We would like to thank Neha Samdaria for her diligent research assistance. Of course, all the controversial interpretations, and any errors, are our own.
Abstract

This paper presents a detailed anatomy of the nearly sevenfold run-up in the price of Tesla stock between March 22, 2013 and February 26, 2014 with the goal of attempting to determine the role played by investor sentiment. Tesla offers a unique opportunity in this context because the run-up was on the order of magnitude experienced by some of the most volatile technology stocks, but Tesla operates in an industry, automotive manufacturing, and a potential industry, battery construction, that are mature and are populated by established competitors. This makes it possible to construct discounted cash flow valuation models that are anchored on established fundamentals. On the basis of these models, in conjunction with a detailed event study and analysis of institutional stock holdings and short sales data, we conclude that the run-up cannot be explained as a rational reaction to fundamental information. Instead, we conclude that at the end of the run-up the stock was overvalued by approximately 150 percent. In our view, the case study provides support for Summers assertion the price and rational value can diverge significantly for prolonged periods of time.
Introduction

Despite extensive literature on the subject, the question of whether and how market sentiment affects stock prices remains an interesting and unresolved question. Following DeLong, Shleifer, Summers and Waldman (1990), investor sentiment is here defined as a belief about future cash flows and investment risks that is not justified by the facts at hand. In this paper, we extend that literature by examining one particular event in detail. That event is an almost sevenfold increase in the price of Tesla in less than one year. On March 22, 2013 Tesla was trading at $36.62. By February 26, 2014, the price had risen 590.9% to $253.00. (Tesla does not pay a dividend so the price path reflects the total return on the stock.) In comparison, the total return on the S&P 500 index during the same interval was a much more modest 20.4%, so that the total net of market return over the period for Tesla was 471.1%. An equal weighted index of the other major automotive manufacturers listed on American exchanges closely matched the overall market during the interval rising 16.2%, so Tesla’s jump clearly was not industry related.

Exhibit 1 plots the paths of wealth for Tesla, aforementioned index, and the S&P 500 from the date of Tesla’s IPO to the end of the run-up period. What makes Exhibit 1 particularly surprising is that for the first two and a half years following Tesla’s IPO in June of 2010, Tesla’s price tracks both the market and the industry indices. Then

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1 See Baker and Wurgler (2007).

2 The index of major automotive manufacturers is composed of the four major companies, GM, Ford, Toyota, and Honda that are available through CRSP. Expanding the index to include other manufacturers has no noticeable impact on the results.
beginning on March 22, 2013, the two paths diverge dramatically. This paper studies that sudden shift and the subsequent dramatic run-up. In particular, we attempt to isolate the possible role played by market sentiment.

-- Exhibit 1 here --

Of course, large increases in the price of individual stocks, though rare, are hardly unprecedented. However, Tesla is special along a variety of dimensions that make it a uniquely useful test case for studying whether market sentiment played a role in the run-up. First, Tesla is part of large, mature and well defined industry. By 2012, the manufacturing of automobiles had matured to the point where the long-run growth rate of the industry closely mirrored long-run aggregate growth. This is helpful because much of the debate regarding the role of sentiment during the internet boom of the 1990s, and to an extent during the current social media boom, is over the extent to which sharp run-ups in prices can be attributed to rational assessment of industry growth. Because forecasting growth rates for newly developing industries like social media typically requires making assumptions that are hard to verify on the basis of historical data, unambiguous conclusions are difficult to draw.

Second, the mature state of the industry also makes it easy to identify comparable companies. This is helpful because comparable company analysis is a useful tool in valuation analysis. In addition, the slow, predictable growth of the aggregate market implies that a sudden, dramatic change in the value of Tesla stock means that Tesla must be expected to profit at the expense of competitors, so it is important to be able to identify those competitors unambiguously.
Third, the available technologies in the industry are largely known and innovations are incremental. There is not the “Twitter” problem where much of the value of a company is attributable to growth options related to some as of yet unspecified technology. Even Tesla, trumpeted as an innovator in the automotive industry, uses electric motor technology that has been widely available for years and relies on established battery technology and batteries provided by third party suppliers.

Fourth, the stable nature of the business implies that the expected return, whichever model is used to estimate it, should not be changing rapidly. Therefore, when investigating the sudden divergence of the stock price from movements in the market and the industry it is not necessary to waste time worrying about the changes being due to variation in the discount rate.

Fifth, the run-up in the price of Tesla occurred over almost a year. Therefore, it cannot be related to the market learning of a few pieces of previously undisclosed information. It must reflect an on-going reassessment of the long-term prospects of the company, though not necessarily a rational one.

Finally, there is the added bonus that one of us, Damodaran (2013, 2014), developed a detailed discounted cash flow models for Tesla in real time and posted the results online on September 4, 2013 and March 25, 2014. As discussed in detail below, the models were calibrated using what we believe to be optimistic assumptions regarding Tesla’s future growth and operating margins. Nonetheless, the estimated values for Tesla were $72.00 in September 2013 and $100.31 in March 2014. In both cases this is only about 40 percent of the market price. If market prices continue to exceed model prices, or in the more extreme case that the gap widens, it is evidence that either our calibrating
assumptions were too pessimistic or that the market prices are inconsistent with the DCF valuation.

We also employ standard analytical tools, including an event study and an examination of the holdings (including shorts) of Tesla stock, to supplement our valuation analysis. Here too we find evidence that the run-up cannot be attributed to a rational evaluation of fundamental news.

Tesla: A brief history

Tesla Motors, Inc. (Tesla), incorporated on July 1, 2003, designs, develops, manufactures and sells electric vehicles and advanced electric vehicle powertrain components. The Company is also involved in designing, developing and manufacturing lithium-ion battery packs, electric motors, gearboxes and components both for its vehicles and for its original equipment manufacturer customers. Tesla owns its sales and service network. The company went public on June 29, 2010.

Tesla’s first car, the Tesla Roadster, a high-performance electric sports car, was a moderate success. On June 12, 2012, Tesla began deliveries of its Model S, a four door, five-passenger premium sedan. The reviews of the car were highly favorable and it was well received by customers.

Currently, Tesla manufacturers cars at its factory in Fremont, California. The company also has an electric powertrain manufacturing facility in Palo Alto, California. In addition to building cars, the company provides services for the development of electric powertrain components and sells electric powertrain components to other automotive manufacturers.
Pricing versus Valuation: Convergence and Divergence

Though the words “price” and “value” are often used interchangeably, here they mean different things. For a cash flow generating asset or business, we define value to be the present value of a rational forecast of future cash flows. Because “rational” is in the eye of the beholder, value cannot be observed and has to be estimated. When we use the term value in this paper, we mean our estimate of value. Price, on the other hand, is determined by supply and demand in the market place. That supply and demand may depend on factors other than rational estimates of future cash flow. Exhibit 2 lays out the contrast:

-- Exhibit 2 here --

Rather than rehashing old debates about price and value, we use the evolution of Tesla as a case study of how both value and price evolve in the market. The analysis proceeds in three steps. First, we develop DCF models to estimate the value of Tesla under what we consider to be a set of aggressively optimistic assumptions. Next, we compare those estimates to the market price of the stock and find, as noted earlier, that the stock appears to be dramatically overpriced. In step three, we study the trading behavior of the stock both in terms of how it responded to information and in terms of changes in institutional holdings and short sales. We find further evidence consistent with that from the valuation analysis – the sharp run-up in Tesla stock far exceeds that which can be explained by fundamentals. Investor sentiment must at least be part of the story.
The DCF Valuation Models for Tesla

While the process for valuing mature businesses is well established and described, there remain substantial differences of opinion regarding how that process should be applied to young companies. The approach we use is that described by Damodaran (2013). This approach focuses on four basic inputs. The first input is the expected cash flow from existing assets. The second input is expected growth, with growth in operating income being the key input. Because this growth requires investment, the value effect of growth will depend upon how efficiently that growth is generated in terms of required investment. The third input is the discount rate, defined as the cost of the overall capital of the firm, when valuing the business, and as cost of equity, when valuing equity. Other things remaining equal, companies that operate in riskier businesses or riskier countries should have higher costs of equity and capital than companies in stable businesses and developed markets. The final input is the terminal value, defined as the estimated value of firm at the end of the forecast period. This estimate is generally based on the assumption that cash flows will grow at a constant rate forever beyond that point, which in turn, requires the firm to be mature and grow at a rate less than overall economic growth. In the case of Tesla this requires a long forecast horizon because a substantial period of supernormal growth is anticipated.

The challenge with young companies

Looking at the four inputs highlights the problems that analysts face in valuing young companies like Tesla. The cash flows from existing assets are often negative, with operating cash flows being non-existent or small (because the firm’s revenues are small) and investing cash flows being large (as the company ramps up for growth). As a result,
almost all of the value of the company comes from future growth, but the crutches used to estimate that growth including past growth or sustainable growth models are missing.

In an earlier paper, Damodaran (2013) laid out a three-step process to deal with the estimation challenges raised by young companies. The first step is estimating a revenue growth rate. That estimate, in turn, is driven by an estimate of the growth of the overall market in which the company operates in conjunction with an evaluation of the relative strengths and weaknesses of the company’s products and services. The second step is forecasting a target operating margin to which the company’s margin will converge to over time. That forecast is typically based on the margins earned by the most comparable mature companies in the industry. The final input is an estimate of the investment required to achieve the forecast growth that is typically derived by examining changes in revenue from period to period and making judgments on how much additional capital will be required to provide for growth.

The discount rate in the valuation (cost of capital) is best estimated by looking at publicly traded companies in the same space as the young company, with the initial estimates being tied to smaller, riskier firms in the sector and the end numbers reflecting larger, more mature firms. While incorporating risk into discount rates is important, it is also important that we keep in mind two other factors. The first is that a significant portion of the risk that young firms are exposed to is company-specific and should be diversifiable at a portfolio level. The second is that young firms have a greater chance of failure than more mature firms, but that survival risk is ill suited for inclusion in the discount rate and is better considered explicitly when valuing the firm. This is because the cash flows to be discounted are expected cash flows, not anticipated cash flows.
conditional on the company surviving. To take account of this distinction, we introduce an estimated probability of failure, with the expected proceeds in the event of failure (usually liquidation proceeds) being used to compute an expected value.

**Tesla’s Historical Performance**

Though Tesla’s history is short, the starting point for assessing future revenue growth is its past track record. Exhibit 3 plots quarterly revenues from inception through the end of 2013 for Tesla. The exhibit shows relatively flat revenue until the introduction of the Model S that led to a burst of growth that then flattens out.

-- Exhibit 3 here --

Tesla’s profits have followed a rockier path, with losses accumulating over time. While the extent of the losses depends on the choice of measure, for much of Tesla’s history, every measure of profitability has been negative. In Exhibit 4, we graph six different measures of earnings:

(a) Gross Profits, i.e., revenues net of cost of goods sold.
(b) Earnings before interest, taxes, depreciation and amortization (EBITDA).
(c) Earnings before interest, taxes, depreciation, amortization and R&D (EBITDAR&D) to look at cash earnings prior to R&D expenses, which are more capital than operating expenditures.
(d) Adjusted EBITDA, obtained by adding back stock-based employee compensation expenses to EBITDA. This mirrors a number that Tesla has reported in its financial statements over the last few quarters.
(e) Operating Income or EBIT.
(f) Net Income.
No matter what measure of earnings is used for Tesla, the company is trending in the right direction. In fact, the company has turned profitable on four of the measures of earnings for the last four quarters.

To assess operating margins, we looked at four measures of it over Tesla’s lifetime: gross profit, EBITDA, and two measures of operating income as percent of sales. The first measure is reported operating income as a percentage of revenues each quarter and the second is an adjusted operating income as a percentage of revenues. The results are presented in Exhibit 5.

Note that the margins, based on all measures of income, are increasingly negative until the introduction of the Model S just prior to the third quarter of 2012 when a turnaround begins. Based on sales of the Model S, Tesla generated an adjusted operating profit margin, which we believe is the most relevant measure for valuation, of 2.51% for the last quarter of 2013 and 1.42% for the entire year.

*Forecasting Future Cash Flows for Tesla: September 2013 & March 2014*

Because Tesla is expected to experience supernormal growth for more than the typical five-year horizon used in most DCF models, we use a ten-year horizon. As

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3 To get to the adjusted operating income, we capitalize R&D expenses using a five-year life and straight-line amortization. Thus, we add back the R&D expense from the current quarter to the reported operating income and subtract out the amortization of the sum of the R&D expenses over the prior 20 quarters (or as many as are available).
described above, the first step in forecasting cash flows is estimating future revenue growth. To provide perspective, Exhibit 6 translates revenue data into growth rates quarter over quarter and current quarter over the same quarter the previous year.

--- Exhibit 6 here ---

Not surprisingly, the growth rate spikes with the introduction of the Model S, but declines after that. We note, however, that Mr. Musk and many analysts see the Model S as only the beginning. Tesla is expected to introduce a lower priced car in 2015 and many analysts foresee future innovation after that. The decision of whether the run-up is due to value creation or sentiment clearly depends on the growth assumption. To give value creation the benefit of the doubt, we choose the most aggressively optimistic assumption that we think can be reasonably defended. The figure we select for future revenue growth, for both the September 2013 and March 2014 DCF valuations, is 70 percent over the entire 10-year forecast period. At a growth rate of 70 percent, Tesla revenues increase by a factor of 50 from the base year to the end of the forecast period. As a result, Tesla rises from a niche player to become a major automotive manufacturer on the order of the position occupied by Audi today.

The next piece is the operating margin. As noted earlier, Tesla is currently operating at a negative margin. However, the critical question is to what margin the company will converge as it matures and takes advantage of economies of scale. Once again, we make an aggressively optimistic choice and assume Tesla margin will converge to a 12.5 percent margin, a number comparable to that achieved by Porsche, one of the most profitable automobile manufacturers.
The final piece is the investment required to realize the dramatic growth in revenues. To provide background, Exhibit 7 plots the history of two key drivers related to required investment, invested capital (and its change) and the sales to capital ratio.

A higher sales to capital ratio is reflective of higher quality growth because the company is generating more revenues with relatively less investment. For all of Tesla’s history the number has been below 1.0, which is much less than the average for the automobile sector. The results for the last quarter of 2013 suggest that the company is starting to convert its past investments into revenues, as the ratio increases from 0.66 in the third quarter of 2013 to 0.87 in the last quarter of the year. Once again, to be optimistic we assume going forward that the sales to investments ratio will jump to the industry average in the first forecast year and remain there throughout.

The final element of the cash flow forecast is the risk of failure. Given the competitiveness of the automotive industry, and the history of failure of most start-ups, it would not be unreasonable to assume failure probability of ten percent or more for Tesla. Nonetheless, to stay on an optimistic path, we assume that the probability of failure is zero.

To illustrate the importance of the investment assumption, one of the events to which Tesla’s stock price responded was the release of a Morgan Stanley (2014) analyst report that included a DCF model and a price target of $320. The price target, not surprisingly, was based on a forecast of rapid growth. However, the DCF model included minimal new investment. We observe that correcting this inconsistency reduces the DCF valuation, and presumably the price target, significantly.
The Discount Rate

The discount rate for Tesla is difficult to assess. The volatility of the stock returns for Tesla is on the order of 60 percent per year - much greater than that for other automotive manufacturers and more akin to that for young technology firms. However, much of that risk is idiosyncratic. Consistent with our previous assumptions, we assume that the systematic risk for Tesla can be approximated by using a weighted average of the betas of the technology and automobile sectors, with the weights shifting to the latter as the company’s revenues increase. This results in a higher beta (1.28) and cost of capital (10.03%) in the September 2013 valuation than in the March 2014 valuation, where the beta used is 1.22 and the cost of capital is 8.74%. In both valuations, the company is predominantly funded with equity to start the process and the cost of debt has little impact on the valuation.

Within both valuations, we preserve consistency, lowering the cost of capital towards 8.00% (roughly the average for the automobile sector) as we move forward in our forecast period. The adjustment occurs in the second half of the growth period (years 6 through 10) in linear increments. We are, in effect, assuming that Tesla will not only start to see its systematic risk converge towards that of mature automobile companies, but that it will avail itself of its debt capacity over time.

The Value Estimates

Exhibit 8 presents summary results for the DCF valuations conducted in September of 2013 and March of 2014 based on the assumptions discussed above. For
comparative purposes we also include a valuation prepared by Damodaran in May of 2011, prior to the start of the run-up.

-- Exhibit 8 here --

Given our consistently optimistic assumptions, one might guess that the estimated value would exceed the market price, but Exhibit 8 shows that this is clearly not the case. The estimated value as of September 2013 comes to $72.00 dollars compared to a market price of $168.76 – implying that the stock is overvalued by about 150 percent. In March 2014, the estimated value rises to $100.35. This increase is due almost exclusively to the fact that the base off of which the forecasts are based jumps after the introduction of the Model S. Generally, when starting from a higher base, an analyst will reduce expected growth somewhat because some of the growth story is now in the rear view mirror. Here we do not do that so the estimated value jumps to $100.35. Nonetheless, by March 2014 the stock price has hit $250, so the estimated market overvaluation remains about 150 percent. Given the markedly optimistic nature of all our assumptions, the bottom line of the DCF analysis is that price exceeds rational fundamental value. To examine this possibility further, we take a closer look at the price behavior of the stock

The Pricing Narrative

If the market is rational and relatively efficient, then the run-up in the price of Tesla stock between March 22, 2013 and February 26, 2014, both in comparison to industry competitors and the market generally, should be the result of information that arrives during that time period. To examine that hypothesis, we begin by isolating days with significant residual changes in Tesla’s stock price then check to see if there is the arrival of sufficient new fundamental information to justify the movements on those days.
The Price History

There were 234 trading days during the run-up period. To determine whether the firm-specific Tesla return on any individual day was significant, we define residual returns to be simply Tesla returns net of the return on the S&P 500. This definition has virtually no impact on the results because the significant days are determined almost exclusively by large movements in Tesla stock. To compute t-statistics, the residual return is divided by the standard deviation of the residuals over the interval from January 1, 2011 until the day preceding the start of the run-up period.

Given that the run-up period was defined by Tesla’s exceptional stock price performance, one would expect more than 5 percent of the daily returns to be significant at the 5 percent level and more than half of the significant returns to be positive. That is what we find. Of the 234 trading days during the period nineteen (8.1%) were significantly positive and eight (3.5%) are negative. Overall 56 percent of the returns were positive during the run-up period and 44 percent were negative. The ratio is surprisingly close to one given that the sample is conditioned on a run-up of 590 percent. It must be the case that the positive days were substantially larger in absolute value than the negative days on average. That is what we find. The compound residual return over the twenty days with significantly positive residuals was 740 percent compared to a compound return of (55.3) percent for the eight significantly negative days. Taken together the compound residual return for all the significant days was 275 percent. Thus most of the story of the run-up was associated with the significantly positive days with the skewed ratio of positive to negative returns accounting for the rest.
Price Changes and Fundamental Information Arrival

To examine whether the big residual returns for Tesla during this period were the result of fundamental information reaching the market, we examined the days where the returns were significantly different from zero (either positive or negative). Taken as a whole the event study brings to mind Gertrude Stein’s characterization of Oakland – “There is no there, there.” The most telling evidence from the evident study is what is missing. There is no new product introduction. There is no proposed acquisition or other transaction. There is no announcement of significant new technology. It is worth noting in this context that the inability to explain price movements is a remarkably consistent characteristic of stock price behavior. Cutler, Poterba and Summers (1989) and Cornell (2013) examine the largest 50 moves in the overall market during successive 25 year intervals. Both papers reach the conclusion that a majority of even these large market movements cannot be tied to fundamental news. This finding is not so dramatic in the case of individual stocks because many of their large changes are usually associated with earnings surprises. Therefore, to explore further the relation between information arrival and movements in Tesla’s stock price, we start with earnings announcements.

Exhibit 9 reports the details for the four earnings announcements during the run-up period. Three of the announcements are associated with significant residuals – two positive and one negative. The second two, one positive and one negative, net almost exactly to zero, so the impact of earnings surprises is a total residual return of 24% associated with the first announcement. While this is not trivial, it hardly accounts for the sevenfold increase in price. In addition, the earnings surprise comes to $.08. This translates into about $10 million dollars in added earnings. In comparison, during the
run-up the market value of equity jumped from under $5 billion to almost $30 billion. For the jump to be rational, the story must include much more than the reported earnings surprises.

-- Exhibit 9 here --

Of course earnings are not the only source of fundamental information. But the full event study presented in Exhibit 10, which summarizes the news associated with all the significant residuals during the run-up period, highlights just how little real information relevant to the valuation of Tesla arrived during the period.

-- Exhibit 10 here --

The exhibit is broken down into positive and negative residuals with each sorted by date. Turning first to the positive residuals, there are 16 not related to earnings announcements. In our judgment, ten of those are not associated with meaningful news of any type. In fact, in several cases the main news story was the rise in the stock price itself. There were three residuals associated with what could be called fundamental news. Two related to higher than anticipated sales of the Model S. However, higher here means 6,900 in a quarter rather than 6,000 compared to the millions sold by major manufacturers. Moreover, the growth in sales is not sufficient to suggest that our 70 percent growth is too low. If anything, the reverse is true. The other example of fundamental news was the announcement of the planned introduction of a mass market car in 2015. The final three significantly positive residuals were all associated with the release of positive analyst reports. However, those reports failed to contain new fundamental information other than the positive opinions and forecasts of the analysts.
On the negative side, there were seven significant residuals not associated with earnings. Four of those by our count were unrelated to any meaningful information. Two were associated with fires involving the Model S and the third was associated with a negative analyst report.

The upshot is that the most striking feature of the event study is how little real news arrived during the run-up period. While one might quibble about the details of any particular news release, in the aggregate there is nothing that remotely explains a sevenfold increase in price.

The Impact of Noise Trading

If it is not fundamental information that is driving Tesla’s prices during this period, what is the source of price movements? Following the path breaking work of DeLong, Shleifer, Summers, and Waldmann (1990) and Shleifer and Vishny (1990), an extensive literature blossomed regarding the role of noise traders in financial markets and the limits on the willingness of sophisticated traders to counteract their impact. The basic idea was that noise traders were subject to bouts of sentiment, which could drive a wedge between stock prices and fundamental value. Because of the risk associated with betting against the noise traders, and because of limitations on risk capital, it was hypothesized that there would be situations in which sophisticated traders would fail to fully offset the impact of noise traders. Furthermore, the theory held that the riskier the stock, and the greater the extent to which its value depended on growth options, the more unlikely it would be that the impact of noise traders would not be fully offset.

To evaluate the extent to which the noise trader theory applies to Tesla, we examine the time series of two related statistics: the ratio of individual share holdings to
institutional holdings and the ratio of shares sold short to shares outstanding. Exhibit 11 plots both the stock price for Tesla and the institutional ownership as a percentage of the shares outstanding. The figure shows that institutional ownership peaks at about 87 percent just as the run-up begins in late March 2013. It then declines steadily, with some volatility, to approximately 65 percent by the end of the run-up period. The figure provides support for the noise trader theory that as noise traders drove the run-up, the “smart” institutional investors liquidated their positions. However, the evidence is far from overwhelming. Even by the end of the period, when our DCF models predict that the stock was significantly overvalued, institutions still accounted for about two-thirds of the Tesla holdings.

-- Exhibit 11 here --

The data in Exhibit 12, which plots short interest as a percent of shares outstanding, are more ambiguous. First, the short interest rises almost monotonically from the IPO to the date at which the run-up began despite the fact that Tesla’s stock was not outperforming either the market or the industry during this period. When the run-up begins, the short interest plummets. There are two plausible explanations for the drop. One, along the lines of Shleifer and Vishny (1990), is that short sellers are capital constrained so that when losses accumulate, as they would during the run-up, they cannot meet continuing margins calls and are forced to cover their positions. The other explanation, more along the lines of the noise trader literature, is that short sellers become aware of the added volatility of the stock when the run-up begins and, therefore, are unwilling to maintain the level of their short positions in the face of the higher perceived volatility. However, by the time the stock price hits $150, short interest starts to rise
again and it increases steadily until the end of the run-up period.\(^5\) This suggests that if fundamental investors perceive the overvaluation to be large enough, the higher expected returns of selling short become sufficient to overcome the capital constraints and perceived risk.

-- Exhibit 12 here --

Overall, the trading data are broadly consistent with a view that the sentiment that drove the run-up came from what have come to be referred to as “noise” traders. Sophisticated investors did lean against the trend to an extent in that institutional holders were net sellers and short positions rose. However, the magnitude of these offsetting effects was too weak to blunt the sevenfold increase in the price.

**Reconciling Price and Value**

Looking at the value and price narratives, there is clearly a divergence between price and value that is large. There are two possible explanations. The first is that the value process is missing a key component and that the valuations are therefore understated. For this to be true, it also has to be the case that this key fundamental component has become more important over time since the gap has widened. The second is that the pricing process has lost its fundamental moorings and is increasingly being driven by sentiment and momentum.

*Possible Sources of Missing Value*

\(^5\) It is worth noting that throughout the time period following the IPO, Tesla’s shares outstanding have been rising because of the exercise of stock options granted to employees and management. As a result, gross short positions have been rising more quickly than the percentages reported in the text.
As stressed earlier, we made an effort to make every assumption as optimistic as reasonably possible when developing our DCF models. There are, however, some factors we did not consider. First, there is a chance that Tesla could be an attractive target for a larger company (either technology or automobile) to acquire as an entrée into either the electric battery or electric automobile market. Over much of the last few years, rumors have floated about Apple, Google and numerous auto companies being interested in acquiring Tesla, even though Elon Musk has been fairly explicit in his assertions that he will not sell the company. To the extent that there is synergy that can accrue from such a merger, research has found that target companies generally capture most of the benefits.\(^6\) It is possible, therefore, that the market price of Tesla includes a premium for the expected synergy from an acquisition that we did not include. We note, however, that if our analysis is correct and Tesla price greatly exceeds its fundamental value, a potential buyer, who presumably is both sophisticated and rational would be deterred from making a bid.

Another possible explanation for the value gap is that Tesla’s battery technology is so unique and difficult to replicate that it will allow them to use it to enter other markets. In the most recent quarter, for instance, the announcement that Tesla would build a mega factory for electric batteries started a discussion of whether Tesla was planning to enter the electric utility market (and supply power to homes). While this is pretty much sheer speculation given that no specific battery technology has been announced, it could be used as the basis for a real options argument that would add a premium to Tesla’s market price of Tesla that we did not include in our valuation.

\(^6\) See, for example, Weston, Mitchell and Mulherin (2003)
In our opinion, both these possibilities carry little weight. Not only are they speculation unsupported by any direct evidence, but even if they were to come to pass it is not clear that much value would be added.

Taking all the evidence into account, our view is that the conclusion that Tesla’s stock price was driven, at least in part, by investor sentiment, stoked by momentum, is inescapable. Even assuming that Tesla would grow at a compound rate of 70 percent per year, transforming it from a niche manufacturer to a company with the market share equal to that of Audi, while maintaining margins comparable to Porsche, we are able to rationalize values only about 40 percent of Tesla’s market price.

Conclusion

This paper presents a detailed anatomy of the nearly sevenfold run-up in the price of Tesla stock between March 22, 2013 and February 26, 2014 with the goal of attempting to determine the role played by investor sentiment. Tesla offers a unique opportunity in this context because the run-up was on the order of magnitude experienced by some of the most volatile technology stocks, but Tesla operates in an industry, automotive manufacturing, and a potential industry, battery construction, that is mature and is populated by established competitors. This makes it possible to construct discounted cash flow valuation models that are anchored on established fundamentals.

As part of our analysis we constructed a detailed DCF model and used it to value Tesla at three separate dates: prior to the start of the run-up, during the run-up, and at the end of the run-up. The valuations all yield estimates of value that are well below the market price (at the time of the valuation), with price more than two and one-half times
an aggressively optimistic estimate of value. From this perspective, we conclude that investor sentiment played an important role in the run-up.

Our event study analysis of the information that arrived during the run-up period leads to a similar conclusion. Though good news did arrive during the run-up period, there were no path-breaking innovations such as the development of new technologies or the introduction of new products. Earnings and revenue surprises were net positive, but not dramatically so. Once again, therefore, we conclude that the price appreciation during the period cannot be explained by fundamentals and must be attributed, at least in part, to investor sentiment.

If a sentiment unrelated to fundamentals played a significant role in the run-up, the standard noise trader model predicts that sophisticated investors would “lean against the wind,” but that their willingness to take oversetting positions may be blunted by both noise trader risk and capital constraints. We see some evidence for both effects. The fraction of Tesla stock held by institutions falls consistently during the period and after an initial collapse, short interest increases sharply. It should be stressed, however, that the stock price rose by a factor of seven times even in light of these offsetting forces. Consequently, the impact of “smart” trading was clearly dominated by sentiment.

To conclude, our case study of Tesla offers support for Summers’ (1986) assertion that stock prices can diverge significantly and persistently from rational fundamental value. But persistently does not mean forever. At some point, as the information about the cash flow generating characteristics of the business become clearer, price and value should start to converge.
REFERENCES


Exhibit 1: Path of Wealth June 29, 2010 Through February 26, 2014
Tesla versus S&P and Industry Index
Exhibit 2: Value versus Price

Tools for intrinsic analysis
- Discounted Cashflow Valuation (DCF)
- Intrinsic multiples
- Book value based approaches
- Excess Return Models

Tools for "the gap"
- Behavioral finance
- Price catalysts

Tools for pricing
- Multiples and comparables
- Charting and technical indicators
- Pseudo DCF

Drivers of intrinsic value
- Cashflows from existing assets
- Growth in cash flows
- Quality of Growth

Drivers of "the gap"
- Information
- Liquidity
- Corporate governance

Drivers of price
- Market moods & momentum
- Surface stories about fundamentals

INTRINSIC VALUE → Value → THE GAP Is there one? Will it close? → Price → PRICE

Diagram with curves representing intrinsic value and price, showing the gap and its potential to close.
Exhibit 4: Tesla's Earnings - 2008 to 2013
Exhibit 5: Tesla Profit Margins - 2008 to 2013
Exhibit 6: Tesla Revenue Growth Rates - 2008-2013

- Over same quarter, previous year
- Over previous quarter
Exhibit 7: Tesla Invested Capital and Sales/Capital
### Exhibit 8

#### Summary of the DCF Valuation Models

<table>
<thead>
<tr>
<th></th>
<th>May 2011</th>
<th>September 2013</th>
<th>March 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailing 12-month revenues</td>
<td>$117.00</td>
<td>$1,329.00</td>
<td>$2,013.50</td>
</tr>
<tr>
<td>Trailing 12-month operating</td>
<td>($81.00)</td>
<td>($217.00)</td>
<td>-$21.81</td>
</tr>
<tr>
<td>income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target revenues (in year 10)</td>
<td>$5,047.00</td>
<td>$65,422.00</td>
<td>$79,520</td>
</tr>
<tr>
<td>Target operating margin</td>
<td>10.00%</td>
<td>12.50%</td>
<td>12.00%</td>
</tr>
<tr>
<td>Sales/Capital ratio</td>
<td>1.8</td>
<td>1.41</td>
<td>1.55</td>
</tr>
<tr>
<td>Return on capital (in year 10)</td>
<td>8.52%</td>
<td>11.27%</td>
<td>12.15%</td>
</tr>
<tr>
<td>Cost of capital (initial)</td>
<td>11.08%</td>
<td>10.03%</td>
<td>8.74%</td>
</tr>
<tr>
<td>Cost of capital (perpetuity)</td>
<td>6.93%</td>
<td>8.00%</td>
<td>8.00%</td>
</tr>
<tr>
<td>Estimated Equity Value</td>
<td>$964.00</td>
<td>$11,797.00</td>
<td>$16,742</td>
</tr>
<tr>
<td>Estimated value/share</td>
<td>$8.56</td>
<td>$67.12</td>
<td>$100.35</td>
</tr>
<tr>
<td>Price/share</td>
<td>$22.20</td>
<td>$168.76</td>
<td>$220.00</td>
</tr>
<tr>
<td>% under or over valued</td>
<td>159.35%</td>
<td>151.43%</td>
<td>119.24%</td>
</tr>
</tbody>
</table>
### Exhibit 9

**Tesla Earnings Surprises and the Stock Price Reaction**

<table>
<thead>
<tr>
<th>Date</th>
<th>Reported</th>
<th>Consensus Estimate</th>
<th>Surprise</th>
<th>Excess Return (Tesla - S&amp;P 500)</th>
<th>T statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8/2013</td>
<td>$0.12</td>
<td>$0.04</td>
<td>$0.08</td>
<td>23.99%</td>
<td>7.23</td>
</tr>
<tr>
<td>8/7/2013</td>
<td>$0.20</td>
<td>($0.20)</td>
<td>$0.32</td>
<td>14.72%</td>
<td>4.43</td>
</tr>
<tr>
<td>11/5/2013</td>
<td>$0.12</td>
<td>$0.10</td>
<td>$0.02</td>
<td>-14.23%</td>
<td>-4.29</td>
</tr>
<tr>
<td>2/9/2014</td>
<td>$0.33</td>
<td>$0.26</td>
<td>$0.07</td>
<td>5.22%</td>
<td>1.57</td>
</tr>
</tbody>
</table>
Exhibit 10: Tesla Motors Event Study Significant Residual Returns

<table>
<thead>
<tr>
<th>Significant Date</th>
<th>Tesla Price</th>
<th>Tesla Return</th>
<th>S&amp;P 500 Return</th>
<th>Tesla Market Residual</th>
<th>Significant Increase/Decrease in Return</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/1/2013</td>
<td>43.93</td>
<td>15.94%</td>
<td>0.41%</td>
<td>15.54%</td>
<td>Increase</td>
<td>Tesla Sees 1st-Quarter Profit on Better-Than-Expected Model S Sales (Dow Jones Newswires): &quot;Tesla Motors Inc. (TSLA) expects to report a first-quarter profit on a reported and adjusted basis thanks to better-than-expected sales of the luxury electric-car maker's Model S.&quot; UPDATE: Tesla Motors Records Its First Quarterly Profit (Dow Jones Newswires): &quot;Tesla Motors Inc. (TSLA) said it will report its first-ever quarterly profit - for the opening three months of 2013, after delivering more Model S electric cars than it had previously estimated.&quot; Tesla set for first-ever quarterly profit (Financial Times): &quot;Tesla Motors said it was on the verge of reporting its first quarterly profit in its 10-year history, a watershed moment in its attempt to become the electric car industry's first successful start-up. The news sent Tesla's shares up more than a fifth in early trading on Monday in New York to a new high of $45.88, valuing it at more than $5bn.&quot;</td>
</tr>
<tr>
<td>4/16/2013</td>
<td>45.59</td>
<td>5.29%</td>
<td>-2.30%</td>
<td>7.59%</td>
<td>Increase</td>
<td>Tesla shares get a jolt (CNN Money): &quot;While there may not be any tangible news behind Tuesday's surge, StockTwits traders had plenty to say ... 'TSLA pretty much at all-time highs...Tesla wants to lead the market and its the right company to do it (long) Bullish' ... 'TSLA just upgraded to the race track... Bullish' ... 'There is a strong underlying bid for TSLA. It is shaping out to be one of the leading stocks in 2013' ... 'TSLA With such a huge short interest, $50s could happen in a flash. Not a stock to be short right now. On the verge.'</td>
</tr>
<tr>
<td>4/29/2013</td>
<td>54.94</td>
<td>7.30%</td>
<td>-0.18%</td>
<td>7.49%</td>
<td>Increase</td>
<td>Tesla Tunes Up Model S Warranty, Loaner Cars, Service Plan (Green Car Reports): &quot;On Friday [26 April 2013], Tesla held a media call to reveal another in the series of announcements touted in tweets by CEO Elon Musk.&quot; Tesla Reveals Generous Model S &quot;Hassle Free&quot; Battery Replacement, Service Programs (Daily Tech): &quot;Tesla explained its new service and warranty program for the Model S last week, revealing convenient options like valet services and even a Roadster loaner if your Model S needs to go to the shop. Tesla CEO Elon Musk laid out the new service and warranty program for the Model S in a blog post, saying that customers should have a service experience that is even better than not needing service at all.&quot;</td>
</tr>
<tr>
<td>5/6/2013</td>
<td>59.50</td>
<td>9.07%</td>
<td>1.05%</td>
<td>8.02%</td>
<td>Increase</td>
<td>WSJ Blog: Tesla Motors Revamps Sales Program (Dow Jones Newswires): &quot;Tesla Motors Inc. said it revamped a month-old sales program that guarantees the resale value of its about $70,000 plug-in electric car after the program was widely criticized. A new offer guarantees that the Model S will be worth at least 50% of its original cost after three years, up from 43%.&quot;</td>
</tr>
</tbody>
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</tr>
</thead>
<tbody>
<tr>
<td>5/9/2013</td>
<td>69.40</td>
<td>24.40%</td>
<td>0.41%</td>
<td>23.99% Increase</td>
<td>Tesla shares accelerate (Financial Times): &quot;Shares in Tesla Motors soared to record highs in after-market trading yesterday as the US electric carmaker reported its first quarterly profit and lifted its forecast for deliveries of its new Model S sedan for this year, writes Richard Waters in San Francisco. A rise of more than a quarter took the total jump in Tesla's share price to 88 per cent since it disclosed at the beginning of last month that it expected to report a quarterly profit.&quot;</td>
</tr>
<tr>
<td>5/10/2013</td>
<td>76.76</td>
<td>10.61%</td>
<td>-0.37%</td>
<td>10.98% Increase</td>
<td>Getting the Short Story on Tesla Motors (The Wall Street Journal): &quot;After announcing its first-ever quarterly profit Wednesday [8 May 2013], the electric-car maker saw its shares surge 24% Thursday [9 May 2013]. With a market value of $7.9 billion, Tesla is now worth more than Fiat.&quot;</td>
</tr>
<tr>
<td>5/13/2013</td>
<td>87.80</td>
<td>14.38%</td>
<td>0.43%</td>
<td>13.94% Increase</td>
<td>Tesla's electric car drives up price as S&amp;P resurgence hits the brakes (Financial Times, 10 May 2013) &quot;US stocks declined despite a jump in Tesla Motors, with the carmaker's shares rising strongly after its latest electric vehicle received a near-perfect score from a leading consumer reviews publication ... Tesla Motors touched a record high and rose 24.4 per cent to $69.40. Its shares were lifted by a review of its Model S-electric car, which was awarded a near-perfect score by the Consumer Reports magazine. The review came after Tesla reported its first profit and bolstered its full-year sales outlook.&quot;</td>
</tr>
</tbody>
</table>

A letter to the short sellers from Tesla and Netflix (Financial Times): "Elon Musk, boss of electric luxury car maker Tesla Motors, and Reed Hastings, chief executive of Netflix, love to write quarterly updates to their shareholders." 

Tesla sales beating Mercedes, BMW and Audi (CNN Money): "...in the first quarter of this year, more people bought a Tesla Model S than bought any of the similarly priced gasoline-powered cars from the top three German luxury brands, according to data from LMC Automotive. About 4,750 buyers bought a Model S while just over 3,000 people bought Mercedes' top-level sedan. "

...
Exhibit 10: Tesla Motors Event Study Significant Residual Returns

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<th>Tesla Return</th>
<th>S&amp;P 500 Return</th>
<th>Tesla Market Residual</th>
<th>Significant Increase/Decrease in Return</th>
<th>Comment</th>
</tr>
</thead>
</table>
| 5/16/2013        | 92.25       | 8.73%        | 0.51%          | 8.22%                 | Increase                                | US HOT STOCKS: Infinity Pharmaceuticals, Pike Electric, Tesla Motors -2- (Dow Jones Newswires): "Tesla Motors Inc. (TSLA, $90.17, +$5.33, +6.28%) said it plans to sell stock and convertible notes to repay debt and for corporate purposes, taking advantage of a recent rally in its stock price."
|                  |             |              |                |                       |                                         | Tesla's Capital Raise to Test Demand for Its High-Flying Stock (Dow Jones Newswires): "An offering of stock and convertible debt by Tesla Motors Inc. (TSLA) slated for after the close of trading Thursday is set to be a test of demand for the red-hot stock. The chance to grab of blocks of Tesla shares—which have increased in value by more than 50% in little over a week—could provide a window to demand among professional money managers, who typically buy a significant portion of the shares in such deals, market participants said."
|                  |             |              |                |                       |                                         | Tesla Upsizes, Lowers Coupon Range In Convertible Bond Offering (Dow Jones Newswires): "Tesla Motors Inc. (TSLA) upsized its convertible bond sale, according to people familiar with the matter, an apparent sign of strong demand for the offering."
|                  |             |              |                |                       |                                         | Elon Musk raises $1.3bn for green tech (Financial Times): "Tesla Motors, Mr Musk's electric car company, revealed plans to capitalise on its soaring share price by raising $830m. Around $450m would come from a sale of convertible notes, with the rest from an offering of common stock, Tesla said. Mr Musk himself would put up $100m of the money, it added ... Tesla's shares climbed another 9 per cent on Thursday despite the size of the capital-raising, as investors reacted positively to the greater financial flexibility it will now have." |
| 5/23/2013        | 92.73       | 6.29%        | -0.83%         | 7.12%                 | Increase                                | Corporate News: Electric Car Startup Tesla Repays U.S. Loan (The Wall Street Journal): "Luxury electric-car maker Tesla Motors Inc. said on Wednesday it has fully repaid a $452 million federal loan it received in 2010, and said it would be able to finance development of its next two vehicles without selling new shares. Tesla promised earlier this month that it would use some of the proceeds from a $1 billion sale of stock and debt to repay a loan it received during the depths of the financial crisis, when even well-established car makers were scrambling to finance their operations. The company and the U.S. Department of Energy confirmed the repayment on Wednesday." |
| 5/28/2013        | 110.33      | 13.65%       | -0.06%         | 13.71%                | Increase                                | Tesla Shares Break $100, Punishing Short-Selling Skeptics (Bloomberg Businessweek): "Shares of Tesla (TSLA), that automaker-slash-tech-darling, crossed 100 today for the first time, after already tripling this year. The headline reason is the electric vehicle upstart’s planned announcement of an expansion to its Jetson-esque charger network this week." |
## Exhibit 10: Tesla Motors Event Study Significant Residual Returns

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<th>Tesla Market Residual</th>
<th>Increase/Decrease in Return</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/1/2013</td>
<td>117.18</td>
<td>9.15%</td>
<td>-0.43%</td>
<td>9.57%</td>
<td>Increase</td>
<td>Tesla shares reach new high (CNN Money): &quot;Tesla's stock soared into record territory Monday after the electric car maker received another upgrade from Wall Street analysts. Tesla (TSLA) shares ended the day at a record $117.18, gaining more than 9%. The rally came after analysts at Jefferies raised their price target to $130, saying the company is likely to report stronger-than-expected sales of the new Model S this year.&quot; Tesla Jumps to Record After Analyst’s Note: Mover (Bloomberg): &quot;Tesla Motors Inc. (TSLA) surged to a record high after a Jefferies Group LLC analyst almost doubled her price target for the maker of electric cars and increased estimates of its 2013 deliveries … Elaine Kwei, an analyst for Jefferies, today raised her price target on Tesla to $130 from $70 and increased her estimate of 2013 Tesla production to 21,500 Model S sedans from 19,800. Kwei also boosted her estimate for Tesla’s second-quarter output to 5,000 from 4,500. Despite the massive run in the stock, we believe TSLA is one of the best growth stories in the market today and still has upside,&quot; Kwei wrote, referring to Tesla’s ticker symbol. The analyst cited higher Model S sales and better profit margins as among 'potential positive catalysts.'&quot;</td>
</tr>
<tr>
<td>7/17/2013</td>
<td>120.25</td>
<td>10.27%</td>
<td>-0.37%</td>
<td>10.64%</td>
<td>Increase</td>
<td>Tesla shares bounce back (CNN Money): &quot;Tesla Motors made a comeback Wednesday, one day after Goldman Sachs issued a bearish research report on the electric car maker. Tesla (TSLA) shares rose more than 10%, recovering most of the previous day's sharp losses. It ended the day at $120.25. The stock plunged Tuesday after Goldman Sachs (GS, Fortune 500) analysts gave Tesla a price target of $84 a share, based on the average outcome of three scenarios it foresaw for the company.&quot; Earnings: Tesla Hikes Output --- Investor Push Up Shares on Smaller Loss (The Wall Street Journal): &quot;Luxury electric-car maker Tesla Motors Inc. reported a net loss for the quarter, but exceeded Wall Street expectations for production and gross margins, sending its shares higher in after-hours trading.&quot; Strong sales power Tesla (Financial Times): &quot;Shares in Tesla Motors, the electric carmaker, hit another new high in after-hours trading on Wednesday, despite a quarterly dip in revenues, as sales of its Model S beat expectations and deliveries began in Europe. Elon Musk, Tesla's chief executive, said the California-based manufacturer had delivered 5,150 electric vehicles in the three months to June 30, above its forecast of 4,500, as Tesla expands into Europe and Asia.&quot;</td>
</tr>
<tr>
<td>8/8/2013</td>
<td>153.48</td>
<td>14.34%</td>
<td>-0.38%</td>
<td>14.72%</td>
<td>Increase</td>
<td>U.S. HOT STOCK FUTURES: HOT STOCKS TO WATCH (Dow Jones Newswire): &quot;Luxury electric-car maker Tesla Motors reported a net loss for the second quarter, but exceeded Wall Street expectations for production and gross margins, sending its shares higher in after-hours trading. Shares climbed 14% to $152.80 after hours.&quot;</td>
</tr>
<tr>
<td>Significant Date</td>
<td>Tesla Price</td>
<td>Tesla Return</td>
<td>S&amp;P 500 Return</td>
<td>Tesla Market Residual</td>
<td>Significance Increase/Decrease in Return</td>
<td>Comment</td>
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</tr>
<tr>
<td>8/22/2013</td>
<td>157.10</td>
<td>6.25%</td>
<td>-0.58%</td>
<td>6.83%</td>
<td>Increase</td>
<td>Corporate News: Tesla Amps Its Crash Score (The Wall Street Journal): &quot;Tesla Motors Inc. has created its own vehicle-safety ranking based on federal crash-test data to amplify a claim that its Model S electric car is the safest car ever tested by U.S. regulators. Tesla, in a statement widely reported this week, said its car 'achieved a new combined record of 5.4-stars' in federal crash tests. Tesla noted that the National Highway Traffic Safety Administration, which conducts the government's auto-crash tests, doesn't use a rating above five stars.&quot;</td>
</tr>
<tr>
<td>11/4/2013</td>
<td>175.20</td>
<td>8.03%</td>
<td>0.29%</td>
<td>7.74%</td>
<td>Increase</td>
<td>Press Release: Tesla Motors Reaches Agreement with Panasonic to Receive 2 Billion Automotive Grade Lithium-Ion Battery Cells Over Four Years - Video News Alert Posted on InvestmentPitch.com (Dow Jones Institutional News): (NASDAQ:TSLA) reached an agreement with Panasonic, whereby Panasonic is expanding its supply of automotive grade lithium-ion battery cells to the car company. It will now supply 2 billion battery cells to Tesla Motors.</td>
</tr>
<tr>
<td>12/3/2013</td>
<td>144.70</td>
<td>16.53%</td>
<td>-0.27%</td>
<td>16.81%</td>
<td>Increase</td>
<td>&quot;Morgan Stanley made Tesla Motors Inc. (TSLA, $144.70, +$20.53, +16.53%) its top pick saying the stock has gone from 20% overvalued to 20% undervalued due to the news about the Model S fires. The electric-car maker on Monday [2 December 2013] said that an investigation by German authorities into three recent fires in Model S electric sports sedans found no manufacturer-related defects.&quot;</td>
</tr>
<tr>
<td>12/12/2013</td>
<td>147.47</td>
<td>5.60%</td>
<td>-1.13%</td>
<td>6.73%</td>
<td>Increase</td>
<td>TESLA: We Will Probably Reveal Our Mass Market Car At The 2015 Detroit Auto Show (Business Insider): &quot;Tesla's cheaper electric car is coming. In an interview with AutoBild, chief designer Franz von Holzhausen says Tesla will &quot;probably&quot; reveal its more affordable car at the 2015 Detroit auto show.&quot;</td>
</tr>
<tr>
<td>1/14/2014</td>
<td>161.27</td>
<td>15.74%</td>
<td>1.08%</td>
<td>14.66%</td>
<td>Increase</td>
<td>Tesla Reports 6,900 4Q Deliveries, 20% Above Guidance -- Update (Dow Jones Institutional News): &quot;Tesla Motors Inc. delivered 6,900 Model S electric sedans in the last three months of the year, 20% higher than the estimate it gave when it reported its third-quarter earnings in November, said Jerome Guillen, Vice President of sales. The news sent Tesla shares up more than 10% in afternoon trading on the NASDAQ stock exchange.&quot;</td>
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<td>Tesla shares rise despite charger fears (Financial Times): &quot;Tesla Motors said on Tuesday it had overcome manufacturing and supply constraints to deliver 6,900 vehicles in the final quarter of 2013, significantly more than it had forecast. The statement, which was made shortly after US regulators said they had found problems of overheating in a Tesla electric charger, pushed the company's shares up by nearly 16 per cent.&quot;</td>
</tr>
<tr>
<td>Significant Date</td>
<td>Tesla Price</td>
<td>Tesla Return</td>
<td>S&amp;P 500 Return</td>
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</tr>
<tr>
<td>2/20/2014</td>
<td>209.97</td>
<td>8.43%</td>
<td>0.60%</td>
<td>7.83%</td>
<td>Increase</td>
<td></td>
</tr>
</tbody>
</table>

Tesla Motors: Up, Up and Away -- Barron's Blog (Dow Jones Institutional News): "How good were Tesla Motors' (TSLA) earnings? So good that not only has the stock has come close to a double-digit gain this morning, but analysts—even the bearish ones—are being forced to raise their price targets. Jefferies’ Elaine Kwei explains why investors are so enthusiastic about Tesla's report: We think [Tesla's] 2014 guidance exceeded the high end of Street expectations on both deliveries & gross margin. The 35,000 deliveries will be essentially all Model S, the Model X is not expected to ship in meaningful numbers until early 2015. The bridge to the gross margin improvement is comprised of higher manufacturing volumes, process improvements, & lower costs from suppliers. Although 1H production faces some battery cell supply constraints, this is expected to improve in 2H as Panasonic increases production. Finally, [Tesla] now expects to produce vehicles at a rate of 1000 cars/week exiting 2014 (up from 600 cars/week currently), a 25% increase from prior guidance for 800 cars/week. The increase in production capability comes from the addition of final assembly capacity, which has thus far been the constraining factor on the factory floor. We expect [Tesla's] international expansion into China & other global markets to be the dominant theme for 2014."

Corporate News: Tesla Opens Production Throttle (The Wall Street Journal): "The Palo Alto, Calif., maker of $70,000 and up electric cars on Wednesday [19 January 2014] said it had a net loss of $16.2 million for the final quarter of 2013. Factoring out non-cash executive compensation and other costs, Tesla said it earned $46 million, and generated $40 million in free cash flow, a sign that it is making money from building cars. Revenue soared to $615.2 million from $306.3 million in the same quarter a year earlier. The results -- and Mr. Musk's bullish outlook for sales of the current Model S electric sedan and a future Model X electric sport-utility vehicle -- boosted Tesla's shares by 12% to $216.67 in after-hours trading."
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</tr>
</thead>
<tbody>
<tr>
<td>2/25/2014</td>
<td>248.00</td>
<td>13.94%</td>
<td>-0.13%</td>
<td>14.08%</td>
<td>Increase</td>
<td></td>
</tr>
</tbody>
</table>

Tesla Shares Surge on Morgan Stanley Report -- WSJ Blog (Dow Jones Institutional News): "Tesla Motors Co. might be on the verge of disrupting two industries, warranting a share price of $320, says Morgan Stanley analyst Adam Jonas, in a note to investors released Tuesday. It's shares surged 11% to $241.18 in early trading on the Nasdaq after Mr. Jonas released his note."

Tesla Motors: Do I Hear $320? -- Barron's Blog (Dow Jones Institutional News): "Sure, why not, say Morgan Stanley's Stephen Byrd and team, as they consider Tesla Motors' ( TSLA) disruptive potential. Byrd explains why he raised Tesla's price target to $320: Our previous target of $153 was based on the company implementing a successful EV business, but mostly confined to niche status, occupying less than 0.5% of global auto market share by 2025 ... But what if Tesla's ambitions extended further than giving high-end OEMs a run for their money? What if a period of transformational technological change in the auto industry coincided with Tesla's application of its capabilities in hardware, software, infrastructure, and manufacturing. Assuming the Gen 3 is a success, we actually have a hard time imagining Tesla not having a very significant impact on the process of standard-setting in the auto industry over the next decade."

The Bear Case for Tesla -- WSJ Blog (Dow Jones Institutional News): "The higher Tesla Motors Inc. shares rally, the louder the bears keep growling. Shares surged Tuesday following an upbeat report from Morgan Stanley, which more than doubled its Tesla price target to $320 and said the electric car maker might be on the verge of disrupting two industries. The stock traded as high as $259.20, a new record."

Tesla's sudden acceleration recalls dotcom rush (Financial Times): "Seldom since the days of the dotcom bubble has a single investment analyst's call so electrified the stock market. Shares in Tesla Motors, the US electric car manufacturer that had already climbed a wall of investor euphoria, shot up as much as 19 per cent on Tuesday morning thanks to a single note from a Wall Street analyst."

Panasonic, Tesla to Set Up Auto Battery Plant in U.S. - Nikkei (Dow Jones Institutional News): "TOKYO -- Panasonic and California-based electric-vehicle startup Tesla Motors are in talks to build an automotive battery plant in the U.S., aiming to lower manufacturing costs via mass production, The Nikkei reported in its Wednesday morning edition."

Tesla Lines Up Partners For Factory (Dow Jones Institutional News): "Tesla Motors Inc. shares hit a record high of $248 on Tuesday ahead of an expected announcement of a battery-production partnership in which the company would carve out a business making advanced batteries for itself and others."
## Exhibit 10: Tesla Motors Event Study Significant Residual Returns

<table>
<thead>
<tr>
<th>Significant Date</th>
<th>Tesla Price</th>
<th>Tesla Return</th>
<th>S&amp;P 500 Return</th>
<th>Tesla Market Residual</th>
<th>Significant Increase/Decrease in Return</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/3/2013</td>
<td>41.10</td>
<td>-7.31%</td>
<td>0.52%</td>
<td>-7.82%</td>
<td>Decrease</td>
<td>Investors Get a Not-So-New Deal From Tesla (The Wall Street Journal, 4 April 2013): &quot;Late Tuesday [2 April 2013], the electric-vehicle maker outlined a new leasing program, an announcement hotly anticipated due to prior tweets sent by Chief Executive Elon Musk. The day before, the company surprised by saying it had beaten its first-quarter deliveries target and would now show a profit for the period under generally accepted accounting standards. Tesla's stock hit an all-time high of almost $47 on Monday and, despite slipping back, is still up 8.5% this week.&quot;</td>
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<tr>
<td>5/7/2013</td>
<td>55.51</td>
<td>-6.71%</td>
<td>0.19%</td>
<td>-6.90%</td>
<td>Decrease</td>
<td>Tesla zooms to new high, then pulls back (CNN Money): &quot;No cruise control for Tesla. Shares of the electric car maker took off Tuesday, racing to a new high above $60 right out of the gate. But by late morning, the enthusiasm had chilled, and the stock was down about 3%. The supercharged moves come one day before Tesla (TSLA) is set to report its first quarterly profit ever.&quot;</td>
</tr>
<tr>
<td>5/31/2013</td>
<td>97.76</td>
<td>-6.85%</td>
<td>0.37%</td>
<td>-7.22%</td>
<td>Decrease</td>
<td>Why You Should Tap The Brakes On Tesla Motors (Forbes): &quot;Tesla Motors has garnered a lot of attention lately. Shares of the Silicon Valley based automaker have jumped close to 100% in the last month and more than 50% since it released its earnings a couple of weeks ago. The automaker turned profitable for the time in the first quarter, which shows how far the company has come. Keeping in mind the latest developments, we have raised our price estimate for Tesla to $69. On the other hand, it is still about 20% below the market price. One should exercise cautious optimism following the rally in the company’s shares. It is important to look at the company’s fundamentals to gauge the kind of premium levels that are justified and reasonable. We are cautious on the stock due to the following factors: 1) Revenue Per Vehicle Unsustainable ... 2) Margin Forecast A Challenge ... 3) Profits Are Still Very Small ...&quot;</td>
</tr>
<tr>
<td>7/16/2013</td>
<td>109.05</td>
<td>-14.31%</td>
<td>0.14%</td>
<td>-14.45%</td>
<td>Decrease</td>
<td>On Tesla, Goldman, And The Failure Of Imagination (Forbes): &quot;A Goldman Sachs analyst named Patrick Archambault did what no one else has been able to in 2013: He put a stop to the rally in shares of Tesla Motors TSLA -2.6%, sending them down 14% with a bearish forecast for the company.&quot;</td>
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<td>MARKET TALK: Tesla Slides as Goldman Crunches Numbers (Dow Jones Newswires): &quot;Tesla Motors (TSLA) slides as Goldman Sachs sets a new price target for the luxury electric-car maker. Though the firm ups its target to $84 from $61, that's still significantly lower than Monday's close of $127.26. Plus, in Goldman's best case scenario for TSLA, which sees TSLA getting 3.5% global market share with sales of 200,000 vehicles and achieving slightly better than forecast 15.2% operating margin, the firm sees shares at $113. Worst case, TSLA moves only 105,000 vehicles and has operating margins of 14.6%, implying a share price of $58. TSLA shares, which have nearly quadrupled since the start of the year, fall 8.2% to $116.89.&quot;</td>
</tr>
<tr>
<td>Significant Date</td>
<td>Tesla Price</td>
<td>Tesla Return</td>
<td>S&amp;P 500 Return</td>
<td>Significant Residual Returns</td>
<td>Comment</td>
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<tr>
<td>10/2/2013</td>
<td>180.95</td>
<td>-6.24%</td>
<td>0.80%</td>
<td>-7.04% Decrease</td>
<td>Tesla settles dealer dispute in Virginia, fights to quell fire fears (Dow Jones Newswires, 3 October 2013). Tesla shares were down 5.24% in early trading Thursday [3 October 2013] and fell 6.2% on Wednesday [2 October 2013] after a one-two punch of negative news that began with a downgrade by R.W. Baird to &quot;neutral&quot; from &quot;outperform&quot; and was followed by a video of a Tesla Model S burning after an accident went viral on the web. Tesla's cars are powered by lithium-ion batteries, which have become associated with fire risk following various incidents, including fires traced to lithium-ion batteries aboard new Boeing 787 jetliners.</td>
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</table>
| 11/6/2013        | 151.16      | -14.51%      | -0.28%         | -14.23% Decrease            | Corporate News: Tesla Stock Skids on Outlook (The Wall Street Journal): "Tesla Motors Inc. reported a narrower quarterly loss on sharply higher production but its shares fell in after-hours trading as investors worried the luxury electric car maker's outlook for revenue and profit fell short."

<table>
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<th>Tesla Return</th>
<th>S&amp;P 500 Return</th>
<th>Significant Residual Returns</th>
<th>Comment</th>
</tr>
</thead>
</table>
| 11/2/2013        | 139.77      | -7.53%       | 0.43%          | -7.96% Decrease             | Tesla reports third fire involving Model S electric car (Reuters): "Tesla Motor Inc's [TSLA.O] Model S electric car has suffered its third fire in six weeks, sending its shares down nearly 9 percent in Thursday midday trading."

<table>
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<th>Significant Residual Returns</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/18/2013</td>
<td>121.58</td>
<td>-10.24%</td>
<td>0.42%</td>
<td>-10.66% Decrease</td>
<td>The law firm of Wohl &amp; Fruchter LLP investigates alleged violations of financial reporting rules by Tesla Motors, Inc. (Business Wire): &quot;The law firm of Wohl &amp; Fruchter LLP is investigating potential federal securities law claims against officers and directors of Tesla Motors, Inc. (Tesla) (TSLA) in connection with alleged violations by Tesla of Securities and Exchange Commission (SEC) rules governing the disclosure of financial metrics that do not comply with Generally Accepted Accounting Principles (GAAP). &quot;</td>
</tr>
</tbody>
</table>
Exhibit 11: Tesla Stock Price vs Percentage of Institutional Ownership
March 24, 2013 through March 2, 2014

Note: Institutional ownership is reported on the Sunday of each week. Thus, the relevant stock price used is as of the Friday immediately prior.

Source: Bloomberg
Exhibit 12: Tesla Short Interest as Percent of Shares Outstanding vs. Tesla Stock Price

7/15/2010 - 2/28/2014

Source: Bloomberg.