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Is the Internet facing a Bubble 2.0?

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Introduction

Facebook, Snapchat, Uber, AirBnB… These are all companies that regularly make it to the cover of magazines and financial papers. But what is so special about them? Well, aside from severely transforming their respective industries, these companies were created not so long time ago. In fact, the oldest in the group cited above is Facebook and is just 12 years old. Yet, these young organizations are valued at dozens of billions of dollars, and are therefore members of the exclusive "Unicorn" club. A "Unicorn" is an invented term created to designate private companies that are valued over $1B. The enormous valuation of these companies have led many investors to wonder: are these valuations justified? Is it rational to pay several billions of dollars for some companies that are yet to make profits? The Internet has created new business models that no-one just two decades ago could have even thought of: Uber is the leading transportation company, yet it does not own a single vehicle. AirBnB is the leading company in the hotel industry, yet it does not own a single hotel. Has everyone gone insane, or do these companies have revolutionized the way we place economic transactions and have it all figured out?

In this thesis we will investigate the valuation of technological companies and try to assess whereas they are justified by the underlying financial theory. Indeed, not so long time ago, the economic world shook as the so-called "Dotcom Bubble" burst. Overenthusiastic expectations about the newly democratized World Wide Web had led thousands of investors to lose their mind (and most of their money) while an irrational wind of mania blew on the worldwide financial markets during the years 1999 and 2000. As millions are thrown into the Facebook, Uber and Snapchat of our time, the question is now more than ever worth asking: are we in a Dotcom Bubble 2.0?

This topic is particularly interesting, as young companies and startup tend to have a disproportionate impact on the economy. The first impact on is

employment. Indeed, studies have shown that about 65 percent of the newly created jobs in the recent years can be attributed to small businesses and startups (Damodaran, 2009). Moreover, startups have a large, if not the largest, impact on innovation. Many experts agree that disruptive innovation is much more likely to come from lean and small businesses rather than rigid and large corporations that have too much to lose. In fact, it is even said that the Silicon Valley (a San Francisco area with the highest concentration of startups in the world) is the cradle of innovation (Peter Thiel, 2012). Last but not least, startups are responsible for economic growth. In the early 1990's, the United States have been able to generate more and faster economic growth than Western Europe, and this was mainly due to the rapid emergence of small technology businesses. A similar case is happening right now in India, where technological companies are believed to fuel most of the growth of this rapidly evolving economy.

This thesis is divided into three main parts. In the first part we will review the existing financial literature about speculative bubbles. We will see that it cannot entirely be explained by traditional market theory, but is believed to be the result of psychological biases and valuation issues. In the second part, we will make a trip in the past and have a closer look at the Dotcom bubble of 1999-2000. We will investigate the economic context in which the bubble took place, and its underlying causes. This task will prove particularly useful, as it will allow us to create benchmarks with the actual situation and help us determine if the past ought to repeat itself.

In the last part, we will constitute a set of indicators that will help us answer the research question of this thesis: are we in a bubble 2.0? In the pursuit of this quest, we will discover that it is not much about present tech startups being overvalued (there remain little doubts about it), but rather about what is so different with the current bubble and the 1999-2000 Dotcom bubble. Indeed, we will show that while the Dotcom Bubble affected millions of small public investors, the current situation ought to impact a few but wealthy private investors.

1 Bubbles: Behind The Word

The term « bubble » has been thrown and repeated an increasing number of times during the past decades. In today's society, it is often associated with financial crisis and speculation. Kindleberger and Aliber (2005) define a bubble as *« an upward price movement over an extended period of fifteen to forty months that then implodes* ». As a general rule, economists employ the term "bubble" to characterize « *any deviation in the price of an asset or a security or a commodity that cannot be explained in terms of fundamentals* » *(Kindleberger & Aliber, 2005, p. 29).*

Bull markets are typically characterized by high optimism and overly strong confidence in the market and its expected results. However, not every bull market, or « boom » is a bubble. The main difference between a bull market and a bubble relates to the fact that the increase in prices and transaction value is no longer underpinned on strong fundamental values. As the asset prices continue to rise while fundamentals are not, the price moves away from its intrinsic value. The bubble only occurs after an extended period of excessive overvaluation. This phenomenon has been theorized by Krantz (2001) in what he calls the « greater fool theory ». According to the author, a speculative bubble is characterized by the fact people continue to invest in overvalued stocks with the aim of selling within a short time to another investor, who is an even greater fool, at a yet higher price making a profit.

Kindleberger (2005) with his words « *Monkey see, monkey do* » highlights yet another characteristic of a speculative bubble: the entrance of new, unprofessional actors in the « game of investing ». In this sense, Kindleberger (2005) states that « *there is nothing more undermining for a person's self-esteem than to see its neighbor get rich* ». The entrance of new actors is perfectly illustrated with this popular story known as « the tip from the shoeshine boy ». This story tells how Rockefeller, when being asked from his shoeshine boy (some variant of the story pretend it was his driver) what stock he should buy, sold all

his positions just before the 1929' stock market crash. As more investors start to recognize this phenomenon, investors exit to take their profit leading to a rush for cashing out stock returns, which in turns results in a substantial decrease of stock prices (Kindleberger, 1989).

History has brought us many examples of speculative bubble. The most infamous must certainly be the Dutch « Tulip Mania » in the 1630's. Demand for certain tulip bulbs, drove their prices to reach the price of a small house, until it peaked and collapsed to be almost worthless in early 1637 (Dufwenberg, Lindqvist & Moore, 2005).

1.1 The Stages of a Bubble

For this section, we will mainly refer to Dr. Rodrigue (2006) who theorized the main stages of a bubble.

To understand the formation of a speculative bubble, one should first differentiate a bubble from a natural business cycle. Business cycles are a common understanding for most economists, who often link them to technological innovations. They often lead to an increase in investment, bringing new markets and employment opportunities. Economic expansion is the natural outcome of this new situation, "*but as the technology matures and the market becomes saturated, the expansion slows down* » *(Rodrigue, 2006, para 2).* To clear the excessive investments and/or capacity that occurred during the expansion stage, a correction is often needed, representing the so-called economic recession (Rodrigue, 2006).

One should note that the role of the central banks is to « smoothen » the natural economic cycles. However, history has shown us that the intervention of the central banks, such as the Federal Reserve, has often done nothing but amplify these cycles, "*exaggerating the amplitudes of bubbles and the mania that fuel them* » *(Rodrigue, 2006, para 2).* The author argues that « *instead of economic stability regulated by market forces, monetary intervention creates long term instability for the sake of short term stability* » *(Rodrigue 2006, para 2).*

As we have mentioned above, bubbles have appeared throughout history: the Tulip Mania, The 1929 Krach, then again in 1987, and again in 2008. Although each mania is obviously different, we can identify 4 stages that simplistically characterize all past bubbles:

1. **The stealth phase:** investors who understand best the fundamentals and alert for market changes discover an emerging opportunity. Of course, these investments are at risk as the underlying assumptions are yet to be proven. Thus, the « smart money » gets invested in the asset class, « *often quietly and cautiously* » *(Rodrigue, 2006, para 3).* The investors at this point are the ones with the best understanding of the wider economic triggers of such emerging opportunities and have better access to information. Rodrigue (2006) states « *prices gradually increase, but often completely unnoticed by the general population. Larger and larger positions are established as the smart money start to better understand that the fundamentals are well rounded and that this asset class is likely to experience significant future valuations* » *(Rodrigue, 2006 para 3).*

2. **The awareness phase**: as more and more investors start noticing the opportunity, their demand pushes the prices higher. Some investors are regularly taking profits, causing some punctual price drops, but the overall trend remains bullish. The smart money takes advantage of these off phases to reinforce their positions. As the prices rise, the asset class benefits from media attention, which in turns brings more and more « unqualified » investors (Shiller, 2003). Davis (2006) has demonstrated the worsening impact of media on market response to news, and the enhancing effect on irrational behaviors.

3. **The Mania Phase**: at this point, everyone wants his « piece of the cake » and the public jumps for this « opportunity of a lifetime ». Rodrigue says

   The expectations about future appreciation becomes a « no brainer » and a

linear inference mentality sets in; future prices are an extrapolation of past price appreciation, which of course goes against any conventional wisdom. This phase is however not about logic but a lot about psychology (Rodrigue, 2006, para 4).

We will later examine the psychological processes in play during bubbles. At this point, the market is characterized with « *irrational exuberance* » (Shiller, 2003) as « paper fortunes » are made from regular « investors » and greed sets in. The actors have no more understanding of the market dynamic nor the fundamentals. Prices are only driven by the never stronger general belief that it will be possible to sell at prices allowing for large profits. However, the smart money as well as most institutional investors notice the exuberance and quietly step away and liquidate their positions (Kindleberger, 2005) It is interesting to note that such exuberance is generally made possible by the large availability of financial means, mostly leverage and debt.

4. **The Blow-off phase**: this is when with Rodrigue's words « *a moment of epiphany* » hits everyone (Rodrigue, 2006). Confidence and expectations collapse and a wind of panic blows all over the market. A denial phase can sometimes occur where many try to reassure the public « that it is just a temporary setback ». As everyone starts expecting price declines, investors try to cash-out but takers are few. The bubble's deflation has cleared out and bankrupted the over-leveraged investors, which even furthers precipitate prices' collapse. At this point, the smart money may start to acquire assets as lower-than-ever prices (Rodrigue, 2006).

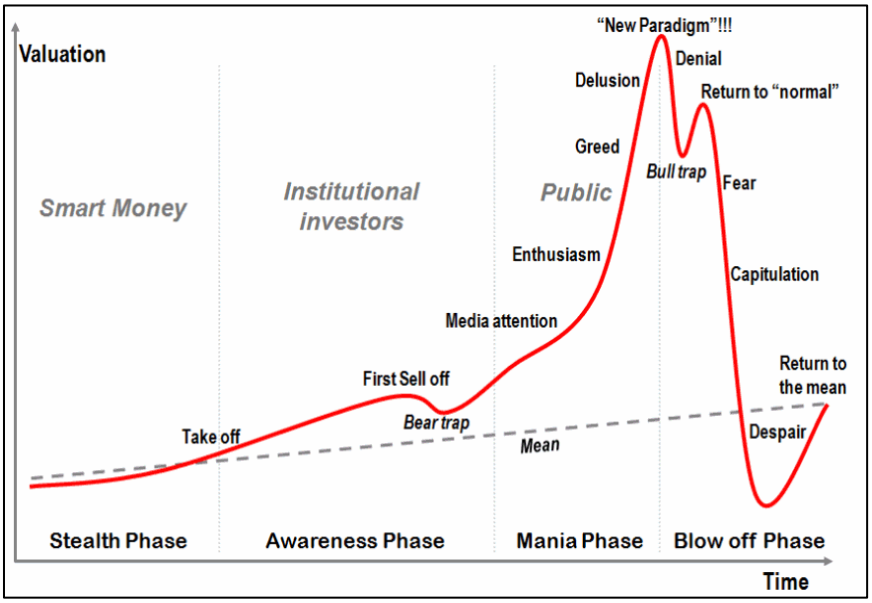

FIGURE 1: STAGES OF A BUBBLE (SOURCE: RODRIGUE, 2006)

1.2 Bubbles versus Market Efficiency

As we have just seen, bubbles are a consequence of irrational behavior. But what does the financial theory say about it? Can it explain it? The existence of bubbles is controversial among the believers of the market efficiency theory by Eugene Fama (1970). They argue that savvy market participants would drive clear overvaluations of assets down to their intrinsic value, hence that market bubbles do not really exist and are in fact the result of a recession. Fama (1970) defines an efficient market as a market in which the prices fully reflect all available information, so that no investor could take advantage of information asymmetries and predict stock returns. Through his theoretical and empirical work, he advocates three forms of market efficiency: weak form, semi-strong form and strong form of efficiency. The weak form tests the reflection in prices of all historical data. The semi-strong investigates if prices efficiently adjust to all publicly available information (such as announcements of quarterly earnings, stock splits…). Finally, the strong form is *« whether investors or groups have monopolistic access to any information relevant for price formation » (Fama, 1970).* Fama came to the conclusion that the market efficiency assumption holds up pretty well. This implies that no technical analysis (study of past prices) nor fundamental analysis help investors select « undervalued » stocks and thus

earning an abnormal return on their portfolio compared to a randomly selected portfolio with a comparable risk. The market efficiency model has generally been associated with « the random walk model » (Malkiel, 2003) which states future prices cannot be predicted from past prices. If stock prices immediately reflect the information available, future stock prices reflect information of the future and are thereby independent of present stock prices, making the changes unpredictable and random (Malkiel, 2003). The existence of bubbles is therefore controversial, as no departure from intrinsic value is allowed by the efficient market theory.

Some economists disagreed with the market efficiency theory, arguing that prices are not set by rational investors, pointing at events like speculative bubble to illustrate that psychological factors must have played a determinant role. Malkiel says:

A new breed of economists emphasized psychological and behavioral elements of stock-price determination, and they came to believe that future stock prices are somewhat predictable on the basis of past stock price patterns as well as certain "fundamental" valuation metrics. Moreover, many of these economists were even making the far more controversial claim that these predictable patterns enable investors to earn excess risk adjusted rates of return (Malkiel, 2003, p. 61).

Malkiel's conclusion is that markets are far more efficient than some economists like to deny, and that markets can be efficient even if many of its participants are not, although pricing is not always perfect. To summarize his opinion: nor the professional, nor the amateur investor can earn above average risk-adjusted returns in the long run (Malkiel, 2003). However, as we will now see, several biases in the financial decision-making process of market participant can be identified and could possibly explain bubbles.

1.3 Bubbles from the Behavioral Finance Perspective

As we have seen, there are opposite views on the market efficiency theory and

the rational behavior of its participants. Traditional economic theories have characterized human beings as « wealth maximizers » (Levy, 2001), but is that always so? Is it fair to assume that all humans behave rationally in their investing decisions? How can we then explain the existence of bubbles and « irrational exuberance? Behavioral finance is a relatively new field that aims to answers those questions. It seeks to combine cognitive and behavioral psychological theory with conventional economics and finance to provide explanations as for why people make irrational financial decisions (Levy, 2001).

For a long time, the market efficiency theory seemed to do just fine predicting most market behaviors. But more and more anomalies to these predictions started to raise questions among academics in both the traditional economics and finance fields. From a pure « Homo Economicus » perspective, human beings are always seeking to maximize their well-being, leaving no place for emotions and other irrationalities. Of course, this does not always happen in the « real world » where millions of people daily purchase lottery tickets against all logic, although the odds of winning are astronomically low.

While behavioral finance has gained an increasing popularity in the last few decades, it is not without its critics. One of the most vocal critics of behavioral finance is Eugene Fama (1988) (see efficient market theory above), he argues that the market efficiency model can in fact explain behavioral finance. However, it is not our task in the present thesis to debate over the utility of one versus the other theory, but rather to expose the reader with multiple views that bring us closer to our goal: understanding bubbles. For this end, we will look in this section closer to « herd behavior », a theory within the field of behavioral finance.

Although the dotcom bubble was catastrophic, it was not the first time it had happened. Economic history is filled with similar examples. How can such events happen over and over again? One possible explanation is inherent to the human nature: herd behavior (Sewell, 2007). Herd behavior can be defined as « *the tendency of individuals to mimic the actions (rational or irrational) of a larger group, while they wouldn't necessary makes the same choice individually* » *(Sewell, 2007).* This kind of behavior can be intuitively explained by at least two

factors:

1. Social conformity and belonging: following a group and acting like it is perceived as the best way to be a member of it. It is the social pressure of conformity that drives an individual to mimic the group's actions.

2. The second one is the common rationale that a large group could not likely be wrong. It is based on the common perception that a large group most likely knows things that an individual does not. This phenomenon is even stronger with inexperienced individuals.

Herd behavior is said to be the result of information cascade (Shiller, 2005). Shiller (2005) illustrates this principle through the following example: let us imagine two restaurants side by side, opening at the same time. An individual is asked to choose among one of the restaurant by just looking at them. After the first individual has chosen, a second one, having observed the first one's choice is being asked to make an identical choice. And so it goes for a large number of individuals. Based on the choice of the first individual, one restaurant was fully crowded while the other one struggled for customers (Shiller, 2005).

Herd behavior was exhibited in the late 1990's during the dotcom bubble, when venture capitalist and private investors were pouring huge amounts of money into technological companies with no valid and sound business models. The driving force that seemed to compel these investors was « *the reassurance they got from seeing so many others do the same thing* » (Kamalodin, 2011). Furthermore, Welch (2000) demonstrated that this pattern of behavior appeared to be stronger in bullish markets rather than bearish, indicating that information collection was poorer in up-markets (Welch, 2000).

1.4 Valuation Issues, Venture Capital and IPO Underpricing

As we have seen, bubbles are departures of assets prices from their intrinsic

value. The market efficiency theory doesn't explain such departure as prices should reflect the available information at all time, and all assets should be correctly priced. However, behavioral finance studies biases than can occur in the decision process and lead us the way to possible explanations for mispricing.

In the present section, we will review another possible aspect of mispricing: valuation issues. If an asset cannot precisely be priced, or is commonly mispriced by a large segment of the population, bubble-like phenomenon can occur.

1.4.1 Valuing young companies

Young companies and startups have unique characteristics that make traditional valuation methods inapplicable to them (Damodaran, 2009). Why is that so?

- **Absence of operating history**: by definition, young companies have very limited histories and there is therefore a limited amount of data available for any projections.
- **Small or no revenues and operating losses**: most startups start with an idea, and the road to a commercial product is paved with R&D obstacles and concept validation. Therefore, most young companies have no or very small revenues. For those that are making revenues, the constant focus on growth, an inherent characteristic of startups, burns a lot of cash causing in most cases at least operating losses. Their financial situation makes the absence of past financial data even more useless in the effort to value those companies.
- **Dependent and private equity**: as the company does not yet generate enough cash to sustain its operations, young companies are dependent upon external financing. The founders, followed by angel investment and venture capital in case of success, generally provide the starting equity.
- **High mortality rate**: The majority of startups (numbers vary in different studies) don't make it past the ten years mark. This factor should be accounted somewhere in the valuation method.
- **Multiple claims on equity**: as startups go through multiple rounds of financing, multiple parties have claims on the startup cash flow. However,

according to the stage of financing, the typologies of investors differ, and so do their conditions to invest in the company. The different investors and the financial instruments used can affect the value of the startup.

- **Illiquid investment**: as we will subsequently see, venture capital is highly dependent on exits, and most startups tend to stay private for several years. Thus, investments in startups are largely less liquid than their publicly traded counterparts.

According to the Discounted Cash Flow (DCF) method, there are four crucial elements necessary for the valuation of a company: (1) the cash flow for existing assets, (2) the expected growth from both new investments and improved efficiency on existing assets, (3) the discount rates that emerge from our assessments of risk in both the business and its equity, and (4) the assessment of when the firm will become a stable growth firm. Damodaran (2009) argues that on each of these four elements, young companies pose issues due to their intrinsic characteristics.

Existing Assets

The current DCF approach, as its name suggest, use the current assets to predict the future cash flows they will generate. Damodaran states « *with some young firms, existing assets represents such a small proportion of the overall value of the firm that it makes little sense to expend resources estimating their value* » *(Damodaran, 2009, p. 23)*. However, even when these companies do have some valuable assets, the lack of financial history makes it very hard to assess their value. The absence of historical data makes the process of assessing the resistance of existing assets to fluctuations of macroeconomic conditions. Furthermore, startups are characterized with huge burn rates and marketing expenses. This complicates the valuation, as expenses incurred to generate future growth should not be mixed with expenses associated to generate their current revenues (Damodaran, 2009).

Growth Assets

One of the main differences between an SME and a startup is that a startup has an extreme growth ambition. Hence, most of the justification for higher than average multiples for startups comes from the growth potential. However, as Damodaran argues: "*The absence of revenues in some cases, and the lack of history on revenues in others, means that we cannot use past revenue growth as an input into the estimation of future revenues" (Damodaran, 2009, p. 24).*

Discount rates

The standard DCF method requires discounting future cash flows with a discount rate that reflects the risk of the underlying company. However, using the CAPM model, the discount rate heavily relies on the Beta for equity and the cost of debt. The beta is found with a regression of the stock returns to a certain market index, while cost of debt is usually the interest rates on the trading bonds issued by the company. For young companies, this causes many problems. As Damodaran says:

First, most young companies are not publicly traded and have no publicly traded bonds outstanding. Consequently, there is no way in which we can run a regression of past returns, to get an equity beta, or use a market interest rate on debt. To add to the problem, the equity in a young company is often held by investors who are either completely invested in the company (founders) or only partially diversified (venture capitalists). As a result, these investors are unlikely to accept the notion that the only risk that matters is the risk that cannot be diversified away and instead will demand compensation for at least some of the firm specific risk (Damodaran, 2009, pp. 28-30).

Furthermore, the equity financing for startups comes from a large amount of different sources: « love money », angel investments, venture capital or the founders resources. Hence, different cost of equity might be associated with these sources of financing (Damodaran, 2009).

Terminal Value

The terminal value in the DCF approach, usually accounts for a large proportion

of the entire value of a company. This is even truer for startups, and it is not unusual to see terminal value accounting for over 90% than the overall value of the company. However, a startup is by definition in a constant uncertainty. Hence, estimation of terminal value is problematic (Damodaran, 2009).

Another traditional approach is the comparable method which suggest one should look at other publicly traded firms multiples to infer its own multiples. However, this poses two major problems (1) most startups aren't publicly traded (by definition) (2) even if we wanted to compare to other startups, as they are all in the same scenario and lack financial history, which would be the benchmark? Furthermore, nothing would prevent a whole sector to be severely misvalued.

Another approach is the Venture Capitalist approach. The method used by most venture capital firms provides no better answer, yet is hugely popular. However, the specifics of the method are not relevant here, and we send the interested reader to the excellent paper written by Damodaran (2009). For the sake of this thesis, we will just remember that the valuations methods used to make important investment decisions are fundamentally flawed by the inherent characteristics of young companies, and although alternatives exists, few people use them.

1.4.2 Venture Capital

Young companies and startups, as mentioned earlier, are highly dependent on external funding. If a bubble should exist, it would mean, by definition, that the investors financing startups and young companies are behaving irrationally and that young companies are overpriced. Hence, it's only natural if we take a look closer at the venture capital industry and other sources of financing, the process and their motives. Gaining a better understanding of how the financing process goes for a startup will later enable us to infer indicators of whether investors are behaving rationally and if startups are priced at their intrinsic value.

The financing options at the disposal of young companies are: raising money from venture capitalist (hereafter shortened VC's), angel investments, "*love money*" (money from family and friends) or the resources from its founders. The venture capital industry has allowed innovative young firms to turn their innovations into profitable, marketable technologies and enlarge their growth prospect (Bercovici, 2011). Venture capitalists are professional investors who pool money from multiple investors into one or more funds that they manage. Some venture capital funds count big individual fortunes and investment banks among their clients (Bercovici, 2011). The focus of venture capitalist is most and foremost the search for a profitable and risk-adjusted rate of return. Venture Capitalists generally invest in companies that have huge growth potential and great upside perspectives. Venture capital is a very important source of financing for startups as their growth is vital for their survival (« *grow fast or die fast* ») and they do not yet have access to the traditional capital markets. Contracting debt is often not an option for startups as they have little or no financials to show, nor valuable collaterals to secure the debt (Damodaran, 2009).

Venture capitalists usually structure deals in such a way that additionally to providing equity, the have their word to say in the management of the startup. They usually do this by adding terms in the « term sheet » providing them with seats in the board of directors of the startup they invest in. Equity in the startup is usually done through instruments like convertible securities and preferred shares as a way to protect themselves against downside risk while still allowing them to benefit from a potential upside. Preferred shares give a downside protection thanks to seniority rights on the assets of the firm in case of liquidation, and often guarantees a fixed, pre-determined dividend payment before payment to common shareholders (Shiller, 2006).

Exit strategies

As Espenlaub (2009) says:

The success of the venture capital industry depends heavily on the exit process. The structure of the venture capital industry is unique in that venture capital firms are involved in start-up financing and are engaged in their backed companies for only a limited period of time. The exit opportunity is a key part of the venture capital cycle and allows the quantitative assessments of venture capital firms' performance. {…} The issue of how venture capital firms exit their backed companies interests various parties. They only realize returns from their investments at the time of exit and their backed companies do not pay any dividends. As a consequence, venture capital returns are directly linked to the exit from an investment (Espenlaub, 2009, pp. 33-35).

There are five main strategies for the VC's to exit their investment. It can either be done through an Initial public Offering (as seen above), a merger or acquisition, a repurchase or a management buy-out, a secondary sale or in the least favorable scenario, write-offs or bankruptcy. Disinvestments through IPO's are the most successful routes for venture capital in the U.S while disinvestments through M&A tend to break even or generate a moderate profit (Espenlaub, 2009). Gompers and Lerner (2006) address this question in their book "*The Venture Capital Cycle*" For a sample of 794 venture capital-backed firms as of July 31, 1992, the breakdown of exit outcomes were as follows:

Type of Exit	Number	Percentage
IPO's	127	22,5 %
M&A	134	23,8 %
Liquidation/Bankruptcy	88	15,6 %
Remained Private	215	38,1 %

FIGURE 2: EXIT DISTRIBUTION (SOURCE: GOMPERS AND LERNER, 2006)

It is interesting and relevant to note that venture capital money is no long-term money (Cumming & Macintosh, 2003). VC's exit behaviors have been studied in the economic literature and the holding period for their investments in startups is believed to be between 2 to 8 years (Cumming & Macintosh, 2003; Pandey & Rajan, 2011).

1.4.3 The IPO Process

« *For a company going public typically marks the transformation from startup adolescence to corporate adulthood* » *(Bartov, Givoly & Hayn p. 324).*

As we have read above, the venture capital industry is heavily dependent on exit strategies, and going public is one of the most important one. In this section, we will show that a certain phenomenon, namely underpricing, typically occurs during bubbles. This will prove particularly useful later on in this thesis, as we will examine the current IPO climate and use it as one of the indicator to determine whether we find ourselves in a new dotcom bubble or not.

Going public is the process of offering securities of a privately owned company for sale to the general public (PricewaterhouseCoopers, 2010). When « going public », the company raises capital from the public by issuing and selling of a set number of shares at a given price. Going public is an important step in the life of a young company, and while we'll discuss the reasons behind it, Ljungqvist (2004) describes at least two main advantages for companies to do so: (1) it provides the firm with access to public equity funding, which may lower the firm's cost of capital (2) it allows its stockholders to exchange their shares to diversify their portfolio and provides them with an exit possibility (particularly important for Venture Capital firms).

The IPO can be made through three different methods: the "fixed price method", the "auction method" or the "book building method » (Pinho, 2013). The « book building method » has become the most popular method in the world's biggest

markets, and, for that reason, is the only one we will discuss here. According to that method, the underwriter (an investment bank) set a price range within with they wish the company to go public at, and then present the IPO opportunity to a large range of institutional investors (in what we call « roadshows ») to collect non-binding indications of interest in the stock (Pinho, 2013).

1.4.3.1 IPO Underpricing

Underpricing is a well-documented fact and means that newly traded stocks tend to trade at a significantly higher price then when they were introduced (Bartov et al., 2002). Ljungqvist (2004) measures underpricing as the percentage difference between the offering price and the price at which the stock subsequently trade in the markets. Ljungqvist (2004) also defines IPO underpricing as the amount of money « *left on the table* » which is calculated by taking the difference between the aftermarket trading price and the offer price, multiplied by the number of stocks sold during the IPO. Ljungqvist (2004) further states « *shares sold at the offer price could have been sold at the aftermarket price instead - that is, that aftermarket demand is price inelastic » (Ljungqvist; 2004, p. 32).*

One should note that IPO underpricing is costly for the company's owners for at least two reasons. The first one is that stocks sold for personal profit are sold for a too low price. The second one is that stocks retained in the firm's balance sheet are worth subsequently less.

Ljungqvist (2004) further stated that underpricing is more common than overpricing, as illustrated in ***Figure 2*** here under which illustrates the Initial IPO returns in the United States, calculated as the first-day closing price over the IPO offer price minus one.

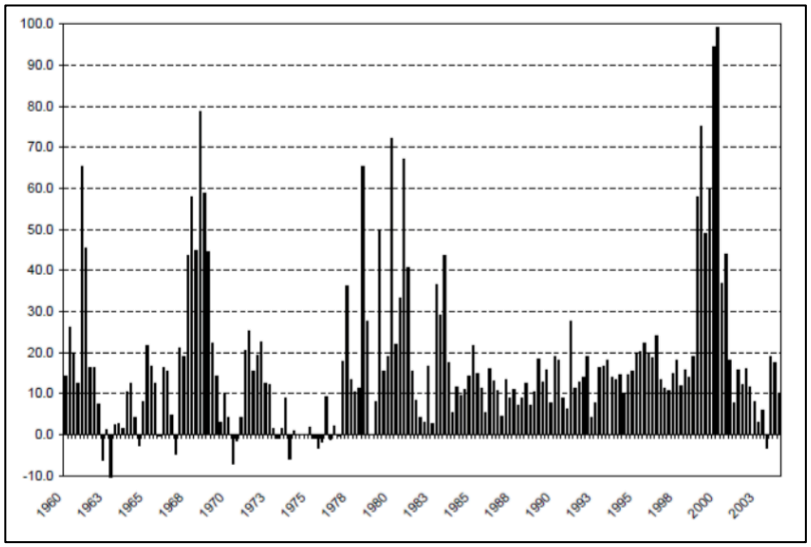

FIGURE 3: INTIAL IPO RETURNS (SOURCE: LJUNGQVIST, 2004)

As we can clearly see on Figure 2, during the year of 1999, in the middle of the Dotcom bubble, 117 IPOs doubled in price on their first day of trading, leaving the amount of $37 billion left on the table. First-day returns exceeded 30 percent every month from November 1998 to March 2000, where mostly of the firms were very young and had venture capital backing (Loughran and Ritter, 2004). In the years 1999 and 2000, U.S. issuers left an aggregate of $62 billion on the table and the average IPO was underpriced by 71% and 57% respectively.

We identified several reasons for underpricing during the dotcom bubble:

Riskier IPO's are more underpriced than less risky IPO's

Ljungqvist and Wilhelm (2003) stated that young Internet companies have a lot of uncertainty surrounding their business models and environment; hence, they have to accept a higher underpricing to reflect that uncertainty. This hypothesis was further supported by Loughran and Ritter (2004) who showed that riskier companies suffered more of underpricing during their IPO's than less risky companies. The underpricing is necessary to reach an equilibrium in which a sufficient amount of investors is willing to take part in the initial public offering.

IPO's as a branding opportunity

Ljungqvist and Wilhelm (2003) suggest that in some cases IPO underpricing is the result of the will from the company that is going public to gain media attention and use the IPO as a « branding opportunity ». In fact, DuCharme, L., Rajgopal and Sefcik (2001) argue that IPO underpricing can result in higher consumer awareness and even an increase in sales. Therefore, as it clearly becomes a marketing transaction, it should have a cost: this is exactly what the « money left on the table » represents.

Irrational Behavior

Ofek and Richardson (2003) provided another possible explanation for underpricing during the Internet bubble. The authors suggest that IPO underpricing is the result of an irrational transfer of optimism into Internet stocks valuations. As there was no benchmark to refer to for early Internet companies, it is believed that investors simply transferred their optimism and « hype » around the Internet industry into the asset prices. The authors thus suggest that the trading price was simply the result of a superior demand versus the supply, and was not justified by cash flows or any other intrinsic valuation methods.

2 The Dotcom Bubble

2.1 The Beginning

Although the origins of the Dotcom bubble that occurred in the late 1990's cannot precisely be retraced, it is commonly admitted that the triggering event was the invention of the first « mainstream » web browser: Mosaic (Shiller, 2003). Mosaic Communications Corporation, founded in 1994 commercialized a browser service that for the first time allowed people to take real advantage from the Internet. The product was made available in February 1994, introducing the World Wide Web (« www ») for the masses. A browser is a portal to the Internet, allowing for common applications such as search but also e-commerce. The company had a solid 80% market share of the browser market and was converted into Netscape Communications Corporation in 1998 (Yoffie & Cusumano, 1999). By 1999, Netscape was the fastest growing software company of all time, and all agree on its tremendous impact on popularizing the web for « common people » and raising interest in other Internet-related companies. Netscape IPO was largely underpriced: the day it went public; the share price went from an offering price of $28 to $75 (Perkins & Perkins, 1999). Netscape's IPO paved the path to numerous IPO's as it led people to believe that successful IPO's were possible in Silicon Valley. From this day on, the number of initial public offerings steadily increased and this is why Netscape's IPO is considered the first day of the Internet bubble.

2.2 Economic Context

Our focus in this section will mainly be on the U.S., as it is it in North America that the first Internet companies emerged, with their IPO's in the Nasdaq market, the American index for technological stocks. In 2000, unemployment was at its lowest with a 4% unemployment rate for the last quarter, according to a report of the Bureau of Labor statistics. In the same time, America was

experiencing a period of intense growth for almost ten years. Gross Domestic Product (GDP) jumped 5.6% in the last quarter of 2000, however the first signs of slow-down started to appear. The monetary politics led by the Federal Reserve and its president Alan Greenspan were aggressive: between 1999 and 2000, he raised the interest rates not less than 6 times! Inflation was slightly upward trending at 2,5% versus 2,1% the year before (Owen and Griffiths, 2006).

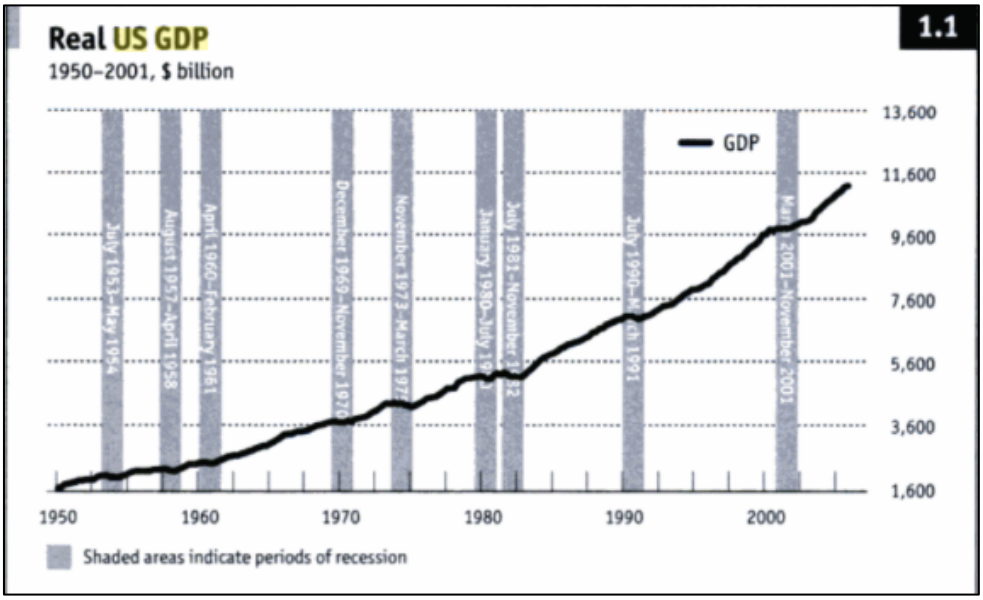

FIGURE 4: REAL US GDP (SOURCE: OWENAND GRIFFITHS, 2006)

2.3 The Rise and Fall of Technology Stocks

The emergence and quick rise of technology stocks, called « Dotcoms » has been the result of many factors characterizing the late 1990's. One should not undermine the impact and upheaval Internet has had on the economy as a whole, not only changing radically the way we access and consume information and products, but also impacting the way companies and brands could market themselves. We therefore investigate further on the marketing paradigm shift that Internet provoked as it has drastically modified the firms' structure of costs.

2.3.1 Cyber Marketing

Djamchid Assadi (2004) states that the marketing contribution of Internet is a

reinforcement of the existing qualitative processes such as the personalization of the offer, one-to-one marketing, and allows for new perspectives in customer relationships management and the way transactions will be concluded.

For Assadi, cyber marketing is « *a facilitator, a simplifier and accelerator of consumer behavior* » *(Assadi, 2004, p. 6)*. The emergence of Internet will be accompanied with an evolution from direct marketing to relationship marketing. The main idea will be to loyalize the client thanks to a « *one-to-one strategy* » where the offering will have to fit to the individual needs of the client. Another interesting contribution of the Internet is allowing marketers to collect and leverage data to build customized relationships with each client, and doing so at lesser cost.

With the mainstream emergence of Internet, the crowd suddenly sees it as new way to revolutionize the economy. Markets seem unlimited while costs should radically lower. In short: the possibility of large profits in the very close future. Paradoxically, revenues and profits are not immediately a main concern. In the first phase of its development, e-commerce is all about acquiring new users and making profits is considered a secondary focus (Coggan, 2002). Philip Coggan (2002) illustrates this mindset with the following:

In late 1999 and early 2000 ordinary investors could make unique fortunes by picking the right shares at the right time. Stocks in some small companies rose by several hundred percent in a day. In one week in December 1999 you could have turned £11,000 into £1 million if you had invested in the small companies Culver Holdings, Lionheart, Produm Foods and Bolton International". He further says *« when Internet appeared, it seemed like a no brainer. A new technology that was going to change the world: how could it fail at generating profits? (Coggan, 2002, p.172).*

Overly confident investors characterized this period of time, and the continuous publicized flow of young entrepreneurs turned millionaires would reinforce that perception (Coggan, 2002).

During this phase of euphoria, Internet companies were desperately seeking to

increase their market share, at the cost of huge marketing expenses in thoughtless marketing strategies. These companies, as explained by Kozberg

{…} *begin by making large expenditures on R&D to develop a site's quality, improving their ability to retain viewers and attract new ones via reputation effects. In addition, firms engage in major advertising campaigns and other promotions oriented towards attracting larger audiences. As audience increases so does the number of pages viewed, increasing the advertising and promotion based revenue opportunities for the firm. Increased audience could also lead to additional opportunities resulting from network economies of scale and scope (Kozberg, 2001, p. 9).*

However, advertising expenses must be coupled with sound business models. Some companies were spending 250$ for the acquisition of one single customer, while hoping he would make a 50$ sales (Kozberg, 2001). Philip Coggan (2002) also denounces the exuberance in the advertising expenses during the bubble. One of the most infamous examples is boo.com, the online shop created in 1998 that burned the enormous amount of $188 million in just six months, while pets.com is believed to have spent $179 in marketing. Boo.com collapsed with a liquidation value of just over $1 million.
However, Philip Coggan specifies « *in this climate of general euphoria, most investors were just but « momentum players », people buying stocks because they were rising* » *(Coggan, 2002, p. 13).* When the stocks failed to maintain their growth, these players exited the markets, precipitating their fall.

Opportunities to get rich were not lacking at that time. Venture capital funds were largely oversubscribed, while in the meantime, the Federal Reserve's president, Alan Greenspan, was concerned about maintaining growth. It was not a time to worry about the justification of the high valuation of technological stocks, but rather just buy them (Lacoste, 2009). The combination of economic expansion and the technological explosion was going to contribute to what we called « *The New Economy* ».

This economy is characterized by an almost non-existing inflation, and full employment, similar to other historical good times in developed countries in the 1950's and 1960's. Estimated at $4 billion in 1994, revenues directly generated by the Internet peaked at $301 billion by 1998, which brought the Internet industry to similar levels as other big American industries such as the automobile industry ($350 billion) (Lacoste, 2009). In 1997, in his testimony to the U.S. Senate, the former U.S. Federal Reserve chairman Alan Greenspan suggested the existence of a bubble:

Is it possible that there is something fundamentally new about this current period that would warrant such complacency? Yes, it is possible. Markets may have become more efficient, competition is more global, and information technology has doubtless enhanced the stability of business operations. But, regrettably, history is strewn with visions of such new eras that, in the end, have proven to be a mirage. In short, history counsels caution (Alan Greenspan, 1997, cited by Lacoste, 2009, p. 26).

2.3.2 Venture Capital Greed

The emergence and growth of technological stocks was mainly catalyzed by the enormous amounts venture capital firms funds were pouring into startups. Matthew Zook (2005) recalls an interesting parade. Indeed, despite the fact that Internet has allowed faster and broader distribution of information, dotcom companies have grouped into smaller « clusters », which is mainly explained by the fact that know-how and capital were highly concentrated in certain regions. Access to capital attracted companies, themselves attracting other companies, bringing with them more and more specialized and qualified employees in their respective fields (Zook, 2005). This is the case of the famous Silicon Valley in San Francisco.

The high growth and high risk encountered for the startups there have led their founders to seek for financing opportunities. Zook (2005) further demonstrates that the amount of Venture Capital invested in the United States increased by

1300% between 1995 and 2000. From July 1999 to December 2000, the amount of venture capital was equivalent to the capital invested in the last thirty years combined. The average rate of return on venture capital during that period was 23%, while it was steadily over 50% during the bubble. According to Zook (2005), the most widespread form of venture capital was the 'Limited Partnership », meaning that the sought-after capital was provided by multiple investors (the « limited partners ») and from which the « general partner » was in charge of the management and the discretion over the startup's investment decisions. Venture funds took shares in the ventures for a limited period of time and were highly interested in exit opportunities (see above "exit strategies").

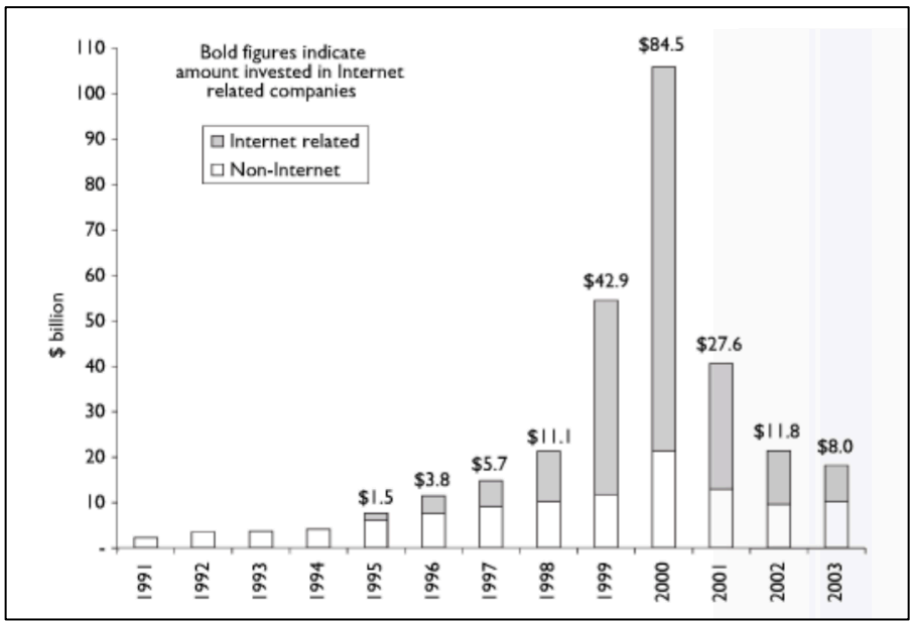

FIGURE 5: INVESTMENT IN VENTURE CAPITAL (SOURCE: ZOOK, 2005)

Not only did they provide equity funding, venture capitalists often were part of the board of directors to counsel the CEO and participate in strategic decisions. According to Zook (2005), it is not that much the availability of capital in Silicon Valley to made it so interesting, and propitious to a rapid extension, but the network and relations brought by the venture capitalists.

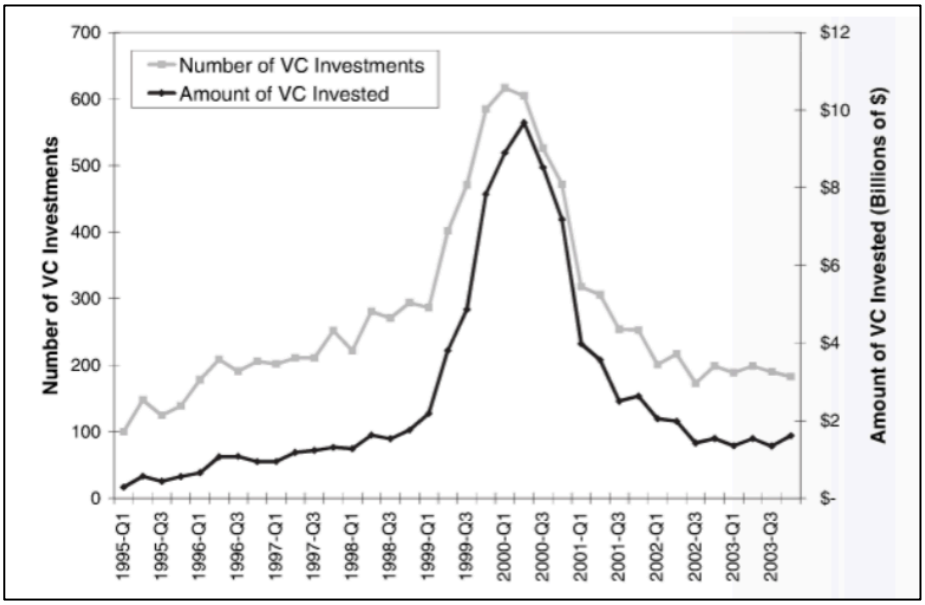

FIGURE 6: NUMBER OF DEALS AND AMOUNT OF VENTURE CAPITAL IN SAN FRANSCISCO AREA

(SOURCE: ZOOK, 2005)

However, the situation would eventually darken. The unprecedented access to capital brought entrepreneurs into a unique situation in which there was more money to be invested in viable businesses and experienced managers. Hence, the competition between venture capital firms to fund the best deals let to a harmful compression of due diligence process, and to high valuations of companies with doubtful business models.

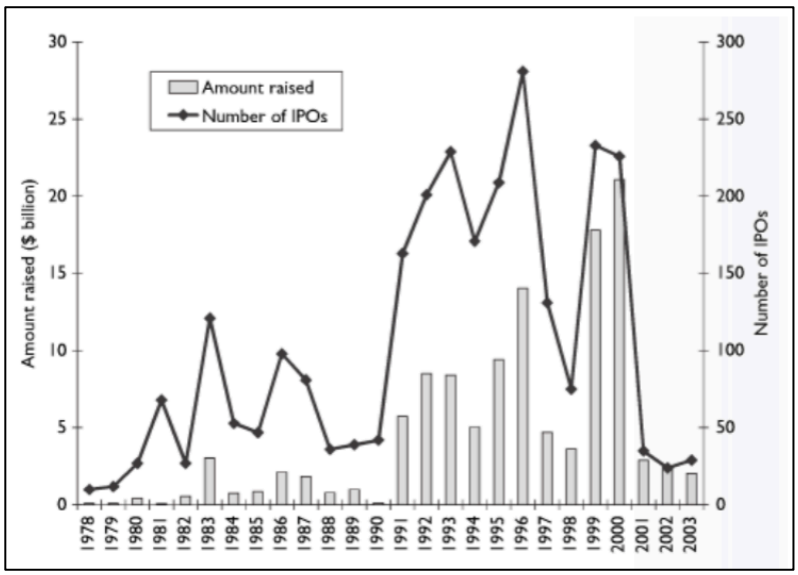

FIGURE 7: NUMBER OF VENTURE BACKED IPO (SOURCE: ZOOK, 2005)

According to Zook (2005), « *the upward trend in VC funding that started in 1997 eventually slowed down by the second quarter of 2000 and for the first time in three years, even declined* » *(Zook, 2005, p. 76)*. This reversal strongly impacted a lot of Internet Companies that were highly dependent on external funding to finance their growth. Hundreds of companies started to file for bankruptcy and thousands of jobs were lost. The San Francisco Bay saw its unemployment rate climb more than 4% in a single year. Most Internet companies had non-viable cost structure without relying on the massive cash injections from venture funds and capital markets. Shortly after this reversal, investors started to look more closely to fundamentals to invest in startups, and it became increasingly difficult for companies to justify their business model (Coggan, 2002).
Interestingly, fifteen years after the dotcom bubble, Silicon Valley is still the biggest cluster and incubator for the development of innovative technological firms. And so plays Holland a central role in the Tulip industry, about 400 years after the tulip mania.

2.3.3 Short Sales Restrictions

If technology stock prices were obviously irrationally high, why did not rational investors sell them short and drive prices back to lower, rational levels? Probably the simplest and most common explanation is that investors could not borrow and short the stocks at a reasonable cost (Ofek & Richardson, 2003). Moreover, even if investors found shares to sell short, they faced the possibility that the borrowed stocks would be recalled and the short positions closed before the anticipated market correction. As Battalio and Schultz (2006) say:

Several authors point to other indirect constraints on short selling. For instance, deLong et al. (1990), Shleifer and Vishny (1997), and others consider the possibility that prices may move further out of line before returning to fundamentals: while well- capitalized, long-term investors may be able to weather such adverse price moves, hedge funds and other intermediaries typically face

outflows of capital when they lose money over short horizons. Similarly, short-term losses can trigger margin calls for investors even if they are making correct long-term investment decisions. Finally, Abreau and Brunnermeier (2002) suggest that bubbles persist in the short and intermediate term because short sellers face synchronization risk, that is, uncertainty regarding the timing of the correction. They argue that the combination of holding costs and synchronization risk "typically cause arbitrageurs to delay acting on their information. (Battalio & Schultz, 2006, pp. 23-25).

2.3.4 Exuberant IPO's

Bhattacharya et al. (2010) reported that accounting fundamentals were very weak for the majority of Internet IPO firms despite the optimism expressed by investors regarding these companies (first day returns to Internet IPOs averaged over 80%). According to the authors, 88% of Internet companies reported negative earnings in the year prior to their IPO, 91% of these had accumulated deficits, and many did not even have revenues at the time of their IPOs. In the end, over 24% of publicly traded Internet companies ultimately failed within five years of their IPO (Bhattacharya, 2010).

3 A Bubble 2.0?

With the help of the theoretical framework developed in the first chapter, and the benchmark created by the investigation of the Dotcom Bubble, we will now try to assess whereas we are currently witnessing a new tech bubble.

Our unique contribution lies in the compiling of a set of different criteria that will be used to answer our research question. By leveraging all sorts of studies and data, we will be able to provide the reader with a clearer view on the current economic situation and the valuations of tech startups.

Four main criteria will be examined. The first one consists of the level of venture capital funding. This indicator is particularly relevant, as it is believed to be a strong indicator of the presence of a speculative bubble. As we have seen in Chapter 2, venture capital greed and irrational investors fueled the 1999-2000 Dotcom Bubble. More precisely, we will have a closer look at which sector benefits from the most attention from venture capital firms and why. We will then get interested in the "unicorn" phenomenon. While this term was invented in reference of the mythological creature because of its rarity, we will demonstrate that it is no longer the case as no less than 152 companies are now part of the Unicorn club. As we have seen in the previous chapter, bubble are typically characterized by the arrival of non-specialized investors, and we will therefore show that investing in tech startups is no longer the exclusive privilege of venture capitalist, but that hedge funds and even mutual funds are fighting for their piece of the cake. We will then close the examination of this indicator by highlighting certain market corrections that have recently taken place in the tech industry.

The second chosen criteria are Initial Public Offerings. As we have seen, IPO's are one of the main exists venture capitalist are counting on to get their money back. An explosion of the number of IPO's characterized the Dotcom Bubble, and

it is therefore only natural that we choose to investigate the current IPO climate. We will show that current companies tend to stay private (a lot) longer than during the years 1999-2000, and that the level of profitless IPO's is particularly worrisome.

The third criterion is the analysis of the Nasdaq Stock Market. The Nasdaq is a market index that mainly regroups technological stocks quoted on the American Stock Exchange. During the Dotcom bubble, the Nasdaq peaked before brutally collapsing when the bubble burst. Moreover, price-earnings ratios were at astronomically high levels. Recently, the Nasdaq has come back to levels unprecedented since the Dotcom bubble, but will show that public investors seem to be much more careful and that today's public companies make much more revenues than they use to make in the years 1999-2000.

Finally we will finish our analysis with the inspection of a variety of external signals such as the real estate Market in the San Francisco area or the Venture Capital Confidence Index. All these small details put together will show reasons to be concerned about potential excessive valuations.

3.1 Global Economic Overview

The following section is directly derived from the « World Economic Situation and Prospect 2016 » report from the United Nations (United Nations, [UN], 2015).

Weak Inflation

Among other factors, the declining commodity prices and the weak aggregate demand, have lead global inflation to plunge at its lowest level since 2009. In developed countries, annual inflation in 2015 is expected to equate just 0.3 %. Ultra-loose monetary policies have so far inhibited deflation from becoming rooted in the developed-market economies. However, low inflation has been correlated with higher volatility in inflation, growth, investment and consumption in a great part of large developed and developing countries and transitioning economies.

Increasing Unemployment

The declining employment intensity of growth in many countries, coupled with stagnant real wages, poses a challenge to promoting inclusive and sustainable economic growth, employment and decent work for all (United Nations, [UN], 2015, p. 14).

Increasing Financial Markets Volatility

The steady decline in global commodity prices, including an impressive decrease in the oil price, mirrors a combination of abundant supply and decelerating demand. Demand from China plays a major role in price changes for metals, especially as the country accounts for almost 50% of the global metal consumption. The mixture of commodity price adjustments and capital outflows has been related with acute exchange-rate changeovers and increased volatility in foreign-exchange markets.

Unprecedented monetary accommodation

In developed-market economies, central banks have been in charge for carrying growth after the economic meltdown of 2008, which has led to an unprecedented level of monetary accommodation in recent years. As the economic climate in the United States has ameliorated, the United States Federal Reserve has clearly indicated its intention to start raising the policy rate again, after several years of near-zero interest rates.

This is likely to reduce policy uncertainties on the one hand, although the pace and sequence of anticipated interest rate increases remain unknown. On the other hand, the increase in the policy rate is expected to have significant spillovers, exacerbate capital outflows from developing countries, and tighten financial conditions worldwide (United Nations, [UN], 2015, p. 15).

Summary and Prospects

To summarize, a humble amelioration is expected to start next year, with global growth reaching 2.9%and 3.2% in 2016 and 2017, respectively. The anticipated

normalization of the monetary accommodation in the United States is expected to prevent disproportionate volatility in exchange rates and asset prices. The normalization will eventually lead to higher borrowing costs, while rising interest rates should however encourage firms to boost investments in the short term. While global growth has been mainly fueled by developing economies in the post-crisis period, developed countries are expected to take over in the next months..

3.2 The Technology Industry

3.2.1 Overview

Now that we have an overview of the global economic situation, we can narrow our focus to the technology market, which will help answer the question: "are we in a new tech bubble"?

The technology sector is the largest single segment of the stock markets, above the financial and industrial sectors. It is often associated with innovation and progress, with the investors in general expecting high R&D expenses and a steady flow of innovative products and services. The main distinguishing feature of the technology sector, compared to other business sectors, is that the resulting products and services are disseminated throughout the entire economy: there is no one sector today that does not heavily rely on the technological innovations and services. The technological sector is also known to have very short obsolescence cycles and a high competition. While there are a large variety of firms operating in the technological sector, it is possible to break it down to 4 major categories: semiconductors, software, networking and hardware (Deloitte Technology Report, 2015).

Semi-conductors

Often simply called « chips », they are the heart of virtually any other technology in the world. While the market for semi-conductors is huge, it is said to generate a four times bigger market in physical products that integrate these semi-conductors. As Paul Sallomi (2015) says:

The industry is highly cyclical and follows a boom-bust cycle of ordering and capacity construction. Despite that cyclicality, what matters most for companies in the semiconductor industry is the ability to design superior products (more features per chip, less power consumption, more reliability, etc.) at the best price (Paul Sallomi, 2015, p. 52).

Software

Easily understandable, the software industry is estimated at over 300 billion worldwide. Software is the life supply of computers. From a cellphone, to the electronic car system or a personal computer, none of them can do anything without software.

A recent trend in software is the wide emergence of « Software as a Service » (SaaS) which no longer requires having the piece of code on the client's computer, but can rather be accessed on the « cloud » through a simple Internet Connection. SaaS have transformed both the business models and distribution strategies of software companies (Deloitte, 2015).

The software industry is not believed to be particularly cyclical, except from the natural economic cycles. This can be explained by the fact that firms will cut off more rapidly on SaaS in bad economic times, and will spend more during better times (Deloitte, 2015).

Networking and Internet

We have previously discussed thoroughly the Internet and Web 2.0, however it is important to note that this sector heavily relies on the other three (Software, and Hardware which in turn relies on semi-conductor) while becoming large enough to stand on its own. The gigantic network that is Internet has allowed virtual commerce to flourish and access a virtually global audience. The Retail e-commerce in the U.S. alone is believed to be worth around 300 billion (Deloitte, 2015).

Hardware

This includes all the innovations in physical computers, phones, servers, routers,

… fueled by the increasing demand and the more and more demanding users in terms of speed and quantity of information access.
Technological stocks frequently trade at premiums compared to other industries. The higher than average valuation for these stocks can be explained through the higher growth potential of the sector. It also has an above average number of IPO of firms that are not yet profitable; we will cover it later on in this chapter in the "Initial Public Offerings" section (Deloitte, 2015).

3.2.2 The Internet Industry

3.2.2.1 Overview

DuCharme et al. (2001) define an Internet or Dotcom company as a company that generates more than 51% of its revenues through the Internet. As software companies initially constituted the largest part of those companies, today a huge amount has « joined the club ». From Social Networks like Facebook, to blogs, newspapers and even the largest retailers have shifted a great part of their activity online. Internet has become the gateway to not only information, but also to our daily consumption items. In fact, Cumming and Johan (2009) go even further by stating that « *the Internet is transforming society and business life in a revolutionary way. Many compare the impact on society and business life of this « information revolution » with the industrial revolution or the invention of the telephone and radio* » *(Cumming and Johan, 2009, p. 333).*

Since 2001, the Internet industry has been able to evolve rapidly and become a point of convergence for « traditional » and newer industries (Kozberg, 2001). In October 2004, the concept of Web 2.0 (as opposed to the « Web 1.0 ») was first brought up by John Battle and Tim O'Reilly at the first Web 2.0 conference, which aimed at investigating the evolution of the web and the lessons learned from the past. During the Web 2.0 conference, O'Reilly stated that « *far from having crashed, the web is more important than ever, with exciting new applications and sites popping up with surprising regularity* » *(Cumming and Johan, 2009, pp. 322).*

Originally, data was posted on websites and viewers simply and passively viewed or downloaded the content. The web 2.0 is about interaction and control over this data. As the Society for Technical Communication (STC) defines "*The Web 2.0 allows users to interact and collaborate with each other in a social media environment, as consumers of user-generated content in a virtual community" (Society for Technical Communication, 2011, para 2).* This contrasts with websites, which limit users to viewing content that they create and control. Examples of Web 2.0 include social networking sites, blogs, wikis, video sharing sites, hosted services and Web applications (STC, 2011) (see Appendix 1 for definition of some Web 2.0 elements).
According to Spencer-Scarr's (2009), Web 2.0 plays an increasingly important role and a good understand of it is key, he further says:
Over the last four years, Web 2.0 has become a pivotal phrase for a social paradigm shift which is being adopted and adapted by enterprise: finding its way into business methodologies and common technologies such as mobile phones » (Spencer-Scarr's, 2009, p.1).

The main industry are Google and Yahoo, the famous search engines, social networking platforms such as Facebook, Twitter and LinkedIn, the biggest online retailer Amazon, or the coupon website Groupon. A short list of the main players and a short description can be found in Appendix 2.

3.2.2.2 Value Drivers

As we have seen earlier, valuing young startups is not an easy task. The task is even more complex when trying to put a price tag on Internet startups. As Estrada and Blakely (2009) illustrate

Forget all the financial wizardry. Visually every Wall Street analyst has tried to concoct some formula to pinpoint the correct valuations of Internet stocks. But those efforts are pretty much shots in the dark. The stock prices of these companies are based largely on what the future hold for the web, and no crystal ball can

predict that. So you've got to make a gut call. My gut tells me the Internet is going to be huge (Estrada and Blakely, 2009, p. 12).

The valuation methods of young, fast-changing, technology based companies have been a controversial topic during the Dotcom bubble. The key variable for company valuation is profit (or revenue) and most Internet companies back then were operating at huge losses. For the few firms that managed to be in the black, their P.E.R (Price-earnings ratio) were astronomically high. The historical average for the P.E.R. is believed to be around 15. However, in November 1999, Yahoo's ratio was 1382 and the P.E.R. of eBay was 3351 (Trueman, B., Wong, Zhang, 2000). Ofek and Richardson (2002) observed that over 20% of Internet companies have a P.E.R. over 1500, while 50% exceed 500. Some studies suggest that given the rapidly evolving nature of companies in this sector, their financial information is from limited value for investors. This is notably due to two main reasons. The first one is that Internet companies were so young that the availability of historical information was very limited. The second reason is that the industry was evolving so rapidly, that the relevance of any historical information became rapidly null as time passed. Estrada and Blakely (2009) discuss the shortcomings of the use of the discounted cash flow model (DCF) for Internet companies, as does Damodaran (2009). Although Damodaran proposes some alternatives, Van der Goot and Knauff (2001) suggest that the value of an Internet company depend solely on individual expectations of the future. They further indicate that relative valuations using accounting multiples is a widely used method for valuing Internet Companies, however, *"this approach provides no safeguard against an entire sector being undervalued or overvalued" (Kim & Ritter, 1999, pp. 412).*

Attending those shortcomings, several authors have tried to identify the main value drivers for Internet stocks. Bartov et al. (2002) indicates that « *the valuation of Internet firms departs from conventional knowledge, with earning not being priced and negative cash flows being priced, as they are viewed as investments* » *(Bartov et al., 2002, p. 45).* As we mentioned earlier, the primary focus of newly created Internet companies are to build their brand image and

secure their market leadership, with huge marketing expenses and R&D which are either immediately expenses or capitalized and quickly amortized. Hence, most of the dotcom companies reports little or no profit, and some authors argue that in fact, losses enhance, not reduce, the value of these companies (Van der Goot & Knauff, 2001).

Other authors, such as Demers and Lev (2001) suggest that the Web Industry should rely upon non-financial metrics as indicators of the firm's performance and ability to generate future cash flows. Indeed, the Internet industry offers a large range of non-financial data on the product usage and user's behaviors that can be employed in prediction of future profitability.

For example, the number of unique visitors (referred as web traffic) is believed to be positively correlated with future revenues, at least in the extent in which the company will be able to charge for advertising space on its website. This metric is an indicator of the consumers' demand and interest in the business and is central to revenue generation and growth of B2C Internet firm (Rajgopal et al., 2000). Some authors studied the effect of media on Internet companies during the dotcom bubble as non-financial value driver. Robert Shiller (2002) in his book « *Irrational Exuberance* » states « the effect of the media on investor psychology is undoubtedly one of the driving factors behind the bull market ». The authors provided strong evidence that IPO underpricing increases in line with media exposure from which the company benefits several days before it's IPO.

3.3 Indicators

With recent tech IPO's like Facebook and LinkedIn and some startups receiving huge funding from venture capital firms after just a few month of existence, the question is worth asking: are we on the verge of a new technological bubble? In this section we will try to provide answers with the analysis of 4 criteria. The criteria used to assess the eventuality of a new technology bubble are:

- Venture Capital funding;
- Initial Public Offerings;
- The Stock Market;

- External Signals;

3.3.1 Venture Capital Funding

« *I believe that the level of Venture Capital funding in Internet companies is a major indicator to determine if a bubble is or is not in formation* » - *Sundeep Gantori, Analyst at UBS, 2014.*

Snapchat, Instagram, WhatsApp, Tumblr… these are all companies with valuation over 1 billion dollar. But there is a hitch: those companies have so far little or no revenues to show. As an example, Ello, the anti-Facebook social network has just raised $5,5 million dollars while promising their users they would never sell ads nor their data. This is just but one example out of the numerous startups with exceedingly high valuation that have received venture capital funding. Raising funds for tech startup has never been so easy. And the money is not just coming from Venture Capitalists anymore: mutual funds and hedge funds have started too to invest millions in tech startups. The never so easily accessible money has radically changed valuation expectations for entrepreneurs (KPMG, 2015).

2015 was a record-setting year for venture capital, funding over $128 billion of total investment made worldwide, topping 2014's total by 44 percent, with the technological sector claiming 76% of that grand total. The software industry represents the biggest part of it, reaching levels not seen since 1999 (*see figure 9 below*).

According to the MoneyTree Report from PricewaterhouseCoopers (PwC) and the National Venture Association (2015), the venture capital ecosystem has provided over $58,8 billion across the United States in 2015, making the second highest full year total in the last 20 years. Most of that money however comes from the Silicon Valley. Indeed, in the first 6 months of 2015, Silicon Valley has witnessed more tech investments than New York has seen in the last five years combined.

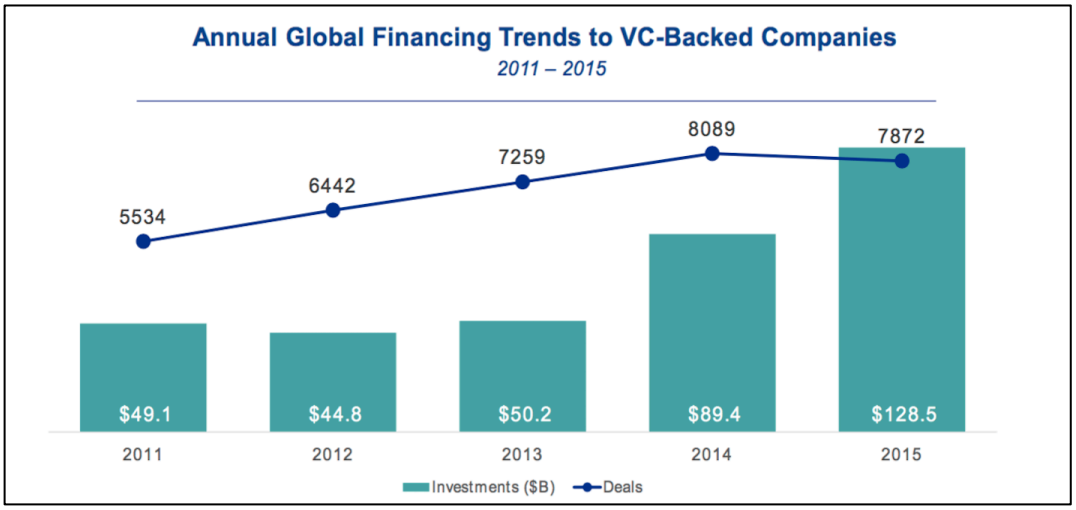

FIGURE 8: GLOBAL VC FINANCING (SOURCE: CBINSIGHTS)

Startup financing usually goes in rounds. The first round is called the « seed funding » and (except for angel investments) is the first time a startup receives money from venture capital firms, regardless of the deal size. It is interesting to note that in 2015, early-stage startups (thus making none or almost none revenues) have raised significant money with the average deal size being $3,3 million, up 39% versus 2014. The seed funding is than usually followed by series A, B, C, and so forth until the company goes either public, is acquired/merged, or vanishes (see « venture capital exists » in the previous chapter).

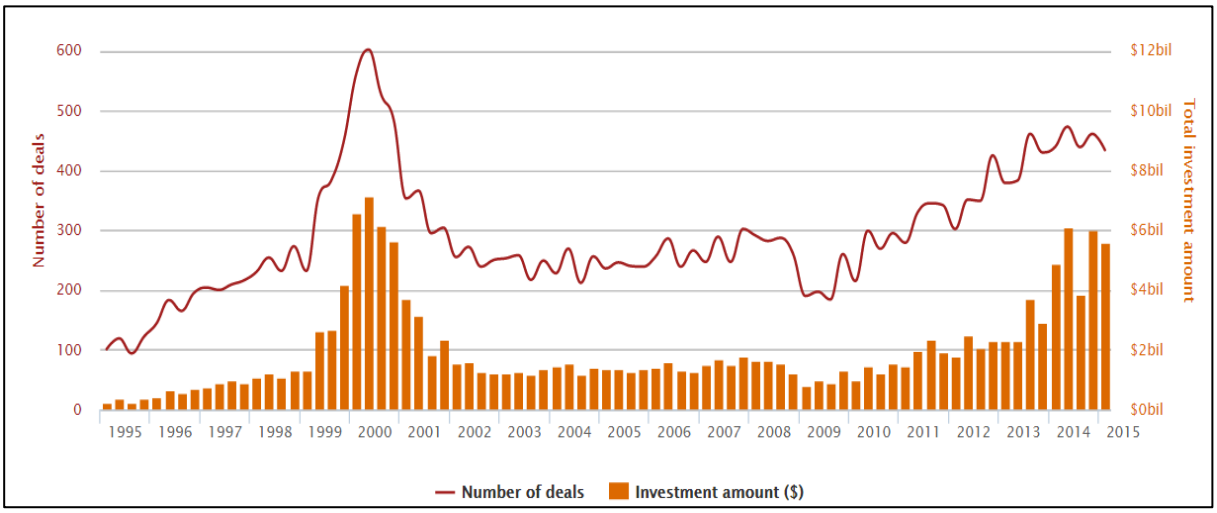

FIGURE 9: VC SOFTWARE DEALS IS BACK TO DOTCOM BUBBLE LEVELS (SOURCE: MONEYTREE REPORT)

3.3.1.1 Unicorns

In 2013, the venture capitalist Aileen Lee invented the term « unicorn » to refer to startups being valued at over $1 billion. At the time, it was there perfect way to allude to something rare, magical and mythical. In 2015, many investors are betting on the so-called unicorns: Snapchat, Uber, Airbnb and Square among others. Up to this date, there are 84 $1 billion pre-IPO startups in the US and 152 worldwide (source Bloomberg, consulted on February 2016). The combined valuation of all US unicorns is $486 billion, « *more than the annual Gross Domestic Product (GDP) of Austria, Columbia or South Africa, and not one has made any profit, as they are all concentrated on aggressively spending to expand their reach and thereby increase their valuation before floatation* » *(Neate, 2015, para 2).*

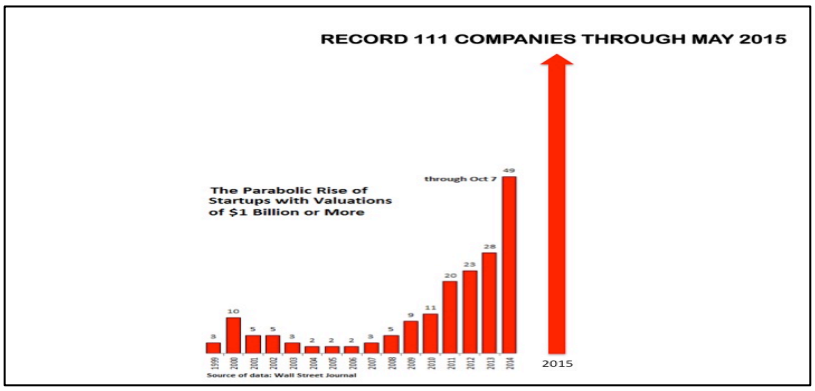

FIGURE 10: NUMBER OF "UNICORNS" (SOURCE: WALL STREET JOURNAL)

In fact, there are now so many members in the Unicorns club that the Silicon Valley ecosystem had to come up with new terms to describe their most successful members: « *Decacorns* ». « Decacorns" is an invented term to refer to startups valued at over $10 billion. To cite a few, Uber at his latest round of financing was valued at $51 billion, Airbnb at $25,5 and Snapchat at $16 billion. Alan Patrick, co-founder of technology consultancy Broadsight, stated that there was "*irrational enthusiasm*" for investing in startups, and that

It is unlikely to be matched by what the market is prepared to pay at IPOs. The private market has been driving these valuations to extraordinary levels, and as

they approach the public market the smart money is starting look at it and go 'oh no, no, no'. The number of unicorns is a sign that there is a bubble in the private market – in the dotcom era there were 10 or something, now there are too many to count. That for me is a sign that these values are untested and out of step with reality. And none of them are making money; they are all buying revenue with huge war chests (Patrick, 2015, para 5).

However, at the end of 2015, some institutional investors have started to write-off some of their positions in the « unicorns club ». As an example, the mutual fund « Fidelity » wrote down the value of its investment in Snapchat by 25% (Bloomberg, 2016). Fidelity has also written down its investment in Dropbox and other big startups.

3.3.1.2 Money "IN" versus Money "OUT"

For the first time in a long time, more money is now being invested into tech startups than is coming out in the form of exits. Using CB Insights data, we studied the amount of money being invested into American venture capital-backed technological companies each year against aggregate exit valuations. As illustrated on the graph below, the aggregate exit valuations outrun total funding for the last five years. More significant, aggregate exits in 2012 were eight times more important than the money invested. However, the difference between total capital invested and exits began to be filled in the next two years, with the 2015 total funding outpacing exits by more than $ 16 billion. This can partially be explained by companies staying private much longer than they used to and the rise of « Mega-round » which we will review in the next section.

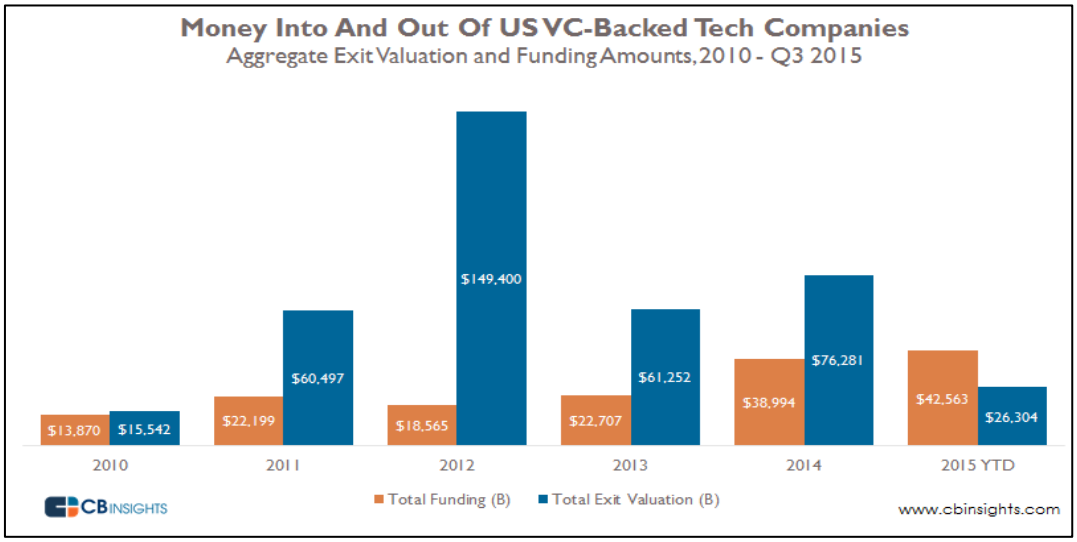

FIGURE 11: MONEY INTO AND OUT OF US VC-BACKED TECH COMPANIES (SOURCE: CBINSIGHTS)

3.3.1.3 The Rise of "Mega Rounds"

According to the data collected from CBInsights, as from the second quarter of 2015, there have been more than hundred « Mega-rounds », i.e. startups raising more than a hundred million dollars in one round. In aggregate, these startups raised over $16 billion. This demonstrates that the average deal size is in an uptrend. While late-stage financing still accounts for the largest part in deals in terms of money raised, the average deal size for early-stage startups is steadily increasing with an average deal size of $3,3 representing a 39% increase since 2014. Early-stage startups, as their name mentions, are in the stammering of their existence and even less than their unicorn homologs, do (almost always) not make any revenue.

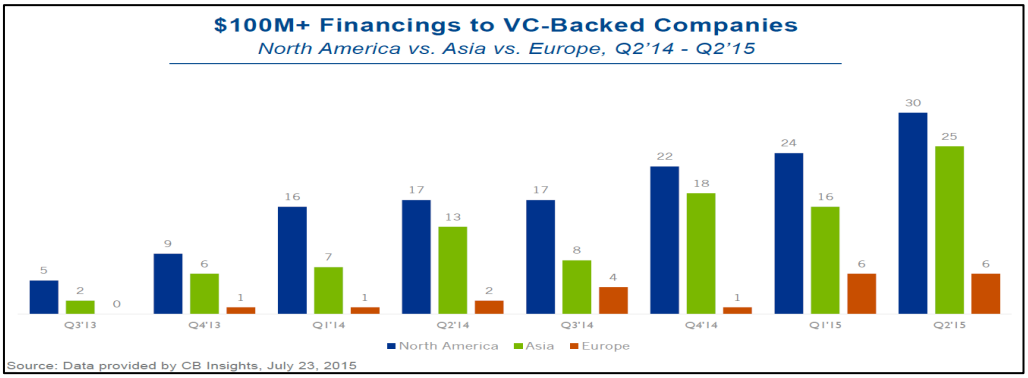

FIGURE 12: $100M+ FINANCING TO VC-BACKED COMPANIES (SOURCE: CBINSIGHTS)

3.3.1.4 Late Stage Explosion

The increasing availability of financing for late stage rounds have, among other factors which we will discuss below, led companies to stay private longer. The number of investors in later rounds has increased dramatically as well. While only specialized venture capital firms used to deal with late stage companies, today there are mutual funds, hedge funds, sovereign wealth funds and corporations wanting their piece of the pie too.

By using CB Insights data including the investors in Series D+, Growth Equity, Private Equity, and Corporate Minority rounds into tech companies, we can observe that there has been a huge increase since 2010 in just the absolute number of late stage deals. The hope to finance a unicorn has pushed investments to a 160% increase in these late stage rounds. The biggest increase as illustrated below was between 2013 and 2014, which saw a 42% increase.

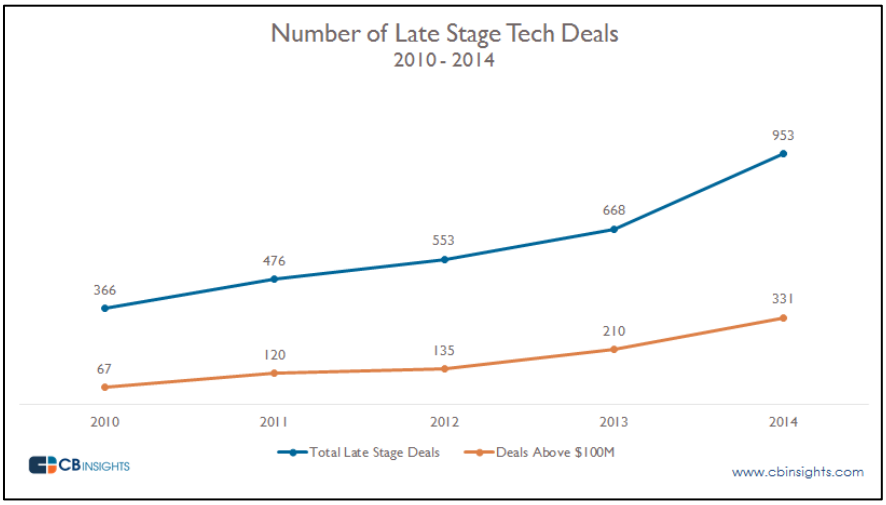

FIGURE 13: NUMBER OF LATE-STAGE TECH DEALS (SOURCE: CBINSIGHTS)

The number of investors that want a "piece of the late-stage, wannabe unicorn action" is also increasing as the graph below illustrates. 2014 saw a big increase in the number of active investors in late stage tech deals reaching past the 1100 mark in 2014. The number of investors in late stage rounds was 72% higher than that in 2010. Interesting too is the increase in the number of investors

participating in late stage deals over $100 million.

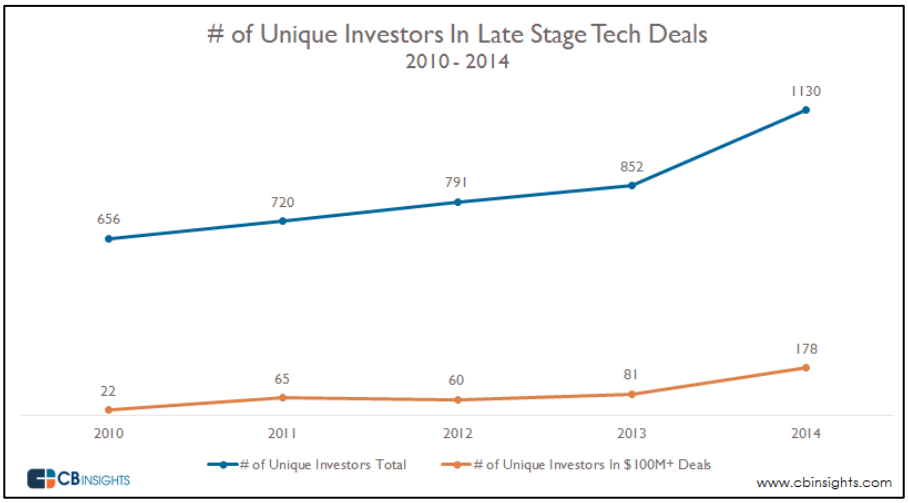

FIGURE 14: NUMBER OF UNIQUE INVESTORS IN LATE STAGE DEALS (SOURCE: CBINSIGHTS)

3.3.1.5 A Recent Lucidity

After two incredibly strong quarters, an atmosphere of cautiousness has struck investors worldwide on the startup investments. Investors are becoming more prudent with their funding. Venture capital investment cooled down drastically, falling from $38.7 billion in the third quarter to $27.2 billion in the fourth quarter of 2015. The number of deals hit a low not seen since 2013. The cool down was most observable in Asia, where China and India received significantly less funding than in all previous quarters of 2015. Moreover, some signs of seed fatigue were felt among investors. While the average deal sized increased and despite more « micro-venture capitalists " and multi- stage funds investing at the seed-stage, seed investments fell for the second straight quarter to a 24 percent deal share (PwC, 2015). As we will see later on, the recent corrections in the stock market have caused investors to question valuations.

3.3.1.6 Concluding Remarks

In this chapter, we have investigated on the level of venture capital funding that startups were receiving. We have demonstrated that the level is reaching very

high levels, in fact, levels not seen since 1999, despite a recent correction affecting both the number of deals and the deal sizes. We have seen that the technology industry is taking the biggest chunk of the pie, and particularly the software industry, accounting for 76% of the venture capital investments worldwide. We have seen, with no big surprises, that most of the VC money was concentrated in the San Francisco bay area. A concerning phenomenon is the emergence and multiplication of « unicorns », startups valued over a billion dollars while none of them is making profits yet. We further showed that the money invested in startups was superior to the money recovered from exits, suggesting a surplus and an imminent write-off in the private investors' portfolios.

If the level of VC funding is an estimator of whether we are in a bubble state or not, and we believe it is, the current levels show reasons to be concerned. The recent downtrend is interesting, and should be further investigated in the long run. However, we believe that not all « unicorns » will be able to live up to their high valuations, and predict some tragic deaths in the coming months/ couple of years.

3.3.2 Initial Public Offerings

A recent trend in the stock market has seen companies going public before they make any profit. Compiling data from 2014 until early 2015, Jay Ritter (2015) has come up with the conclusion that 71% of the IPO's during 2014 were from unprofitable companies. Ritter says « *it is a warning sign for the IPO market, these are unprecedented levels since the dotcom bubble* » *(Ritter, 2015, para 2).*

However, these numbers have to be nuanced, as only a quarter of these IPO's is from tech companies. Instead, most of these companies are biotech companies. Ritter explains « *with biotech, people are gambling on a blockbuster drug, even though they know that most will never develop one* » *(Ritter, 2015, para 3).*

If we look at the number of IPO's that happened during the dotcom bubble versus now, we will find that there are far less IPO's now than during the bubble. In 2014, according to a report from PricewaterhouseCoopers (2015) 118 IPO's were

recorded worldwide, while at the heart of the Internet bubble, more than 200 IPO's took place.

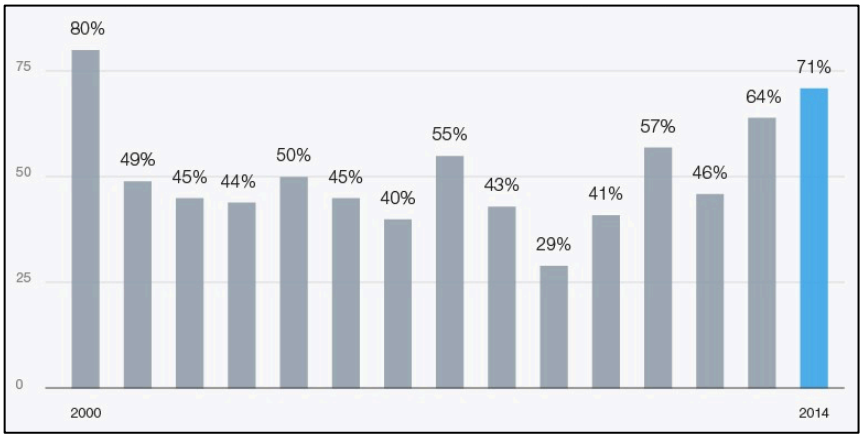

FIGURE 15: NUMBER OF PROFITLESS IPO'S (SOURCE: JAY RITTER)

However, this is because companies are now delaying IPO's at their maximum, raising money from private investors instead. In fact, the average time to go public has now stretched to 11 years, versus 4 in the Dotcom bubble. An obvious reason of course is the stricter reporting requirement that a public company has to comply with. However, it is believed by some analysts that the main reason is that their high valuation might not hold up in the « real world », and that the so-called « smart money » will not be as forgiving as venture capitalists on the profitless financial statements.

According to Jeremy Abelson and Ben Narasin (2015), public markets have a very clear preference for larger companies, assigning more than double the revenue multiple for companies that achieved a market capitalization of over a billion dollars, relative to those with capitalizations under 500 million dollars (see the following table)!

Size	**multiple**	**value**
$0-500M	1,7	2016 Sales

$500M-1B	4,5	2016 Sales
$1B+	4,6	2016 Sales

An identical trend is observable at the time of the IPO. Public investors are willing to pay a higher multiple on future sales (FY+2) for companies with larger market caps (Abelson and Narasin, 2015):

Size	**Multiple**	**Value**
$0-500M	2,3	FY+2 Sales
$500M-1B	3,2	FY+2 Sales
$1B+	3,7	FY+2 Sales

Abelson and Narasin say

This is strong evidence to suggest that it is the public markets that punish companies for going public too early. The trading data makes it abundantly clear: There is a quantifiable advantage to doing an IPO as a larger, more mature company. Smaller market-cap IPOs perform worse on Day 1 — and continue to deteriorate over time. There is a tremendous correlation between the size of the IPO (market cap) and how it performs as well (Abelson and Narasin, 2015, para 4).

If we look at the median of Day 1 returns, we see a significant preference for larger companies:

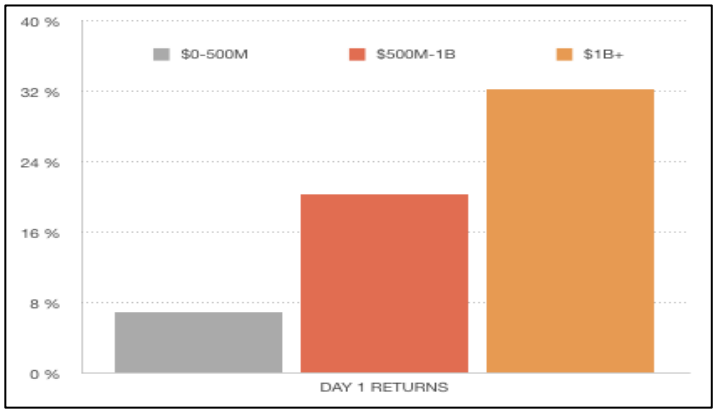

FIGURE 16: DAY 1 RETURN (SOURCE: ABSELON & NARASIN, 2015)

The preference is even more pronounced by looking at the median of annualized returns to date for the same group of companies:

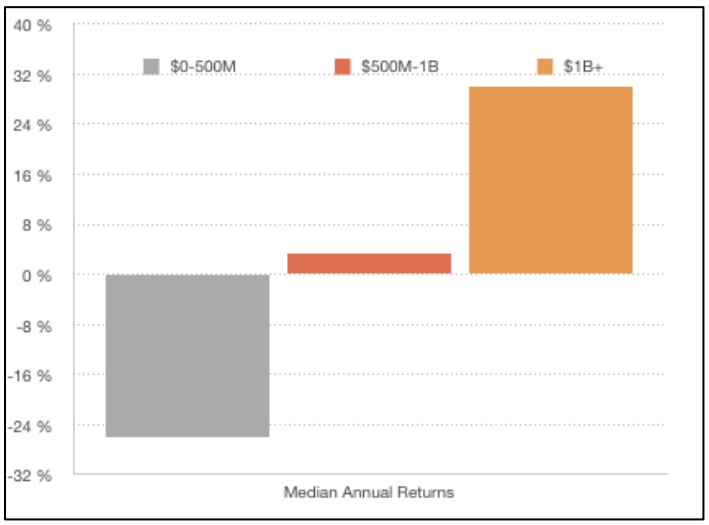

FIGURE 17: MEDIAN ANNUALIZED RETURNS (SOURCE: ABSELSON & NARASIN, 2015)

This further displays that a premature IPO can have a lasting impact on a stock. Abelson and Narasin further say

Premier private companies with IPO aspirations assess their prospective public market valuations by comparing their financial profile to comparable public companies with similar metrics, with size (market capitalization) being one of the most important. The CEO of a $500 million company reasons, "I'd like to be valued relative to these higher market cap companies." The conclusion would then

be, "Let's wait, continue to grow revenues until we can get to a size where our long-term public market investors will look more favorably on us, and accordingly, pay a higher multiple (Abelson and Narasin, 2015, para 6).

What this study suggests is that as the market seems to "punish" startups for going public too early, this pushed the entrepreneurs and their investors to stay private longer and keep growing revenue. A strong implication of this is that the risk stays in the private sector, as the public market shows prudence and selectivity when choosing investments. This is of course very interesting and relevant in our quest to assess the likeliness of a new tech bubble.

The fact that companies stay private longer is further illustrated by another interesting study conducted by CbInsights. Over the years, CbInsights has published studies about their « IPO pipeline » which could be defined as the "*the cream of the crop within investor portfolios, those companies that may be on their way to an IPO given sustained product, market and financing momentum, as well as a few companies that may be forced to go public due to financing conditions » (IPO Pipeline Report, 2016, pp. 1-2).*

Of course, it should be explicitly stated that not all of these 531 companies will go public next year or will even ever go public. Many are valued just over $100M and with the time to IPO increasing significantly, have still a long path in front of them before even considering an IPO. Others will probably never even go public, or will have taken other exits by then, like being acquired, falling short, getting out-executed, or they may never see a liquidity event at all (IPO Pipeline Report, 2016).

The graph below shows that the companies that are in the « pipeline » for an IPO are raising more money than ever, strongly suggesting that the money poured in the private sectors leading to those extravagant valuations are almost exclusively private money.

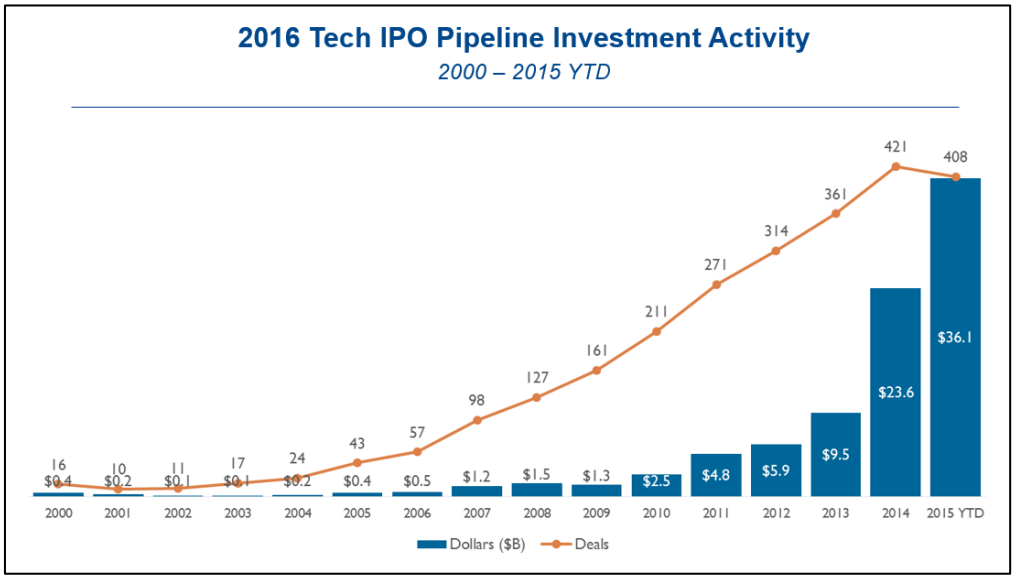

FIGURE 18: FUNDING RECEIVED & NUMBER OF DEALS WHILE IN "PIPELINE" (SOURCE: CBINSIGHTS)

From the 2016 report, three key takeaways are identifiable

1. The pipeline is composed of 531 tech companies that have raised $89,03B in equity investments, spread over 2600 deals since the dotcom bubble. 40% of the funding came from 2015 alone. The main investors remain venture capital firms, however the steady increase in funding is fueled by the newly expressed interest from hedge funds, mutual funds, and corporates in tech startups.

2. The arrival of these non-traditional investors have lead the average funding of 2016's Tech IPO Pipeline companies to an all-time high of $182M and $105M on a median basis. This represents respectively a 64% and a 42% increase compared to last year's figures.

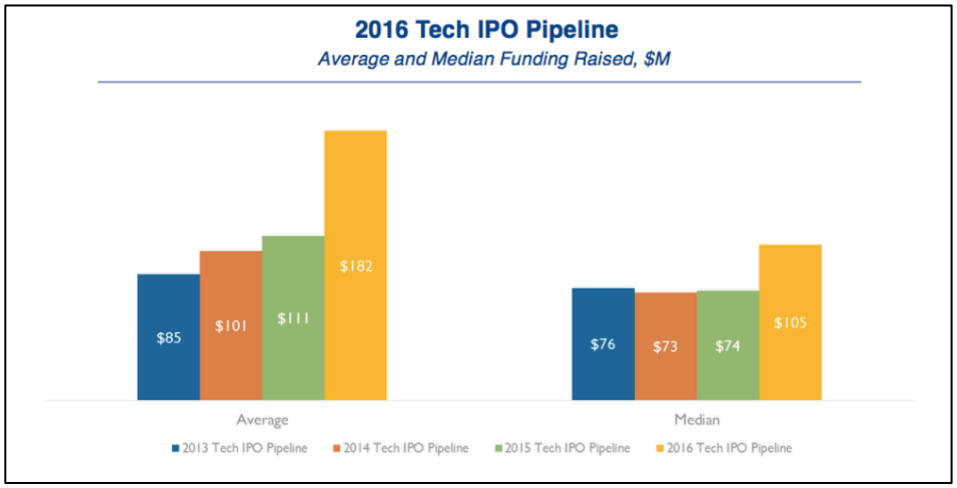

FIGURE 19: MEDIAN AND AVERAGE FUNDING IN "PIPELINE" (SOURCE: CBINSIGHTS)

3. The number of private Tech IPO Pipeline companies that have been valued over $1B has skyrocketed in the past two years, with 39 companies accessing the unicorn status this year alone. Overall in the past two years 62 pipeline companies have joined the billion-dollar club in comparison to just 16 from 2011 – 2013.

3.3.3 The Nasdaq Stock Market

The Nasdaq Stock Market is an American stock exchange, the second largest in the world in terms of market capitalizations. It is also the first electronic stock market in the world. The term « Nasdaq » is commonly used to refer to the Nasdaq Composite, an Index that encloses over 3000 stocks that are listed on the Nasdaq Exchange. The Nasdaq Composite Index will be further referred simply as « The Nasdaq ».

In order to determine if the technological stocks are in a new bubble, let us first have a look at the Nasdaq level, from the dotcom bubble until now.

FIGURE 20: NASDAQ COMPOSITE INDEX FROM 1998 TO NOW (SOURCE: GOOGLE FINANCE)

As we can see, the index has reached the high prices it had known during the dotcom bubble. However, is that an appropriate estimate of over- or undervaluation? No. If high valuations are justified by solid cash flows and profits, the Nasdaq high levels should not be a concern. A good barometer to assess how « expensive » stocks are, is the price earnings ratio for the trailing twelve months (PE TTM).

PE (TTM) = Market price / trailing twelve months earnings

We could also rely on the forward P/E ratio, which is calculated as the market price over the expected earnings. However, many analysts believe it is based on wishful thinking, erroneous assumptions and analysts' bias (Long, 2015).

In March 2000, the P/E TTM ratio for the Nasdaq composite reached an astounding 175! Let us now look at today's PE TTM. As we can derive from the graph, we are nowhere close the levels reached in 2000, which would suggest *against* a current « bubble » state.

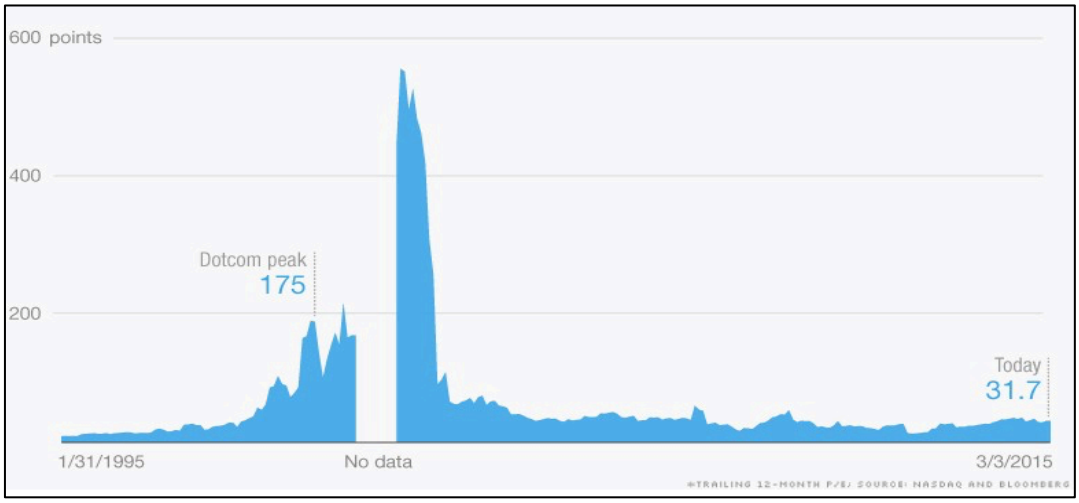

FIGURE 21: TRAILING 12 MONTH P/E RATIO (SOURCE: BLOOMBERG)

Another interesting indicator to look at is the Cyclically Adjusted Price Earnings ratio, shortened as the CAPE ratio. The Yale Professor and recent Nobel Prize in Economics winner Robert Shiller has popularized it. Schiller is also the author of the famous book « *Irrational Exuberance* ». Hence the indicator is often called the « *Shiller CAPE* ». It is defined as the market price divided over the moving average of the last 10 years of earnings, adjusted for inflation. As such, the CAPE ratio is mainly used to assess likely future returns from assets on long-term sales of 10 to 25 years. Originally not designed to identify imminent market crashes, high CAPE values have however historically been associated with such events. The graph below represents the evolution of CAP ratio for the Nasdaq over the period spanning from 1880 to present day. The blue line shows the fluctuation of CAPE for the S&P 500 over time. The mean historical CAPE is represented with the black line and has a value of 16,5. Finally, the red line represents the current CAPE level of 25. It is very clear that the current CAPE is well above its historical value, indicating that the stock market is globally overvalued. In fact, since 1881, the CAPE on the S&P 500 has been above 25 only 8,9% of the time (Shiller, 2015). Wayne Duggan (2015) goes even further: "*In fact, the CAPE has only crossed above the 25 level four other times in history*.

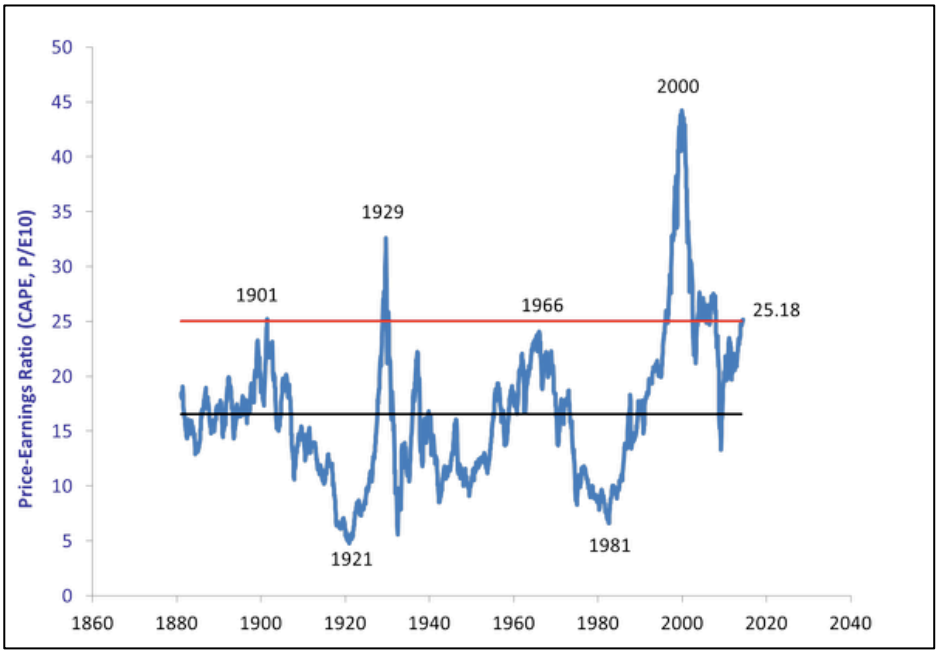

FIGURE 22: CAPE RATION FOR THE NASDAQ (SOURCE : IRRATIONALEXHUBERANCE.COM)

At the height of the dot-com bubble, the CAPE peaked at over 44 in December 1999. When the bubble burst a month later, the Dow dropped about 20% from January 2000 to March 2001. The most recent time the CAPE breached the 25 level was in the end of 2003, during the housing bubble. We all remember the financial crisis that resulted, and the subsequent 50% drop in the Dow from 2007 to 2009 (Duggan, 2015).

However, the CAPE has its limitations. While it is effective at indicating if the stocks are « expensive », i.e. if the market is overvalued, it does not provide any indication onto when the corrections will occur. For example, if an investor had sold his shares when the CAPE hit 25 in 2003, he would have sold it when the S&P 500 was around 1000 points. Of course, the investor would have avoided the subprime crisis of 2008, but would have missed a 50% increase in the market in the next 4 years.

Robert Shiller told in a recent interview for CNBC (CNBC, 2015)

Investor sentiment today is looking like it did in 2000, and that could be a sign markets are in a bubble. The valuation confidence index shows investors believe

equities have not been so overvalued since 2000, when the dot-com bubble burst. Just before the dot-com bubble burst, investors had very little confidence in stock valuations, but they were confident in the market in the short term (Shiller, 2015, para 4)

Interestingly, had this thesis been written a few weeks before, this is where we would have left the current analysis of the stock market. However, during the last few weeks, the Nasdaq has endured massive declines. The decline is mainly attributed to the « FANG » stocks. « FANG » is an acronym that stands for the Facebook, Amazon, Netflix and Google (now called Alphabet) which has been the actor of a consistent uptrend since 2014. This group of stocks caught particular buying interest among investors and yielded superior annual returns. However, these stocks started to sell off in the beginning of 2016. The decline pulled the Nasdaq Composite Index to low levels not seen since October (Bloomberg, 2016).

FIGURE 23: NASDAQ DURING THE LAST 3 MONTH (SOURCE: GOOGLE FINANCE)

Sean Lynch, co-head of global equity strategy for Wells Cargo Investment Institute said

Some of those got way over-extended in terms of valuation and really weren't trading on valuation either; they were just trading on growth and momentum. Anytime you start to see cracks in the market or worries about the economic build up, certainly valuation becomes a little bit more of a focus (Lynch, 2016, para 3).

So what Mr. Lynch is really saying is that the recent uptrend in the FANG group were mostly justified by momentum, rather than intrinsic valuation. To support that statement, It is interesting to note that Facebook, even while having lost 16 percent in the beginning of 2016, is still valued at 76 times its earnings, and is even « cheap" compared to Amazon, who, before its big dive, peaked at a stunning 1000 times the earnings (source Bloomberg, February 2016). The FANG group has lost almost 19 percent on average this year, compared with a +83% last year, and even with the recent selloff, the quartet is still valued at a median price earnings ratio of 185. That is more than 10 times the S&P 500's multiple of 16,5!

However, we will nuance Lynch's statements by providing three reasons to explain the downfall of the FANG stocks. First, investors often wait until January to sell market leaders to avoid paying capital gains taxes in the prior reporting year. Second, investors got caught in a worldwide decline triggered by plunging commodities and China's growth outlook. Third, although it is commonly admitted that there was some momentum in play explaining their 2015 uptrend, we will show that these stocks trade at much safer levels than did the publicly listed stocks back in the dotcom bubble. Indeed, as Long says

The top 10 holdings today generate nearly five times the earnings of the top 10 as of December 31, 1999. Overall, companies today are earning a lot more and have much higher cash on hand. Apple is the poster child with its $175 billion in cash, but other companies also hold tremendous amounts of money (*Long, 2015, para 3).*

On January 21 2016, Marko Kolanovic, analyst at JP Morgan noted

As some assets are near the top and others near the bottom of their historical ranges, we are obviously not experiencing an asset bubble of all risky assets, but rather a bubble in relative performance: we call it a Macro-Momentum bubble. He further says While some parts of the Technology sector certainly have reasonable and even low valuations, segments of the Tech sector disproportionately benefited

from momentum investing as well as investing based on extrapolation of past growth rates (Kolanovic, 2016).

Interesting to note too is that if the P/E ratio of the Nasdaq Composite Index is much lower than what it was in the late 1990's, it is also attributed to the increasing number of « Unicorns » that are not yet public, yet allegedly highly over-valued. Hence, if the VC money replaces for a big part the IPO's that were occurring on a regular basis during the Internet bubble, this is not really an "apple to apple" comparison. One can easily imagine that if those unicorns were to go public tomorrow, the P/E ratio of the Nasdaq will most likely skyrocket.

3.3.3.1 Concluding Remarks

In this section we have demonstrated that while the Nasdaq has reached levels similar to the ones reached during the Internet bubble, the average P/E ratio is such lower than it was before. However, this can be nuanced by the fact that most tech startups that re valued over 1 billion dollars (the so-called Unicorns) are not yet public, while they most likely would have been had they existed 16 years ago. Furthermore, the P/E ratio for the FANG group (Facebook, Amazon, Netflix and Google) is well above the S&P 500's average. However, these companies have sound business models, steady streams of cash flows and important growth prospect that may justify their premiums. We also showed that the CAPE level, although not a predicting indicator shows dangerously high levels. However, some corrections on the market are already in play and still expected to last over the course of 2016. Hence we would conclude by estimating the risk of a bubble in the public market as moderate, while being much more concerned over the private market.

3.3.4 External Signals

As we have seen during the previous chapters, a number of factors suggest an over-inflated technology sector. With interest rates close to zero, investors are looking for other investment opportunities, and they typically tend to artificially

overvalue some classes of assets. We took a closer look at the venture capital industry before looking to the recent IPO trends. Lastly, we analyzed the public market. Let us now identify external elements that would possibly suggest a tech bubble.

3.3.4.1 Technology Mergers & Acquisition Activity

Mergers and acquisitions (M&A) have skyrocketed over the course of the last 2 years.

From well-established companies to new entrants, the resurgence has been considerable. For the first time, M&A activity, particularly in the US, has reached pre-crisis levels. The increase in M&A activity was particularly driven by historic low interest rates, record stock prices, improving employment numbers and an abundance of available financing (Financier Worldwide, 2015, pp34-38).

M&A deals in the technology sector have been particularly numerous. According to data from EY's 'Global technology M&A update (2015) in the first quarter of 2015, the technology sector has seen its M&A activity continuing to set new post-dotcom-bubble highs for both quarterly value and volume. The M&A activity reaches new high levels not seen since 2000. The media, information, marketing and technology sectors saw 1,358 transactions worth $126 billion in 2015.

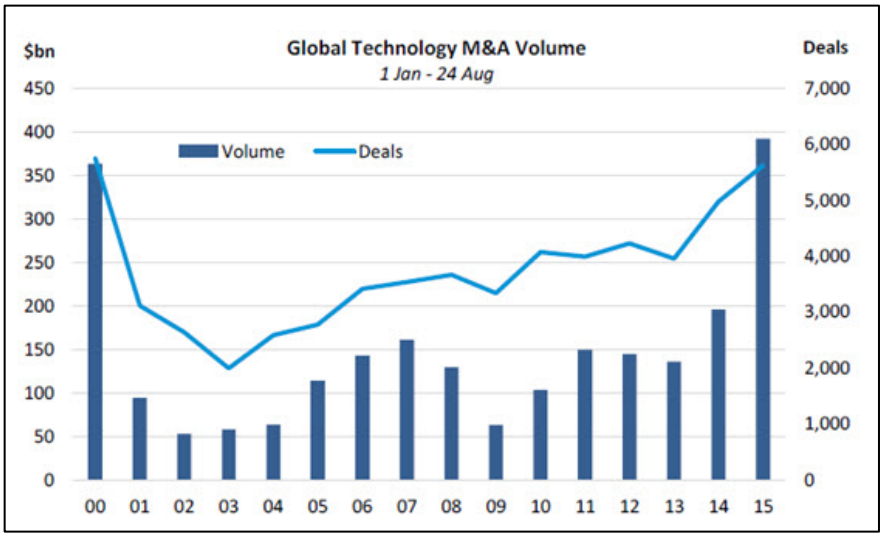

FIGURE 24: GLOBAL TECHNLOGY M&A VOLUME (SOURCE: BLOOMBERG)

3.3.4.2 Technology Hiring Market

The hiring market for talented people working in the technology sector is incredibly tight. According to Data from Glassdoor, the salaries of software engineers (excluding bonuses) are constantly increasing, reaching over $100.000 per year. Some of the biggest tech companies like Facebook and Google are actively lobbying the United States Congress to ask them to relax immigrations rules so that they can attract and hire foreign talents, as the domestic salaries have reached new highs.

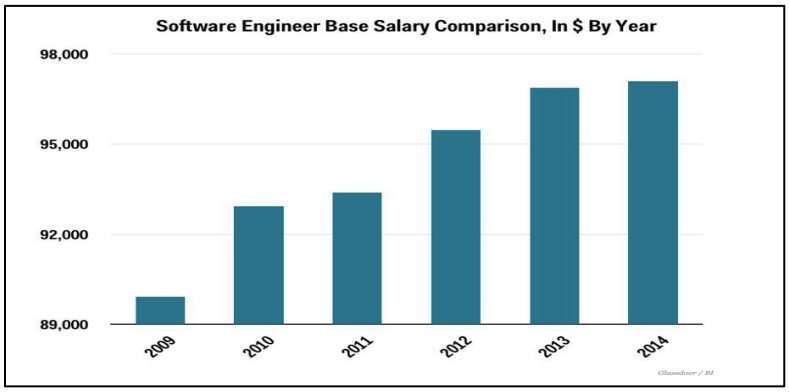

FIGURE 25: SOFTWARE ENGINEERS ANNUAL SALARY (SOURCE: GLASSDOOR)

Matt Allen 2015), a recruiter specialized in tech hiring said

We're experiencing first hand greater insanity than the dot-com days when Interwoven Software was pulling out BMW Z3's for engineers who joined. Instead, we're seeing sign-on bonuses for individuals five-years out of school in the $60,000 range. […] Candidates queuing-up six, eight or more offers and haggling over a few thousand-dollar differences among the offers (Allen, 2015, para 6).

For examples, some engineers are now paid salaries that would make the best traders in Wall Street jealous. Chris Fry, vice-president of technology at Twitter is paid more in compensation than Jack Dorsey, the CEO and Facebook's vice-president of Engineering was paid in 2014 an astronomical amount of $25 million

(Edwards, 2013).

3.3.4.3 Real-Estate Market Prices

According to data pulled from Kwelia, the yearly median income in Palo Alto is now $220.000, pushing the rent per square foot as high as 5$ a month. However, Silicon Valley is now more than ever the « place to be », and the city sees a constant flow of people wanting to move in, as illustrated in the graph below.

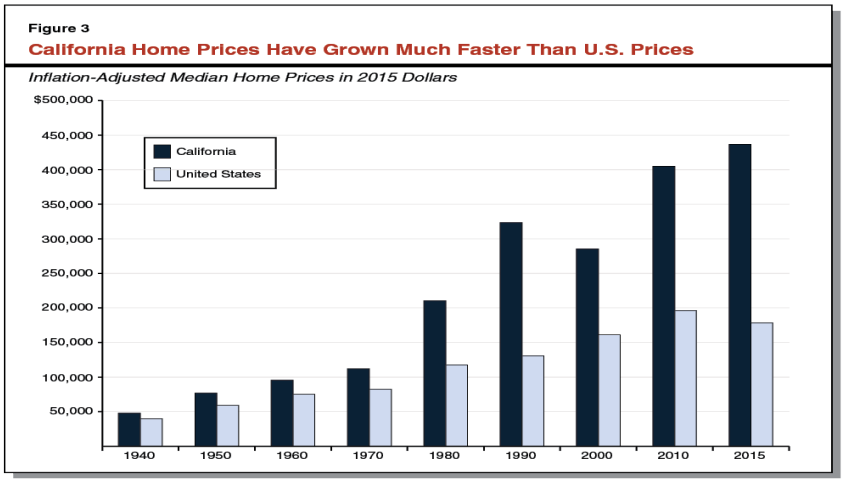

FIGURE 26: CALIFORNIA HOUSING PRICES (SOURCE: US GOVERNMENT)

3.3.4.4 Venture Capital Confidence Index

For the first time in two years, venture capitalists have a decreased confidence in the recent tech valuations. While it does not necessarily mean that there is a tech bubble, or that, if there is one it is about to burst, however it is another signal among many others that would suggest so. A survey of venture capitalists in the tech sector by Mark Cannice (2015) showed for the first time in two years a decline in confidence.

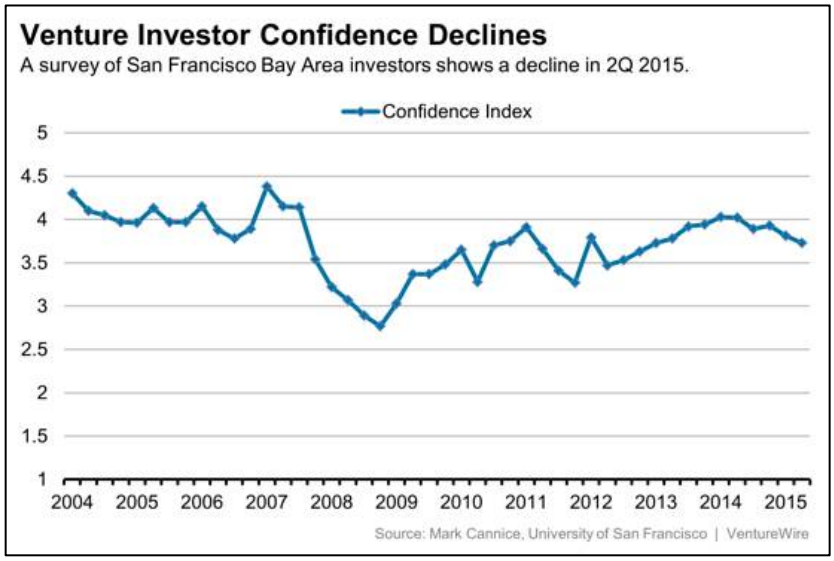

FIGURE 27: VC CONFIDENCE INDEX (SOURCE: CANNICE 2015)

3.3.4.5 Testimonies

Marc Andreessen, cofounder and general partner of Silicon Valley venture capital firm Andreessen Horowitz: "*When the market turns, and it will turn, we will find out who has been swimming without trunks on. Many high burn rate companies will vaporize » (Andreessen, 2015, para 4).*

Fred Wilson, cofounder of Union Square Ventures, a New York City-based venture capital firm expressed similar doubts about companies that burn cash without moving toward a self-sustaining business model: "*We have multiple portfolio companies burning multiple millions of dollars a month. Thankfully it's not our entire portfolio. But it is more than I'd like and more than I'm personally comfortable with ... I've been grumpy for months, possibly for longer than that, about this ... At some point you have to build a real business, generate real profits, sustain the company without the largess of investor's capital, and start producing value the old fashioned way. » He further says, "Everywhere I go, everywhere I speak, I get asked this question. Are we in a bubble? I've been getting asked that question for at least four years now. It's hard to sustain a bubble for four years. But we are also not in a normal valuation environment for high growth tech companies and we have not been in one for a while » (Wilson, 2015, para 2).*

Bill Gurley, general partner at Benchmark, a Silicon Valley venture capital firm: "*Every incremental day that goes past I have this feeling a little bit more. I think that Silicon Valley as a whole or that the venture-capital community or startup community is taking on an excessive amount of risk right now. Unprecedented since "99. I do think you'll see some dead unicorns this year* » *(Gurley, 2015, para 6)*

Peter Thiel, president of Clarium Capital, a global macro hedge fund with $700 million in assets under management; a managing partner in Founders Fund, a venture capital fund with $2 billion in assets under management: *"I think we have a bubble in the US in government bonds, because of the quantitative easing and the negative real interest rates, and to some extent, that increases asset values across the board, including in startups » (Thiel, 2015, para 9).*

Timothy Draper, founder of the venture capital firm Draper Fisher Jurvetson: "*We all know how this plays out, there is no question that this is fueling some kind of bubble" (Draper, 2015, para 13).*

Chris Sacca, investor in Twitter and Uber: "*Bad deals are being done. It's kind of inevitable that the funds right now that are putting a lot of this money to work here aren't going to see it all back" (Sacca, 2015, para 4).*

Not only venture capitalists believe the environment is bad. Founders are expecting a shift too: a report from « *First Round Review* » (2015) reports a survey performed among more than 500 entrepreneurs who were asked if they believed it would become easier or harder to raise money in the next 12 months. Of those founders with a point of view: **95%** of Series Seed, **97%** of Series A, and a whopping **99%** of late-stage founders say it's going to remain the same or get harder. Moreover, 73% of them believed we were in a bubble.

4 Conclusion

In the last part of this thesis, we have investigated and looked for evidence that the technological sector was in a bubble, a period of irrational overvaluation, away from intrinsic valuations driven by fundamentals. Recent history has shown much mediatized transactions that have seen worldwide know startups being valued at very high prices. Snapchat, which has yet to validate its business model, has been valued at $16 billion. Uber, the startup revolutionizing transportation has been valued at over $60 billion. These huge amounts are mainly justified by the growth potential that has yet to materialize.

During our investigation, we have taken a closer look at the level of funding young companies were receiving from venture capital firms. In fact, we have demonstrated that it has reached levels unprecedented since the late 1990's when the Internet or Dotcom bubble exploded. An even more worrisome, is the « Unicorn phenomenon »: the emergence of companies valued at over $1 billion. There are up to this date 152 so-called unicorns worldwide, and more than half (84) in the U.S. alone. After examining the industry of venture capital, we took a closer look at Initial Public Offerings (IPO's). The recent data demonstrate that 71% of the IPO's that occurred during the year 2014 were of companies failing yet to make profits. Again, this level is unprecedented since the Internet bubble that burst in 2000. These findings are consistent with another study we investigated. Indeed, in 2015 more money was invested in startups, than money was « getting out » in the forms of exits, like IPO's for example. This can partly be explained by the fact that startups are staying private much longer (11 years on average, versus 4 in 1999) and the rise of « mega-rounds », huge investments done in later stages of the startups' lives.

When investigating as for why startups were staying private longer, we found very compelling data. The market seemed to punish companies for going public too early, and showed strong preferences for more mature companies, with much

larger capitalizations. Indeed, the trading multiples of those mature companies are higher than smaller capitalizations, in terms of sales, forecasted sales, and in fact, future performance. This is particularly interesting as it has a huge implication: as the market punishes companies for going public too early, the entrepreneurs and their investors are incentivized to stay private much longer, and keep growing revenues. This leads all the risk to never leave the private sphere! As we see, the main takeaway from this thesis is not really whereas we are in a technology bubble or not (there is little doubts that the technology sector is widely overvalued), but rather the main difference with the previous Internet bubble from 2000. While the Dotcom bubble saw millions of small, non-professional investors loose hundreds of millions during the crash, the big collapse is now happening inside the private sphere. Does it mean it will not be as bad? Not necessarily.

Silicon Valley is said to be the cradle of innovation. Behind the walls of the valley, hundreds of thousands of brilliant minds from the technology sectors work hard to be the « next Facebook or Google ». In addition to its capital, both human and financial, what makes Silicon Valley's unique added value is both its faith and trust. The venture capital industry in San Francisco is by far the most developed in the world. In fact, there are countless stories of foreign startups that could only convince their national venture capital firms to invest in their startups once they had received funding from Silicon Valley's venture capitalists. It is as if the entire venture capital industry was waiting for Silicon Valley stamp of approval. If the system had to collapse, needless to say the entire venture capital industry would be impacted. In fact, many technological hubs worldwide depend on Silicon Valley Capital. Over 20% of the money raised from startups established outside the U.S. actually comes from the U.S. But that's not all, if the venture capital had to suffer, so would innovation. Let us take the example of Spain. Spain has a sky-high unemployment rate of over 20%, almost 50% among the people under the age of 25. The small but growing technology ecosystem is a place where young people got to create jobs, innovations, and ultimately sustainable added value. But this is of course, provided that these entrepreneurs

can have access to capital, without which failure is almost inevitable. However, according to Venture Watch Research, over 30% of the total investment in Spanish ventures came from the United Stated, and another 25% from outside the country. What would happen if Silicon Valley suddenly pulled the plug? Of course, one could imagine a desperate youth, chased away by the ghost of unemployment joining other countries with brighter futures, ultimately depriving Spain of talents and companies that would otherwise have provided jobs, innovation and economic value. Spain is no isolated case.

Another consequence of a potential bubble burst, is the huge amount of people working for profitless companies worldwide that would lose their jobs. The millions of people working for the so-called unicorns would not stand as their companies suffocate without the millions in oxygen venture capitalist pour for their survival. Moreover, many of the compensation packages for the most talented employees include equity and stock options that would be worthless in the event of bankruptcy. Even more worrisome, are the direct implications for private markets by nature: illiquidity. As the billionaire investor Mark Cuban (2015) said « *the only thing worse than a market with collapsing valuations is a market with no valuations and no liquidity. If a stock in a company is worth what somebody will pay for it, what is the stock of a company worth when there is no place to sell it*? »

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7 Appendices

Appendix 1: Web 2.0 elements

Some elements of the Web 2.0 (Glossary for Internet Technologies, 2011).

- **Wikis**: Websites that enable users to contribute collaborate and edit site content. Wikipedia is one of the oldest and best-known wiki-based sites.
- The increasing prevalence of **Software as a Service** (SaaS) (see above), web apps and cloud computing rather than locally installed programs and services.
- **Mobile computing**, also known as nomadicity, and the trend toward users connecting from wherever they may be. That trend is enabled by the proliferation of smartphones, tablets and other mobile devices in conjunction with readily accessible Wi-Fi networks.
- **Mash-ups**: Web pages or applications that integrate complementary elements from two or more sources.
- **Social networking**: The practice of expanding the number of one's business and/or social contacts by making connections through individuals. Social networking sites include Facebook, Twitter, LinkedIn and Google+.
- **Collaborative efforts** based on the ability to reach large numbers of participants and their collective resources, such as crowdsourcing and crowdfunding.
- **User-generated content** (UGC): Writing, images, audio and video content, among other possibilities, made freely available online by the individuals who create it.
- **Unified communications** (UC): The integration of multiple forms of call and multimedia/cross-media message-management functions controlled by an individual user for both business and social purposes.
- **Social curation**: The collaborative sharing of content organized around one or more particular themes or topics. Social content curation sites include Reddit, Digg, Pinterest and Instagram.

Appendix 2: Main Internet industry players

Google: Google is a multinational, publicly traded organization built around the company's hugely popular search engine. Google's other enterprises include Internet analytics, cloud computing, advertising technologies, and Web browser and operating system development.

Facebook: Facebook is a popular free social networking website that allows registered users to create profiles, upload photos and video, send messages and keep in touch with friends, family and colleagues.

YouTube: YouTube is a free video-hosting service that allows member to store and serve video content

Amazon: Amazon is the world largest online retailer. It originally started as a book retailer.

Zynga: Zynga is the world largest video game making company. Some of its popular social games include Farmville and CityVille.

Twitter: Twitter is a free social networking microblogging service that allows registered members to broadcast short posts called *tweets*. Twitter members can broadcast tweets and follow other users' tweets by using multiple platforms and devices. Tweets and replies to tweets can be sent by cell phone text message, desktop client or by posting at the Twitter.com website.

LinkedIn: LinkedIn is a social networking site designed specifically for the business community. The goal of the site is to allow registered members to establish and document networks of people they know and trust professionally.

Groupon: Groupon is a marketing service that offers its subscribers daily discount coupons by email, Facebook and Twitter feeds. Typical Groupon deals focus on local restaurants, stores, services, events and regional products. Today, there are thirty-five million registered Groupon users worldwide. a discount coupon will only become active if a pre-determined number of people commit to purchasing the advertised product or service.