HEC Paris
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Evaluation of a start-up through the signaling theory:

Tesla case study

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Abstract

Fundamental analysis does not explain all of the value of start-ups or young companies. This analysis proposes to utilize selected signals to have a more accurate and complete view of the value of start-ups and young companies. Tesla is used as an example of this.

The research is divided in two parts: (i) a review of the literature body and key methods concerning company valuations, both fundamental and signal-based, and (ii) a case study to apply the signals theory to Tesla.

In the first part, a review of the signals theory is complemented by an analysis of the valuation techniques used to value a company.

In the second part, a fundamental valuation of Tesla done by Damodaran is used as a starting point to demonstrate that some signals were to be taken into account to fully understand Tesla's stock price since fundamental analysis alone justified only a portion of the company's value.

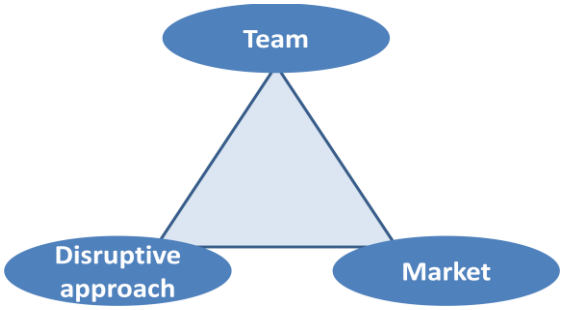
Theory

1. Useful signals

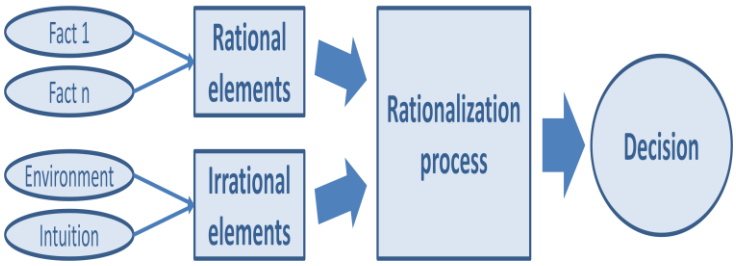
In evaluating a start-up company standard valuation techniques only explain part of the company's value. For this reason, I find it appropriate to add a new perspective to the valuation analysis: the **signals** a company and its stakeholders give to the market may be a good leading indicator of future company performance and, hence, stock prices.

Interpreting the signals and account for them in a valuation model appears a difficult exercise and probably not so "scientific" compared to a DCF, a trade multiple analysis or a transaction multiple analysis. Nevertheless, some signals like the equity investment of an entrepreneur, the number of employees or the investment in the company by officers are strong indicators and ought to be taken into account to have a full view of a company's valuation.

For this thesis I interviewed Mr Boris Golden of Partech Ventures, a venture capitalist fund ('VC'), and found his point of view about seed investments and financing extremely interesting. When Partech invests in early-stage companies a significant part of the due diligence is based on signals given by the entrepreneurs rather than on results which are not yet achieved. The investment decision process is based on both rational elements, a sort of check list for some specific requirements, and subjective assessments or intuitions based on signals and market knowledge. In particular, Graph 1 shows three important aspects which are taken into account in Partech's investment decision: **people**, **disruptive approach (product, business model)** and **market**. Graph 2 shows a simplification of the investment decision process.



Graph 2: key aspects for an investment decision



Graph 1: investment decision process

Both graphs are a rationalization of a much more complex process. However, they help understand at what level the signals are identified (Graph 1) and when they are used (Graph 2). Signals can then be divided in *soft signals*, more linked to intuition and experience, and *factual signals*, more linked to the interpretation of facts. Many soft signals are linked to the management team: credibility, reputation, critic management (open vs defensive), investment in the project (time, money...). On the other side, factual signals are likely to be found in the product and the market: maturity of the idea related to the market, readiness of the market to accept it, market insights on the product quality, other VCs willingness to invest. Both soft and factual signals are then processed in a rational way to express the reasons that bring to the willingness to invest, or not, in a project.

In general, signals can be a strong tool to evaluate or give an insight on the future valuation of a start-up or a company with a short track record. In fact, if the definition of a start-up is that of a company with negative results, negative cash flows and a binary business that either works or fails, using classic valuation techniques such as multiples and DCF is most of times impossible because:

- There are no positive results to compare with the industry
- Risk and the cost of capital are difficult to estimate
- Growth is hard to measure in the long term
- The probability of success of the business is unclear at this early stage.

Clearly, the drawback of a valuation through signals is that most signals are qualitative and as such cannot be utilised quantitatively in deriving a clear-cut hard value of a business. Still, they are strong leading indicators of future company performance, as demonstrated by the following review of some of the most significant theories about early stages signal valuations.

A. Leland and Pyle theory on informational asymmetries, financial structure and financial intermediation (1977)

This work demonstrates that in equilibrium the entrepreneur's equity position in his project is related to the value of his project.

The work is based on the assumption of Akerlof (1970) and Spence (1973) that an equilibrium between supply and demand cannot be found if the information is asymmetric. In fact, as Akerlof demonstrates, while sellers know the quality of their cars, buyers cannot distinguish among them. Therefore, the market value will reflect the average car quality. The price for a good car will then be too low and the price for a bad car too high. Owners of good cars will not be willing to sell their cars at a discount and only bad cars will be sold. Following this negative spiral, the market value will continue to decrease because the average expected value of cars will continue to decrease.

The same concept is applicable to entrepreneurial projects: without a signal, only bad projects will be financed.

To avoid incurring in the negative spiral, and for good projects to be financed, an information transfer must occur. The work demonstrates how entrepreneurs can send signals to the market about the project quality. One such action is the willingness of the founder (or any person with inside information) to invest in the project. In particular, a firm's value increases with the share of the firm held by the entrepreneur.

This finding is in contrast with Modigliani and Miller (1958) where the value of a firm is independent from its financial structure.

The entrepreneur will try to maximise his wealth based on (i) the financial structure of the firm, (ii) his equity in the firm, (iii) his holding of a market portfolio and (iv) risk free assets. The maximisation problem must satisfy the entrepreneur's budget constraints. It is demonstrated that in equilibrium the entrepreneur's equity position in his project is related to the value of his project. In fact, if the implied value of the firm were higher than its actual value, external investors would receive less than the return expected for this type of project. On the other hand, if the implied value of the firm were lower, the opposite would be true.

Two theorems are then demonstrated:

- "THEOREM I. The equilibrium valuation function $\mu(\alpha)$ is strictly increasing with α over the relevant domain, if and only if the entrepreneur's demand for equity in his project is normal", where $\mu(\alpha)$ is the firm's value related to the entrepreneur's share in the firm α

- "THEOREM II. In equilibrium with signalling by α, entrepreneurs with normal demands will make larger investments in their own projects than would be the case if they could costlessly communicate their true mean".

So a high shareholding stake held by the entrepreneur is interpreted as a signal of a good project with α as a signal. At the same time, a welfare loss arises because if the markets were totally efficient, there would be no need for any signal – which has a cost, as in the case of the entrepreneurs investing in their projects - to be communicated to the market for a proper appreciation of the true value of the firm.

To conclude, Leland's and Pyle's works demonstrate rationally that the entrepreneur's share in the firm is a strong signal for the project value. In the context of evaluating a start-up or a company with little track record, this theory appears very useful for external investors in selecting projects. The fact that the entrepreneur believes in his own project and is aligned with external investors by risking a significant part of his wealth has to be interpreted as a strong signal about the project's quality.

B. Signalling through inter-organizational relationships (Reuer, Tong and Wu, 2012)

This work demonstrates how a firm's inter-organizational relationships (e.g. associations with prominent investment banks, venture capitalists and alliance partners) can send a signal about its value to the market. In particular, it analyzes the impact of these relations on the premium paid by acquirers on firms that had been listed in the last five years prior to the acquisitions.

Firms going through an IPO, like start-ups, have short track records and are subject to information asymmetries during the valuation process. Therefore, they will be subject to discounts, unless signals about their quality can be sent to the market.

According to this work, (e.g., Stuart et al., 1999; Hallen, 2008; Hsu, 2006) such signals as partnering with a leading investment bank for the underwriting, being backed by prominent venture capitalists or having strategic alliances all result in strong signals that have long-term effects on the value of start-ups:

- **Partnering with a leading investment bank**: there is a mutual benefit for a good firm to be sponsored by a leading bank and for a leading bank to sponsor a good firm. High quality firms should be willing to pay more for the services of reputable banks to use the bank's reputation to lower the discount investors will pay. On the other hand, since banks repeat their offer to different clients, reputation is key and any opportunistic behaviour can affect future business. As a consequence, the most prominent banks will try to protect their reputation by minimizing the risk of sponsoring a bad company. This two-sided relationship is costly to replicate and therefore it increases the signalling value
- **Being backed by a prominent venture capitalist**: many firms are sponsored by a bank, but only few partner with a VC. The rationale for being backed by a VC can be similar to the one for partnering with a leading bank. However, having the support of a VC is an even stronger signal sent to the market in the sense that VCs have longer term views of a firm. VCs act in the middle between the firm and the market, because VCs are very selective and only chose the projects with the higher chances of success. VCs do not only put their reputation at stake, as banks do, but also money. So they track their investments, they bring their expertise to grow the companies and take a long term view. As for banks, associations with prominent VCs are costly to replicate, because private companies will need to accept a lower valuation when deciding to use a prominent VC's reputation (Hsu, 2004), and high-quality projects are more likely to be able to bear such a cost
- **Having strategic alliances**: alliance partners will have an operational view that neither banks nor VCs have about a firm's technologies and resources. As being associated with a leading bank or a prominent VC, having strategic alliances gives the firm the opportunity to use the partner's reputation to convey a signal to the market about the true value of the project.

The work tests the hypothesis that the acquisition premium is: (i) positively related to the reputation of the investment bank used for the IPO; (ii) is greater for targets backed by prominent VCs; and (iii) is positively related to the number of alliances the company has formed with prominent partners.

The results are noteworthy because they confirm that these signals are significant to explain higher premia:

- Acquisition targets that were sponsored by banks with an above the median reputation during their IPO achieved an average premium of 51%, compared with an average of 43%, and a significance of p-value = 0.10 and t = 1.89
- Acquisition targets backed by prominent VCs achieved an average premium of 53%, compared with an average of 42%, with a significance of p-value = 0.01 and t = 2.64
- Acquisition targets that developed strategic alliances in the last five years achieved an average premium of 56%, compared with an average of 40%, with a significance of p-value = 0.001 and t = 3.63.

In conclusion, partnering with a leading bank, prominent VCs and strategic allies gives a strong signal to the market about a firm's quality. This research is particularly important in the context of a start-up that, like IPO companies, has a short track record. Banks, VCs and allies will be willing to offer their reputation to firms with a short track record only if their perceived gains are higher than their risks: these partnerships are clearly a strong signal to the market.

C. Headcount growth as a signal for changes in valuation (Davila, Foster and Gupta, 2002)

This work tries to understand the relationship between growth in the number of employees and VC funding. In particular, one of the findings is that headcount impacts the valuation of the equity and that the growth in headcount is positively and significantly correlated to the growth in equity value.

Headcount growth can be a signal about the quality of a firm because (i) it is a cost that only good firms are willing and able to bare and (ii) it shows increasing commitment in the project. Considered as a signal, headcount growth can be viewed as a real time measure of the firm. In fact, the research finds that the coefficient for growth in the number of employees is positive and significant at a 3.5% level suggesting a positive relationship between changes in equity value and changes in the number of employees.

In conclusion, it is interesting to note how the growth in headcount can be a significant signal about the quality of a start-up and on its equity value. Furthermore, headcount is easy to measure and gives an internal perspective about the quality of a firm.

D. Deducting information from insiders' trades (Jeng, Metrick, and Zeckhause, 2003; Nejat Seyhun, 2000; Nejat Seyhun, 1986; Finnerty 1976; Lin and Howe 1990; Zaman 1988)

Many papers tried to answer two key questions regarding insiders' trade analysis: the first is whether insiders earn abnormal returns and the second is whether outside investors can mimic insiders' strategies to earn abnormal returns.

The findings of Jeng, Metrick, and Zeckhause (2003) are extremely important to understand the signals that insiders send to the market. In their work, two distinctive six-months portfolios were built, a purchase and a sale one, to track their performance against the market. Three methods are used to compare the results, the CAPM, the four factors model and characteristic-selectivity method. All three methods find that significant abnormal returns are earned by the purchase portfolio: this evidence suggests that insiders have a good feeling about the near-term development of their firm. On the other hand, none of the methods finds significant abnormal returns for the sale portfolio.

The findings about the purchase portfolio work against the strong form of market efficiency and also show that the insiders' position within the firm as well as the size of the firm have no impact on abnormal returns.

On the other hand, the insiders' sale portfolio does not earn significant abnormal results. In fact, the insiders transactions might be motivated by other reasons than returns, like diversification purposes, rebalancing objectives or liquidity needs, that do not bring any relevant information.

Finnerty (1976) shows how insiders time the market using private information. According to this research, there is a relationship between insiders' trades and future financial and accounting information. In particular, it is shown how insiders are long on small, high earnings and high dividends firms and short on large, low earnings and low dividends firms.

Lin and Howe (1990) confirm the previous studies and add that insiders are able to time the market so that insiders' transactions have a significant predictive content.

These studies on insiders' trading are extremely interesting because they confirm statistically that insiders' trades bring information about future results and that insiders can earn abnormal profits.

Now, concerning the second question, whether outsiders can earn abnormal results by following insiders' strategies, Lin and Howe (1990), Rozeff and Zaman (1988) and Seyhun (1986), demonstrate that outsiders are not able to gain from insiders' informative trades. In fact, actively trading on the information provided by insiders' is subject to trading costs that completely offsets the abnormal returns otherwise gained.
The results are interesting because, even if actively mimicking insiders' strategies does not bring any abnormal return, it is demonstrated that insiders' positions are informative about future performance and, hence, company values.

2. Fundamental analysis

Fundamental analysis - like DCF and multiple approaches - are typically the starting point when evaluating a company. They are supposed to be scientific because they force the analyst to understand the firm by building a sound model that forecasts a firm's future performance and they benchmark a firm to the market for a consistent approach.

However, they have many limitations for companies that:

- Have negative results and operating margins
- An unpredictable cost of capital
- An unpredictable growth.

All these elements are typical of a start-up or a young company with little track record and little visibility about its future returns. To arrive at a solid valuation of a start-up is normally quite difficult for three main reasons: (i) past accounting data are unavailable and not significant for fast growing

companies, (ii) projections are mostly subjective, and (iii) valuations are done occasionally at each round of financing.

Therefore, even if fundamental analysis has many benefits, they are best applied to mature companies with a reliable visibility about their future performance. Follows a brief overview of the main fundamental techniques with their pros and cons.

A. DCF

The model

As Damodaran says, "Every asset that has an intrinsic value that reflects its cash flow potential and its risk".

The idea is that every asset class can be valued based on two factors: (i) future cash flows and (ii) the cost of capital that reflects the risk of the project, as follows:

$$PV_{Project} = \sum_{K=1}^{\infty} \frac{CF_k}{(1+r)^k}$$

Therefore, the value of any project is the sum of its future cash flow discounted by the cost of capital. The asset quality depends on different variables that may influence cash flows like:

- The size
- The time
- The duration
- The risk.

The starting point of a DCF is a company's **business plan**. A top down approach is often used to estimate available cash flows and projections are done over a time horizon to estimate future cash

flows based on assumptions on sales growth, margins, CAPEX investments and working capital requirements. Usually hypotheses are made to estimate the aggregates over a 10-year horizon and a terminal value is then calculated to account all the future cash flows from year 10 onward. This model has the advantage in that it forces the analysts to understand the business to make assumptions about the future, but it is obviously better suited for mature companies with relatively stable and predictable cash flows.

Two main methods are used to estimate the terminal value: (i) the growing perpetuity formula $PV = \frac{CF_1}{r-g}$ where r is the discount rate and g the growth rate, usually set as the GDP growth rate, and (ii) the multiples approach where current multiples are applied to the projected aggregates of Sales, EBITDA or EBIT.

All the cash flows available to repay debt holders and equity holders are discounted by the weighted average cost of capital (WACC), which is a weighted average of the cost of the equity and the debt, as follows:

$$WACC = K_e \frac{E}{E+D} + K_d(1-t)\frac{D}{E+D}$$

- K_e is the cost of equity or required return demanded by shareholders to invest in a firm
- K_d is the cost of the debt of a firm, net of taxes, also to account for the tax shield coming from an increase in debt
- t is the marginal tax rate of the firm
- E is the market value of a company's equity
- V is the market value of a company's debt.

The K_e is a measure of the riskiness of an asset. The higher the risk, the higher the required rate the investor will ask to invest in a project. There are different ways to estimate the cost of capital, however the most broadly used is the *capital asset pricing model* (CAPM) developed by Sharpe (1964) and Lintner (1965) based on the work of Markowitz on diversification and portfolio theory.

The model says that the cost of equity is equal to a risk-free asset plus a premium based on the stock risk and the systemic risk, as follows:

$$K_e = R_f + \beta(R_m + R_f)$$

where R_f represents the return of risk free assets, R_m the market return and β the systemic risk of a stock given by $\beta = \frac{Cov(R_i;R_m)}{Var(R_m)}$ where R_i are the returns of an asset and R_m the returns of the market portfolio.

Once the cash flows and the terminal value are estimated, they are discounted by the WACC to obtain the enterprise value (EV), or the intrinsic value available to debt holders first and shareholders thereafter. To obtain the equity value, or the value available to shareholders, net debt is subtracted from the EV, as follows:

$$Equity\ value = EV - Net\ Debt$$

Pros

The real benefit of a DCF is that it gives a rational framework to analyze a company. According to Damodaran every asset class can be valued with a DCF because of the possibility to estimate future results.

Another benefit of the model is that it makes the analyst focus about the many drivers of a company that may have been otherwise overlooked. Estimating the future sales growth, the margins, the investments and the working capital required to run a business helps having a clear view about a company.

Moreover, the model is one of the most scientific ways to look at a company and give a good approximation of the true firm value when its cash flows are easily foreseeable, typically in mature firms or project finance companies.

Cons

On the other hand, the DCF is also subject to many flaws that are amplified for start-ups.

The first problem is about the credibility of the business plan. The entire model is based on the business plan, so having differences with the reality can have a strong impact on the final valuation. In general, business plans tend to be overoptimistic about the future, thus overvaluing a company. For start-ups the problem could even be that a business plan is impossible to build, given that future performance is impossible to forecast. This problem is particularly true for start-ups or young companies that operate in sectors with no competitors, where the company itself is creating the demand. In fact, if it is difficult to know what will be the demand for a product or a service, it could be impossible to feed the DCF model with the data required.

The second problem is the weight of the terminal value over the overall value. The problem of the terminal value is that it is placed far in time, usually 10 years from the first cash flow, so it is particularly uncertain. If most of the valuation comes from the terminal value, most of the valuation will be subject to an acute realization risk. This risk is lower for predictable cash flows, typically initial cash flows. This problem is exacerbated for start-ups, where the terminal value may exceed 100% of the total valuation. In fact, a start-up or a young company typically has an initial period with negative cash flows that become positive only later on.

The third problem of the DCF is the discount factor. The discount factor is the single variable that has the highest impact on the total valuation: a small change in the discount factor can have a huge impact on the final value. This problem becomes even more significant for a start-up or a young company. In particular, two reasons make the discount factor difficult to assess for a start-up: (i) it is extremely hard to evaluate the risk of a company that is creating its market or that it does not have any peers to compare with, and (ii) the discount factor tends to change over the years, usually decreasing over time, because the venture risk decreases given a longer track record and a higher visibility over future results.

The fourth problem relies on the capacity of an asset to generate cash flows. The DCF method evaluates the cash flows generated by existing assets andby future assets as well as the increased efficiency of existing assets. The problem is that no one knows for sure: (i) the level of future investments and (ii) the future improvements of existing assets. This problem is even more amplified for start-ups or young companies, where present assets are extremely low, thus most of value comes from "growth assets" or future assets.

Extension of the DCF model to start-ups by Damodaran

Damodaran in his article "Valuing Young Growth Companies", gives a six-step model to evaluate fundamentally a young company, trying to apply it to LinkedIn in occasion of its IPO in 2011.

The six steps are as follows:

- Estimate revenues by calculating the size of the market and what share the company will gain
- Estimate the margins. Damodaran suggests to set a target margin and estimate how difficult it will be to reach that target over time
- Assess the required reinvestment to sustain growth as needed
- Estimate the cost of equity and capital over time. Damodaran takes sector averages to calculate betas, cost of debt and debt-to-equity ratios focusing on the riskiest and the smallest companies for the initial phase and on more mature companies for later phases
- Estimate the expected value and adjust for the risk of failure. The start-up growth period should end at a certain point to reach a growth level more in line with a mature business. Also some other aspects should be taken into consideration in assessing whether a firm may survive: (i) its flexibility in raising funding, (ii) its dependence on some few key employees, and (iii) market conditions
- Adjust the value for other equity claims like options.

Applying this modified version of the DCF to LinkedIn's IPO, Damodaran tried to obtain a fundamental value for a young company with very little track record. However, his resulting final valuation of $23.27 per share is far away from the opening price of $43 and its continued growth.

In conclusion, even this new DCF model for young companies is not in a position to value start-ups: therefore, either the market is remote from fundamentals or fundamental methods have some limits in explaining start-ups' or young companies' intrinsic value.

B. Multiples approach

The model

There are two categories of multiples: (i) trade multiples or multiples of comparable listed companies, and (ii) past transaction multiples. Each category is divided in: (i) *indirect multiples* that calculate first the enterprise value (EV) and then the equity value by subtracting the net debt from the EV, or (ii) *direct multiples* that calculate directly the equity value of a company.

An average or a mean of comparable multiples is usually used and multiplied by the company's aggregate figures (e.g. Sales, EBITDA, EBIT, Net Income) to obtain the enterprise value in the case of indirect multiple or the equity value in the case of a direct multiple. Whenever possible, a number of multiples is used to build a valuation range.

The limitations

Using the multiples method can be extremely easy and logical since it is quite rational that the value of a firm falls within a range given by comparable firms or transactions in the market. However, using the multiples approach can be misleading. The underlying assumption of using comparable multiples

is that aggregates such as EBITDA, EBIT or Earning are positive. Table 1 tries to give an overview of the most common issues:

	Multiples	**Key issues**
Indirect	EV/Sales	Same growth rate, margins, risk, investment policy
	EV/EBITDA	Same growth rate, risk , investment policy
	EV/EBIT	Same growth rate, risk
Direct	P/E	Same growth rate, risk, financial structure

Table 1: key issues in multiples approach

Common to all multiples are the growth rate and the company's risk. To be comparable two firms need to have the same expected growth. In fact, from the company's sales depend the cash flows, earnings and dividends, all key aspects in establishing the intrinsic quality of a company. The same is true in evaluating risk. It does not make sense to compare companies with different risk profiles based on quality and quantity of earnings.

The growth rate and the risk are important factors that potentially limit the use of multiples. In fact, it can be very difficult to find comparables with the same growth profile, at the same development maturity and subject to the same external and internal risks. However, even though these two limits can have a strong impact on the valuation of a company, sometimes comparables are still used to have a broad view of values.

Another factor that must be taken into account when using multiples is the investment policy: investments affect present and future cash flows, but also the profitability of a company.

Another factor, that strongly limits the use of the P/E ratio, is the financial structure. By using the ratio of a comparable company, it is assumed that the two companies share the same financial structure. If this is not the case, this ratio can be extremely misleading. For example, applying a P/E ratio of 15 to the earnings of a company that has net cash of 100 invested at 4% after tax, would be the same as valuing the capital employed at 15 times EBIT after tax and at 15 times the financial income after tax (or 15x4%x100 = 60). This means that the cash worth 100 will be undervalued by 40 (100-60).

3. Venture capitalist (VC) method

The VC method has the benefit of being easy and fast to implement giving a view on what VCs expect from a start-up.

Two complementary approaches are proposed: (i) the first being more to discriminate among possible investments and (ii) the second being more schematic.

For the first method, the VC sets a target return for its portfolio of investments (usually 2x to 3x cash-on-cash over five years). Given the target return and an expected survival rate of the portfolio's companies, the VC knows the expected growth of the companies it has to invest in, as follows:

$$Expected\ growth\ of\ survivors = \frac{Target\ portfolio\ return}{Survival\ rate}$$

For example, if a VC's target return is 3x and the survival rate is 20%, the VC has to invest in companies with an expected growth of 15x. Therefore, it can also assume the revenues expected by the portfolio companies. Assuming that one unit of enterprise value equals one unit of sales and that the VC acquires 20% of the target companies, the sales the VC expects from its portfolio companies are given by the following formula:

$$Expected\ sales = \frac{Investment}{Stake} x Expected\ growth$$

Therefore, assuming an investment of $1, the VC expects to invest in companies that have target sales of $75.

The logical steps are summarized by Table 2.

Target return (x)	3,0x
Survival rate (%)	20%
Expected growth of survivors (x)	**15,0x**

Investment ($)	1
Stake (%)	20%
Company valuation of survivors - beginning ($)	5
Company valuation of survivors - end ($)	**75**

Table 2: VC method

The second more schematic approach is a four-step process proposed by Damodaran:

- Estimate expected earnings for the near future, normally two to five years
- Obtain the value of the company at the end of the forecast period. Multiples of comparable listed companies or of transactions of companies operating in a similar business are used to arrive at the company's value
- Discount the value of the company at the end of the forecast period. As shown by Damodaran (Tables 3 and 4), the discount rates are much higher than the actual returns of VCs. The gap is explained by the failure risk that is factored in the discount rates, as follows:

Stage of development	Typical target rates of return
Start up	50-70%
First stage	40-60%
Second stage	35-50%
Bridge / IPO	25-35%

Table 3: start-up target returns

Stage	3 year	5 year	10 year	20 year
Early/Seed VC	4,9%	5,0%	32,9%	21,4%
Balanced VC	10,8%	11,9%	14,4%	14,7%
Later Stage VC	12,4%	11,1%	8,5%	14,5%
All VC	8,5%	8,8%	16,6%	16,9%
NASDAQ	3,6%	7,0%	1,9%	9,2%
S&P	2,4%	5,5%	1,2%	8,0%

Table 4: actual return by segment of companies

Source: The dark side of valuation, Damadoran (2009)

- Calculate the share of the firm the VC is entitled to based on its contribution, with the post money valuation = pre money + new capital, as follows:

$$Proportion\ to\ VC = \frac{New\ capital\ provided}{Post\ money\ valuation}$$

Unfortunately, also the VC method has several flows. Damodaran in particular finds that four problems may arise:

- The method encourages "game playing" or bargaining on the value of the firm. The method is not based on a real analysis of the company, but more on the target revenues or project earnings proposed by the founders and the VCs to respectively bring up or down the value of

the firm. Consequently, the firm's value becomes the bargaining base between the founders and the VCs

- The method has the benefit of being easy and quick to use, however the comparable multiples method does not consider the future cash flows, whereas the multiple of the firm at the end of the period will be a function of the cash flow generation ability
- The assessment of the discount rate has two main problems. The first is that there is a discrepancy in using a cost of equity when discounting an enterprise value derived from a multiple of sales: the cost of capital should be used instead. The second is that factoring in the probability that the firm will not survive implies that the rate will not change over time
- In adding the new capital to the pre-money valuation to calculate the share of the VC in the firm, it is assumed that the money raised stays within the firm to fund future investments. If part of the new money is used to buy out existing shareholders, the money that goes out of the firm should not be added to the pre-money valuation.

4. Real option valuation

The real option valuation technique sees the value of a firm as a call option held by shareholders, as if the shareholders at a certain time had the possibility either to buy the residual value of their company after having paid all liabilities or leave the company. This valuation technique looks particularly suited for start-ups because, as Kotova (2014) says, it is appropriate for projects that:

- Have a high level of uncertainty
- Have flexible decision making processes
- Have financial results mostly dependent on intangible assets that have yet to prove their ability to generate results.

The valuation is based on the following Black-Scholes (1973) model:

$$V_e = S * N(d_1) - K * e^{-r\tau} * N(d_2)$$

where:

- V_e is the equity value of a company
- S is the enterprise value calculated as the present value of future cash flows
- K is the option exercise price or the value of investments required for the project's implementation
- r is the risk-free rate
- τ is the time to maturity
- σ is the volatility
- N is the cumulative distribution function of a normal centred variable

and where:

- $d_1 = \frac{\ln\left(\frac{S}{V_e}\right)+(r+\frac{\sigma^2}{2})\tau}{\sigma\sqrt{\tau}}$
- $d_2 = \frac{\ln\left(\frac{S}{V_e}\right)-(r+\frac{\sigma^2}{2})\tau}{\sigma\sqrt{\tau}} = d_1 - \sigma\sqrt{\tau}$

As Kotova (2014) points out: "the price of the option is higher when the present value of expected cash flows grows, the cost of project implementation is lower, there is more time before the expiry of the option [and the project is subject to a] greater risk".

The biggest challenge of using the real option model relies in the difficulty of finding reliable data to calculate σ.

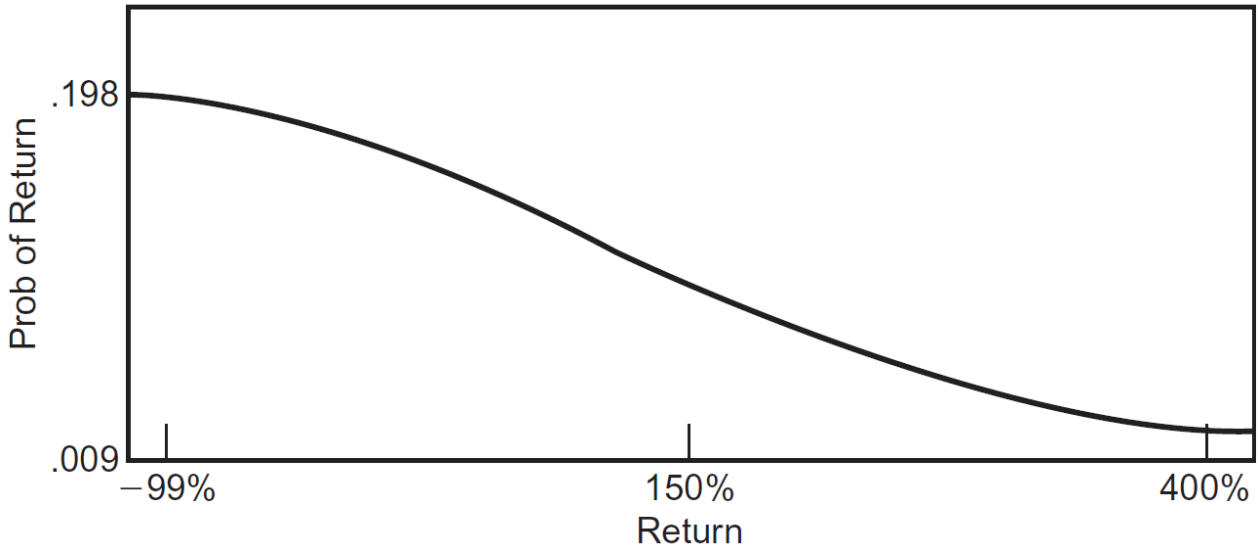
Some argue that there could be two major concerns in using the Black-Scholes model to value privately held companies and in particular start-ups:

- There should be a non-tradability discount on the option
- There is a an understatement of the volatility when using lognormal returns.

However, none of these concerns has a real impact on the model.

For the first, it is argued there should be no discount applied to the option because the non-tradability discount should already be incorporated in the asset.

For the second, as explained by Metrick and Yasuda (2010) in 'Venture Capital and the Finance of Innovation', "the objection here is usually caused by confusion about the difference between normal distributions (which look like a bell curve when drawn in periodic returns) and lognormal distributions (which look like a bell curve if drawn in log returns, but look like Graph 3 if drawn in periodic returns)".



Graph 3: lognormal distribution

Source: Venture Capital and the Finance of Innovation, Metrick and Yasuda (2010)

Case study: Tesla

In this section, a case study is developed to gauge the implications of the signal theory on the valuation of Tesla, a young listed company that still has negative cash flows, negative results and its business model is based on the disruptive idea to sell only electric cars.

As discussed with Mr Boris Golden of Partech Ventures, companies at a very early stage are extremely hard to valuate because entrepreneurs are selling a very unproven project to VCs with very limited track records and results. VCs are able to estimate what percentage of a start-up it is reasonable to acquire thanks to a due diligence process that, among others, takes into consideration the soft and factual signals previously discussed such as the pressure that comes from other investors. At more advanced maturity stages, companies start to have a track record, the chance to fail diminishes and more scientific approaches can be used.

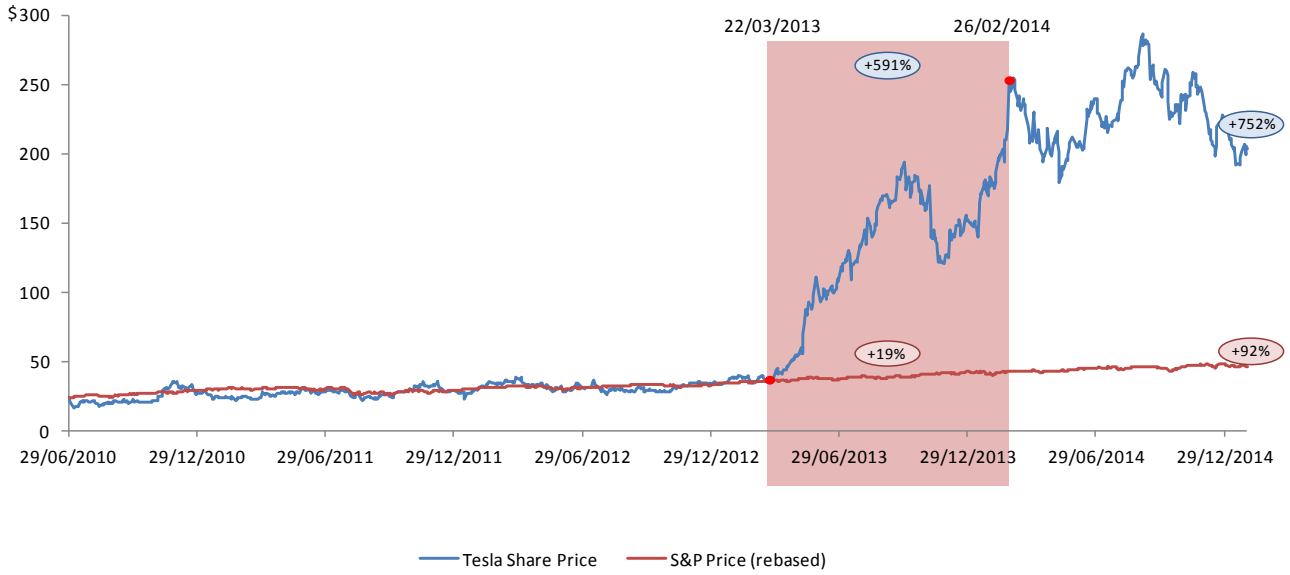
The starting point of this analysis will be the conclusions reached by Damodaran on his fundamental valuation of Tesla which comes far short of Tesla's market value. The signal theory will then be used to try to explain the gap between Damodaran's valuation and the stock market valuation.

1. Adding to Damodaran fundamental analysis

In his paper (2014) "Tesla: Anatomy of a Run-up Value Creation or Investor Sentiment?" Damodaran demonstrates how Tesla is fundamentally overvalued after the sevenfold stock increase from March 2013 to February 2014, as shown in Graph 4.

Damodaran argues that Tesla "operates in an industry automotive manufacturing, and a potential industry, battery construction, that are mature and are populated by established competitors" so a DCF anchored on established fundamentals should be appropriate.

Damodaran's conclusion is that Tesla's stock price, according to his fundamental analysis, is overvalued by approximately 150% and that the market value and the rational value can diverge for prolonged periods of time.



Graph 4: Tesla and S&P500 share price evolution

Source: Bloomberg

Damodaran, based on DeLong, Shleifer, Summers and Waldman (1990), concludes that Tesla's share price is based on investors sentiment that is defined "as a belief about future cash flows and investment risks that is not justified by the facts at hand".

According to the paper, there are five reasons supporting the soundness of a fundamental analysis on Tesla:

- Tesla is part of a mature industry where the long term growth rate corresponds to the GDP growth rate. So there should not the problem of making assumptions over the long term growth of the company
- The mature state of the industry makes it easy to find comparables and a comparable analysis is useful to have a sense of a company valuation
- The technology is known and innovations are incremental. Therefore, there is not the problem of having much of the value coming from a disruptive technology

- The stable nature of the industry should not make the expected return, thus the discount rate, changing rapidly
- The stock increase happens over one year, therefore it cannot be related to the market learning previously undisclosed information.

The analysis is made in three steps: (i) a DCF valuation, (ii) an analysis of the new information and (iii) an analysis of the impact of noise trading on Tesla's stock price.

While the results provided by Damodaran to demonstrate that Tesla's stock is fundamentally overpriced seem conclusive, these result will be the starting point of this case study to show how some signals must be considered to have a full picture of the stock price increase.

A. DCF valuation

The model used is the one presented earlier adjusted to value young companies.

- Forecasting the revenue growth rate. This estimate is driven by the market average and the intrinsic quality of the company. The model estimates an annual growth rate over 10 years of 70%, making Tesla at the end of year 10 a major player in the automotive industry
- Forecasting operating margins. Tesla's operating margins were very negative till the introduction of Model S. With Model S a turnaround of the company happened, but margins were still negative. The valuation model expects Tesla will be able to reach Porsche's profitability, one of highest in the market, of 12.5%
- Estimating the investment required to achieve the growth rate and operating margins. The ratio taken into account is sales/capital and till the last quarter of 2013 it has been lower than one, even if it has been increasing. This means that the company was not able to convert its investments in sales. From the first quarter 2014 the valuation model considers the industry average

- Estimating the cost of capital adjusted for the chance of failure. The model is optimistic about the probability of failure, set at zero, and estimates that the cost of capital will be decreasing converging to the market average of 8%

As Table 5 shows, Damodaran's valuation results as of September 2013 and March 2014 arrive at much lower fundamental values for Tesla than the market does.

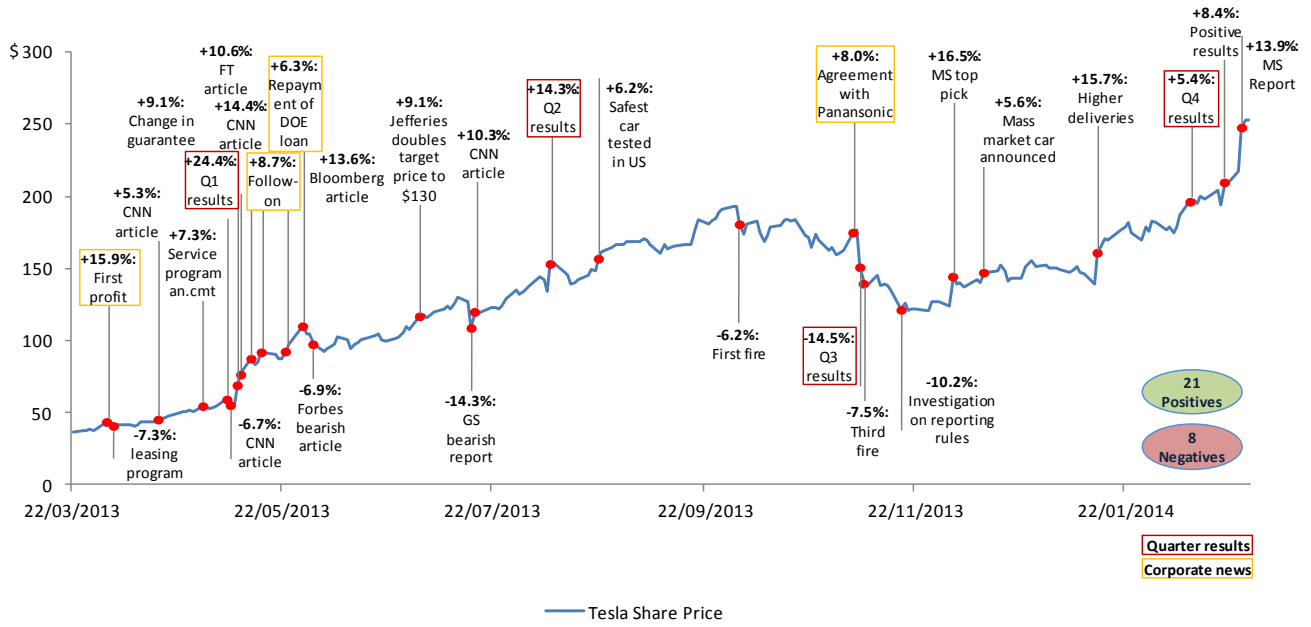
Aggregates	**May 2011**	**September 2013**	**March 2014**
Trailing 12-month revenues	$ 117,00	$ 1.329,00	$ 2.013,50
Trailing 12-month operating income	$ -81,00	$ -217,00	$ -21,81
Target revenues (in year 10)	$ 5.047,00	$ 65.422,00	$ 79.520,00
Target operating margin	10,00%	12,50%	12,00%
Sales/Capital ratio	1,80	1,41	1,55
Return on capital (in year 10)	8,52%	11,27%	12,15%
Cost of capital (initial)	11,08%	10,03%	8,74%
Cost of capital (perpetuity)	6,93%	8,00%	8,00%
Estimated Equity Value	$ 964,00	$ 11.797,00	$ 16.742,00
Estimated value/share	**$ 8,56**	**$ 67,12**	**$ 100,35**
Price/share	$ 22,20	$ 168,76	$ 250,00
% (under) or over valued	159,35%	151,43%	119,24%

Table 3: Damodaran's results

Source: Tesla: Anatomy of a Run-Up, Cornell and Damodaran (2014)

B. Impact of new information

Damodaran then tries to explain rationally the sevenfold increase by an event analysis. Graph 5 summarizes the major events identified.



Graph 5: impact of new information on Tesla share price

Sources: Bloomberg and Cornell and Damodaran (2014)

To start, the event analysis concentrates on earnings surprise and the stock price reaction. Three quarters bring positive news and one negative results. According to the paper, earning surprise explains 24% of residual returns (Tesla returns minus S&P500 returns).

The second step was to study other news that could fundamentally explain the price run-up. It is demonstrated how little real information came to the market that could explain such a price increase. The news are separated in two groups, one associated with positive and the other with negative residuals. Of the positive, 16 are not related to earnings announcements. Of those, only three contain fundamental information: two about anticipated higher sales and one about the planned introduction of a mass market car in 2015. Three others are related to positive analyst reports, however they do not contain any new fundamental information and the others are meaningless information where most of the times the information has been the increase in stock price itself. On the negative side, seven residuals were not related to earnings. Of those, four were not related to meaningful information, two related to fires involving Model S and one related to a negative broker's report.

In conclusion, according to the paper, the event analysis fails to explain fundamentally the increase in stock price.

C. Impact of noise trading

Damodaran's paper concludes the analysis trying to assess the impact of noise traders on the stock price increase with the use of two measures: (i) the percentage ownership of institutional investors and (ii) the ratio of shares sold short to the shares outstanding.

For the first measure, it is shown how the institutional ownership peaks at 87% just as the run-up begins and steadily declines to approximately 65% at the end of the run-up. This finding supports the noise trading theory for which "smart" institutional investors liquidate their positions when the stock price is far from its fundamental value. However, also Damodaran says that "the evidence is far from overwhelming"; in fact, at the end of the run-up institutional investors still account for more than two third of Tesla shareholdings.

For the second measure, it is shown how short positions plummeted at the beginning of the run-up and increased again when the stock price passed the $150 mark. The first drop in short positions, according to the paper, is in line with the noise trading theory for which short sellers acknowledge the increased volatility of the stock when the run-up begins, thus they "are unwilling to keep their short position in the face of higher perceived volatility". However, when the stock price passed $150, short sellers again started to short the stock. According to theory this is rational if short sellers perceive that the fundamental value is lower than the stock price. In fact, the higher perceived risk would be offset by an increased expected return.

Only part of the increase in stock price could be explained by noise traders, in fact institutional shareholders were net sellers and short positions rose. However, how Damodaran says, "the magnitude of these offsetting effects was too weak to blunt the sevenfold increase in the price".

Damodaran concludes by saying that "investor sentiment must at least be part of the story" and that "at some point, as the information about the cash flow generating characteristics of the business become clearer, price and value should start to converge", i.e. markets are crazy and I will be right in the long run!

2. Financial analysis

Before entering into details of how signals should be used to have a complete vision about Tesla's value, Tables 6, 7, 8 and 9 summarise Tesla's figures.

Profit and loss statement

As of 31/12 in '000	2010A	2011A	2012A	2013A	2014A
Sales	116.744	204.242	413.256	2.013.496	3.198.356
Cost of sales	86.013	142.647	383.189	1.557.234	2.316.685
Gross margin	**30.731**	**61.595**	**30.067**	**456.262**	**881.671**
R&D	92.996	208.981	273.978	231.976	464.700
SG&A	84.573	104.102	150.372	285.569	603.660
EBITDA	**(136.215)**	**(234.569)**	**(365.458)**	**53.943**	**114.976**
D&A	10.623	16.919	28.825	115.226	301.665
EBIT	**(146.838)**	**(251.488)**	**(394.283)**	**(61.283)**	**(186.689)**
Financial income	(734)	212	34	(32.745)	(99.760)
Other income (expense)	(6.583)	(2.646)	(1.828)	22.602	1.813
Pre-tax income	**(154.155)**	**(253.922)**	**(396.077)**	**(71.426)**	**(284.636)**
Corporate income tax	173	489	136	2.588	9.404
Net income (group's share)	**(154.328)**	**(254.411)**	**(396.213)**	**(74.014)**	**(294.040)**

Profit and loss statement

As of 31/12 in % of sales	2010A	2011A	2012A	2013A	2014A
Sales	100%	100%	100%	100%	100%
Cost of sales	74%	70%	93%	77%	72%
Gross margin	**26%**	**30%**	**7%**	**23%**	**28%**
R&D	80%	102%	66%	12%	15%
SG&A	72%	51%	36%	14%	19%
EBITDA	**(117%)**	**(115%)**	**(88%)**	**3%**	**4%**
D&A	9%	8%	7%	6%	9%
EBIT	**(126%)**	**(123%)**	**(95%)**	**(3%)**	**(6%)**
Financial income	(1%)	0%	0%	(2%)	(3%)
Other income (expense)	(6%)	(1%)	(0%)	1%	0%
Pre-tax income	**(132%)**	**(124%)**	**(96%)**	**(4%)**	**(9%)**
Corporate income tax	0%	0%	0%	0%	0%
Net income (group's share)	**(132%)**	**(125%)**	**(96%)**	**(4%)**	**(9%)**

Table 4: profit and loss statement

Sources: Tesla annual reports

Table 6 shows the profit and loss aggregates. It is interesting to note that the company has always had negative results, but 2013 represents a turning point with the positive impact of the introduction of Model S. Sales skyrocketed by about 5x and EBITDA started to be positive. Also, net income increased dramatically in 2013: if before 2013 1$ in sales produced a loss of approximately 1$, after 2013 1$ in sales produced no more than 0.1$ of losses.

Economic balance sheet

As of 31/12 in '000	2010A	2011A	2012A	2013A	2014A
Goodwill	-	-	-	-	-
Intangible assets	-	-	-	-	-
Tangible assets	122.599	310.171	562.300	1.120.919	2.596.011
Financial assets	-	-	-	-	-
Other non-current assets	22.730	22.371	21.963	23.637	43.209
Total assets	**145.329**	**332.542**	**584.263**	**1.144.556**	**2.639.220**
Inventories	45.182	50.082	268.504	340.355	953.675
Clients	(708)	4.048	21.877	(460.252)	(745.197)
Other current assets	10.839	9.414	8.438	27.574	94.718
Suppliers	49.896	88.250	343.180	412.221	1.046.830
Customer deposits	30.755	91.761	138.817	163.153	257.587
Other liabilities	19.137	27.650	50.192	78.774	195.043
WCR	**(44.475)**	**(144.117)**	**(233.370)**	**(746.471)**	**(1.196.264)**
Capital employed	**100.854**	**188.425**	**350.893**	**398.085**	**1.442.956**
Shareholder's equity group's share	207.048	224.045	124.700	667.120	911.710
Minority interests	-	-	-	-	-
Shareholder's equity	207.048	224.045	124.700	667.120	911.710
Long term financial debt (DoE loan facility)	71.828	268.335	401.495	-	-
Long term convertible debt	-	-	-	586.119	1.864.714
Short term financial debt (DoE loan facility)	-	7.916	50.841	-	-
Short term financial convertible debt	-	-	-	182	601.566
Cash & cash equivalents	178.022	311.871	226.143	855.336	1.935.034
Net financial debt (cash)	(106.194)	(35.620)	226.193	(269.035)	531.246
Capital invested	**100.854**	**188.425**	**350.893**	**398.085**	**1.442.956**

Table 5: economic balance sheet

Sources: Tesla annual reports

Days of working capital

As of 31/12 in '000	2010A	2011A	2012A	2013A	2014A
Days of WCR	**(139)**	**(258)**	**(206)**	**(135)**	**(137)**
Days of inventories	141	90	237	62	109
Days of receivables	21	17	24	9	26
Days of payables	123	144	289	71	123

Table 6: days of working capital

Sources: Tesla annual reports

Tables 7 and 8 give an overview of Tesla's balance sheet. Three factors are interesting to consider:

- The dramatic increase in tangible assets (doubling every year). This increase comes from the capital expenses that are higher than depreciation and is normal for a young company trying to build the required capacity
- The fact that the number of working capital days is constantly negative. This is in part due to customer deposits and to the management of suppliers. As shown in Table 8, days of receivables are particularly low, while days in payables are almost constantly over 100 days
- The change in financing strategy: until 2013, the company relied on a loan facility by the Department of Energy. The line was fully drawn in August 2012, but the company decided to repay it completely in May 2013. As a consequence, the company started financing itself with convertible bonds in 2013 and 2014.

Cash flow statement

As of 31/12 in '000	2010A	2011A	2012A	2013A	2014A
Net income (group's share)	(154.328)	(254.411)	(396.213)	(74.014)	(294.040)
Depreciation and amortization	10.623	16.919	28.825	115.226	301.665
Non cash items	27.063	34.230	58.631	74.634	191.863
Cash flow	**(116.642)**	**(203.262)**	**(308.757)**	**115.846**	**199.488**
Change in working capital	(11.175)	75.228	44.942	148.958	(256.825)
Cash flow from operating activities	**(127.817)**	**(128.034)**	**(263.815)**	**264.804**	**(57.337)**
Asset disposals	-	-	-	-	-
Capital expenditures	(105.413)	(184.226)	(239.228)	(264.224)	(969.885)
Other investing activities	(74.884)	21.968	32.298	14.807	(20.559)
Cash flow from investing activities	**(180.297)**	**(162.258)**	**(206.930)**	**(249.417)**	**(990.444)**
Free cash flow after fiancial charges	**(308.114)**	**(290.292)**	**(470.745)**	**15.387**	**(1.047.781)**
Proceeds from share issues	268.842	231.468	221.496	415.000	-
Proceeds from issuance of convertible debt	-	-	-	660.000	2.300.000
Proceeds from issuance of warrants	-	-	-	120.318	389.160
Proceeds from exercise of stock options and other stock issuances	1.350	10.525	24.885	95.307	100.455
Proceeds from DOE loans	71.828	204.423	188.796	-	-
Principal payments on DOE loans	-	-	(12.710)	(452.337)	-
Principal payments on capital leases and other debt	(315)	(416)	(2.832)	(8.425)	(11.179)
Other financing activities (mainly convertible notes hedges)	(3.660)	-	-	(194.441)	(635.306)
Dividends paid	-	-	-	-	-
Cash flow from financing activities	**338.045**	**446.000**	**419.635**	**635.422**	**2.143.130**
Effects of exchange rates	-	-	(2.266)	(6.810)	(35.525)
Increase (decrease) in cash & equivalents	**29.931**	**155.708**	**(53.376)**	**643.999**	**1.059.824**

Table 7: cash flow statement

Sources: Tesla annual reports

Table 9 shows Tesla's cash flow statements. The company heavily relies on share issues and on the issuance of convertible debt starting in 2013 to finance its growth. In particular, it is interesting to note:

- The high capital expenses, typical of a young company ramping up its production capacity
- The change in the financing structure: before 2013 it was totally financed by new equity issues and by a subsidized debt facility by the Department of Energy; after 2013 it was financed by equity and convertible debt as well as warrants and convertible note hedges. As 2014 Tesla annual report says, "taken together, the purchase of the convertible note hedges and the sale of warrants are intended to offset any actual dilution from the conversion of the 2019 and 2021 Notes"
- Dividends are nil: since it is still a young company that needs to finance its growth, it is natural that Tesla does not pay any dividend and it is not expected to do so.

In conclusion, Tesla looks like a young company that needs important sources of financing to build its manufacturing capacity and to grow. It looks like 2013 has been a turning point for Tesla. The introduction of Model S by mid 2012 made EBITDA turn positive for the first time in 2013 and profitability increased dramatically. This growth has been financed by equity, a loan facility coming from the Department of Energy and from 2013 by convertible bonds. Those types of financings are in line with the risky profile of this growing company.

3. Financings

In this section an analysis of Tesla's financing is done to understand how the company found the resources it needed to grow. It is interesting to see how Tesla used a diverse range of equity related financing solutions. To better understand the warrant, that has been used widely during many financing phases, an example of warrant ratchet is provided before entering into the details of Tesla's financing.

A. Theoretical review of a Warrant ratchet

The warrant ratchet is an instrument used to limit the dilution of actual investors at the next financing round. It is a mechanism used in early stages, generally by pre-public companies, in response to a subsequent round of financing that involves issuing shares at a lower price than first-stage investors. Warrants can be either (i) full ratchet or (ii) weighted average ratchet.

Quoting Investopedia (i) a full warrant ratchet is "an anti-dilution provision that, for any shares of common stock sold by a company after the issuing of an option (or convertible security), applies the lowest sale price as being the adjusted option price or conversion ratio for existing shareholders", whereas (ii) a weighted average ratchet applies to the weighted average share price as the adjusted option price or conversion ratio for existing shareholders.

Table 10 shows an example of how a warrant ratchet can impact the final ownership of a first round investor owning a warrant.

Investor	Beginning A	First issue B	Second issue C
Value ($)	100.000	4.000.000	3.000.000
Value per share ($)	1	40	20
Investment ($)	100.000	2.000.000	1.600.000
# of new shares	100.000	50.000	80.000
# of shares without ratchet	100.000	150.000	230.000
# of new shares from full ratchet for B	-	-	50.000
# of new shares from weighted ratchet for B	-	-	22.222
Ownership of investor B without ratchet (%)	0,00%	33,33%	21,74%
Ownership of investor B with weighted ratchet (%)	0,00%	33,33%	28,63%
Ownership of investor B with full ratchet (%)	0,00%	33,33%	35,71%

Table 8: theoretical impact of warrant ratchets on shareholding structure

In the example it is assumed that there are three phases with three different investors entering the company's share capital. Investor A is the founder, Investor B an early stage VC and Investor C a growth VC. It is assumed that the value of the company increases from the beginning to the first issue, but decreases from the second to the third issue resulting in a lower value per share than the first issue.

If Investor B had no warrants, it would be diluted from 33,33% to 21,74%. With a full ratchet, on the other hand, Investor B's shareholding would increase from 33,33% to 35,71%. In fact, with a full ratchet, the minimum value per share between the first issue and the second is taken into account; since the value per share halves from the first to the second issue, the Investor B's number of shares doubles thanks to the full ratchet. With a weighted average warrant ratchet Investor B is diluted, but by a much lower amount than without having a warrant. In fact, the number of shares Investor B is to receive are calculated using the weighted average price per share and not the minimum price, as follows:

$$\#\ of\ new\ shares\ weighted\ average = \frac{Investment_1}{\frac{\#\ shares_1 * P_1 + \#\ shares_2 * P_2}{\#\ shares_1 + \#\ shares_2}} - \#\ existing\ shares$$

As shown by the example, it is understandable why early investors are keen to ask for some kind of protection against possible future dilutions and why warrants are so widely used in the financing phases of start-ups.

B. Tesla Equity Series A, B, C, D, E, F

In '000 (except $ and %)	Series	Issued preferred shares	Preferred shares from conversion	Total preferred shares	Proceeds (m$)	Estimated % of total outstanding shares	Tesla implied value (m$)
2004	A	7,213		7,213	7		
2005	B	17,459		17,459	13		
2006	C	35,242		35,242	40		
2007	D	18,440		18,440	45		
2009	E	19,901	82,875	102,777	50	9,1% [1]	550
2009	F	27,785		27,785	83	10,5% [2]	784

Table 9: Tesla equity financing rounds pre-IPO

Sources: Tesla annual reports and Techrunch.com
Notes:
1 from Techcrunch.com 19/05/2009
2 from Techcrunch.com 15/09/2009

As it appears from Table 11, Tesla started to finance itself through convertible preferred stocks that is senior to common shares and which carries an option to convert into a fixed number of common shares, anytime after a predetermined date.

Throughout the years the company was needing an increasing amount of cash to develop its activities and raised approximately $235m of convertible preferred stock. In fact, it is common for a start-up to raise convertible preferred stock instead of common stock because it is less risky: (i) it is senior to common stock and (ii) it gives the possibility to participate in the equity potential upside by converting the preferred stock into common stock.

Very interesting are the implied valuations of the last two rounds of financings through convertible preferred stocks: in a matter of months, Tesla's value appreciated by more than 40%.

C. Bridge convertible notes (converted in Series E)

The year 2008 has been the only year during the first round of financing without a capital increase through convertible preferred stock. However, the company was needing financing, so it decided to issue senior secured convertible promissory notes in February and December 2008 for a total amount of approximately $80m in anticipation of the Series E convertible preferred stocks. Both notes had accrued interest of 10% per year.

It is interesting to note how fast Tesla converted those promissory notes in the Series E convertible preferred shares, showing (i) the need of financing by Tesla and (ii) the flexibility a start-up has in finding new streams of financings. In fact, the convertible notes had to close the financing needs gap and were all converted in convertible preferred stocks at the issuance of the Series E convertible preferred stocks at a discount of 60% to the price paid by the other investors.

Table 12 summarizes the investment in the original note by Tesla's officers, directors and principal stockholders.

Name of Stockholder	February 2008 Debt Financing Aggregate Principal Amount of notes	February 2008 Debt Financing Warrants	December 2008 Debt Financing Aggregate Principal Amount of Notes	Aggregate Principal Amount and Accrued Interest of February 2008 and December 2008 Notes Converted	Series E Preferred Stock Issued upon Conversion of all Debt
Elon Musk Revocable Trust dated July 22, 2003	18.026.074	-	20.356.974	41.029.775	40.825.647
Valor Equity Partners, L.P.	7.185.248	-	1.500.000	9.662.882	9.614.808
Technology Partners Fund VIII, L.P	1.568.346	-	2.500.000	4.365.108	4.343.392
VantagePoint Venture Partners	1.995.902	398.025	-	2.251.389	896.110
Jasper Holdings LLC	262.461	-	290.611	597.832	594.857
Westly Capital Partners, L.P.	39.918	-	4.600.000	5.171.260	5.145.532

Table 10: subscription of convertible notes by major shareholders

Sources: Tesla IPO prospectus

D. Tesla's IPO in 2010

In 2010 Tesla decided to go public to fund its growth plans. In its prospectus, Tesla states that it will use the IPO proceedings for "making aggregate capital expenditures of between $100 million and

$125 million during the year ended December 31, 2010. These capital expenditures will include approximately $42 million to purchase our planned manufacturing facility for Model S in Fremont, California, exclusive of any manufacturing equipment we may subsequently acquire. Our aggregate capital expenditures will also include funding the expansion of our Tesla stores".

Apart from continuing to expand, the IPO has been a mean for some investors to capitalize their gains. However, it is interesting to note how small are cash-outs to stockholders compared with the total offering: only 11% of total proceeds without exercise of the over-allotment option and 22% with the exercise of the over-allotment option.

				Without Greenshoe		With Greenshoe	
IPO	**# of shares**	**Greenshoe**	**Price ($)**	**Proceeds ($)**	**%**	**Proceeds ($)**	**%**
Company offering	11.880.600	-	17	201.970.200	89%	201.970.200	78%
Stockholders offering	1.419.400	1.995.000	17	24.129.800	11%	58.044.800	22%
Total stocks offered	**13.300.000**	**1.995.000**	**17**	**226.100.000**	**100%**	**260.015.000**	**100%**

Table 11: IPO proceeds

Sources: Tesla IPO prospectus

Moreover, it is interesting to see how fast Tesla's valuation increased from the latest financing round in August 2009. Tesla's valuation increased from an estimated value of $785m to $1.6bn at the IPO date.

E. Convertible bonds

In 2013 Tesla decided to issue its first convertible bond, followed by two others in 2014. A convertible bond is a normal bond that pays interest on its principal, but has an option attached to convert the bond in common shares if the stock price is higher than a defined conversion price. It gives a call option-like type of return and in fact: (i) in case the stock price does not exceed the conversion price, the bond will be reimbursed at face value, (ii) in case the stock price exceeds the conversion price, the bond will be converted into shares with a potential upside for investors.

Issuing convertible bonds is seen as risky for a very young company because there is no visibility about future returns, thus about the stock price. If the convertible bond is not converted, the company has to repay investors in cash possibly facing financial difficulties. On the other hand, it is cheaper than a normal bond and if things go well and the stock price hits the strike price, the company will have financed itself with a cheap instrument.

The issuance in May 2013 of the first convertible bond is a signal that the company believes either that its stock price will increase or that it will have enough cash (or debt facilities) to pay back its debts.

Table 14 shows the main features of the three bonds:

Features	Bond 1	Bond 2	Bond 3
Issue date	15/05/2013	17/03/2014	17/03/2014
Redemption date	01/06/2018	01/03/2019	01/03/2021
Principal amount ($m)	660	800	1.200
Interests (annual)	1,50%	0,25%	1,25%
Conversion price ($)	124,52	359,87	359,87
Spot price at issue date ($)	84,84	233,98	233,98

Table 12: convertible bonds features

Sources: Tesla Convertible bonds prospectus

4. Analyzing signals in the Tesla case

Now that Tesla's financial structure and financing history have been discussed, it is interesting to analyze the significant rise in stock price that Damodaran demonstrated was not related to fundamentals nor to any new sensible information issued by the company. Most likely, however, the market is taking into account also other signals, to value Tesla beyond pure cash flows.

In this section, the signals discussed earlier in the Theory section will be applied to Tesla to understand whether any of these could have been, or indeed have been, interpreted by the market.

A. Founder investment

As we have seen, Leland and Pyle (1977) demonstrate that a strong signal to external investors comes from the founder's investment in the firm.

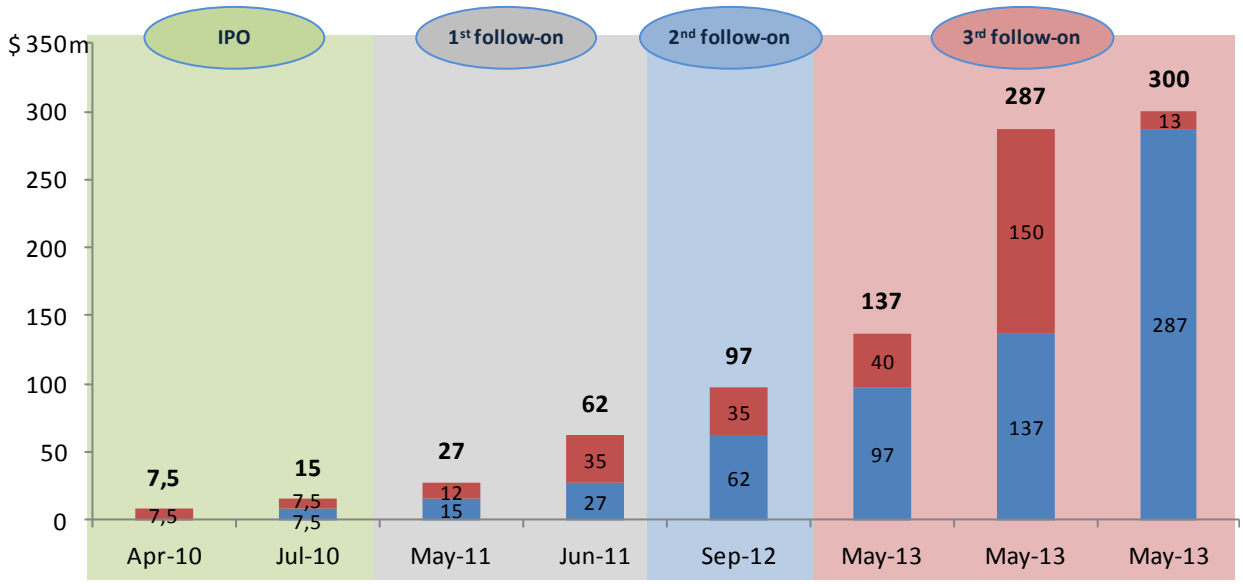
As table 15 shows, Mr Musk is estimated to have invested approximately $220 million in different rounds of capital increases. This level of financial commitment is rare for founders of start-ups and even Forbes is surprised "Most investors don't go on leading subsequent rounds of investment in companies they've already invested in. He's definitely a rare investor/founder/CEO who has invested in his own company multiple times as a lead investor, before even a commitment to buy $100M of shares in 2013 [3] years after the IPO".

Musk investment In '000	2004 Series A	2005 Series B	2006 Series C	2007 Series D	2008 Debt	2008 Debt	2011 Equity	2012 Equity	2013 Equity
# of shares				4.098			1.416	35	1.084
Price ($)				2,44			28,76	28,25	92,24
Investment ($)	6.350[1]	6.500[2]	10.000[3]	10.000	18.026	20.357	40.724	1.000	100.000
Aggregate ($)	**6.350**	**12.850**	**22.850**	**32.850**	**50.876**	**71.233**	**111.957**	**112.957**	**212.957**

Table 13: Mr Musk investment in Tesla

Sources: Tesla annual reports
Notes:
1 Forbes (29/12/2014)
2 Mr Musk has been leading investor in a $13m financing round. Assumed that Mr Musk lead with 50%
3 Mr Musk has been co-leading investor in a $40m financing round. Assumed that Mr Musk co-lead with 25%

Moreover, it is also interesting to note that Mr Musk had to draw different loans with Goldman Sachs and in a minor way with Morgan Stanley for part of the amounts he invested. Graph 6 shows the amounts borrowed by him since Tesla's IPO. It is striking how much debt Mr Musk borrowed to subscribe the capital increases Tesla called after its IPO. However, it has to be noted that not all the amounts borrowed have been invested in Tesla.



Graph 6: Mr Musk incremental borrowings (in red) by time period

Sources: Tesla annual reports

According to the literature about the founder's investment in a firm, both the amounts Mr Musk invested in Tesla and the source of these sums are a strong signal to the market about the quality of the firm. In fact, Mr Musk continues to invest heavily in the company not to be diluted showing a strong belief that the company will continue to grow and eventually become profitable. This signal is particularly strong given that (i) Mr Musk is borrowing to continue to invest in the firm and (ii) that usually founders do not re-invest in their company after several rounds of financing.

B. Capital increase subscriptions by existing shareholders

Another signal related to the amount invested in the company is understanding whether existing shareholders subscribe their part in the capital increase. Since its IPO in 2010, Tesla made three follow-on issues without rights in 2011, 2012 and 2013.

2011

In the 2011 follow-on there are three signals about the stock price potential:

- Mr Musk subscribes 86% of the theoretical amount he could subscribe not to be diluted and invests $40 million. In this follow-on he is only diluted by 0.8% showing his strong belief in the company
- Daimler with its investment vehicle Blackstar Invest Co decides not to be diluted and invests further $17 million
- The top 30 investors subscribe 88.5% of the capital increase, showing a strong appetite by existing shareholders.

2012

The 2012 follow-on "comes as a surprise, as we had expected the company to wait until it was further along in its launch ramp" declares Goldman Sachs. In fact, Tesla cut its outlook. In the 2012 offering no main signals came to the market apart from the fact that the main shareholders continued to invest in the company:

- Mr Musk invested $1 million and was diluted by 1.9%
- The top 30 investors subscribed 87.8% of the capital increase, again showing a strong appetite.

2013

The 2013 follow-on is the turning point for the stock price which increases dramatically from $92.3 to a peak of $253 in February 2014.

Even if the top 30 shareholders decrease their stakes, the biggest signal comes from Mr Musk himself.

Mr Musk invests a significant amount, $100 million, subscribing 1.2x the shares he should subscribe not to be diluted. This is an extremely strong signal for different reasons:

- The amount invested is unprecedented, also considering the amounts already invested by him, and he had to borrow to invest
- The investment comes at a time when the stock price had already increased by 152% in less than three months, showing that even then Mr Musk was a strong believer in the company's potential.

C. Signals from partnering with IB; VC; Alliances

As discussed before, a company can signal its quality to the markets thanks to the partnerships it builds with investment banks, VCs and alliances with industrial players. In fact, a company can leverage on an external player's image to signal investors its quality, and on the other side, external quality players will not be willing to lend their image to bad companies/projects by partnering with them.

According to this literature, Tesla is sending strong signals to the market about its quality:

- It partners with the most prestigious investment banks
- It is backed by top tier VCs
- It has very strong industrial alliances.

Investment Banks

Since its IPO to the last convertible bond issue Tesla has always been advised by Goldman Sachs. Moreover, in its convertible bond issues, Tesla had as underwriters Goldman Sachs, Morgan Stanley and JP Morgan, all top tier banks.

VC

As Table 16 shows, Tesla has been constantly backed by some of the most important VCs. Especially from Series C onward, when the need for capitals increased constantly, Google, JP Morgan and Daimler financed Tesla also assessing its industrial logic.

Series	A	B	C	D	E	F
Year	2004	2005	2006	2007	2008	2009
Amount (m)	$7.5	$13	$40	$45	$50	$83
Investors	Elon Musk Compass	Elon Musk Compass Valor Equity	Elon Musk Capricorn Compass Draper Fischer Google JP Morgan Valor Equity VantagePoint	Elon Musk Capricorn Compass Draper Fischer JP Morgan Valor Equity VantagePoint Tech. Venture	Daimler	Daimler Al Wahada

Table 14: Tesla's investors prior IPO

Sources: Larcker and Tayan (2011)

Again, the big names backing Tesla are a strong signal about the quality of the company.

Alliances

Tesla made several partnerships with different first class industrial players all of which interested in its strong and innovative technology. A double signal comes from those partnerships:

- Leading companies do not want to partner with bad companies
- The quality of Tesla's technology and know-how in the battery field is confirmed by the fact that established firms look to partner with Tesla.

Table 17 shows Tesla's partners, their investments and the development programs they entered in with Tesla.

	2008	2010	2010	2010
Alliance	Daimler	Toyota	Panasonic	DoE
Investment ($m)	75 [1]	50	30	465
Type of investment	Equity	Equity	Equity	Long-term loan
Program	Apply Tesla's technology in a battery pack and charger for Daimler	Cooperate on the development of electric vehicles, and for Tesla to receive Toyota's support with sourcing parts and production and engineering expertise for the Model S	Collaborating on the development of next generation electric vehicle cells based on the 18650 form factor and nickel based lithium ion chemistry	Finance the development of Tesla's planned integrated manufacturing facility for the Model S as well as our electric powertrain production facility

Table 15: Tesla alliances

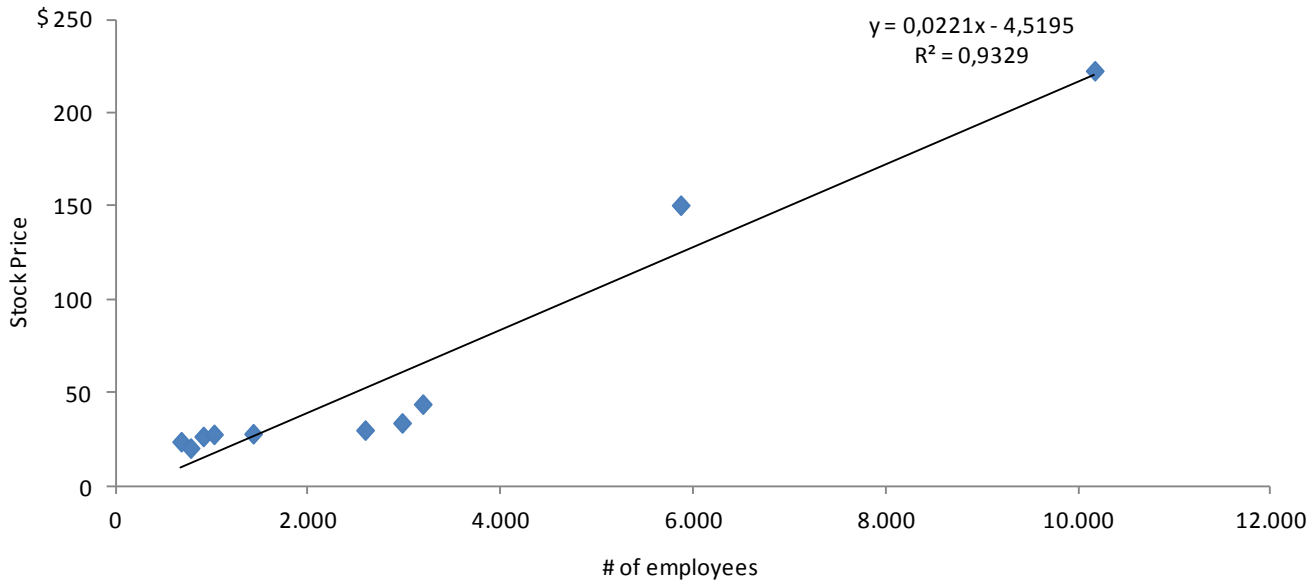
Sources: Tesla annual reports and IPO prospectus
Note:
1 Daimler invested through Blackstar Investco, which is 60% owned by Daimler and 40% by Aabar Blackstar Holdings

D. Number of employees

As discussed earlier, the number of employees is a strong signal about a company's quality. In fact, it is too costly for bad companies to increase their number of employees and their cost base.

Applying this theory to Tesla, the stock price was regressed to the number of employees, when the figure was available, to see whether the number of employees could be an estimate of future stock price performance.

Graph 7 shows an extremely high correlation between stock price and the number of employees. The model explains 93.3% of the variability and the β of 0.022 is significant at 1%.



Graph 7: regression line between number of employees and Tesla's stock price

Sources: Tesla reports and Bloomberg

In conclusion, the impressive increase in the number of employees, from about 3,000 at the beginning of 2013 to more than 10,000 at the end of 2014, has to be considered a signal about the quality of the company and its stock price performance.

This analysis is a clear quantitative finding that should add to Damodaran's fundamental valuation of the company.

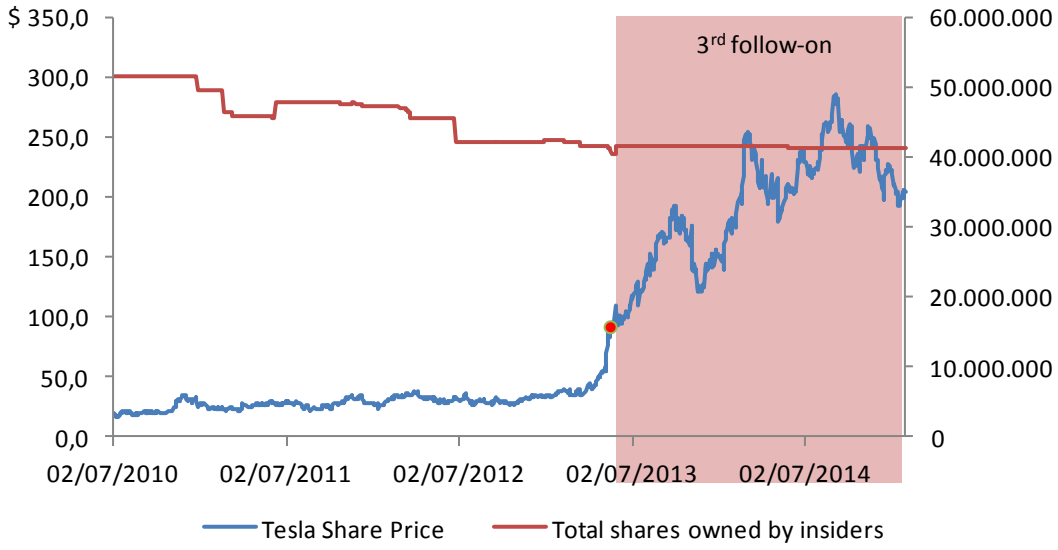
E. Investments by insiders

As discussed earlier, the literature shows how insiders significantly beat the market, but how it is not profitable for outside investors to imitate their trades because of transaction costs. Still, these trades are interesting as a signal.

In this analysis insiders are: (i) company executives and (ii) board members. The sources used are the SEC's records published every month. Insiders might have a direct or an indirect participation via someone else or another entity. This is typically the case of institutional investors like VCs that have a representative on the board who is considered to hold the participation as if it were the investor

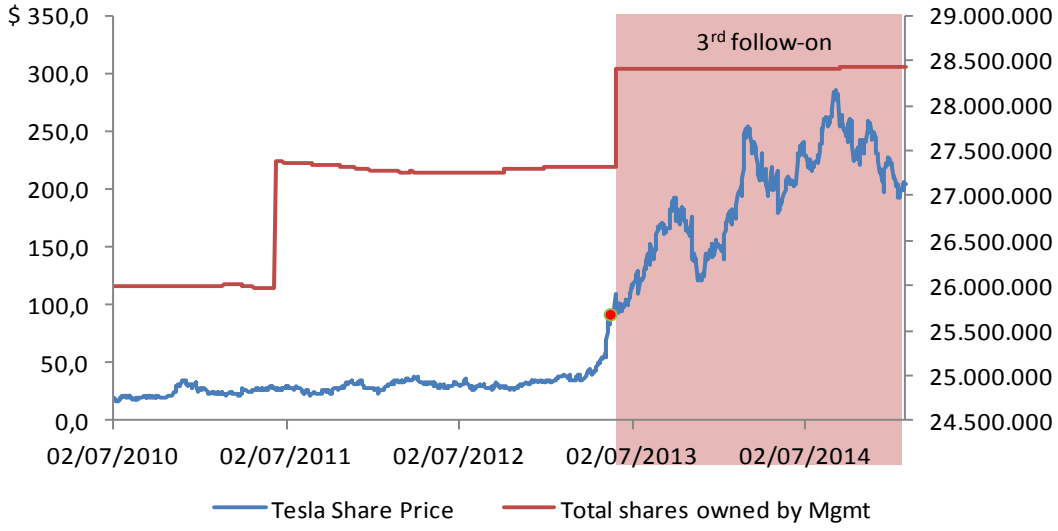
itself. Stock options sold are not considered as sales, nor as a signal, because they are a way for executives to cash-in for their efforts.

Graphs 8, 9 and 10 show the stock price compared to the insiders' number of shares. Graph 8 shows the total shares owned by insiders, graph 9 the shares owned by the management and graph 10 the shares owned by institutional investors that have a seat on the board like VCs.



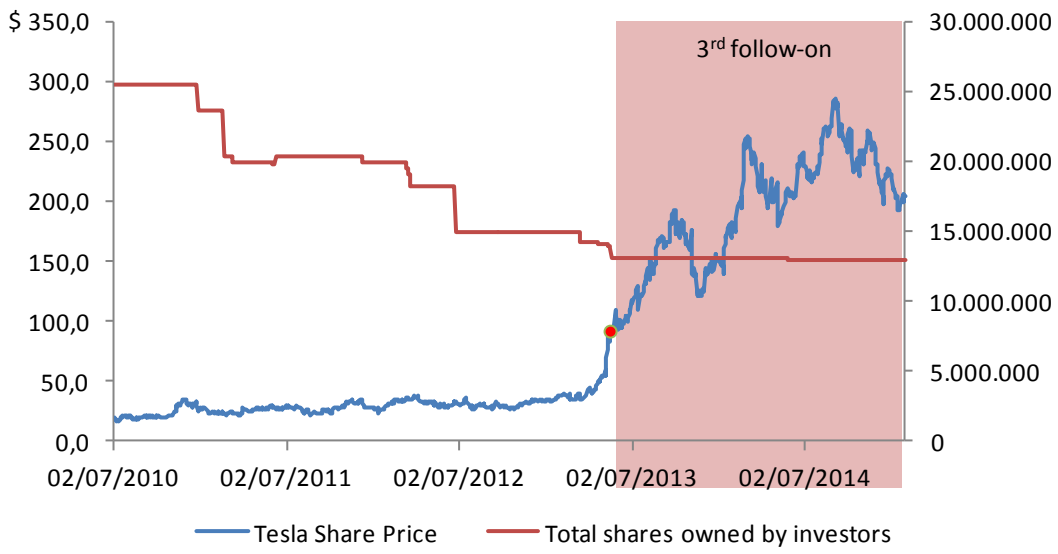
Graph 8: Tesla stock price vs number of shares owned by insiders

Sources: Tesla reports and Bloomberg



Graph 9: Tesla stock price vs number of shares owned by Tesla management

Sources: Tesla reports and Bloomberg



Graph 10: Tesla stock price vs number of shares owned by institutional investors that have a seat on the board

Sources: Tesla reports and Bloomberg

If the total number of shares held by insiders is decreasing, this is exclusively due to institutional investors like VCs. However, management and in particular Mr Musk, continue to buy Tesla's shares showing a strong belief in the company's potential.

Furthermore, not all institutional investors sold shares at the time of the third equity follow-on: almost no VC sold , evidently still seeing a strong potential in the share price.

Finally, another analysis has been carried out to test whether insiders could beat the market and whether outsiders could have gained information from these insiders' trades. Insiders' performances have been calculated over different periods of time (one day, one month, two months, six months and one year) to see whether they could outperform the market. Those results have been compared to the average performance of Tesla's share price over the same periods of times: i.e. for calculating the average one year performance of Tesla's share, every day the annual performance has been calculated then the average of every yearly performance compared to the yearly performance of the average insiders' returns. Positive returns compared with the market have been found for insiders and the management in the buy trades. This result is consistent with literature about buy trades (sell trades are not relevant as they might be done for other reasons than speculation). However, these results are not statistically significant.

To conclude, two types of analysis have been done on insiders' trades: the first looked at what kind of information could be drawn from the number of shares held by insiders and the second tried to understand whether insiders' trades were informative to the market. For the first analysis, it is clear that the management continued to invest in Tesla even after a first stock price increase at the beginning of 2013 and that VCs stopped selling their shares after the founder invested $100 million in the third capital increase. On the other side, for the second analysis, it cannot be concluded that insiders' trades were statistically informative.

F. Convertible bond analysis

The final signal comes from analysing convertible bonds through the Gordon Shapiro formula:

$$V = \frac{D_1}{(k - g)}$$

where D are dividends, k the required rate of return and g the growth rate.

Solving it for k, it becomes:

$$k = \frac{D_1}{V} + g$$

and since Tesla's dividends are zero:

$$k = g$$

Table 21, shows what the market expects about the future price of Tesla stock. With the first convertible bond issued at the same time of the third follow-on, the market expected the share price to grow 8.5% per year and hit approximately $140. At the time of the second and third issues of convertible bonds, the market was expecting a price of $356 in 2019 and of $422 in 2021.

From 16/05/2013	To 01/06/2018
β	1,22
Rf	1,7%
Risk premium	5,6%
Ke	8,5%
Dividend yield	0,0%
Growth	8,5%
Implied stock price growth	51%
Stock price at 16/05/2013	92
Expected stock price ($)	**139**
Conversion price ($)	125
Expected/CP	11,8%

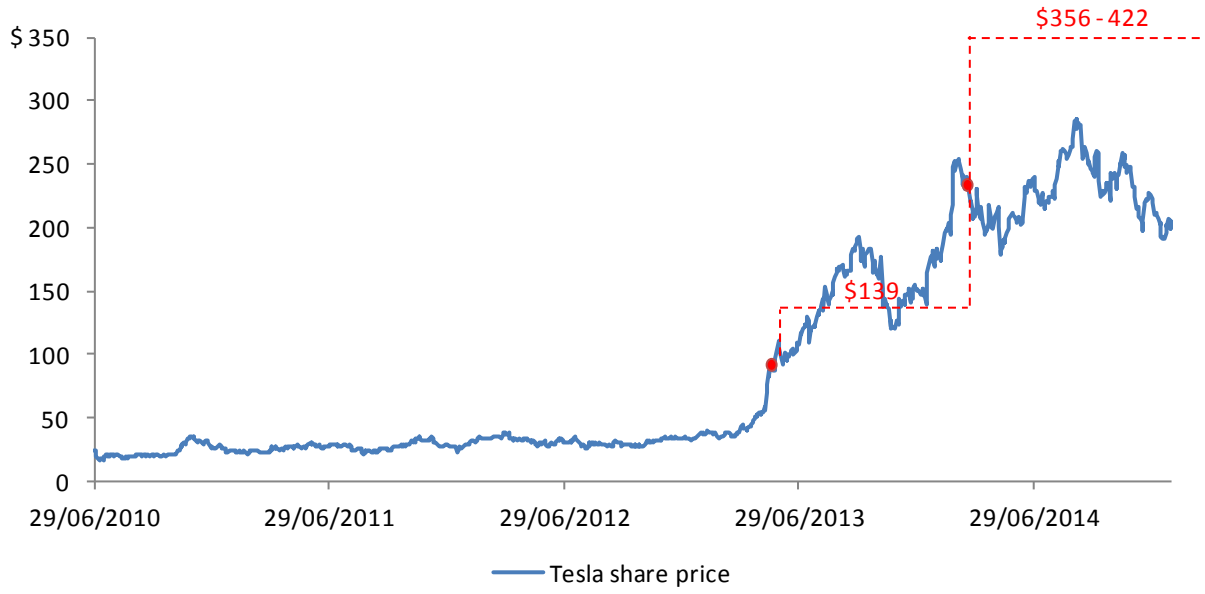
From 17/03/2014	To 01/03/2019
β	1,25
Rf	2,7%
Risk premium	5,0%
Ke	8,9%
Dividend yield	0,0%
Growth	8,9%
Implied stock price growth	52%
Stock price at 17/03/2014	234
Expected stock price ($)	**356**
Conversion price ($)	360
Expected/CP	-1,0%

From 17/03/2014	To 01/03/2021
β	1,25
Rf	2,7%
Risk premium	5,0%
Ke	8,9%
Dividend yield	0,0%
Growth	8,9%
Implied stock price growth	81%
Stock price at 17/03/2014	234
Expected stock price ($)	**422**
Conversion price ($)	360
Expected/CP	17,4%

Table18: expected stock price by the market from convertible bonds

Sources: Tesla convertible bonds prospectuS

Graph 11 summarizes what the market expects in terms of future share price performance:



Graph 11: Tesla stock price vs stock price expected by convertible bond analysis

Sources: Tesla convertible bond prospectus and Bloomberg

In conclusion, the market was expecting a strong performance of the convertible bonds and this clearly represents another signal about expected stock price performance.

While maybe some irrational investors exist, as Damodaran pointed out, it cannot be neglected that many strong signals about future stock price performance have existed and as such had to be considered.

5. Analysis of beta before and after the third follow-on

It is quite obvious that a turning point in Tesla's share price happened with the third equity follow-on. The stock price started to increase at the beginning of 2013 after the announcement of a first profit and in a year it increased by 152%. In September 2013 Damodaran, with a fundamental analysis valued the company at $70 per share. This value is not too far (-23.5%) from the $91.5 price per share on the day of the third follow-on. It is believed that Damodaran's fundamental analysis was broadly correct at the time of the third follow-on: however, this fundamental value was not adjusted for the information Mr Musk had given to the market about his investing $100 million.

Table 18 shows the cost of equity using the CAPM formula, over three periods of time: (i) since the IPO, (ii) from the IPO to the third follow-on and (iii) from the third follow-on. It seems that Tesla's required return increases from 8.5% to 11.4%. However, this is due to the higher volatility the stock price encountered since the third follow-on compared with the S&P500. In fact, the stock price increased dramatically from about $92 to approximately $200 (or by more than 120%) from mid May 2013 till the end of 2014.

From 30/06/2010	To 30/01/2015
βu	1,28
β	1,30
Risk premium	5,8%
Rf	2,2%
Ke	9,7%

From 30/06/2010	To 30/05/2013
βu	1,23
β	1,22
Risk premium	5,6%
Rf	1,7%
Ke	8,5%

From 30/05/2013	To 30/01/2015
βu	1,57
β	1,59
Risk premium	5,8%
Rf	2,2%
Ke	11,4%

Table19: Tesla analysis of unlevered beta and cost of equity

Sources: Tesla reports and Bloomberg

The increased cost of equity is a direct consequence of the increased volatility of the Tesla shares over the S&P500. In fact, the increased volatility could be considered as 'good' since it was skewed toward positive results.

Tables 19 and 20 show the frequency of the residuals between Tesla daily performance and the S&P500 daily performance. It is useful to see how many times Tesla performance was positive or negative compared to the S&P500 in a given timeframe. Table 19 shows how before the third follow-on Tesla returns were positively skewed compared with the S&P500 returns, while Table 20 shows how after the third follow-on Tesla returns were more negatively skewed, showing how the increased volatility was actually 'good'.

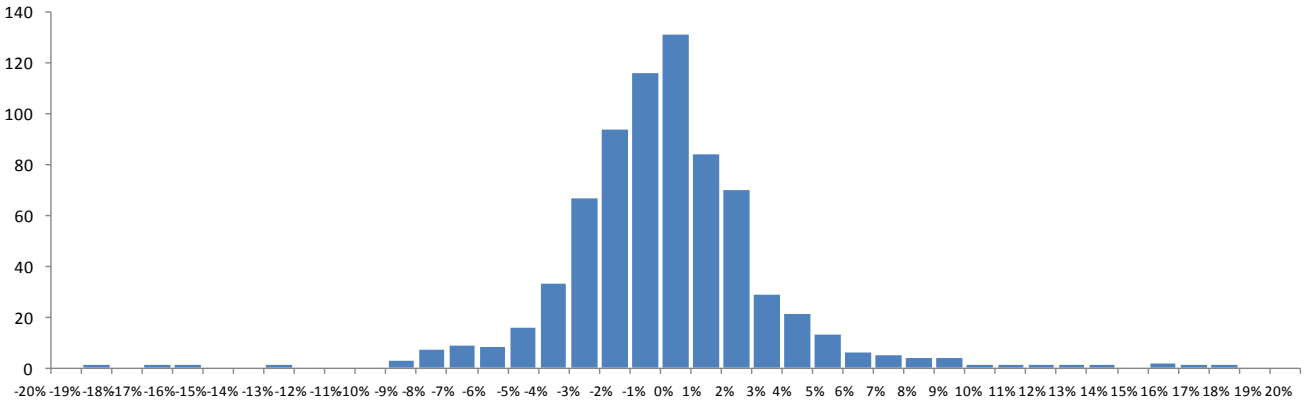


Table20: Tesla frequency of returns over S&P500 returns from IPO to third follow-on

Sources: Bloomberg

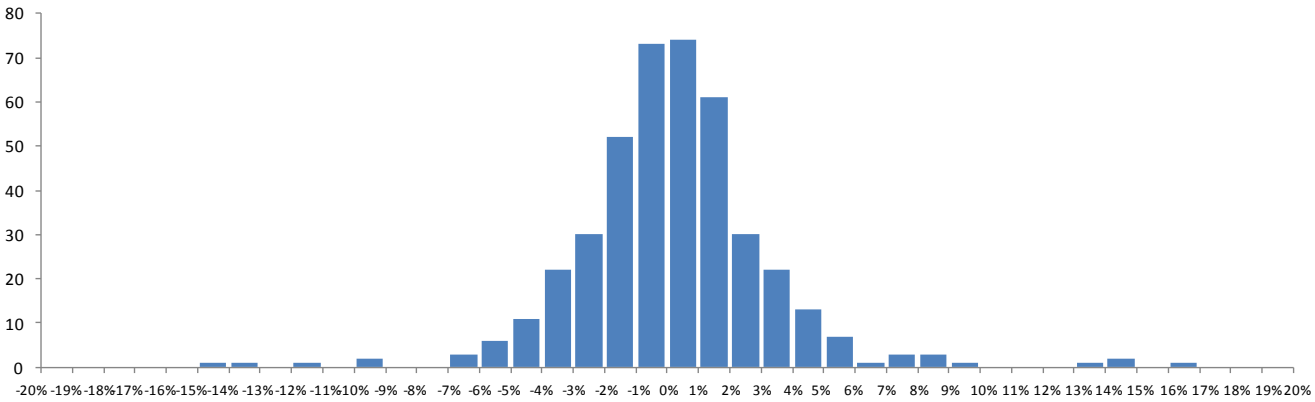


Table21: Tesla frequency of returns over S&P500 returns from third follow-on

Sources: Bloomberg

Conclusion

Fundamental analysis can explain only part of the valuation of start-ups and young companies. Signals sent to the market by these companies are an interesting way to supplement traditional valuation methods and give a fuller picture of their prospective values.

In the first part of this research, there is a review of the theoretical body concerning valuations of start-ups and young companies, in particular, the possible use of signals a start-up or a young company can send to the market about its value, and different more traditional models including:

- Fundamental methods like DCF and multiples analysis
- The VC method
- Real-option method.

All three have their pros and cons for companies at different stages of maturities, so they have to be used with care knowing all their limitations.

In the second part, a case study about the signals Tesla sent to the market is analyzed having as a starting point Damodaran's fundamental valuation. In his paper, Damodaran explains how Tesla's dramatic stock price increase in 2013/14 is not related to fundamentals:

- Neither to its fundamental value
- Nor to fundamental information.

Damodaran reaches a stock price valuation of approximately $70 per share in September 2013 and of $100 per share in March 2014, far below real prices.

In this analysis, different signals have been taken into account to understand why the stock price exceeds fundamental values and if some signals explain the price gap between Damodaran's and the market valuation. Tesla has sent strong signals all along - the founder's investments, the subscriptions at the capital increases, the alliances, the number of employees, the insiders' trades and the convertible bonds - but it appears that the most significant signals about its potential come from the third follow-on where the founder, Mr Elon Musk, invested $100 million incurring in debt, VCs stop

exiting and a convertible bond is issued in 2014 showing explicit expectations about the stock price. All these strong signals lead to high expectations by the market about Tesla's stock price performance.

A separate analysis is done to understand Tesla's risk profile before and after the third follow-on. While the unlevered beta, increased after the third follow-on, it is demonstrated how this increased volatility is actually 'good' for stockholders because the number of times the Tesla shares outperformed the S&P500 had dramatically increased.

To conclude, it seems that even if the stock price does look far from beyond its valuation based on fundamentals, there were very strong signals that should been taken into account to have a complete view of Tesla's value.

References

Akerlof, G. A. (1970): "The market for 'lemons': Qualitative uncertainty and the market mechanism", *Quarterly Journal of Economics,* 84: 488-500

Black, F. and Scholes, M. (1973): "The pricing of options and corporate liabilities", *Journal of political economy*, Vol. 81, No. 3, pp. 637-654

Cornell, B. and Damodaran, A. (2014): "Tesla: Anatomy of a Run-up Value Creation or Investor Sentiment?", *The journal of portfolio management*

Damodaran, A. (2011): "Valuing Young Growth Companies", *AAII Journal*

Damodaran, A. (2009): "The dark side of valuation", *Pearson education,* ISBN-10: 0-13-712689-1

Damodaran, A. (2004): "Investment fables", *Pearson Education*, ISBN 0-13-140312-5

Davila, A., Foster, G. and Gupta, M. (2002): "Venture-Capital Financing and the Growth of Startup Firms", *Stanford Graduate School of Business*, Working Paper No. 1667

DeLong, J. B., Shleifer, A., Summers, L. H., and Waldman, R. J. (1990): "The survival of noise traders in financial markets", *Journal of business*, Vol 64 no. 1

Festel, G., Wuermseher, M. and Cattaneo, G. (2013): "Valuation of Early Stage High-tech Start-up Companies", *International journal of business*, ISSN: 1083-4346

Finnerty, J. E. (1976): "Insiders' activity and inside information; a multivariate analysis", *Journal of financial and quantitative analysis*

Finnerty, J. E. (1976): "Insiders and market efficiency", T*he journal of finance* . VOL. XXXI, NO. 4

Hallen, B. (2008): "The Causes and Consequences of the Initial Network Positions of New Organizations: From Whom do Entrepreneurs Receive Investments", *Administrative Science Quarterly,* Vol. 53pp.685–718

Hsu, D. H. (2006): "Venture capitalists and cooperative start-up commercialization strategy", *Management Science*, 52: 204–219

Kotova, M.V. (2014): "The theoretical and methodological basis of startups valuation", *Odessa national polytechnic university, Odessa, Ukraine*

Jeng, L. A., Metrick, A. and Zeckhause, R. (2003): "Estimating the Returns to Insider Trading: A Performance-Evaluation Perspective", *The Review of Economics and Statistics*, Vol. 85, No. 2, pp. 453-471

Larcker, D. F. and Tayan, B. (2011): "Tesla motors: the evolution of governance from inception to ipo", *Corporate Governance Research Program*, Stanford

Leland, H. E. and Pyle, D. H. (1977): "Informational asymmetries, financial structure, and financial intermediation", *The journal of finance*, VOL, XXXIL NO. 2

Lin, Ji-Chai and Howe, J. S. (1990): "Insider Trading in the OTC Market", *The journal of finance*, VOL. XLV, NO, 4

Lintner, J. (1965): "The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets", *Review of Economics and Statistics*, Vol. 47, No. 1, pp. 13-37

Metrick, A. and Yasuda, A. (2010): "Venture capital & the finance of innovation", *John Wiley & Sons, Inc*, ISBN 978-0-470-45470-1

Modigliani, F. and Miller, M. H. (1958): "The Cost of Capital, Corporation Finance and the Theory of Investment", *The American Economic Review*, Vol. 48, No. 3, pp. 261-297

Reuer, J. J., Tong, T. W. and Wu, Cheng-Wei (2012): "A signaling theory of acquisition premiums: evidence from ipo targets", *Academy of Management Journal*, Vol. 55, No. 3, 667–683

Rozeff, M. S. and Zaman, M. A. (1988): "Market Efficiency and Insider Trading: New Evidence", *Journal of Business,* 1988, voL 61, no. I

Seyhun, H. N. (2000): "Investment Intelligence from Insider Trading", ISBN: 9780262692342

Seyhun, H. N. (1986): "Insiders' profits, costs of trading, and market efficiency", *Journal of Financial Economics*, 189-212.

Spence, M. (1973): "Job Market Signaling", *The Quarterly Journal of Economics*, Vol. 87, No. 3, pp. 355-374

Stuart, T. E, Hoang, H. and Hybels, R. C. (1999): "Interorganizational endorsements and the performance of entrepreneurial ventures", *Administrative Science Quarterly*, 44: 315–349

Wang, W., Shin, Y. C., and Francis, B. B. (2012): "Are CFOs' Trades More Informative Than CEOs' Trades?", *Journal of financial and quantitative analysis*, Vol. 47, No. 4, pp. 743–762