevant for these estimates to become reality.

The final step of the model yields the most sought after financial benchmarks often applied by financial analysts on Wall St. such as the price per share value. My DCF calculations based on forecasted estimates that were in-line with Wall St.'s expectations yielded a price per share of Tesla Motors' stock at **$328.00**.

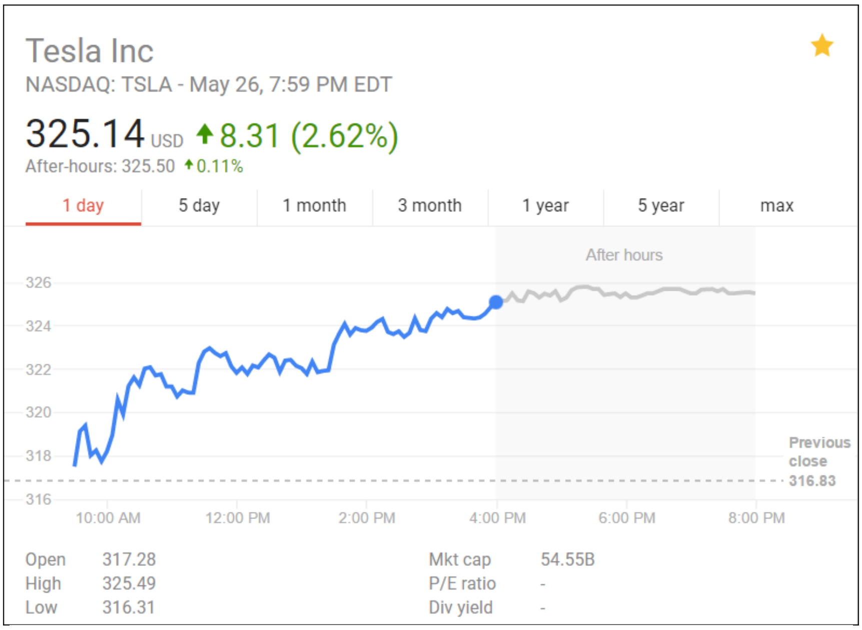
Fig. XXXII – Price per share calculation based on PV of FCF(2017-2021)+TV

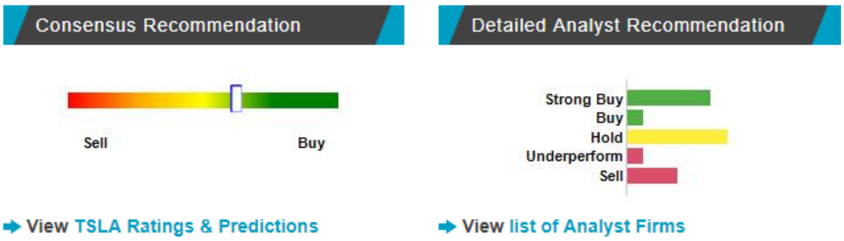
	Actual	Projected				
	2016	2017	2018	2019	2020	2021
Free cash flow		$ (10,723,448.7)	$ (13,307,718.7)	$ (161,864,306.7)	$ (231,608,442.6)	$ 48,240,232.2
Long-term constant growth in FCF					3.5%	3.5%
Weighted average	11.6%	11.6%	11.6%	11.6%	11.6%	11.6%
Horizon value						$ 619,337,856.1
FCF in Years 1-4 and FCF5 + horizon value in		$ (10,723,448.7)	$ (13,307,718.7)	$ (161,864,306.7)	$ (231,608,442.6)	$ 667,578,088.4
Value of operatio	99,904,570.6					
Operating capital	4,228,725.0					
Market value added (MVA=Market value of company - book value of company = Value of operations -	95,675,845.6					

Projected	
	2021
Value of Operatio	$99,904,571
Plus Value of Mkt	$105,519
Total Value of Co	$100,010,090
Less Value of Deb	$2,360,175
Less Value of Pref	$0
Value of Common	$97,649,915
Divided by numbe	219,704
Price per share	$444

In fact, as of May 26th, 2017 *TSLA* Inc traded at $325.14 per share on Nasdaq (See chart below/Appendix). Thus, the projected Discounted Cash Flow firm valuation, as well as the forecasted stock price of $444 per share is higher than the current capital markets price (within 2% accuracy) according to analysts' consensus recommendation you can see in Fig. XXXIII below.

Fig. XXXIII– NASDAQ Analysts' *TSLA* Consensus recommendation





Date	Close/Last	Volume
06/16/2017	371.40	6,347,450
06/15/2017	375.34	10,412,650
06/14/2017	380.66	12,778,480
06/13/2017	375.95	11,773,370
06/12/2017	359.01	10,507,860
06/09/2017	357.32	17,250,060
06/08/2017	370.00	9,028,677
06/07/2017	359.65	9,348,692
06/06/2017	352.85	11,031,920
06/05/2017	347.32	6,769,174
06/02/2017	339.85	5,583,952
06/01/2017	340.37	7,601,764
05/31/2017	341.01	9,937,556
05/30/2017	335.10	7,771,536
05/26/2017	325.14	7,793,009
05/25/2017	316.83	5,000,432
05/24/2017	310.22	5,035,192
05/23/2017	303.86	4,314,267
05/22/2017	310.35	4,324,305
05/19/2017	310.83	4,654,580
05/18/2017	313.06	5,609,153
05/17/2017	306.11	6,695,657
05/16/2017	317.01	4,141,066
05/15/2017	315.88	7,606,854
05/12/2017	324.81	4,118,613
05/11/2017	323.10	4,747,172
05/10/2017	325.22	5,734,524
05/09/2017	321.26	9,663,374
05/08/2017	307.19	7,002,907
05/05/2017	308.35	8,117,449
05/04/2017	295.46	14,135,990

Source: Nasdaq: ***TSLA***, 2017

Wall Street analysts are often in disagreement about the underlying reasons in stock's behavior and are frequently puzzled to explain these trends. While the differences of opinion on Wall Street continue to generate buzz, TESLA's 50% upward rally YTD (as presentd in Fig. VI) maintains its hyper-growth momentum amidst all the controversy.

Fig. XXXIV – TSLA Price % Change YTD

Source: The Motley Fool *TSLA*, 2016-2017

Despite the recent display of Tesla's stock strength and investors' confidence as the stock broke out into record-high territory, Wall St. bears' skepticism has only grown stronger.

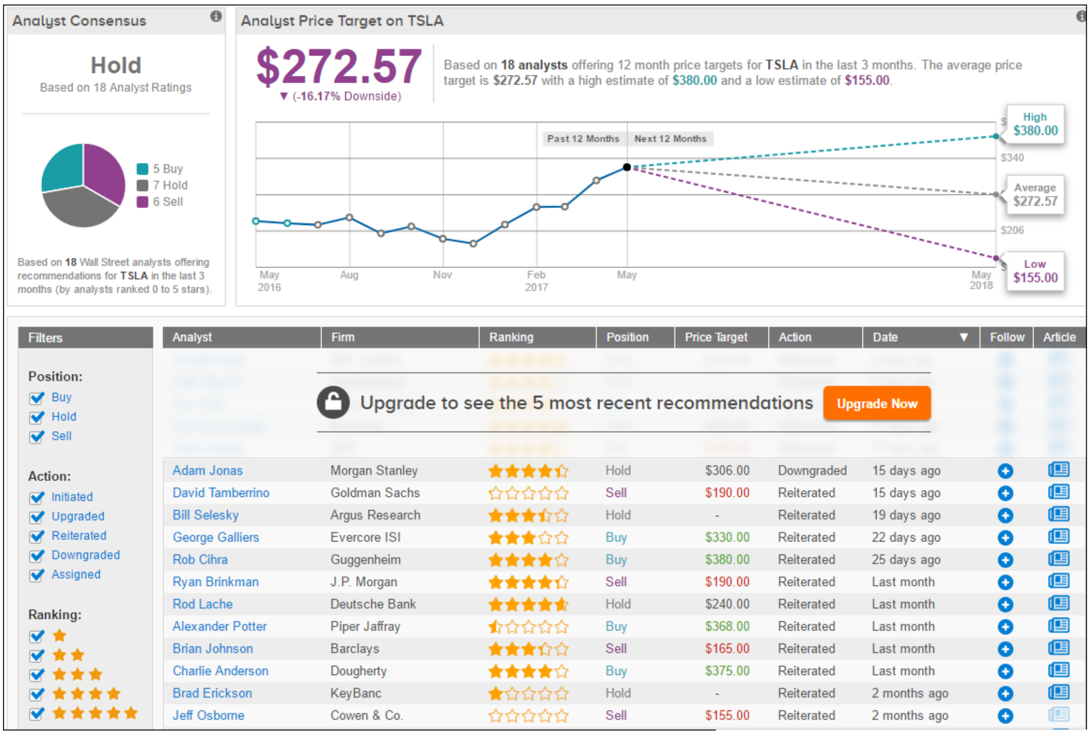
In fact, Alex Potter, a relatively optimistic Tesla analyst for Piper Jaffray, recently raised guidance for Tesla setting target price at $368.00 per share, in spite of heavy concerns and uncertainty emphasized by other though-leaders in the market. Kinsey (The Street, 2017)

These significant disparities in market philosophies, accompanied by an arbitrary level of optimism around Tesla's future stretch the guidance range and expand the spectrum of possible scenarios, as well as assumptions in underlying valuations.

Therefore, to further evaluate and compare a derived DCF price per share of **$328.00** against average 12-months market guidance, I've researched and analyzed data from 18 financial analysts in North America that closely follow Tesla and are well versed in company's history, development and future strategies.

The table below from Market Realist depicts target estimates announced in the last three months (as of May 27, 2017) by well-established financial analysts on Wall St.

Fig. XXXV– TSLA Stock Analysts Consensus Chart



Analyst	Firm	Position	Price Target	Action	Date
Adam Jonas	Morgan Stanley	Hold	$306.00	Downgraded	15 days ago
David Tamberrino	Goldman Sachs	Sell	$190.00	Reiterated	15 days ago
Bill Selesky	Argus Research	Hold	-	Reiterated	19 days ago
George Galliers	Evercore ISI	Buy	$330.00	Reiterated	22 days ago
Rob Cihra	Guggenheim	Buy	$380.00	Reiterated	25 days ago
Ryan Brinkman	J.P. Morgan	Sell	$190.00	Reiterated	Last month
Rod Lache	Deutsche Bank	Hold	$240.00	Reiterated	Last month
Alexander Potter	Piper Jaffray	Buy	$368.00	Reiterated	Last month
Brian Johnson	Barclays	Sell	$165.00	Reiterated	Last month
Charlie Anderson	Dougherty	Buy	$375.00	Reiterated	Last month
Brad Erickson	KeyBanc	Hold	-	Reiterated	2 months ago
Jeff Osborne	Cowen & Co.	Sell	$155.00	Reiterated	2 months ago

Source: Market Realist *TSLA*, 2017

The spectrum of suggested stock price targets range from $155.00 per share on the worst-scenario side by Jeff Osborne (Cowen&Co) to Rob Cihra (Guggenheim), who confidently reiterated "optimistic" guidance set at $380.00 per share, along with a strong Buy recommendation from the firm, amidst all the challenges Wall St. anticipates Tesla will have to face in the upcoming years.

If all analysts "theoretically" rely on the same public data source (SEC K-10 filings available in the appendix) to evaluate fundamentals, analyze trends and develop forecasts, then how can these valuations, as well as target prices vary so much from firm to firm?

The answer for these “unicorn” valuations, i.e. hyper growth companies that are valued at over a billion dollars represented by the mystical animal and considered “statistical rarity” is often fenced by hypotheticals. (Aileen Lee, TechCrunch 2013) Luckily, most financial data is uniform across the industry and based on SEC filings, thus the only plausible explanation to this phenomenon points to the fundamental assumptions and forecast projections derived by each individual analyst resulting in this wide spectrum of guidance.

Logically, these “estimated” inputs are expected to fluctuate, but a divergence of this size is at the very least questionable, and potentially signals heavily skewed assumptions. This notion would explain radically different stock price guidance and disparate equity valuations, as shown in the example from Market Watch above.

Hence, to preserve the integrity of DCF’s results (Forecasted price per share), in the next chapter an outline, as well as, the explanation of all the critical underlying assumptions will be developed and further scrutinized.

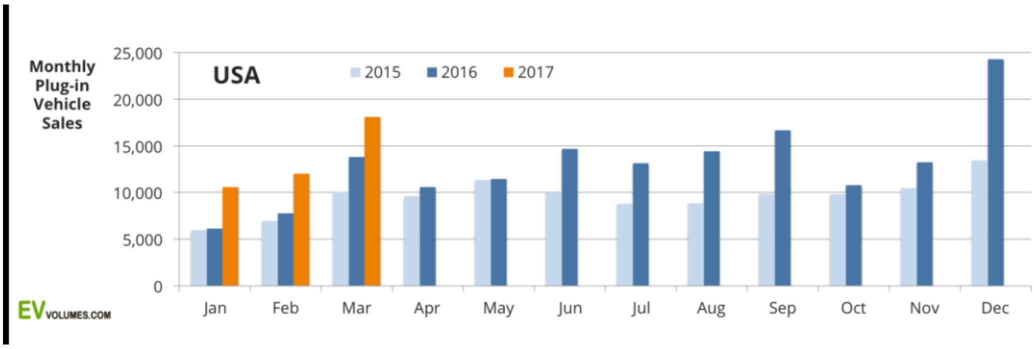
Chapter IV Risk Variable Analysis and Assumptions

The following list of assumptions will be examined in this section:

1. *Revenue/Production Growth rates*
   a. Demand for BEV vehicles will continue to rise over the next 10 years.

Growing demand for alternative modes of transportation is expected to increase worldwide. Further, analysts have raised sales expectations nearly two-fold for the next ten years, as megacities continue to expand in developed areas of the world. Trailing closely behind are the emerging markets where upward social mobility has been steadily accelerating and signaling a potential rise in demand for personal transportation.

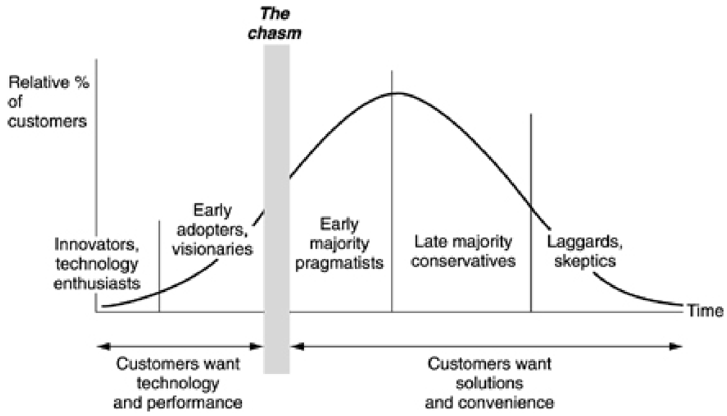
Fig. XXXVI – Monthly Plug-in Vehicle Sales from 2015-2017



These factors are expected to directly impact market demand for affordable, efficient and "eco-friendly" mobility solutions in the next decade. According to the experts at EV-Volumes.com, that collect and analyzes EV sales trends data across the globe- TESLA's strong brand image backed by innovative technology is expected to grow its market share during second quarter of 2017. In addition, Model 3 demand is also expected to intensify significantly by the end of this year. The reason behind these forecasts is based on production forecasts and delivery dates for the "founder's edition" Model 3 that are expected to hit the streets of Palo Alto in late 2017. It is often believed that it is precisely the innovators and technology enthusiasts, who along with "early adopters and visionaries" collectively make up the largest portion of some 400,000+ Model 3 pre-orders. These Tesla fans are expected to fascinate the streets of the West Coast by showcasing these modern marvels, while indirectly generating additional demand.

In support of this assumption a diffusion of innovation theory representation below highlights the expected upward shift in demand for Tesla's technology, during "The Chasm" gate of the curve (Rogers, 1971). Strong sales demand is expected through the latter stages of adoption as the product shifts into the higher-volume, lower cost portion of the spectrum. By this time, the vehicle will begin to engage early majority and pragmatists segment of the population and for the next 2-3 years steadily increase sales. The skeptics' interest is only expected to arouse in the later stages of Model 3's lifecycle when significant amounts of convincing data and reviews have circulated through independent channels. This segment is usually very concerned with Tesla's reliability and most importantly safety rankings.

Fig. XXXVII –Phases of innovation adoption through the chasm



Source: Penn State, 2014

Unarguably a strong product demand in any industry, especially technology sector often prompts a serious boost of investors' confidence for the brand. Tesla Motors is an international brand with strong name recognition and retail stores that spread out across the globe attracting multiple segments of the populations abroad.

"Worldwide plug-in vehicle sales in 2016 were 773 600 units, 42 % higher than for 2015. These include all global BEV and PHEV passenger cars sales, light trucks in USA/Canada and light commercial vehicle in Europe. The total light vehicle market was up by 2 % to 90 million units" -Cox (2017)

As hybrids, plug-ins and electric vehicle sales continue to outpace sales of conventional cars and trucks worldwide (nearly 20X), the worldwide EV sentiment and increasing consumer confidence in a revolutionary product is expected to surge exponentially.

As for Tesla Motors explicitly, there is a high degree of confidence amongst the analysts that demand for Tesla's products is expected to accelerate its journey along the product cycle continuum and significantly boost revenue as supply is increased to over 500,000 units per year by 2020.

2. *Reduction in Lithium-ion battery cost per unit at Tesla's Gigafactory*

In an effort for vertical integration, Tesla Motors strategically invested over $5B in construction of the largest lithium-ion production facility in the world. This site is expected to not only have the largest industrial footprint, but more importantly expected to produce more Lithium-ion (Li) battery packs than the rest of the world combined. Hence, it is logical to assume based on the concept of economies of scale that per unit cost is expected to decline drastically in the upcoming years, directly impacting lower COGS reports on the balance sheet.

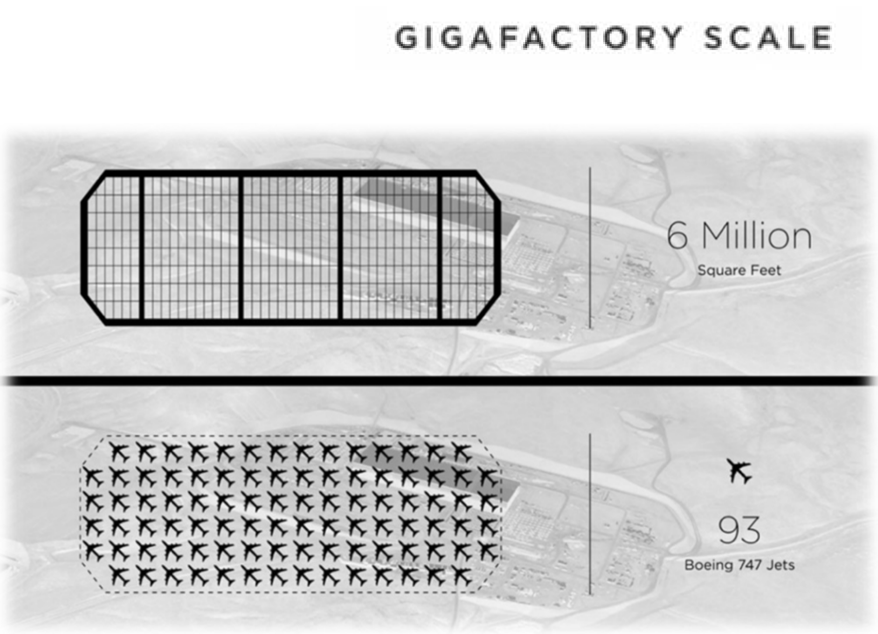


Fig. XXXVIII – Tesla's Gigafactory scale

- World's highest energy dense batteries
- World's lowest cost per kw/h
- World's largest production of batteries

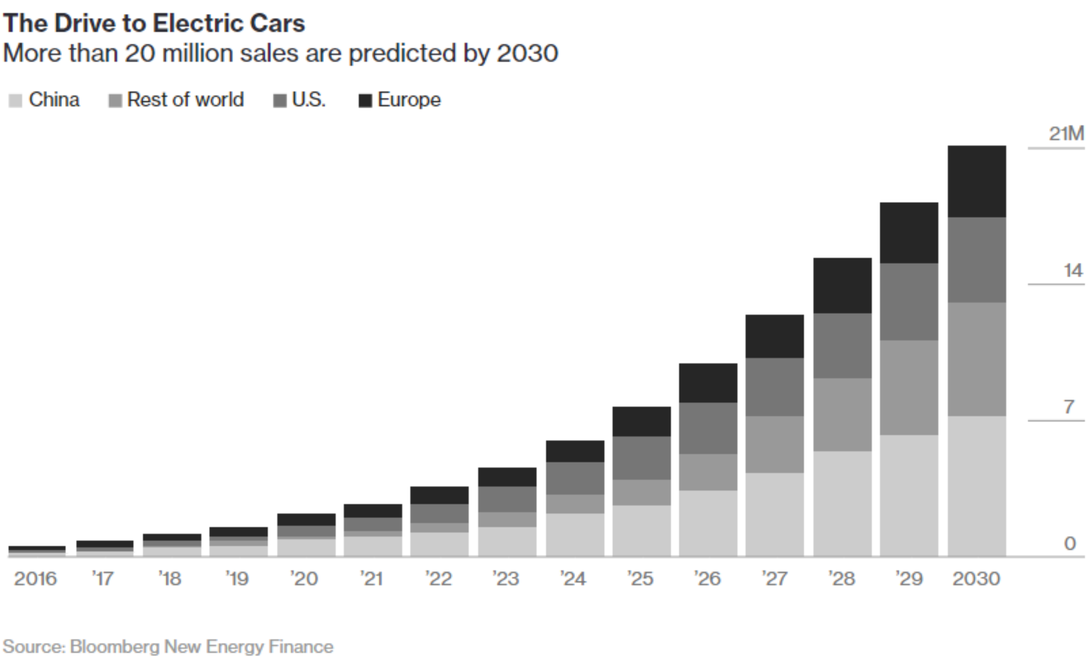
(higher output at full capacity than the rest

Source: Tesla Motors company website, 2017

2.a. Gigafactory

In the world where Tesla has produced and delivered just over 83K+ units (2016), its partnership with Panasonic (PCRFY) to supply battery packs to the Freemont assembly plant has undoubtedly paid off. Yet in a race to power over 500,000 vehicles by 2020 Tesla's unprecedented investment in infrastructure, automation, as well as, robotics and AI is anything but impractical. According to Bloomberg "demand for Plug-in/EVs could top twenty million units" by 2030. Hence, it is no secret and far from a surprise that the ability to sufficiently produce the battery packs at the core of EVs is crucial for Tesla's future.

Fig. XXXIX – Electric Cars forecasted sales through 2030



"Tesla's gigafactory is the 900-pound gorilla in the room, when it comes to production of lithium-ion batteries — or so CEO Elon Musk would have us believe. Musk's pursuit of a domestic solution to the problem of relying on Asian battery manufacturers to supply the power modules to his automobile products inspired his decision to build his gigafactory, which he envisions as a way to bring battery production costs down."- Letter (Financial Post 2016)

c. World's lowest cost per kw/h

We will also assume that battery costs will continue to decrease, as technology and economies of scale achieve full potential. In the recent past, prices of lithium-ion battery have declined drastically due to increased supply of raw material, new entrants in this market, as well as technological advances in mining and production, thus significantly reducing costs. According to Bloomberg New Energy Finance (2017) graph on decline in battery prices, average Lithium Ion forecast cost per kw/h has already drastically been reduced from the 2015 cost of $384 per kWh. The trend is expected to continue its trajectory and is anticipated to eventually reach a 50% decline in average cost per kw/h around 2025.

In this new "green world" powered by lithium-ion battery packs Elon Musk's vision to vertically integrate his supply chain is expected to yield significant benefits from decreased cost of goods to improved vehicle performance and extended travel range soon.

Fig. XL–Lithium Ion production costs forecast ($/kWh)

3. Beta Assumption

As previously discussed the volatility of a stock is typically measured as a relative coefficient to the riskiness of the market overall. The market has a beta of 1, therefore securities with a higher beta coefficient are said to have higher volatility index in comparison to the market. Hence, a stock price with a beta of 1 should then be considered as volatile as the market, and beta coefficient higher than 1 should signal higher volatility.

Beta represents a security's response to a shift in market's behavior. For our example *TSLA's* derived beta coefficient of 1.20 theoretically represents a 20% higher volatility in comparison to SPY500 daily moving averages over a two-year period measured.

Hence, while the stock offers a conceivable possibility of a significantly higher return than the market, during down markets *TSLA* could underperform by approximately 20%.

In calculation *TSLA* beta for this text, a traditional regression model was followed based on historical moving data averages (Nasdaq, 2017) for the following stocks over a 2-year period:

Fig. XLI– Daily moving averages for TSLA, SPY500 and GM stocks

TSLA		SPY 500		GM	
Adj Close	%Change	Adj Close	%Change	Adj Close	%Change
263.140015	0.01345	210.610001	0.00802	28.67356	-0.02609
266.679993	0.02992	212.300003	0.00085	27.92548	0.001307
274.660004	0.02767	212.479996	0.00052	27.96197	-0.004894
282.26001	-0.05488	212.589996	-0.00395	27.82512	-0.003607
266.769989	0.00412	211.75	-0.00179	27.72477	-0.002961
267.869995	-0.00250	211.369995	-0.00563	27.64266	0.039604

After calculating a daily percent change for each stock, an Excel Regression model was applied that yield the following results (Appendix L):

Fig. XLII– Beta calculation results via regression model for *TSLA* and *GM*

TSLA

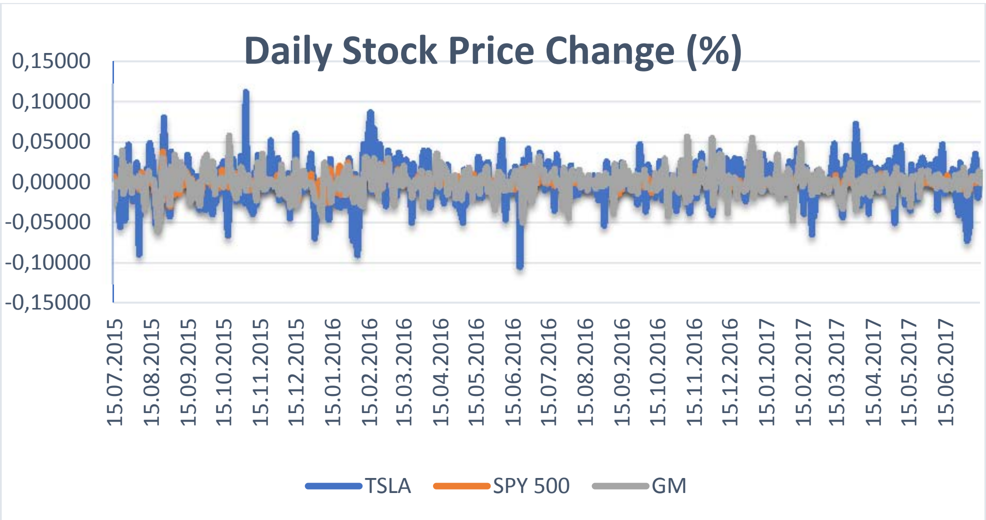
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	Ipper 95.0%
Intercept	[illegible]	0.001018543	0.333867	0.738619314	-0.001661074	0.0023412	-0.00166	0.002341
X Variable 1	**1.20084774**	**0.119908475**	10.014703	1.20522E-21	**0.965263462**	**1.436432**	0.965263	1.436432
	Mean	Standard Deviation			95%Confidence Normal Distribution			

GM

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	Ipper 95.0%
Intercept	[illegible]	0.000577176	0.399986	0.689336977	-0.000903116	0.0013648	-0.0009	0.001365
X Variable 1	**1.06992791**	**0.067948341**	15.746196	1.08285E-45	**0.936429752**	**1.2034261**	0.93643	1.203426
	Mean	Standard Deviation			95%Confidence Normal Distribution			

In accordance with the regression model output for Beta coefficient (*TSLA* 1.20, *GM* 1.07) the Daily Stock price change graph also shows that in general over a two year period daily moving averages for *TSLA* are significantly higher and on several occasions registered movement of over 5-10% change.

Fig. XLIII– *TSLA* stock compared to daily moving averages of *SPY500* and *GM*



However, as beta's random sample was configured as a simulated input in Monte-Carlo risk modeling simulation, risk-adjusted value has increased to a coefficient of 1.33 after ten thousand iterations as you can see in the excerpt from the model below:

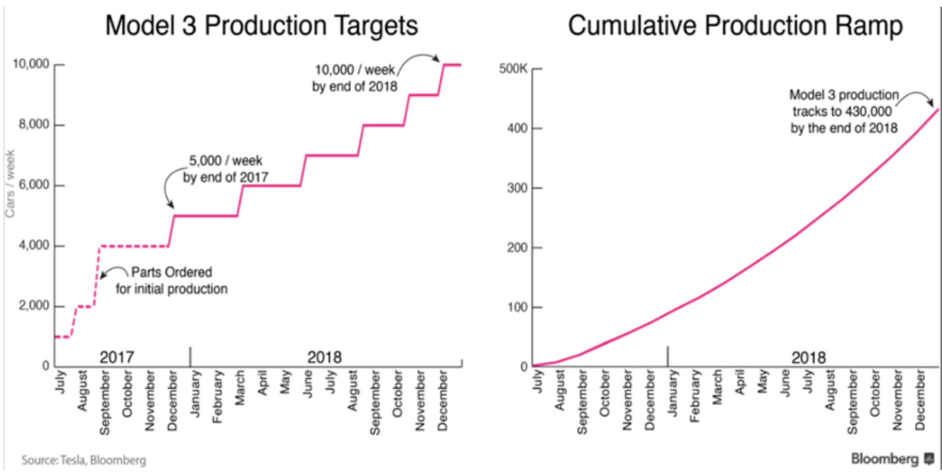
Fig. XLIV– Fundamental assumptions utilized in DCF and the Monte-Carlo model.

Assumptions and Data Used	
Cost of Equity (CAPM) F	12.41%
Cost of Debt (interest cost/t	5.35%
Weighted Cost of Equity	0.91214
Weighted Cost of Debt	0.07997
Risk Free Rate	2.42%
Beta	1.33
Market Premium	7.50%
Tax Rate	2.54%

4. **Revenue/Production Sales Growth:**

In 2016 Tesla provided production guidance to support its ambitious goals to transform from an OEM that delivered 55,000 cars in 2015 to a 'smart" digital factory assembling thousands of vehicles per week at its Freemont facility with a target to produce 500,000 units by 2020. As portrayed below, in the cumulative production ramp-up diagram, Tesla's Fremont assembly plant is expected to peak at maximum capacity by the end of 2018 given this scenario plays out successfully.

Fig. XLV – TSLA Model 3 production ramp-up and delivery targets



To dissipate any skepticism and convey confidence in support of Musk's perhaps aggressive timeline Tesla published the following statement:

"Our Model 3 program is on track to start limited vehicle production in July and to steadily ramp production to exceed 5,000 vehicles per week at some point in the fourth quarter and 10,000 vehicles per week at some point in 2018." - US Securities and Exchange Commission (Exhibit 99.2, 2016)

Tesla's production goals, have been tracking very closely with historical Ford's Model T ramp-up that achieved a 500,000 marker just 7 short years after its unveil. (Appendix G) These complex, yet highly rewarding journeys often take decades for even well-established OEMs to accomplish. Yet, in spite of company's guidance, Ford's accomplishments over a century ago, a number of analysts on Wall St. aren't convinced just yet and continue to scrutinize CEO's Master Plan.

„The Palo Alto, California, company's stock has become a battleground between investors betting Chief Executive Elon Musk will revolutionize the automobile industry and skeptics who question his aggressive production targets".
- Noel Randewich (Reuters, 2017)

The reason, for the often-merciless crusade on Tesla's ambitious timeline is often based on the history of missed deliveries for the Model S, as well as, the Model X. Plus, production projections for the Model 3 are nearly 10X Tesla's last year total output which understandably could raise some concerns around probability of the expected outcome.

The future of this milestone's success is even more unclear as the much-anticipated Model 3 mass-production is heavily reliant on more factors than previously considered. From seamless integration of the new production and assembly lines, flawless execution of the supply and logistics functions to a ubiquitous alignment of the workforce and corporate governance this journey is expected to be saturated with constraints.

"There is a high risk of execution missteps, a challenged track record on meeting timelines, cost challenges, and potential impact from an otherwise full plate of initiatives in '17," Brian Johnson, an analyst at Barclays Plc, wrote in a report earlier -Hull (Bloomberg, 2017)

In the meantime, as market gurus and the captains of the Automotive and Technology industries are often heavily dependent on forecasting to execute on data-driven decisions, analysts attempt to define and quantify a range of potential issues and constraints that could foil Tesla's target production goals. Thus, an Adjusted Earnings growth model is often developed with a goal to focus on "normalizing" target production numbers, as well as, integrating a "risk guesstimate" based on Tesla's historical track record for delays.

One of these examples by Nasdaq analysts is presented below in the Forecast Earnings Growth chart. These estimates are based on the latest available production data and supported by the latest company's earnings reports recently presented by Mr. Musk during Tesla's first quarter earnings call on May 3,2017. (Appendix K)

Fig. XLVI– *TSLA* Projected Earnings growth table (2017-2020)

Source: Nasdaq: ***TSLA***, 2017

Chapter V Presentation of Monte-Carlo uncertainties/risk simulation

a. Distribution (Pert)
b. Definition and purpose of Monte-Carlo simulation
c. Randomization and simulation
d. Analysis

a. While Nasdaq's estimates may be convincing, the complexity of the industry, as well as, the underlying uncertainties around these hypotheticals could significantly benefit from additional spreadsheet modeling to analyze risk and reduce the ambiguity.

"The presence of uncertainty means that there are probabilities attached to different outcomes."- Lehman (2017)

Monte Carlo techniques applied to spreadsheet modeling and often further empowered by software such as ModelRisk sums expected results based on a distribution sample and thus randomizes the probability of the expected outcome with a certain degree of assurance. In fact, Monte Carlo does not only simulate the best-case scenario as defined by Nasdaq's chart above, but rather simulates any possible scenario using probability distributions instead of fixed values.

For the Earnings/Revenue growth variables in Tesla's model, Nasdaq's derived variables will be used (Appendix K), as well as, other critical assumptions previously discussed such as COGS, OpEx and beta.

First step in the Monte-Carlo approach is to define a range of possibilities, which significantly improves the precision of the outcomes of the model, so a three-point estimation technique is often suggested to broaden the spectrum of possible outcomes and capture a potential margin of error in each forecasted value.

These defined distributions are expected to improve the confidence of the model's result and yield a range of possible outcomes instead of simply relying on the accuracy of a single variable.

The framework is based on a range of three possible outcomes starting from pessimistic (85%), then climbing up the confidence spectrum to optimistic (100%), and lastly demonstrating the best-case estimate (115%) of target achieved as defined by Nasdaq's analysts in the chart above.

A. Best-case estimate (115% of target)

B. Most likely estimate (100% of target)

C. Worst-case estimate (85% of target)

Fig. XLVII– Pert Distribution graphical representation

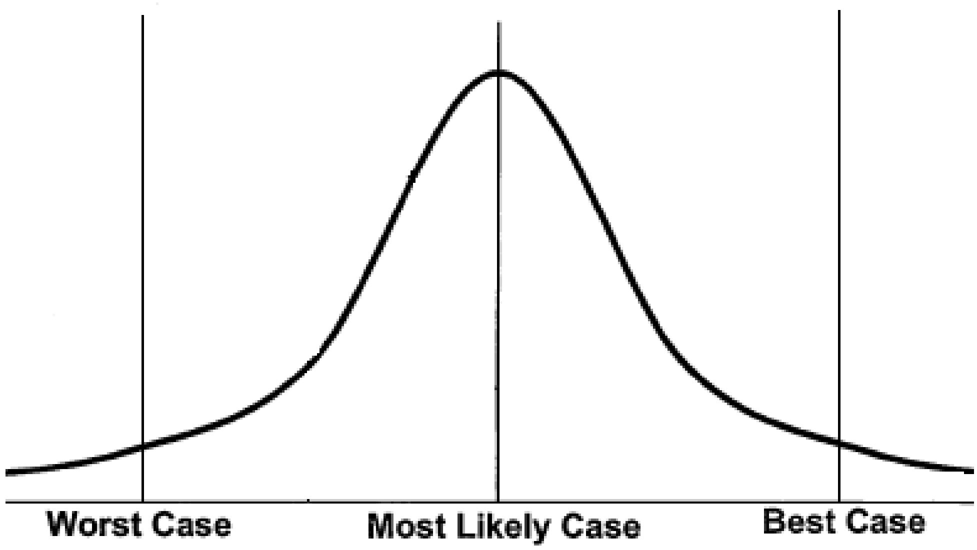


Fig. XLVIII– Distribution range of possible outcomes (percentage on target)

Earnings Growth Forecast*

	2017	*2018*	*2019*	*2020*
A. 115%	50.55%	104.33%	719.88%	148.56%
*B**100%*	*42.97%*	*88.68%*	*611.90%*	*126.28%*
C. 85%	35.39%	73.03%	503.92%	104.00%

Total Operating Expense

A. 115%	47.1%	49.4%	41.2%	35.3%
B**100%	*40.0%*	*42.0%*	*35.0%*	*30.0%*
C. 85%	32.94%	34.59%	28.82%	24.71%

Costs of Goods Sold (COGS) *

	2017	*2018*	*2019*	*2020*
A. 115%	84.71%	82.35%	72.94%	70.59%
B**100%	*72.00%*	*70.00%*	*62.00%*	*60.00%*
C. 85%	59.29%	57.65%	51.06%	49.41%

**Assumes significant reduction in lithium battery cells (raw materials), Gigafactory synergies, Economies of scale at the Freemont and Nevada plants, efficiencies through Industry 4.0 upgrade.*

***Highlighted area is the baseline (Most Likely Case)*

b. Definition, purpose and benefits of Monte-Carlo simulation

Monte Carlo simulation is a quantitative risk-analysis algorithm designed to base the probability of an outcome based on a randomized variable, derived from a distribution range, rather than a single input variable. Palisade (2017). When the probability interval is defined, the system randomizes the outcome via calculating the result and randomly sampling the variable up to tens of thousands of iterations. Hence, conducting the simulation depends on taking random samples from defined distributions (Pert distribution will be use d for Tesla Motors simulation in this chapter) and describing the outcome probabilistically. As all probability distributions entail cumulative probabilities that lie between 0 and 1, a random number from a uniform distribution can be used to represent the cumulative probability of an entire sample.

Modeling Steps

1. *"Specify one or more probability distributions that describe the relevant uncertain variables in the problem.*
2. *Create a random sample from each of these probability distributions.*
3. *Run the model to iterate through thousands of outcomes of each random sample.*
4. *Sum random sample calculation outputs to define the probability of the expected outcome based on hypothesized variables"*

Source: Lehman, Dale *"Practical Spreadsheet Risk Modeling for Management"*, 2012

Benefits

- ***Probabilistic Results.*** Due to random distribution selection and multiple iteration of the sample the simulation models the likelihood of each hypothesis.
- ***Graphical Results.*** Due to the abundance of generated data from the simulation data, there is myriad of graphs and distributions available in the software to visualize the findings.
- ***Sensitivity Analysis.*** The Model-Risk software also empowers Monte Carlo

simulation with a Tornado chart and the functionality to visualize variables for each model that have the most impact on the expected outcome.

- ***Correlation of Inputs.*** The model also provides the ability to evaluate the codependent relationships between the hypothesized variables at the core of the simulation. It's often valuable to emphasize expected behavior of one variable in response to another interdependent variable in the sample.

c. Randomization and simulation

The second step in Monte Carlo's simulation where probability range for variables has been determined is to simulate a random sample that will be iterated thousands of times (Sample will be set to 10000 iterations for Tesla Motors model).

The following table represents a random sample derived from the uncertainty variable's distribution and will be used to derive the "simulated" equity value and the price per share for Tesla Motors.

Fig. XLXI– Random Sample representation of the distribution for each variable

Earnings Revenue Growth

	2017	**2018**	**2019**	**2020**
Random Sample	40%	94%	616%	136%

Total Operation Expense

Random Sample	43.3%	44.5%	35.9%	28.3%

Cost of Goods Sold (COGS)

Random Sample	78%	74%	68%	66%

Beta

Random Sample	1.33

a. Graphical distribution of the result

The next step requires implementation of the simulated variables in the Discounted cash flow model where fixed values that remain constant are now replaced with random probability samples derived from the Pert distribution range.

Fig. L– Monte Carlo simulated variables and results (random in orange)

Inputs	Actual				Projected				
	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sales Growth	0%	159%	127%	173%	42%	89%	613%	133%	30%
Costs / Sales	77%	72%	77%	70%	72%	74%	60%	58%	55%
Cash / Sales	42%	60%	30%	48%	46%	48%	53%	57%	55%
AR / Sales	2%	7%	4%	7%	7%	6%	5%	5%	4%
Inventorie	17%	30%	32%	30%	28%	25%	24%	20%	19%
Net PPE /		57%	84%	85%	91%	87%	81%	79%	60%
AP/ Sales	15%	24%	23%	27%	34%	32%	30%	25%	25%
Tax rate	0.04%	0.03%	0.01%	0.04%	18.00%	19.00%	19.00%	20.00%	24.00%
WACC	N/A	10.4%	10.4%	10.4%	11.3%	11.3%	11.3%	11.3%	11.3%
Total OpEx	25.7%	33.4%	40.5%	32.4%	36.9%	41.6%	34.5%	28.7%	24.0%

b. Analysis of the simulation results

Discounted Cash Flow
Equity and Stock price valuation

Projected	2021
Value of Operations	$100,994,078
Plus Value of Mkt. Sec.	$105,519
Total Value of Company	$101,099,597
Less Value of Debt	$2,360,175
Less Value of Pref.	$0
Value of Common Equity	$98,739,422
Divided by number of shares	219,704
Price per share	**$444**

Discounted Cash Flow +**Monte Carlo**
Equity and Stock price valuation

Projected	2021
Value of Operations	$50,000,815
Plus Value of Mkt. Sec.	$105,519
Total Value of Company	$50,106,334
Less Value of Debt	$2,360,175
Less Value of Pref.	$0
Value of Common Equity	$47,746,159
Divided by number of shares	219,704
Price per share	**$288**

A lower Monte-Carlo simulation result of $288 per/share represents a risk-adjusted price per share that encompasses all probabilities for modeled uncertainties in this calculation including (Earnings, COGS, CapEx and Beta).

Chapter VI Conclusion

Tesla Motors is a unique case of a high-tech disruption in the Automotive Industry. This silicon-valley start-up is strategically positioned at cross-roads of technology innovation and green mobility in the world where status-quo has dominated product roadmaps of traditional OEMs for decades. Tesla's competitive advantage in technology and product design serves as a launching pad skyrocketing demand for company's line of automobiles ahead of well-established competition in a new era of Electrification.

Tesla's simple mission to advance the adoption of electric vehicles worldwide is poised to redefine the EV transport sector and often anticipated to remain an industry-leader in a journey towards autonomous and connected mobility future. From zero-emission, electric powertrains, linked to company's "traffic-control" network with over the air updates, to full-autonomous hardware available in every vehicle manufactured, Tesla's promise for electrification has ignited an industry-wide shift towards advancement in alternative propulsion and Autopilot programs. However, pioneering disruption through innovation is no easy task and comes with a shocking price and a high-rate of failure, especially in the automotive industry reigned by well-established automakers. The steep cost of entry and production ramp-up, coupled with unprecedented financial, logistical, as well as political and socio-economic challenges the company is often expected to navigate a turbulent flight path to overcome these existential challenges.

It is precisely the flammable combination of all the mentioned above uncertainties and risk factors that eclipse Tesla's prospects and probability of success that motivated this master thesis research, financial equity valuation, as well as, risk analysis via Monte Carlo simulation.

The purpose of the Master thesis is to evaluate and calibrate critical risk factors around uncertainties in the Discounted Cash Flow Model and to determine a risk-adjusted equity valuation for the company.

In conclusion, after extensive research on state-of the art, company fundamentals, as well as, market landscape and sentiment, the following key assumptions have been identified and their values for the model examined in detail in this paper:

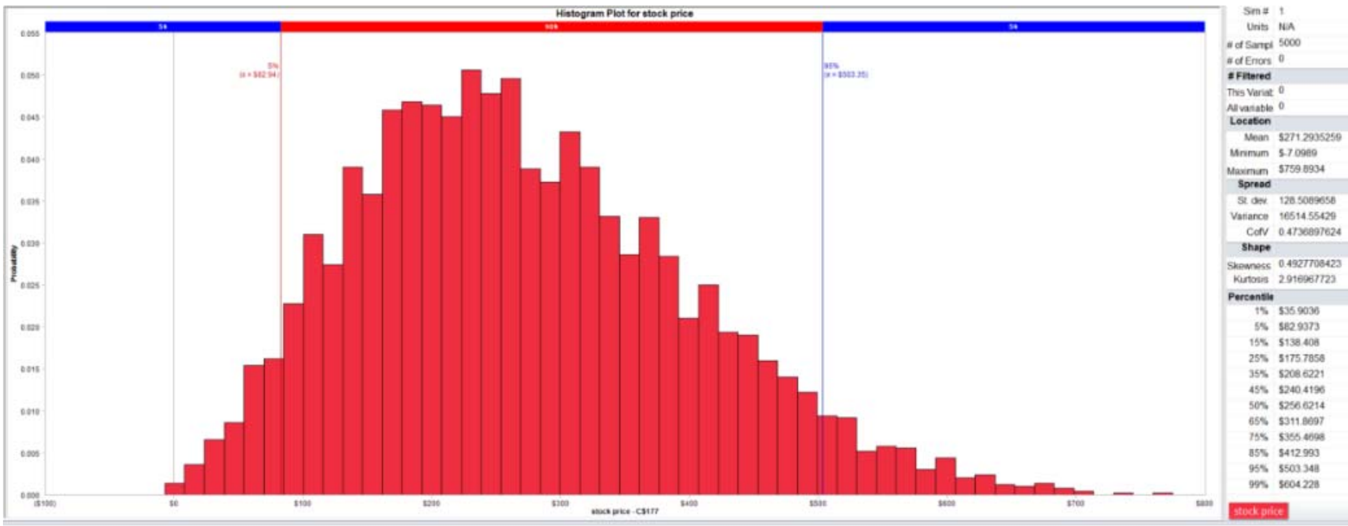
a) Earnings Growth Forecasts
b) Cost Of Goods Sold (COGS)
c) Total OpEx
d) Beta

These fundamental values, recognized as the most impactful drivers of the outcome for equity valuation, were further modeled to account for the underlying risk and uncertainties via Monte-Carlo simulation presented and discussed in Chapter 7.
The summary of the final equity valuation supplemented by risk analysis simulation for Tesla Motors is shown below:

1.	Equity valuation	**$63.45B**
2.	Stock Price (per share)	**$288.00**
3.	Stock price range (per share)	**$86.01-$504.74**
4.	Mean stock price (per share)	**$272.53**

The equity valuation of Tesla Motors (~$63.5B), as well as, the subsequent stock price of $288.00 per share value exists within the 95% confidence interval of the Monte-Carlo simulation model. Further, the price per share is also found within a 7% range for the current market price according to prominent analysts on NASDAQ.

Fig. LI– Monte Carlo simulation stock price distribution histogram



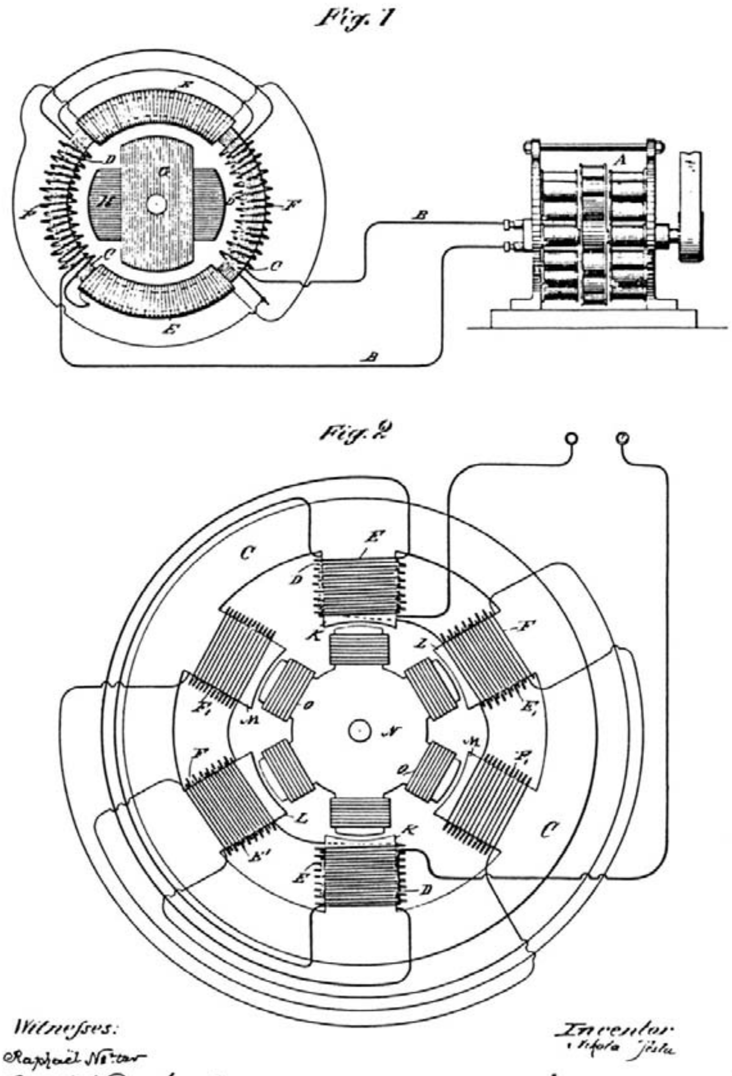
Appendix

Appendix A Nikola Tesla's Alternating Motor Patent #555,190 (1896)

(No Model.)

N. TESLA.
ALTERNATING MOTOR.

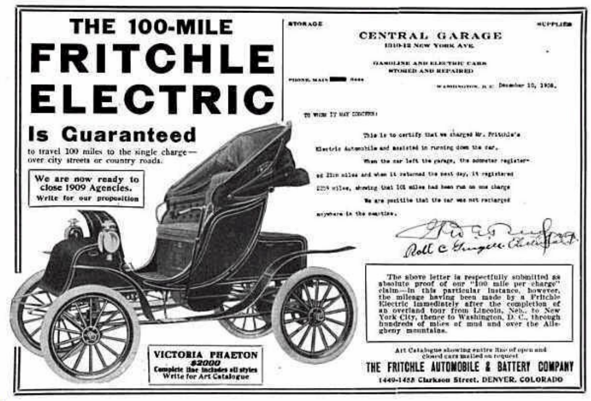
No. 555,190. Patented Feb. 25, 1896.

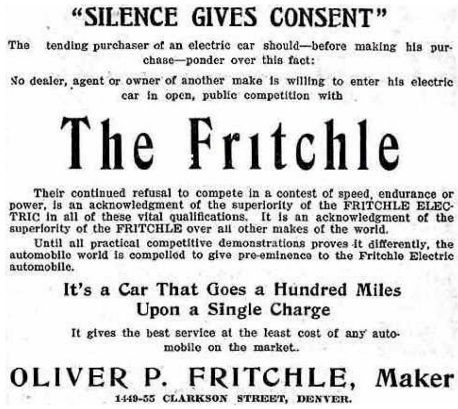


Witnesses:
Raphael Netter
Robt. F. Gaylord

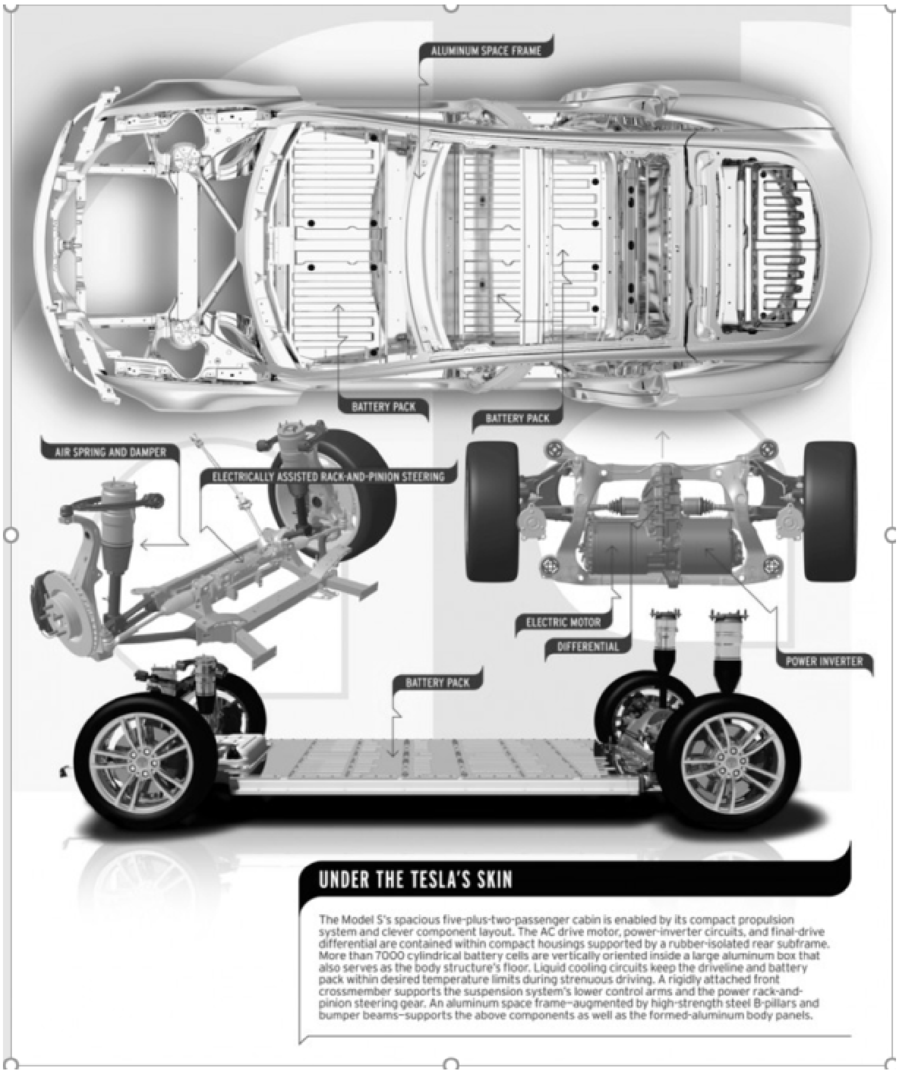
Inventor
Nikola Tesla
by
Duncan, Curtis & Page
Attorneys.

Appendix B Fritchle Electric Automobile public advertising (circa 1909)

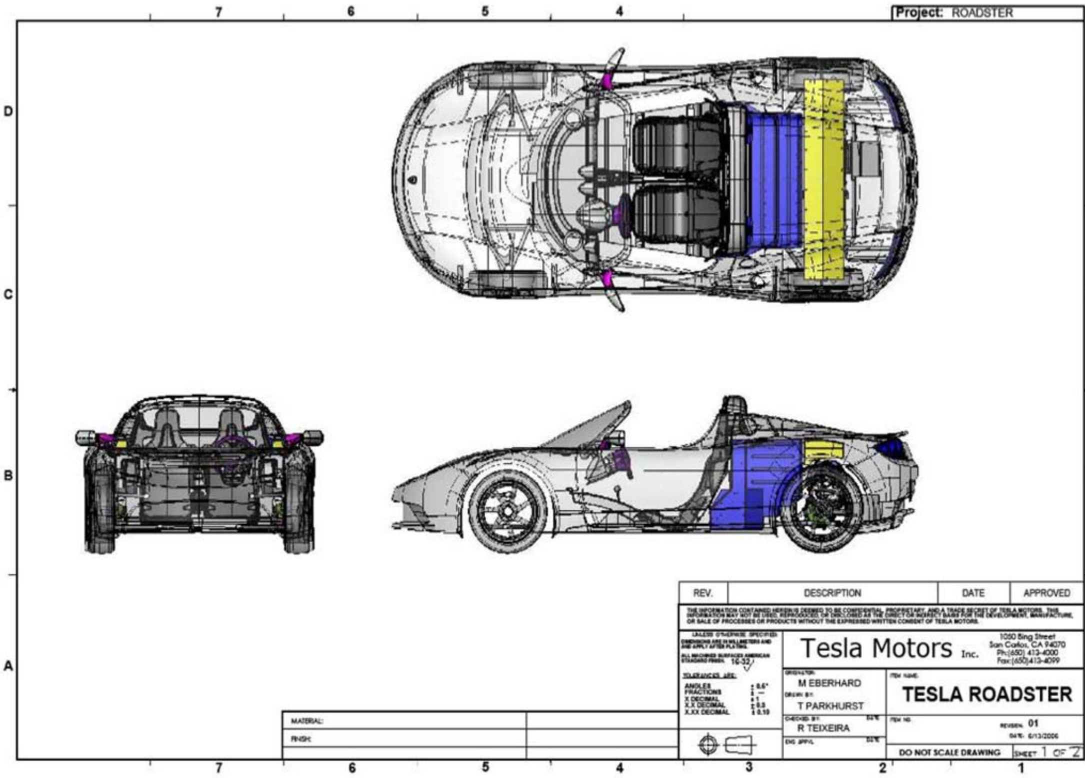




Appendix C Tesla Model S P80 fully-electric drivetrain display (2014)

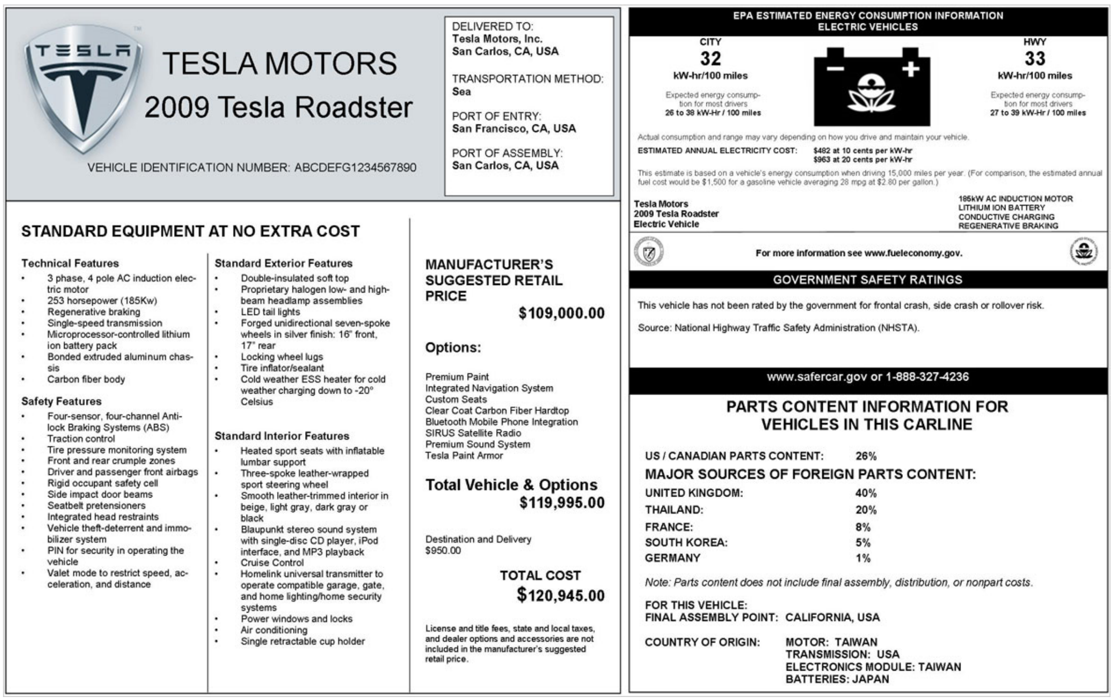


Appendix D Tesla Motors Roadster wireframe (2006)



Tesla Roadster wireframe, June 2006 (Martin Eberhard)

Appendix E Tesla Motors Roadster window sticker (2009)



TESLA MOTORS
2009 Tesla Roadster

VEHICLE IDENTIFICATION NUMBER: ABCDEFG1234567890

DELIVERED TO:
Tesla Motors, Inc.
San Carlos, CA, USA

TRANSPORTATION METHOD:
Sea

PORT OF ENTRY:
San Francisco, CA, USA

PORT OF ASSEMBLY:
San Carlos, CA, USA

STANDARD EQUIPMENT AT NO EXTRA COST

Technical Features

- 3 phase, 4 pole AC induction electric motor
- 253 horsepower (185Kw)
- Regenerative braking
- Single-speed transmission
- Microprocessor-controlled lithium ion battery pack
- Bonded extruded aluminum chassis
- Carbon fiber body

Safety Features

- Four-sensor, four-channel Anti-lock Braking Systems (ABS)
- Traction control
- Tire pressure monitoring system
- Front and rear crumple zones
- Driver and passenger front airbags
- Rigid occupant safety cell
- Side impact door beams
- Seatbelt pretensioners
- Integrated head restraints
- Vehicle theft-deterrent and immobilizer system
- PIN for security in operating the vehicle
- Valet mode to restrict speed, acceleration, and distance

Standard Exterior Features

- Double-insulated soft top
- Proprietary halogen low- and high-beam headlamp assemblies
- LED tail lights
- Forged unidirectional seven-spoke wheels in silver finish: 16" front, 17" rear
- Locking wheel lugs
- Tire inflator/sealant
- Cold weather ESS heater for cold weather charging down to -20° Celsius

Standard Interior Features

- Heated sport seats with inflatable lumbar support
- Three-spoke leather-wrapped sport steering wheel
- Smooth leather-trimmed interior in beige, light gray, dark gray or black
- Blaupunkt stereo sound system with single-disc CD player, iPod interface, and MP3 playback
- Cruise Control
- Homelink universal transmitter to operate compatible garage, gate, and home lighting/home security systems
- Power windows and locks
- Air conditioning
- Single retractable cup holder

MANUFACTURER'S SUGGESTED RETAIL PRICE
$109,000.00

Options:

Premium Paint
Integrated Navigation System
Custom Seats
Clear Coat Carbon Fiber Hardtop
Bluetooth Mobile Phone Integration
SIRUS Satellite Radio
Premium Sound System
Tesla Paint Armor

Total Vehicle & Options
$119,995.00

Destination and Delivery
$950.00

TOTAL COST
$120,945.00

License and title fees, state and local taxes, and dealer options and accessories are not included in the manufacturer's suggested retail price.

EPA ESTIMATED ENERGY CONSUMPTION INFORMATION
ELECTRIC VEHICLES

CITY	HWY
32 kW-hr/100 miles	**33** kW-hr/100 miles
Expected energy consumption for most drivers **26 to 38 kW-Hr / 100 miles**	Expected energy consumption for most drivers **27 to 39 kW-Hr / 100 miles**

Actual consumption and range may vary depending on how you drive and maintain your vehicle.

ESTIMATED ANNUAL ELECTRICITY COST: **$482 at 10 cents per kW-hr**
$963 at 20 cents per kW-hr

This estimate is based on a vehicle's energy consumption when driving 15,000 miles per year. (For comparison, the estimated annual fuel cost would be $1,500 for a gasoline vehicle averaging 28 mpg at $2.80 per gallon.)

Tesla Motors
2009 Tesla Roadster
Electric Vehicle

185kW AC INDUCTION MOTOR
LITHIUM ION BATTERY
CONDUCTIVE CHARGING
REGENERATIVE BRAKING

For more information see www.fueleconomy.gov.

GOVERNMENT SAFETY RATINGS

This vehicle has not been rated by the government for frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHSTA).

www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION FOR VEHICLES IN THIS CARLINE

US / CANADIAN PARTS CONTENT: **26%**

MAJOR SOURCES OF FOREIGN PARTS CONTENT:

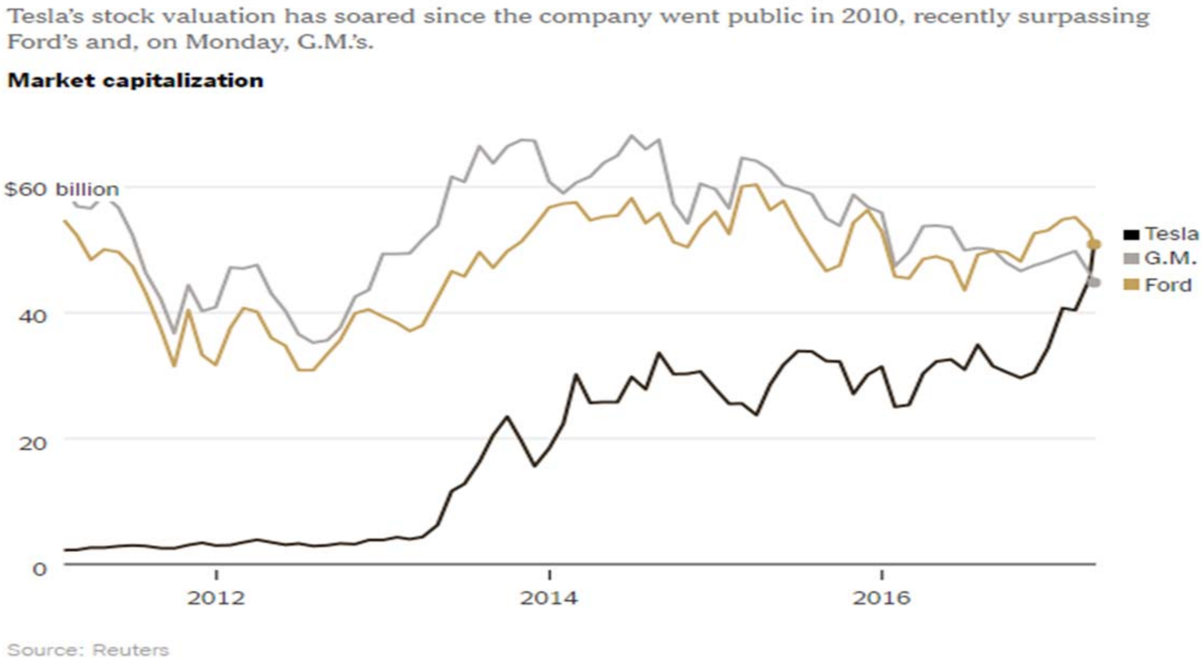
UNITED KINGDOM:	40%
THAILAND:	20%
FRANCE:	8%
SOUTH KOREA:	5%
GERMANY	1%

Note: Parts content does not include final assembly, distribution, or nonpart costs.

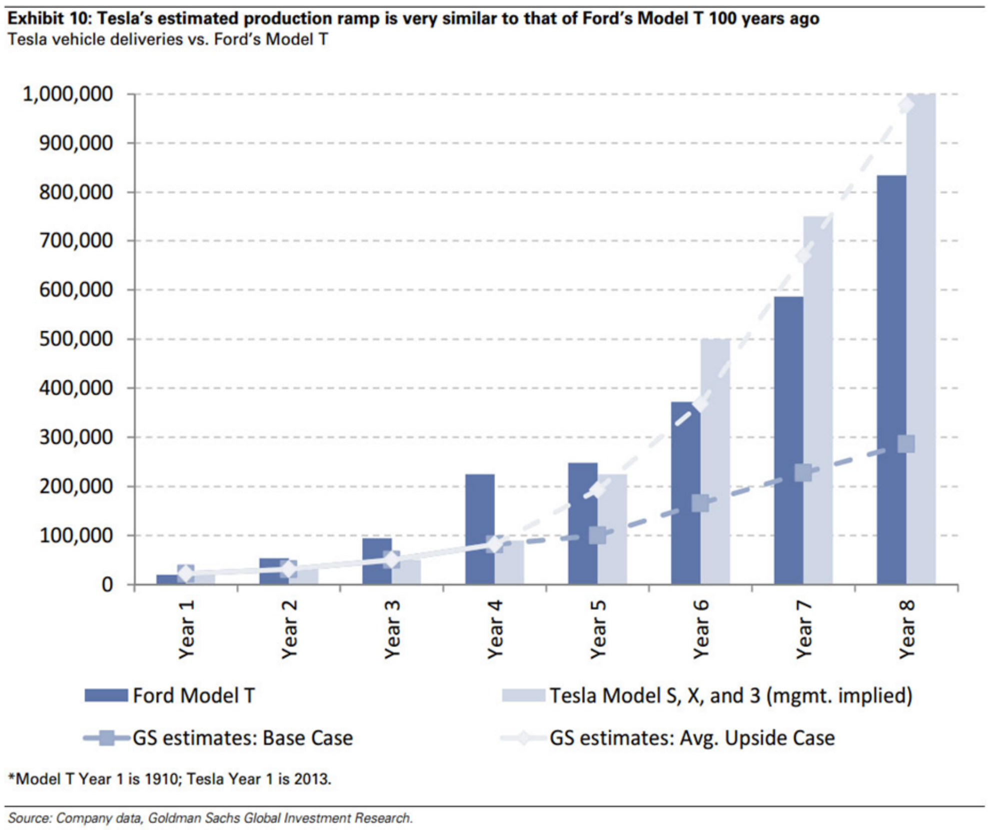
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: **CALIFORNIA, USA**

COUNTRY OF ORIGIN: **MOTOR: TAIWAN**
TRANSMISSION: USA
ELECTRONICS MODULE: TAIWAN
BATTERIES: JAPAN

Appendix F Tesla stock valuation in comparison to Ford and G.M. (2017)



Appendix G Tesla's estimated production ramp in comparision to Ford's Model



Appendix H Tesla Motors Consolidated Income Statement for 2013-2016 period.

Income Statement **Balance Sheet** **Cash Flow** **Financial Ratios**

Annual Income Statement (values in 000's) — Get Quarterly Data

Period Ending:	Trend	12/31/2016	12/31/2015	12/31/2014	12/31/2013
Total Revenue		$7,000,132	$4,046,025	$3,198,356	$2,013,496
Cost of Revenue		$5,400,875	$3,122,522	$2,316,685	$1,557,234
Gross Profit		**$1,599,257**	**$923,503**	**$881,671**	**$456,262**
Operating Expenses					
Research and Development		$834,408	$717,900	$464,700	$231,976
Sales, General and Admin.		$1,432,189	$922,232	$603,660	$285,569
Non-Recurring Items		$0	$0	$0	$0
Other Operating Items		$0	$0	$0	$0
Operating Income		**($667,340)**	**($716,629)**	**($186,689)**	**($61,283)**
Add'l income/expense items		$119,802	($40,144)	$2,939	$22,791
Earnings Before Interest and Tax		($547,538)	($756,773)	($183,750)	($38,492)
Interest Expense		$198,810	$118,851	$100,886	$32,934
Earnings Before Tax		($746,348)	($875,624)	($284,636)	($71,426)
Income Tax		$26,698	$13,039	$9,404	$2,588
Minority Interest		$98,132	$0	$0	$0
Equity Earnings/Loss Unconsolidated Subsidiary		$0	$0	$0	$0
Net Income-Cont. Operations		($674,914)	($888,663)	($294,040)	($74,014)
Net Income		**($674,914)**	**($888,663)**	**($294,040)**	**($74,014)**
Net Income Applicable to Common Shareholders		**($674,914)**	**($888,663)**	**($294,040)**	**($74,014)**

Appendix I Tesla Motors Consolidated Balance Sheet for 2013-2016 period.

Income Statement | Balance Sheet | Cash Flow | Financial Ratios

Annual Income Statement (values in 000's) — Get Quarterly Data

Period Ending:	Trend	12/31/2016	12/31/2015	12/31/2014	12/31/2013
Current Assets					
Cash and Cash Equivalents		$3,498,735	$1,219,536	$1,923,660	$848,901
Short-Term Investments		$0	$0	$0	$0
Net Receivables		$499,142	$168,965	$226,604	$49,109
Inventory		$2,067,454	$1,277,838	$953,675	$340,355
Other Current Assets		$194,465	$115,667	$76,134	$27,574
Total Current Assets		**$6,259,796**	**$2,782,006**	**$3,180,073**	**$1,265,939**
Long-Term Assets					
Long-Term Investments		$506,302	$0	$0	$0
Fixed Assets		$9,117,037	$5,194,737	$2,596,011	$1,120,919
Goodwill		$0	$0	$0	$0
Intangible Assets		$376,145	$12,816	$0	$0
Other Assets		$6,404,796	$78,380	$54,583	$30,072
Deferred Asset Charges		$0	$0	$0	$0
Total Assets		**$22,664,076**	**$8,067,939**	**$5,830,667**	**$2,416,930**
Current Liabilities					
Accounts Payable		$3,070,369	$1,338,946	$1,046,829	$412,221
Short-Term Debt / Current Portion of Long-Term Debt		$1,150,147	$627,927	$611,099	$7,904
Other Current Liabilities		$1,606,489	$844,162	$449,238	$255,035
Total Current Liabilities		**$5,827,005**	**$2,811,035**	**$2,107,166**	**$675,160**
Long-Term Debt		$5,969,500	$2,021,093	$1,818,785	$598,974
Other Liabilities		$4,101,872	$1,658,717	$642,539	$294,496
Deferred Liability Charges		$851,790	$446,105	$292,271	$181,180
Misc. Stocks		$375,823	$47,285	$58,196	$0
Minority Interest		$785,175	$0	$0	$0
Total Liabilities		**$17,911,165**	**$6,984,235**	**$4,918,957**	**$1,749,810**
Stock Holders Equity					
Common Stocks		$161	$131	$126	$123
Capital Surplus		$7,773,727	$3,409,452	$2,345,266	$1,806,617
Retained Earnings		($2,997,237)	($2,322,323)	($1,433,660)	($1,139,620)
Treasury Stock		$0	$0	$0	$0
Other Equity		($23,740)	($3,556)	($22)	$0
Total Equity		**$4,752,911**	**$1,083,704**	**$911,710**	**$667,120**
Total Liabilities & Equity		**$22,664,076**	**$8,067,939**	**$5,830,667**	**$2,416,930**

Appendix J Tesla Motors Consolidated Statement of Cash Flows for 2013-2016 period.

Income Statement | Balance Sheet | **Cash Flow** | Financial Ratios

Annual Income Statement (values in 000's)					Get Quarterly Data
Period Ending:	**Trend**	**12/31/2016**	**12/31/2015**	**12/31/2014**	**12/31/2013**
Net Income		**($674,914)**	**($888,663)**	**($294,040)**	**($74,014)**
Cash Flows-Operating Activities					
Depreciation		$1,034,385	$494,653	$301,665	$120,784
Net Income Adjustments		$308,693	$362,800	$191,863	$69,076
Changes in Operating Activities					
Accounts Receivable		($213,097)	$46,267	($183,658)	($21,705)
Changes in Inventories		($2,465,703)	($1,573,860)	($1,050,264)	($460,561)
Other Operating Activities		$3,985	($53,957)	($65,130)	($17,967)
Liabilities		$1,980,954	$1,088,261	$1,042,227	$649,191
Net Cash Flow-Operating		**($123,829)**	**($524,499)**	**($57,337)**	**$264,804**
Cash Flows-Investing Activities					
Capital Expenditures		($1,440,471)	($1,634,850)	($969,885)	($264,224)
Investments		$16,667	$0	($16,710)	$0
Other Investing Activities		$7,374	($38,701)	($3,849)	$14,807
Net Cash Flows-Investing		**($1,416,430)**	**($1,673,551)**	**($990,444)**	**($249,417)**
Cash Flows-Financing Activities					
Sale and Purchase of Stock		$2,067,078	$856,611	$489,615	$613,724
Net Borrowings		$1,718,190	$683,937	$2,292,092	$199,238
Other Financing Activities		$0	$0	$0	$0
Net Cash Flows-Financing		**$3,743,976**	**$1,523,523**	**$2,143,130**	**$635,422**
Effect of Exchange Rate		($7,409)	($34,278)	($35,525)	($6,810)
Net Cash Flow		**$2,196,308**	**($708,805)**	**$1,059,824**	**$643,999**

Appendix K Tesla Motors Consolidated Statement of operations and Consolidated Balance Sheet for 2014-2016

Tesla, Inc.

Consolidated Statements of Operations
(in thousands, except per share data)

	Year Ended December 31, 2016	2015	2014
Revenues			
Automotive	$ 5,589,007	$ 3,431,587	$ 2,874,448
Automotive leasing	761,759	309,386	132,564
Total automotive revenue	6,350,766	3,740,973	3,007,012
Energy generation and storage	181,394	14,477	4,208
Services and other	467,972	290,575	187,136
Total revenues	7,000,132	4,046,025	3,198,356
Cost of revenues			
Automotive	4,268,087	2,639,926	2,058,344
Automotive leasing	481,994	183,376	87,405
Total automotive cost of revenues	4,750,081	2,823,302	2,145,749
Energy generation and storage	178,332	12,287	4,005
Services and other	472,462	286,933	166,931
Total cost of revenues	5,400,875	3,122,522	2,316,685
Gross profit	1,599,257	923,503	881,671
Operating expenses			
Research and development	834,408	717,900	464,700
Selling, general and administrative	1,432,189	922,232	603,660
Total operating expenses	2,266,597	1,640,132	1,068,360
Loss from operations	(667,340)	(716,629)	(186,689)
Interest income	8,530	1,508	1,126
Interest expense	(198,810)	(118,851)	(100,886)
Other income (expense), net	111,272	(41,652)	1,813
Loss before income taxes	(746,348)	(875,624)	(284,636)
Provision for income taxes	26,698	13,039	9,404
Net loss	(773,046)	(888,663)	(294,040)
Net loss attributable to noncontrolling interests and redeemable noncontrolling interests	(98,132)	—	—
Net loss attributable to common stockholders	$ (674,914)	$ (888,663)	$ (294,040)
Net loss per share of common stock attributable to common stockholders, basic and diluted	$ (4.68)	$ (6.93)	$ (2.36)
Weighted average shares used in computing net loss per share of common stock, basic and diluted	144,212	128,202	124,539

The accompanying notes are an integral part of these consolidated financial statements.

Tesla, Inc.

Consolidated Balance Sheets
(in thousands, except per share data)

	December 31, 2016	December 31, 2015
Assets		
Current assets		
Cash and cash equivalents	$ 3,393,216	$ 1,196,908
Restricted cash	105,519	22,628
Accounts receivable, net	499,142	168,965
Inventory	2,067,454	1,277,838
Prepaid expenses and other current assets	194,465	115,667
Total current assets	6,259,796	2,782,006
Operating lease vehicles, net	3,134,080	1,791,403
Solar energy systems, leased and to be leased, net	5,919,880	—
Property, plant and equipment, net	5,982,957	3,403,334
Intangible assets, net	376,145	12,816
MyPower customer notes receivable, net of current portion	506,302	—
Restricted cash, net of current portion	268,165	31,522
Other assets	216,751	46,858
Total assets	$ 22,664,076	$ 8,067,939
Liabilities and Equity		
Current liabilities		
Accounts payable	$ 1,860,341	$ 916,148
Accrued liabilities and other	1,210,028	422,798
Deferred revenue	763,126	423,961
Resale value guarantees	179,504	136,831
Customer deposits	663,859	283,370
Current portion of long-term debt and capital leases	984,211	627,927
Current portion of solar bonds issued to related parties	165,936	—
Total current liabilities	5,827,005	2,811,035
Long-term debt and capital leases, net of current portion	5,860,049	2,021,093
Solar bonds issued to related parties, net of current portion	99,164	—
Convertible senior notes issued to related parties	10,287	—
Deferred revenue, net of current portion	851,790	446,105
Resale value guarantees, net of current portion	2,210,423	1,293,741
Other long-term liabilities	1,891,449	364,976
Total liabilities	16,750,167	6,936,950
Commitments and contingencies (Note 17)		
Redeemable noncontrolling interests in subsidiaries	367,039	—
Convertible senior notes (Notes 13)	8,784	47,285
Stockholders' equity:		
Preferred stock; $0.001 par value; 100,000 shares authorized; no shares issued and outstanding	—	—
Common stock; $0.001 par value; 2,000,000 shares authorized as of December 31, 2016 and 2015; 161,561 and 131,425 shares issued and outstanding as of December 31, 2016 and 2015, respectively	161	131
Additional paid-in capital	7,773,727	3,409,452
Accumulated other comprehensive loss	(23,740)	(3,556)
Accumulated deficit	(2,997,237)	(2,322,323)
Total stockholders' equity	4,752,911	1,083,704
Noncontrolling interests in subsidiaries	785,175	—
Total liabilities and equity	$ 22,664,076	$ 8,067,939

Appendix L Tesla Stock beta calculation based on daily average regression against SP500 and GM for a two-year period (Nasdaq)

	TSLA		SPY 500		GM	
Date	Adj Close	%Change	Adj Close	%Change	Adj Close	%Change
7/15/2015	263.140015	0.01345	210.610001	0.00802	28.6736	-0.02609
7/16/2015	266.679993	0.02992	212.300003	0.00085	27.9255	0.001307
7/17/2015	274.660004	0.02767	212.479996	0.00052	27.962	-0.00489
7/20/2015	282.26001	-0.05488	212.589996	-0.00395	27.8251	-0.00361
7/21/2015	266.769989	0.00412	211.75	-0.00179	27.7248	-0.00296
7/22/2015	267.869995	-0.00250	211.369995	-0.00563	27.6427	0.039604
7/23/2015	267.200012	-0.00670	210.179993	-0.01037	28.7374	-0.01397
7/24/2015	265.410004	-0.04672	208	-0.00582	28.336	-0.00032
7/27/2015	253.009995	0.04668	206.789993	0.01228	28.3269	0.008696
7/28/2015	264.820007	-0.00378	209.330002	0.00688	28.5732	0.020115
7/29/2015	263.820007	0.01126	210.770004	0.00024	29.148	-0.00125
7/30/2015	266.790009	-0.00240	210.820007	-0.00152	29.1115	-0.01254
7/31/2015	266.149994	-0.02314	210.5	-0.00337	28.7465	0.005395
8/3/2015	259.98999	0.02419	209.789993	-0.00195	28.9016	-0.00505
8/4/2015	266.279999	0.01446	209.380005	0.00330	28.7557	0.002538
8/5/2015	270.130005	-0.08885	210.070007	-0.00819	28.8287	0.008228
8/6/2015	246.130005	-0.01471	208.350006	-0.00192	29.0658	-0.00377
8/7/2015	242.509995	-0.00565	207.949997	0.01260	28.9564	0.006301
8/10/2015	241.139999	-0.01563	210.570007	-0.00902	29.1388	-0.03475
8/11/2015	237.369995	0.00337	208.669998	0.00120	28.1262	0.001298
8/12/2015	238.169998	0.01822	208.919998	-0.00124	28.1627	0.006155
8/13/2015	242.509995	0.00264	208.660004	0.00364	28.336	0.013844
8/14/2015	243.149994	0.04869	209.419998	0.00559	28.7283	0.003811
8/17/2015	254.990005	0.02247	210.589996	-0.00290	28.8378	0.003163
8/18/2015	260.720001	-0.02098	209.979996	-0.00791	28.929	-0.00252
8/19/2015	255.25	-0.05120	208.320007	-0.02088	28.856	-0.02498
8/20/2015	242.179993	-0.04711	203.970001	-0.03010	28.1353	-0.04021
8/21/2015	230.770004	-0.05157	197.830002	-0.04211	27.0041	-0.06081
8/24/2015	218.869995	0.00530	189.5	-0.01177	25.3619	-0.0187
8/25/2015	220.029999	0.02186	187.270004	0.03839	24.8875	0.030059
8/26/2015	224.839996	0.08072	194.460007	0.02474	25.6356	0.017082
8/27/2015	242.990005	0.02259	199.270004	0.00005	26.0735	0.014696
8/28/2015	248.479996	0.00233	199.279999	-0.00808	26.4567	0.015172
8/31/2015	249.059998	-0.04188	197.669998	-0.02985	26.8581	-0.02717
9/1/2015	238.630005	0.03797	191.770004	0.01898	26.1282	0.019902
9/2/2015	247.690002	-0.00856	195.410004	0.00072	26.6483	-0.00342
9/3/2015	245.570007	-0.01482	195.550003	-0.01514	26.557	-0.0079
9/4/2015	241.929993	0.02579	192.589996	0.02513	26.3472	0.034626
9/8/2015	248.169998	0.00298	197.429993	-0.01337	27.2595	-0.0087
9/9/2015	248.910004	-0.00173	194.789993	0.00544	27.0223	0.025291
9/10/2015	248.479996	0.00708	195.850006	0.00454	27.7057	0.005
9/11/2015	250.240005	0.01179	196.740005	-0.00371	27.8442	0.018905
9/14/2015	253.190002	0.00150	196.009995	0.01250	28.3706	0.008789
9/15/2015	253.570007	0.03423	198.460007	0.00867	28.62	0.006776

1.222806589	TSLA Beta
1.17911983	GM Beta

Regression Statistics	
Multiple R	0.40806909
R Square	0.16652038
Adjusted R Square	0.16486006
Standard Error	0.02284782
Observations	504

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.052355924	0.052356	100.2942726	1.20522E-21
Residual	502	0.262055582	0.000522		
Total	503	0.314411506			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	0.00034006	0.001018543	0.333867	0.738619314	-0.001661074	0.002341	-0.00166	0.00234
X Variable 1	1.20084774	0.119908475	10.0147	1.20522E-21	0.965263462	1.436432	0.96526	1.43643
	Mean	Standard Deviation			95%Confidence Normal Distribution			

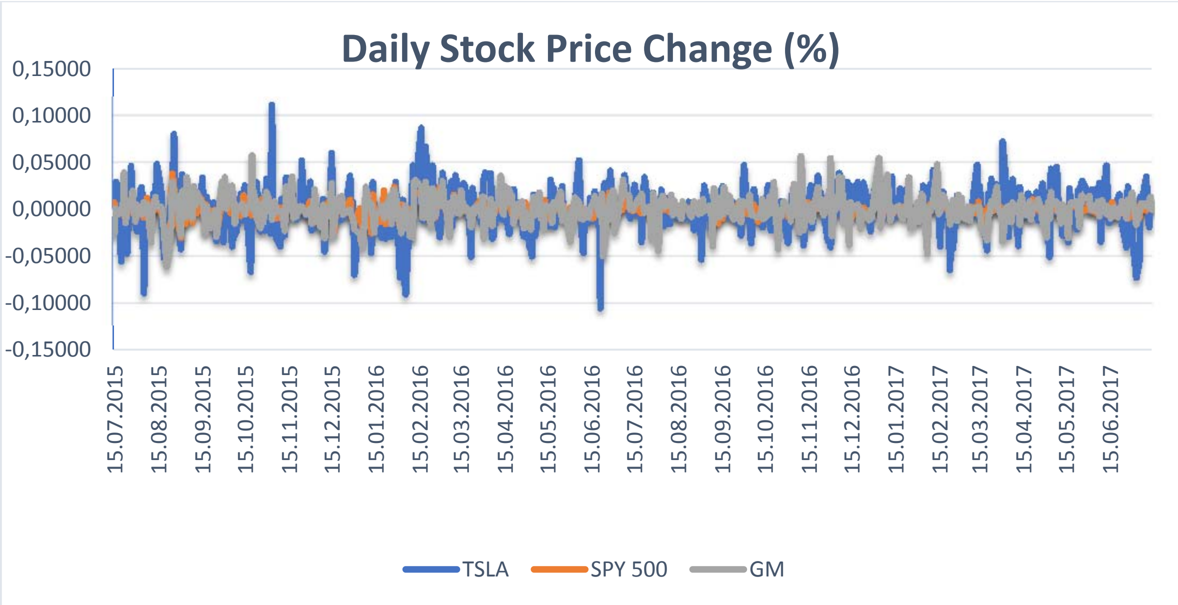
Regression Statistics	
Multiple R	0.57499176
R Square	0.33061553
Adjusted R Square	0.32928209
Standard Error	0.01294714
Observations	504

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.041562243	0.041562	247.9427	1.08285E-45
Residual	502	0.084149466	0.000168		
Total	503	0.125711709			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	0.00023086	0.000577176	0.399986	0.689336977	-0.000903116	0.001365	-0.0009	0.00136
X Variable 1	1.06992791	0.067948341	15.7462	1.08285E-45	0.936429752	1.203426	0.93643	1.20343
	Mean	Standard Deviation			95%Confidence Normal Distribution			

Appendix M Tesla Motors daily stock price change and beta vs SPY500 and GM . (Nasdaq)



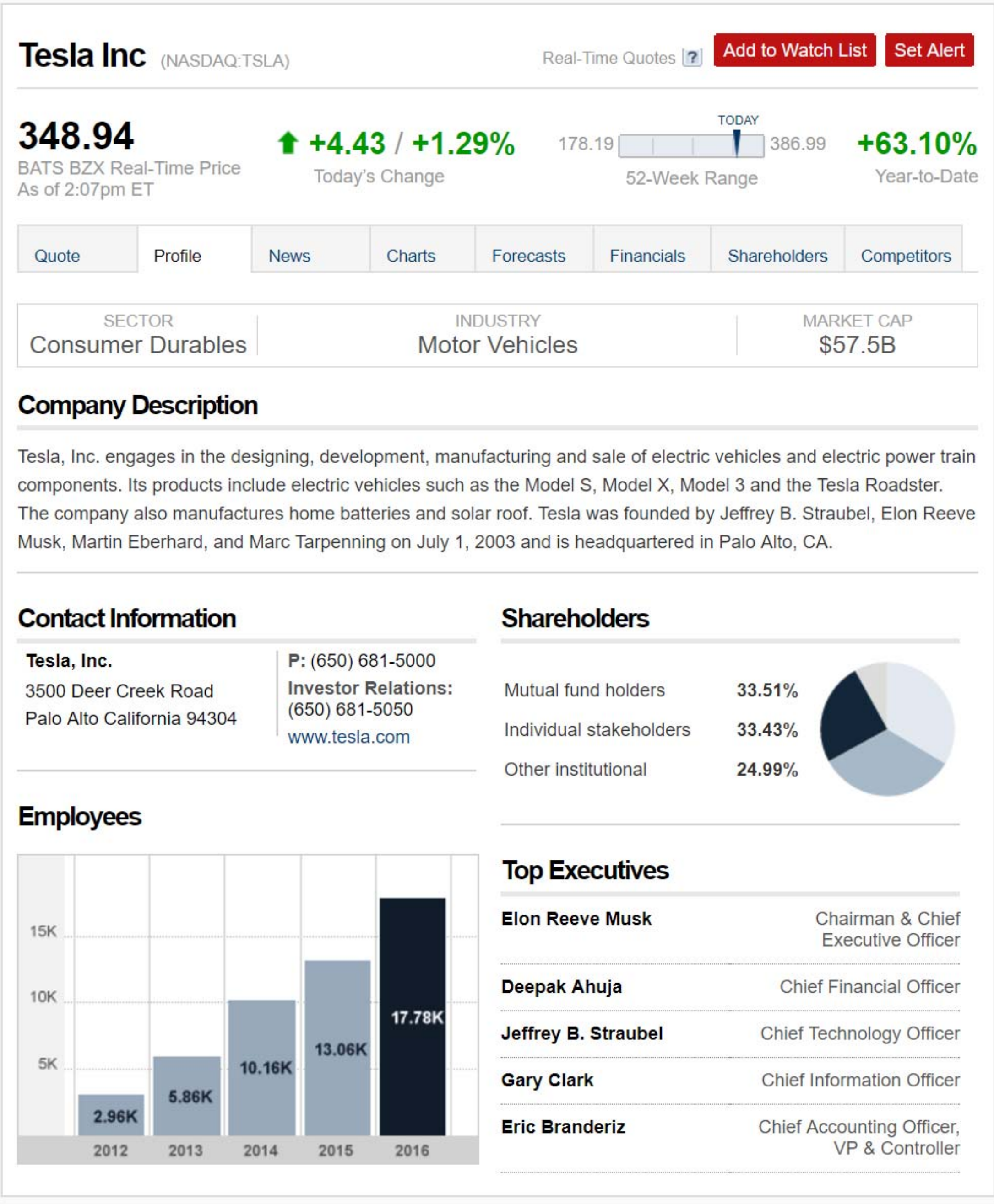
TSLA Beta (1.20)

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	0.00034006	0.001018543	0.333867	0.738619314	-0.001661074	0.002341	-0.00166	0.002341
X Variable 1	**1.20084774**	**0.119908475**	10.0147	1.20522E-21	**0.965263462**	**1.436432**	0.965263	1.436432
	Mean	*Standard Deviation*			*95%Confidence Normal Distribution*			

GM Beta (1.06)

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	0.00023086	0.000577176	0.399986	0.689336977	-0.000903116	0.001365	-0.0009	0.001365
X Variable 1	**1.06992791**	**0.067948341**	15.7462	1.08285E-45	**0.936429752**	**1.203426**	0.93643	1.203426
	Mean	*Standard Deviation*			*95%Confidence Normal Distribution*			

Appendix N Tesla Motors company profile. (Nasdaq)



Tesla Inc (NASDAQ:TSLA)

Real-Time Quotes [?] Add to Watch List Set Alert

348.94
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+4.43 / +1.29%
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178.19 TODAY 386.99
52-Week Range

+63.10%
Year-to-Date

Quote | Profile | News | Charts | Forecasts | Financials | Shareholders | Competitors

SECTOR	INDUSTRY	MARKET CAP
Consumer Durables	Motor Vehicles	$57.5B

Company Description

Tesla, Inc. engages in the designing, development, manufacturing and sale of electric vehicles and electric power train components. Its products include electric vehicles such as the Model S, Model X, Model 3 and the Tesla Roadster. The company also manufactures home batteries and solar roof. Tesla was founded by Jeffrey B. Straubel, Elon Reeve Musk, Martin Eberhard, and Marc Tarpenning on July 1, 2003 and is headquartered in Palo Alto, CA.

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Shareholders

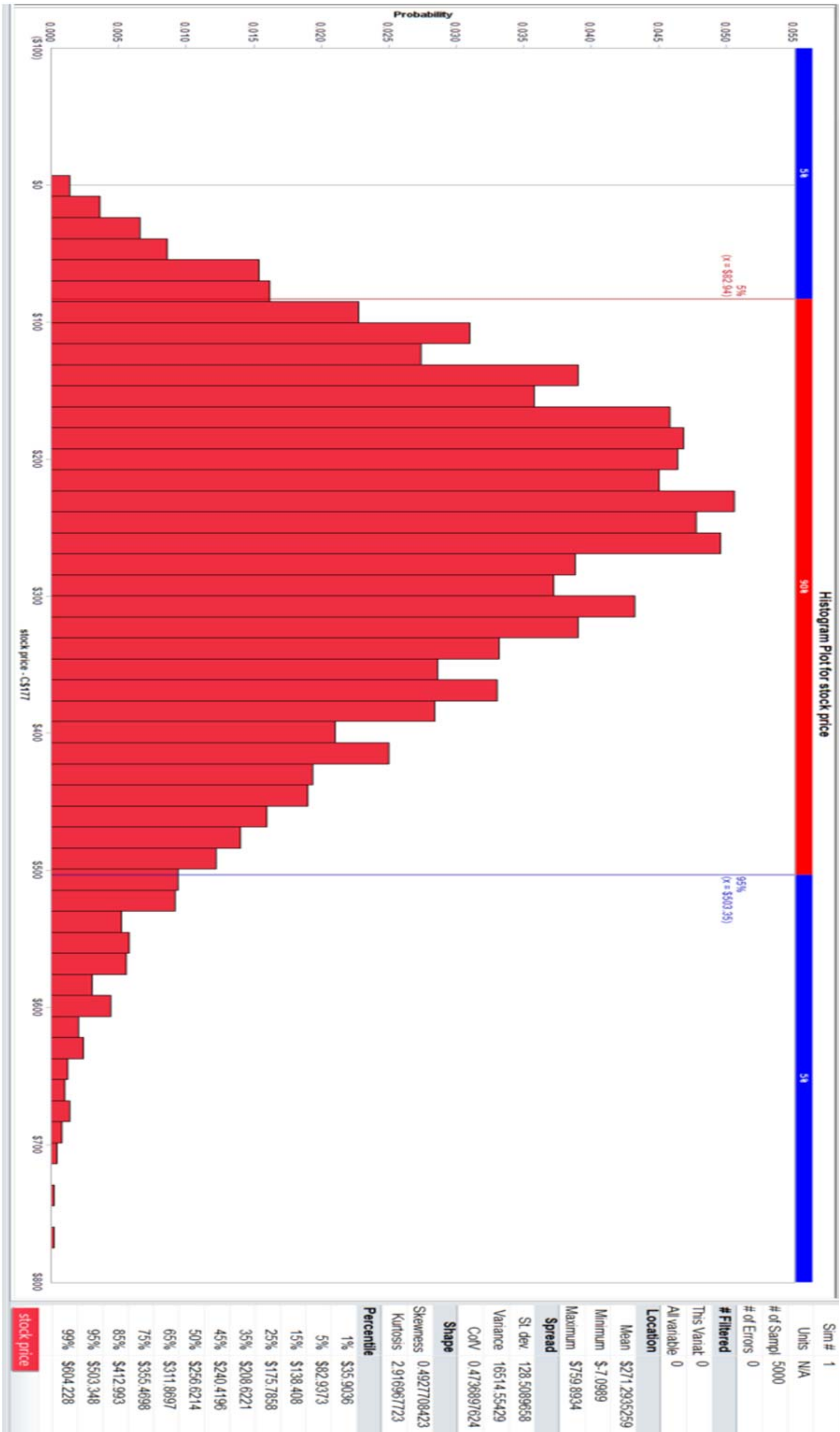
Mutual fund holders	**33.51%**
Individual stakeholders	**33.43%**
Other institutional	**24.99%**

Employees

Top Executives

Elon Reeve Musk	Chairman & Chief Executive Officer
Deepak Ahuja	Chief Financial Officer
Jeffrey B. Straubel	Chief Technology Officer
Gary Clark	Chief Information Officer
Eric Branderiz	Chief Accounting Officer, VP & Controller

Appendix N Monte-Carlo Simulation Stock Price Histogram (ModelRisk, 2017)



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