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Comparison of Selected Market Indicators During the Dot-Com Bubble

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Abstract

Since the outbreak of the recent financial crisis in 2007, central banks around the world have lowered interest rates while stock markets soared. On the example of North America, Europe, and Asia and in particular the United States, Germany, and China, the situation as of December 2015 is compared on the basis of economic theory and selected key performance indicators to the United States dot-com bubble in the nineties years of the twentieth century. Literature review offers a complex general view on the issue of market bubbles with a historical review of the situation in 2007 and 2008. The only indication of a bubble can be found in the China Securities Index 300, more specifically in the technology sector. The further aim of the paper is related to analyse and compare returns of the explored indices among the regions and the sectors. On a broader level, the study finds that even though there are similarities, the current rise in indices does not qualify for an asset price bubble. Conclusion sums all the observed findings on both the levels – regional and national. Also, it offers suggestions for discussion about the situation on the markets after the financial crisis.

Keywords: market, market bubble, dot-com bubble, financial crisis, market index

1. Introduction and relevance of the topic

The last global financial crisis was set-up by risky mortgage backed security loans and triggered by the default of the Lehman Brothers Holdings in September 2008. This marked the beginning of many policy measures and changes. While central banks around the world began to decrease interest rates in order to boost the economy, stock markets soared. At the same time, the internet is becoming more and more a medium for global interconnection due

to technological advancements across all industries. Not only more people connect to the internet every day, also devices actively communicate with one another, coined under the term “the internet of things”. Moreover, recent initial public offerings of well-known internet companies such as Groupon, LinkedIn, Facebook, Alibaba Group Holding Limited and funding support programs in the United States, the European Union and China drive the interest of investors for lucrative opportunities.

When looking at the development of certain equity indices in the United States, Germany and China, the rates show record or close to record peaks as seen on **Figure 1**. For the Nasdaq Composite Index such rates were last seen during the dot-com bubble while the Deutscher Aktien Index 30 is almost twice as high as during the dot-com bubble and before the recent financial crisis of 2008. For the China Securities Index 300, the sources from the Bloomberg database even state price-to-earnings ratios as high as 220 times reported profits.

Bringing these circumstances into a global context, an artificial economic boost was created after the crisis that made equity indices soar—just like before the dot-com bubble. Hence, the question arises how the situation as of December 2015 is different if it is at all. Are there signs of an asset price bubble as some research argues [1, 2]?

The dot-com bubble is one of the most disputed bubbles that occurred in the last decades. Each bubble can be modelled according to some rules. Welfare analysis with empirical prediction is subject to examine [3]. Also, the pure statistical tests are suitable to describe bubble [4]. But alternative assessment can be provided by another angle of view on bubbles [5]. Moreover, market bubbles are related to market volatility in general [6].

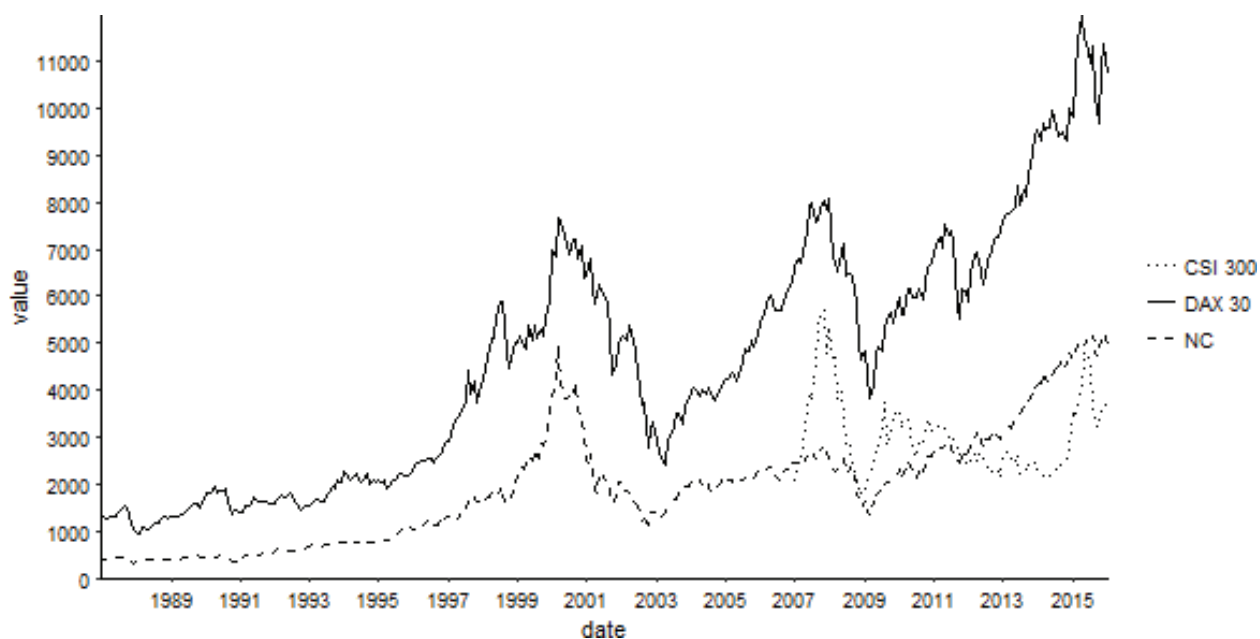


Figure 1. Increase of indices' values across regions. Source: Own elaboration by the authors.

2. Literature review

Since the current situation of peaking indices is too new to expect extensive research on this topic, there are currently only a few similar articles available to the knowledge of the author [7, 8]. Their research, however, is either limited to a single stock, market or pursues another approach. Furthermore, the eventual assessment of a bubble can only happen in retrospect while today's perspective can only try to catch the market sentiment and interpret some key economic indicators.

2.1. Asset price bubble

By the definition of the majority of literature, an asset price bubble is characterised by a substantial deviation from the fundamental value of the asset [9]. On the other hand, according to the efficient market hypothesis, there are three levels of efficiency: weak, semi-strong, strong—which represent the incorporation of information into the price of securities [10]. Hence, under certain assumptions such as that investors perceive information uniformly, securities should trade at their fair value and deviating from the fundamental value should not be possible with respect to the level of efficiency. Despite the critique and controversy of the efficient market hypothesis in recent decades it was confirmed again in 2009 [11]. Nevertheless, severe price deviations did occur and cannot be explained by the efficient market hypothesis. Hence these deviations represent a key flaw in this hypothesis on which much of economy theory relies. In theory, rational investors are expected to base their valuations on fundamentals such as the intrinsic value of an asset which can be approximated by the discounted sum of future cash flows [12]. Since nobody can predict the future, however, projections of future cash flows are likely to be highly subjective. To tackle this issue, the assessment of a bubble can be mainly approached from two dimensions: magnitude and time.

While it is recognised that measuring the fundamental value at the very moment of the occurrence is hardly possible [13]. Therefore, it is suggested that a bubble should be measured by deviations of expected and realised returns over a defined period of time—even decades [14]. Obviously, this can only happen in retrospect since returns cannot be predicted with certainty, especially during times of turmoil in the markets [15].

Beyond the pure stock price, another crucial factor according to equity asset valuation is often taken into account: the price-to-earnings ratio or earnings in general. Commonly speaking, the higher the price-to-earnings ratio increases without substantial news to support a higher valuation, the harder it becomes to justify prices if there is little evidence for future returns other than the pure belief—for instance speculation.

Differentiating a plausible market development and an irrational bubble remains the subject of collective research on expectations and actual future cash flows. In retrospect, only the burst of a bubble, indicated by a substantial depreciation of prices, gives reason to assume that there was one in the first place. That is because a permanent change would require a fundamental reason and not constitute a bubble due to the lack of deviation. Also, there can be an overlap with different types of business cycles. This issue relates to the second dimension by which a bubble has to be assessed – time.

For example, there is an argument that the actual dot-com bubble was quite short and only lasted from 1998 to 2000 [16]. Even though, this might be the time of the actual substantial price deviation, it is important to take into account the circumstance which led to it in the first place. Therefore, a five-stage approach that was described and later refined is favoured in this paper [17]. This is supported by another research, which used a three-stage to five-stage approach, too [18].

Since a single value or theory is unlikely to explain the workings of a complex event of an asset price bubble which is the interplay of irrational humans and algorithm driven economics, it is more likely the combination of these factors.

2.2. Explanations for the occurrence of asset price bubbles

Even though there currently is no guaranteed empirical method to detect an asset price bubble [19], especially in real time, there are still again mainly two methods to approach this issue [20]. The first one is based on rational expectations of the efficient market hypothesis, and the second one on behavioural finance.

Firstly, there are empirical and technical models that are based on the efficient market hypothesis [21, 22]. Even though, such models are able to provide sufficient explanatory power, they are for example limited to historic data [23], certain stocks or companies [24] or more generally, to certain assumptions which were true in the past. Most importantly they lack the major factor of irrational human behaviour that can be observed in certain situations at the stock market, especially during uncertainty due to politics or the introduction of an innovation. Under the category of rational expectations also fall the established economic theories that take into account monetary policies, investment and consumption cycles. For example, there is also an evidence for connecting the emergence of bubbles with the credit creation policies [25].

Secondly, there are qualitative metrics which take into account soft factors such as the current sentiment of the market and irrational human behaviour, including biases as coined under the term behavioural finance. Psychological factors, especially during turbulent times, gain importance while traditional measures lose in relevance [26]. Concepts like herding behaviour and greater-fool theory trump rational economic assumptions such as the efficient market hypothesis and investors willingly forego arbitrage opportunities. Also, soft factors such as human capital, strategic alliances, joint ventures and internet popularity gain in importance [27–29]. Since only forecasts about future cash flows can be made, expectations play an integral role to the development of the market. For example, there is a study showing that during the dot-com bubble financial analysts were more optimistic about internet stocks [30]. Especially in such circumstances fundamental values start to become irrelevant to investors [31]. Also, it must be taken into account that even though there might be an asset price bubble, it can be necessary due to circumstances to ride that bubble instead of acting rationally against the majority of market participants [32]. After all there is nothing so dangerous as the pursuit of a rational investment policy in an irrational world. The financial sector plays also a significant role here [33, 34]. A good example is technical analysis with the Federal Reserve System model which is extensively criticised by theorists for their flaws but used by practitioners nevertheless. The sheer beliefs and usage of such concepts substantially influence the market

even without sound academic background [35]. Furthermore, restrictions like short selling, set by a higher body or lock-in periods for stock options, may skew and alter the economic normalisation processes [36]. Moreover, history shows that politicians are reluctant to take countermeasures before an imminent economic threat can be proven because acting on a false alarm would result in a loss in economic output which in consequence would have negative transitioning effects throughout society [37, 38].

So, taking into account the irrational human behaviour is an important factor. Therefore, a holistic combination of both theories efficient market hypothesis and behavioural finance is expected to yield a better result for the explanation and assessment of a bubble formation.

2.3. Other effects

There are argues that there may be many reasons to cause asset price bubbles [39]. There are several research papers which take also nonfinancial but rather information technology oriented factors into account that might influence investors' decisions when buying technology stocks. The reasoning behind such measures is the Anglo-Saxon approach which focuses on growing big and gaining market share at high costs in the beginning while becoming profitable later [40]. Such factors include, for example, page views or visitors and sales in contrast to traditional measures such as earnings before interest, taxes, depreciation and amortisation or net income [41, 42].

3. Data description and methodology

The data set, which is chosen to be analysed, is the appropriate source to examine the desired aims. Also, the selected methods help to reach the outlined result.

3.1. Data description

The source for the most part of the data is the Datastream maintained by Thomson Reuters Corporation. Also, calculations such as price-to-earnings ratio are done by the Datastream and therefore provide a universal basis across the different regions under consideration. Equity indices and ratio calculations for the Deutscher Aktien Index 30 and the China Securities Index 300 were partially extracted from the Bloomberg database since they could not be obtained from the Datastream. December 2015 has been chosen as an end mark of for the underlying data.

3.2. Methodology

The methodology mainly focuses on alternative approaches while still incorporating some impulses from classical economic theory and the efficient market hypothesis. This is in line with many other research papers which are also based on the macroeconomic environment, alternative measures and the expectations of private and institutional investors [43, 44].

Since markets are interconnected as for example confirmed by the study [45], a holistic perspective for comparison is employed. In this regard the industry under consideration must be specified. For this paper, it is the technology sector which is analysed and even though most of the researchers agree that the dot-com bubble occurred in that sector, others have also identified spillover effects into other sectors such as financial, general industrial and non-cyclical services as well [31].

To tackle the research question, first, a combination of macro-economic indicators was used to compare the dot-com bubble with the recent financial crisis. On the one hand, a global perspective is pursued, but on the other hand, data on an aggregate level was not always available. Therefore, the United States, Germany and China are chosen by their economic dominance and highest nominal gross domestic product as representatives in the named regions to base the local economic indicators on. This way a top-down complementary approach from broad regional equity indices to country specific indicators and indices was employed throughout the paper. The term regional in this regard refers to the regions of North America, Europe and Asia, while local refers to the United States, Germany and China.

Additionally, but due to the limited scope of the paper and the main focus being set on the overall economic situation, a rather simple but meaningful test was employed, the Welch-Satterthwaite t-test. This test in the context of this paper is focused on the comparison of means of returns of two samples. With respect to the regular t-test, the Welch-Satterthwaite t-test gives the advantage of yielding accurate results despite unequal variances of the samples. It is, however, important to strictly differentiate the time-period, index and sector under review.

So after an overall evaluation of the economic situation, a distinction is done by the comparison of means of returns between the Nasdaq Composite index and the Datastream technology index in the 1990s of the twentieth century for three phases of the bubble – pre-bubble, inflation and crash. For this purpose, assumptions about the timing of the phases had to be made. The pre-bubble period was chosen to start in December 1990, which marked the lowest point of the Nasdaq Composite index in the nineties years of the twentieth century. The bubble inflation period was set to start in November 1998 since this year is based on the academic research [16], while also marking a relative historic low of the index. The peak obviously occurred in March 2000 and marked the transition to the crash-phase. Here the lowest point before the eventual recovery was chosen – October 2002. For the recent years such a clear distinction was not possible and therefore a time-frame as a whole from April 2009 to December 2015 was chosen, marking a historic low and high, respectively.

Since the movement of the indices alone cannot support nor reject a bubble, a dedicated section takes into account key performance indicators based on which a fundamental value can be estimated.

Due to the limited scope of the paper, the influence of business cycles, exchange rates and non-financial factors such as page-views have been of minor coverage in this paper, and hence provide room for further analysis.

4. Dot-com bubble and financial crisis of 2007

This section builds on the concepts introduced in the literature review and gives specific interpretations on the example of the dot-com bubble and the recent financial crisis which started in 2007.

As already mentioned in introduction, the dot-com bubble can be divided into five stages that were initially described [25] and later refined [17]. First, they argue that there has to be a displacement in the market such as an external shock due to a crisis, a liquidity shortage and so on. Then, normally, the government steps in to calm the situation and the central bank provides liquidity to boost the economy so that credit is created and capital is easily available, for instance capital flood. What is then distinct to a bubble and goes beyond a regular upward movement of a cycle is the euphoria which might be triggered by some disruptive innovation [46]. This might be personal computers, the internet, the internet of things, digital currencies or any other sort of hype. After that, insiders or people close to this industry start to see its limits and begin to sell their stakes—this is when the financial distress occurs. If their sell reaches a critical mass, the bubble crashes and the initial euphoria turns into revulsion so that banks turn cautious to the credits they provide.

4.1. Displacement

In the nineties years of the twentieth century, the breakdown of the Soviet Union and the Japanese Crisis can be identified as two of the major impulses to disrupt the financial world at that time. For the recent financial crisis, it was the bankruptcy of the Lehman Brothers Holdings in September 2008 due to the subprime mortgage crisis. In both cases, the global interconnections of supply chains and markets triggered a spiral of economic decline which is reflected in the respective gross domestic product figures.

4.2. Credit creation

As a monetary initiative, the central banks in the United States, Europe and China reacted in the same way as the Federal Reserve System during the dot-com bubble, namely decrease lending rates in order to provide liquidity and boost the economy. This time, as basically the whole world is affected, even more capital flows into the market—not just from Japan as during the dot-com bubble. In some cases, the governments were even forced to bail out some banks in order to avoid an economic breakdown of financial systems [47]. Economic research and the central banks confirm the relationship of low interest rates, credit creation and rising prices [48–52]. After these measures, the gross domestic product started to increase and corporate profits recovered too – as seen in **Figure 2**.

Also by other measures such as the unemployment rate and the consumer to business confidence, a recovery with some exceptions was observable. Though these measures worked well for the United States, the issues of the recent financial crisis in the European Union did not allow for a swift and substantial recovery as during the nineties years of the twentieth century in the United States as seen in **Figure 3**.

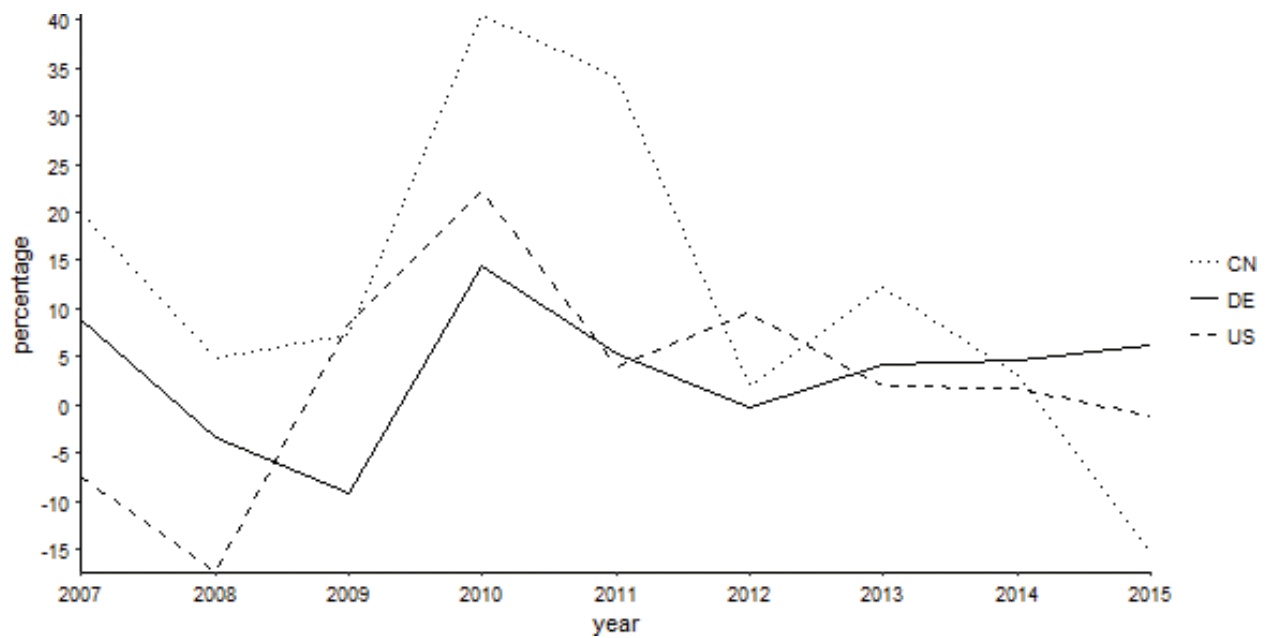


Figure 2. Corporate profit change. Source: own elaboration by the authors.

In the name of the European Central Bank, Mario Draghi promised to further support the economy throughout 2016 and even beyond 2017 if necessary [53]. Putting this promise into perspective and comparing it to the nineties years of the twentieth century, this means that liquidity will flow into the market throughout 2016 and maybe even 2017. Maintaining the interest rate at such low levels, however, increases the risk of a liquidity trap where additional capital in the market does not boost the economy as anticipated due to the neutrality of money in the short-term to long-term [54, 55]. Additionally, current plans to increase the

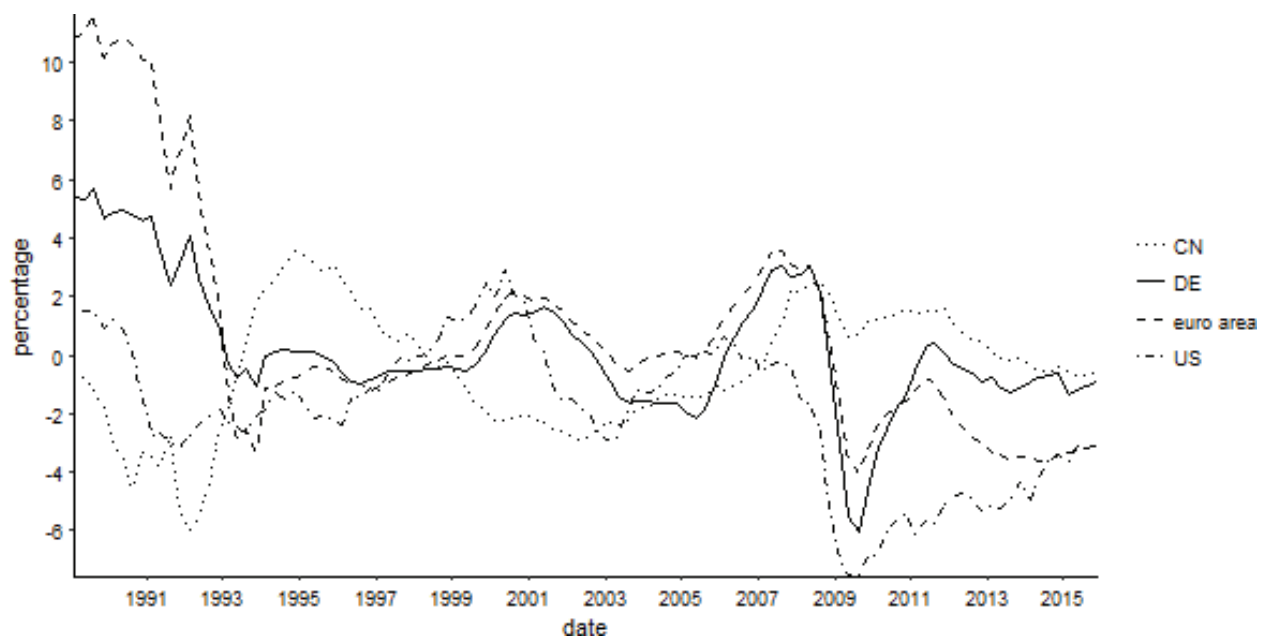


Figure 3. United States output gap. Source: Own elaboration by the authors.

interest rate are damped by the weak support of other indicators. As of 2015, corporate profits stagnate at middle levels and even sharply falling in China in contrast to a steady increase in the middle of the 1990s of the twentieth century in the United States.

4.3. Euphoria

Unique during the dot-com bubble was the creation of euphoria through the personal computer and internet technology hype. Today is different in the way that this technology is innovatively utilised rather than completely new. Nevertheless, there are key concepts which are more strongly emphasised by the media than others, such as artificial intelligence, digital currencies, biotechnologies and so on. However, there is no such strong consensus and focus on one particular technology as during the nineties years of the twentieth century. This marks the difference in motivation for investment between those time frames. During the dot-com bubble, several behavioural concepts such as the law of small numbers, herding, self-attribution bias and others were at play [56, 57]. In the recent years, however, the market sentiment was shaped by political uncertainty while the main driver to invest in stocks is the available liquidity fuelled by the tech-start-up spirit. In the scope of this paper, the following stages are unique to the dot-com bubble since as of December 2015 there was no severe downturn of the indices under analysis, for instance a bubble burst.

4.4. Financial distress and revulsion

All it actually takes to crash a bubble is a critical mass of arbitrageurs who tackle the overvaluation in order for market prices to shift more towards fundamental values. A collapse can happen fundamentally due to the unstable position; the instantaneous cause of the collapse is secondary [58]. The sharp decrease was not triggered by any substantially negative news or announcements. Furthermore, there is an argument that the expiration of a high volume of the lock-up periods expired and provided insiders and arbitrageurs the needed measures to adjust the market and the subsequent fall of the Nasdaq Composite index [36]. More likely it was the interplay and combination of different factors which together created the critical mass that is argued for [59]. Since this critical mass was obviously reached, herding behaviour set in again in the opposite direction—for instance sell—as the news of a downturn spread across media. Eventually, the bubble burst and losses had to be realised which is reflected in most of the indicators shown before, such as the Nasdaq Composite index itself, gross domestic product, corporate profits, the unemployment rate and so on. At this point, banks become more cautious with lending which decreases liquidity in the market and often causes governments and central banks to intervene in order to boost the economy and rebuild trust all over again.

5. Assessment of indices rise in North America, Europe and Asia

The indices' values are assessed throughout their period of rise all over the regions in the world. Mean comparison with key performance indicators are offered.

5.1. Mean comparison

At first, mean comparison is offered to obtain a general view on the explored indices as seen in **Table 1**.

Firstly, the mean comparison showed that on a regional level, for instance in North America, Europe, and Asia, the technology sector showed top returns and one of the highest probabilities for equal means in comparison to the Nasdaq Composite index performance in the nineties years of the twentieth century.

Second, the probabilities increased on a local level for the Nasdaq Composite index, Deutscher Aktien Index 30, the TecDax and the Hang Seng Index. These results, however, have to be interpreted cautiously because the increased probability is most likely due to the prolonged but mild increase before the actual bubble.

Thirdly, the results for the China Securities Index 300 show a considerable similarity to the Nasdaq Composite index in the 1990s of the twentieth century. The probability of equal means for returns is as high as 88.01% for the China Securities Index 300 index and the Nasdaq Composite index in the inflation phase.

5.2. Key performance indicators

The analysis yielded mixed results of the key performance indicators with room for interpretation, including some early warning signals but still the potential to develop either way in the future. On a regional level, the price-to-earnings ratios are as high up as shortly before the actual bubble in the 1990s of the twentieth century as seen on **Figure 4**.

At this point, the irrational exuberance speech by Alan Greenspan from 1996 could be appropriate again. In fact, the Federal Reserve System just increased the federal funds rate to 0.25–0.5% in December 2015. On a local level, the price-to-earnings ratio remains at moderate levels with the exception of the China Securities Index 300, where a peak in the summer of 2015 yet again confirmed the thesis of a bubble from the mean comparison section.

Time span	Nasdaq composite		Datastream technology		Welch-Satterthwaite t-test (%)
	Average monthly return (%)	Standard deviation (%)	Average monthly return (%)	Standard deviation (%)	
December 1990 to October 1998	1.59	4.61	2.03	5.44	54.28
November 1998 to March 2000	6.84	6.90	6.30	9.07	99.57
April 2000 to October 2002	−4.71	10.74	−5.19	13.75	80.43
April 2009 to December 2015	1.70	4.96	1.50	5.28	80.56

Table 1. Nasdaq composite versus Datastream technology phases. Source: own elaboration by the authors.

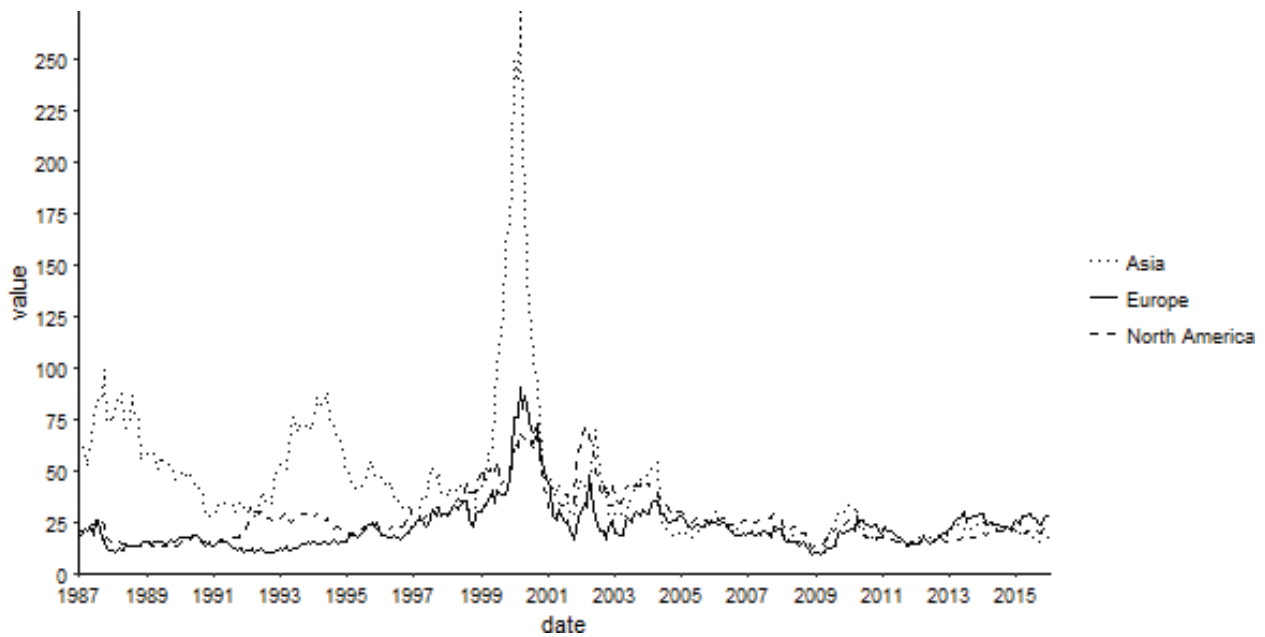


Figure 4. Price-to-earnings ratio by region. Source: Own elaboration by the authors.

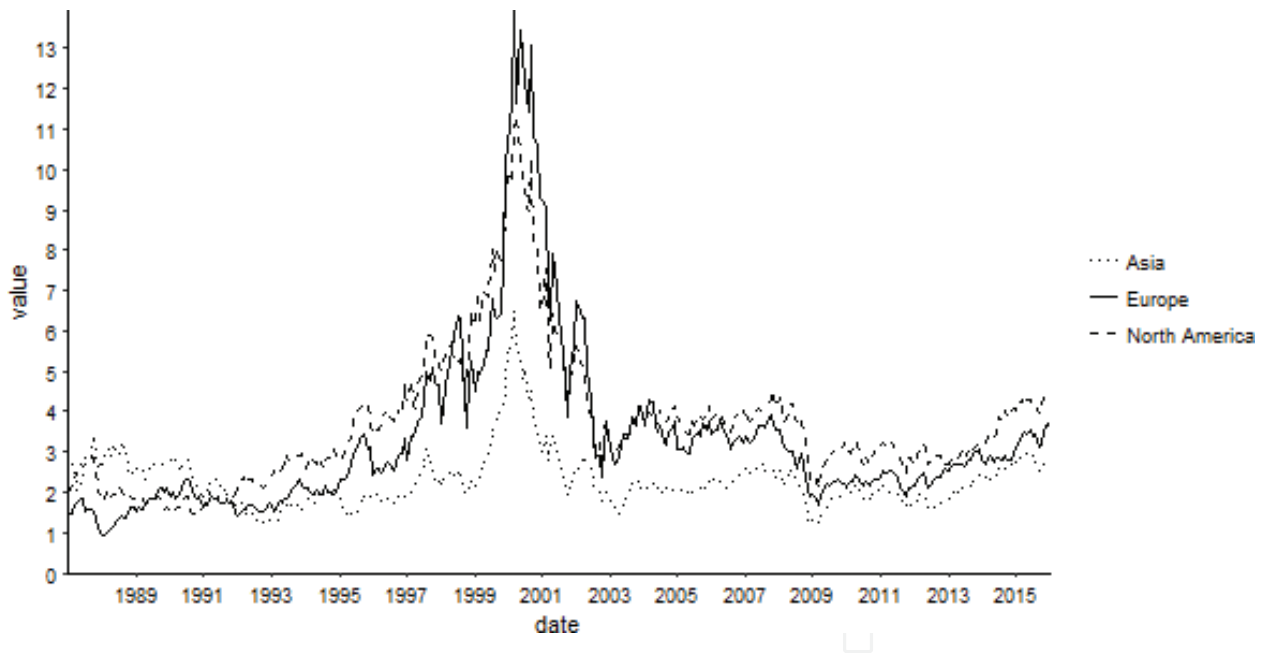


Figure 5. Price-to-book ratio by region. Source: Own elaboration by the authors.

The sales and earnings, for instance earnings before interest, taxes, depreciation and amortisation, figures show mostly support for rising indices with a few exceptions. On a regional level, both sales and earnings are stagnating or even declining, so there is little evidence for optimistic index increases for Europe as a whole. The same is true for all Chinese indices: for instance the Hang Seng Index and the China Securities Index 300. There the sales and earnings are stagnating or declining as well. So at these levels again, the thesis for a possible bubble is strengthened.

Figure 5 shows that on a regional level, the price-to-book ratios are again as high as right before the outbreak of the actual dot-com bubble. Therefore, they should be interpreted as a warning sign for investors. On a local level only the China Securities Index 300 ratio yet again confirms the occurrence of a bubble in middle of 2015 with an extreme peak.

6. Discussion and conclusion

In this section, the results of the comparison between the dot-com bubble and today's crisis are summarised and interpreted. They are grouped into a macro perspective which takes into account the overall economic environment on the one hand. While on the other hand, the indices and ratios of the selected countries and stock exchanges will be interpreted, too. Both perspectives are structured according to the region under consideration.

There are many papers dealing with market bubbles, but only a few of them provide a look in a field of testing the recorded returns in such a way. It is very difficult to compare them. Taking into account the beginning of both situations for instance dot-com bubble and the further financial crisis of 2007, it can be said that they are very similar in many regards. More importantly, the countermeasures in both situations from the central banks were the same: lowering interest rates and providing liquidity. In both cases, the indices responded with a rapid growth and available capital was utilised, finding its way into higher return markets that are also riskier—volatile—by nature. However, there are two differences which must be taken into consideration.

Firstly, during the 1990s of the twentieth century, a new technology—personal computers and the internet—was on the verge of being introduced to average households. The scope of such impact was unforeseeable and the end of the potential for new usages of such technology is not in sight. Today the impact is better, though not perfectly, assessable through the existence of past data and experience from investors' perspectives. As own calculations show, this uncertainty lies inherently in the industry throughout the 1990s of the twentieth century. Despite the governments support for tech start-ups, there is hardly euphoria to the extent as before due to the aforementioned reasons. This result is in line with other current research which finds that even though higher stock valuations in general are possible, they are unlikely and unsustainable [60].

Secondly, the recent crisis is different since it affected the whole world market—not just the high-tech industry—at once in a very severe way, causing global pressure on growth as described before. This is different to the more regional and less of global-scale crises in the 1980s of the twentieth century, for instance Japan, and the 1990s of the twentieth century, for example, the United States, the 1998 Russian financial crisis and the 1997 Asian financial crisis. So the impact of low interest on the economies in the regions under consideration is yet to be seen. Even more, since the start of high volatility in the Chinese economy and the unannounced decrease in interest rates, there is potential for even greater issues in an economy which many countries and regions rely on. This could create a carry-trade similar to the one with Japan and the United States but on a much greater scale.

These two points stand in contrast to one another. On the one hand, there is less hype in comparison to the 1990s of the twentieth century in the tech industry, but on the other hand, there is so much capital available due to the previous crisis and current uncertainty that creates more opportunities for speculators.

There is one more level which can be discussed in this paper. It is an index level, where one can have a look at the contemporary trends and also the current development. On this level, the situation looks more diverse, even more so when differentiating between the broad regions and single countries.

Firstly, on a broader regional level, trends indicate an overall increase due to the stimuli across the world by central banks. For the industry under consideration, there are currently no extraordinary trends of a bubble visible. It must be noted, however, that the levels are to some extent as high as before the crisis or before the actual dot-com bubble in the United States. This is especially true for Europe and Asia. Still, as of 2015, earnings were able to grow simultaneously, making up for the increase in prices. Worrying is the recent development of earnings that are most visibly deteriorating in Europe while slightly decreasing in the United States and at least stagnating in Asia. Such trends, however, must be differentiated to normal business cycles.

Secondly, on a national level, the figures show greater amplitudes and interpretations can only be made from a narrow local perspective. In the United States, the Federal Reserve System is confident of being able to increase interest rates due to the regained trust of investors in the stability of the economy even though it is not yet fully recovered. Since it is a rate which acts as an anchor for investors around the world, the signal is necessary though. This action might come early enough to improve the situation while stopping the market from overheating like in the 1990s. In Germany, it is less possible to see the country on its own since it is tied to the euro area monetary union in which the other countries are further away from having recovered from the financial crisis. If the liquidity boost will continue throughout 2016–2017, it gives incentives for speculators and hence rising equity markets. Only the decrease in earnings might lower expectations and hence incentives to speculate. Even more unstable is the situation in China which experienced a major downturn of its economy as shown in the previous sections. This situation is likely to continue throughout 2016 according to business experts [61]. Closest to a bubble-like behaviour and ratios is the trend in summer 2015 for the China Securities Index 300 index. However, the extraordinary deviations cannot be confirmed even though the underlying data is from their database. In either case, this deviation is for the named reasons nowhere near the magnitude of the dot-com bubble. Addressing the research question of whether the current rise in indices across North America, Europe and Asia resembles the dot-com bubble, the answer is negative for the following reasons. While strong short-term deviations as seen in China in the summer of 2015 have occurred, they do not resemble a prolonged deviation of the magnitude in the late 1990s even though they could be called short-term bubbles, in the case of the China Securities Index 300 index in 2015. It can be said that at least the pre-conditions of the overall economies as well as the indices do resemble important trends on a broader level which were visible during the 1990s in the United States. On the other hand, earnings did grow and the increase and the raise in the interest rate by the Federal Reserve System signal the

end of the crisis. Depending on the further development of the situation in China and overall economic situation the sentiment can still turn either way. As long as there is cheap liquidity in the market, indices can likely be used for speculation. Moreover, the hype of a new technology might be even found within another sector or a combination of two such as biotechnologies, information technology, virtual reality and healthcare for example. Therefore, the future situation highly depends on the business sentiment and performance of stressed economies such as China and Europe. With these findings, this paper hopes to give a basis for cross regional comparison for the rise of regional and local indices through the combined assessment of different theories and approaches. It remains the opportunity for future research to complement on the limitations and build on this basis.

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