

House prices and bank loans

Bachelorarbeit

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1 Introduction

In recent years, the need for accumulating wealth for the retirement age became more and more evident. In times of the low interest rates and a pension system that is likely to collapse in 30 years because of demographic reasons, people are looking for ways to invest money in a reasonable way. One way of investment is to put the income in tangible assets like housing, gold etc. and real property is by far the biggest asset most households are likely to own. With all these circumstances in place owners depend on a stable or even growing value. Therefore, it is especially interesting to investigate how prices for houses develop in Germany in order to estimate how reliable this capital good still is and what other factors or variables influence house prices. The cost for housing are based on a various number of different factors. They largely depend on an operational banking system, interest rates, domestic and foreign markets. This complexity makes a closer investigation of the impact on house prices and how they are affected especially revealing.

Up to this day, nearly 50% of the households in Germany own a house or land to build a house on (figure 1). As a result, owning a house and home seems to be still the dream of Germans as it provides safety, security for retirement arrangement and a place of belonging. In other words for many households in Germany this is the only reliable asset they have on top of the sentimental value that a homestead also represents. Failing to pay back a mortgage or even being unable to afford buying own property is a serious disaster for many households. Evidence of this claim is that 30% of real estate owned by households in 2013 were single-family homes (figure 1). For these families, a house is a symbol for identity and quality of life, a place where to raise the children, as well as a huge investment. According to an article from "Statistisches Bundesamt", a single-family-home sold around 200.000€ in 2010 (Ritzheim, p. 495).

figure 1: Households owning real property in Germany

Assets, debts

Households owning real property of households on 1 January

Households owning real property	Germany			Former territory of ¹ the Federal Republic			New Länder and ¹ Berlin		
	2003	2008	2013	2003	2008	2013	2003	2008	2013
Households projected (1,000)	37,931	39,077	40,032	30,861	31,770	31,440	7,070	7,306	8,592
	In percent ¹								
Households owning real property	48.8	48.0	47.5	51.1	50.1	50.3	39.2	39.0	37.2
Data provided on type of real property	.	46.1	47.2	.	48.2	50.1	.	36.6	37.0
Non-built-up land	5.9	4.6	3.9	6.0	4.6	4.1	5.6	4.2	3.5
Single-family homes	28.6	28.9	30.1	29.8	29.9	31.7	23.9	24.4	24.3
Two-family homes	6.8	5.2	5.3	7.3	5.7	5.9	4.3	3.3	3.4
Residential buildings comprising 3 or more dwellings	2.7	2.1	2.0	2.9	2.3	2.2	1.4	1.3	1.2
Freehold/owner-occupied dwellings	12.8	13.3	13.8	14.6	15.2	15.8	4.5	4.7	6.2
Other buildings	3.6	3.3	3.0	2.7	2.5	2.3	7.4	6.5	5.5
No data provided on type of real property	1.6	2.0	0.3	1.7	1.9	0.2	1.1	2.4	0.3

¹ Before the sample survey of income and expenditure 2013, West Berlin was part of the former territory of the Federal Republic and East Berlin was part of the New Länder.

. = Numerical value unknown or not to be disclosed.

Source: Sample Survey of Income and Expenditure.

(Source: Statistisches Bundesamt)

At the same time, figure 2 shows that the average households own net financial assets worth only around 45.000€. Being that, how it is, households rely on financing their houses with mortgage loans provided by a third party most likely by banks. Since a high percentage of people depend on bank loans for financing their houses, the amount of lending for housing, banks provide, make a huge difference on households' decision either to buy or not to buy a homestead.

figure 2: Income and expenditure in Germany

Assets, debts

Sample Survey of Income and Expenditure

Financial assets, real property and debt of households on 1 January¹

Financial assets and debt	Germany			Former territory of the Federal Republic ²			New Länder and Berlin ²		
	2003	2008	2013	2003	2008	2013	2003	2008	2013
Averages per household in Euro									
Gross financial assets	40,300	47,700	46,800	43,500	52,000	51,100	23,200	28,700	30,900
Consumer credit residual debt	1,400	1,700	1,800	1,400	1,700	1,800	1,300	1,600	1,800
Education credit residual debt	.	300	500	.	300	500	.	300	500
Net financial assets	38,900	45,700	44,500	42,100	50,000	48,800	21,900	26,700	28,600
Current market values	109,700	96,400	103,600	122,600	109,100	119,600	47,500	41,000	44,900
Mortgage residual debt	25,600	24,500	24,800	27,800	27,100	28,200	14,700	13,200	12,300
Total gross assets	150,000	144,100	150,400	166,100	161,200	170,800	70,700	69,700	75,800
Total debt	27,000	26,500	27,100	29,200	29,100	30,500	16,000	15,200	14,600
Total net assets	123,000	117,600	123,300	136,900	132,000	140,300	54,700	54,600	61,200

¹ The results for 2013 have been revised.

² Before the sample survey of income and expenditure 2013, West Berlin was part of the former territory of the Federal Republic and East Berlin was part of the New Länder.

. = Numerical value unknown or not to be disclosed.

Source: Sample Survey of Income and Expenditure.

(Source: Statistisches Bundesamt)

Thinking further the supply and demand of residential property also influences housing prices. As already mentioned before there are a sheer myriad of different factors influencing house prices. Linking the two facts – the dependence of households for finance when it comes to buying a homestead and house prices – the question arises:

What is the connection between bank loans and house prices?

Especially in bigger cities, the house prices where the demand for residential property is potentially much higher than in smaller cities, bank loans should have a huge impact in determining house prices. This paper tries to answer the question how the supply of mortgage loans in Germany affect house prices in the seven biggest cities of Germany but also on an aggregate level. I also assess what impact the financial crisis had on the issuance of bank loans and thus on house prices. It is a well-known fact that the financial crisis crushed the housing market in the United States because of mortgage loans that were given out by banks without any collateral on the part of households. Surely enough the banking system in Germany is quite more distinct compared to the US. Nevertheless the housing and mortgage market could be completely different in

times of crisis. In a crisis mode behaviors and reactions in the market are often indifferent and unpredictable. Interesting in this case is whether there is a different behavior of financial institutes in Germany in times of recession.

2 Literature review

Researchers all over the world have investigated the question how house prices affect bank loans. The following segment will bring some of these together in order to get a conclusive picture if and how these two variables are in any way related, correlated, or whether there is even a causal relationship. As well it will shed light on some other related research that investigates further influences on either mortgage loans or house prices.

One scientific study conducted in the United States was aimed at exactly finding out to what degree house prices are affected by an increase in bank loans. This increase in bank loans was studied as branching restrictions got lifted and so the limitations for banks to provide loans got eliminated. The paper further examines the effect deregulation has on banks to give out bank loans. The studies brought out that over two third of the credit volume could be explained by deregulation and 50% of the increase in house prices could be explained by increased bank loans. (Favara and Imbs 2015) Another paper that analyzed what happens when the supply of mortgage loans shifts (Mian and Sufi 2008) also looked at the expansion of loans in the subprime segment from 2000 to 2005 in the United States. In the end, they also concluded that the credit expansion has a substantial impact on the number of house sales and prices.

The paper by Justiniano et al. (2015) goes another direction and examines the reaction of both the loan market and the housing market pre- and during crisis times. It highlights the fact that pre-crisis house prices and bank loans move upwards together. Furthermore it explains that an expansion of the lending limit increases the collateral price for houses while at the same time reducing the interest rate. It ends with a remark that a reduction of collateral for giving out credit does have the contrary effect – it increases interest rates and depresses

house prices, which explains the development that took place during the recession in the United States.

Research commonly agrees on the fact that monetary policy has a huge impact on the development of house prices in a country (Simo-Kengne et al. 2013, p. 170). Though, research in the European area found out that the different mortgage markets in the European Union lead to different reactions at the housing markets (Zhu et al. 2017, p. 16). One important parameter that influences both mortgage and housing market, often instrumentalized by monetary policy, is the key interest rate. When talking about interest rates we have to distinguish between long term and short term interest rates. Short term interest rates are interesting as an instrument for monetary policy and long term interest rates are important for the financing of housing since this is often a long term process. Even though there is empirical evidence that also short term interest rates do have a significant and constant effect on house prices (Gregory D Sutton, Dubravko Mihajek and Agne Subelyte 2017). This paper also estimates the effect that a drop in interest rates by one percent will increase house prices by 3.5% after three years. This implies that monetary policies can influence the development in the real estate market even in the short run. These findings are in line with commonly accepted research known as the “Taylor Rule” (Taylor 1993). This rule implies that the low key interest rate given out by the central bank should be based on a target output of an economy and a target inflation in order to ensure the stability of an economy. Any deviation from target output or inflation rate results in a change in interest rate to get “back on track”. There is a trade-off between economic growth and a stable inflation rate, hence the short term interest rate is a tool to balance both. Any discrepancy can come along with a boom or busts in the housing market and can have serious implications.

3 The housing market and real estate financing in Germany

As in every other economy, also the real estate market goes through cycles. That fact is apparent that ever since the real estate market in the United States crashed. The boom was followed by a big recession that influenced the entire world, including Germany. The housing market also has a huge impact on the countywide economy or even other economies worldwide. The German housing market was one of the very few ones not affected by the financial crisis (Global Property Guide 2017). In that regard it could be asked what made the circumstances in Germany special – why did the economy here not take such a big hit during that time? For this reason this segment investigates the characteristics of the housing and real estate market in Germany.

3.1 Development of house prices in Germany– a within city comparison

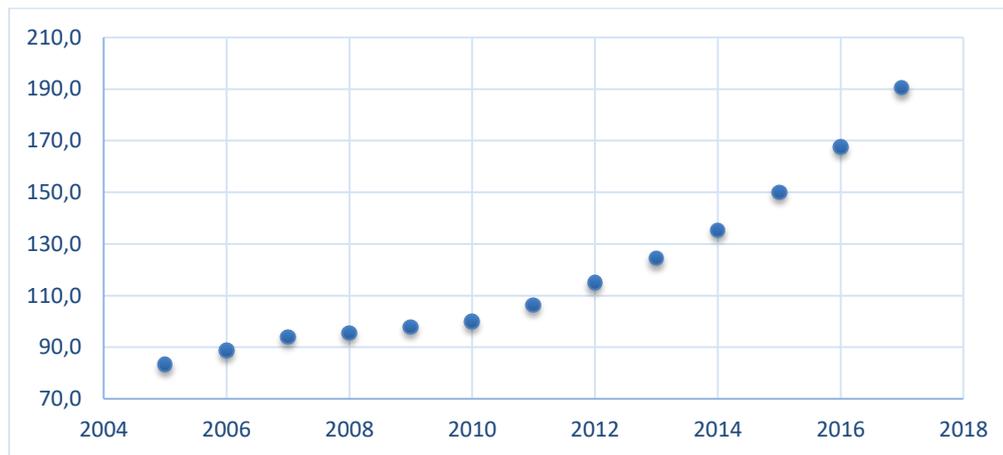
First of all, some introductory words are needed to clarify the term housing market. Obviously, this term includes both rental building and residential houses. In the analysis of the situation on the German housing market, it is in some cases hard to distinguish between these two. This fact is not too alarming as both are supplementary goods and follow the same trends and the development of one of them goes hand in hand with the other (Global Property Guide 2017). In the following, I will use the term housing market solely to describe the real estate, not the rental market. This section focuses on the overall trends and the specific characteristics of the German housing market.

In order to understand the housing market, let us look at the main target group that owns or buys houses in Germany. As mentioned before, over 45% of households in Germany own their own home. The typical household that owns a house is a couple with minor children. Over 58% of households that fall into this category reported owning a homestead (Statistisches Bundesamt 2014). The people least likely to own a home are one-person-households (28%), lone parents with one child (23%) and lone parents never married (14%). Also, people over 64 are also less likely to own their own home – only 20% of singles over 64 own

real estate, compared to 36% of senior couples (Statistisches Bundesamt 2014). According to research from “Deutsche Bank” the costs of living space are highest for Munich followed by Dusseldorf and Frankfurt (Deutsche Bank Research 2018).

Looking at the data for house pricing indices in Germany from 2004 to 2017, one development is apparent: for every major city the house prices are constantly rising in a dramatic manner. For the top 7 cities, the house price index for residential housing rose from 80.5 in 2004 to 190.5 in 2017. Therefore house prices increased above 2.3 times during the 13 years.

figure 3: Development of house prices in the top 7 cities in Germany from 2004 to 2017 (own diagram)



Each of the 7 biggest cities shows the same pattern. Hamburg, for instance, had a house price index of 73.2 in 2004 and it grew to 176.4 (in 2017) which is an increase of above 2.4. During this period the house prices grew most in Berlin (about 2.9 times).

figure 4: Development of house prices in Berlin 2004 to 2017 (own diagram)

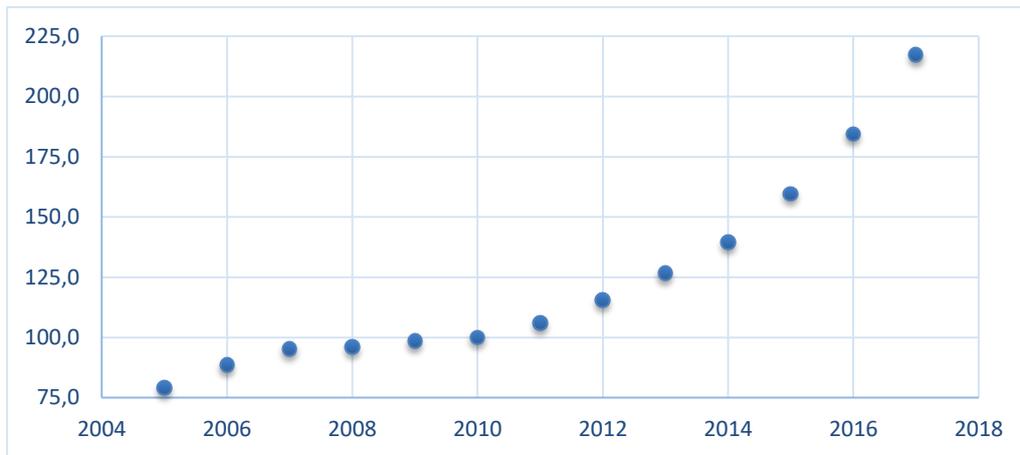
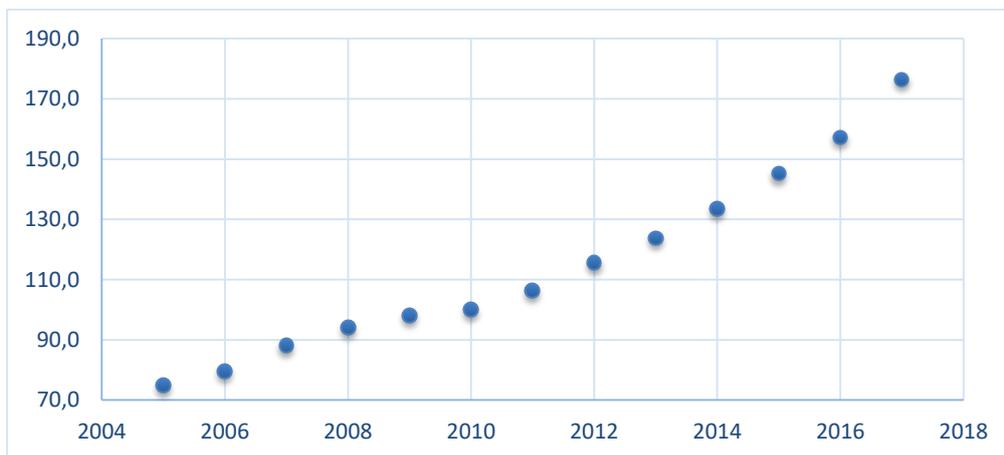
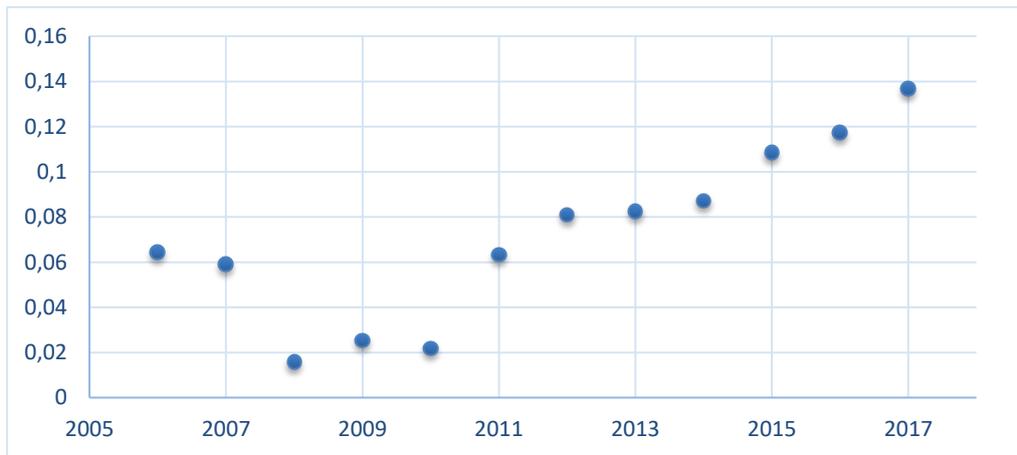


figure 5: Development of house prices in Hamburg 2004 to 2017 (own diagram)



The house pricing index takes the year 2010 as a reference. What all of the seven biggest cities have in common is, that there was a sharp increase in house prices from 2011 onwards. After 2011, the house prices grew between 6.5 and nearly 13.5 percentage points (in 2017) each year (table 6). What is apparent when looking at the development of growth rates for house prices is that the growth rate increases each year from 2010 onwards. Which means again that the value increase for houses grows every year. This development holds not only true for big cities but is also seen in small cities as well.

figure 6: Growth rate of house prices from 2006 to 2017 (own diagram)



According to a report of “Deutsche Bank” from 2017, even house prices in smaller cities rose up to 60% from 2009 till 2017 (Deutsche Bank Research 2018). It is argued further that this trend is a result of a shortage in supply for residences in all cities but especially in the bigger cities. This gap between supply and demand is believed to stay rather big and is likely to cause a price bubble. (Deutsche Bank Research 2018) This would mean if house prices continue to rise at that rapid pace at some point the demand would suddenly drop leaving supply way to high. This abrupt discrepancy between supply and demand would drive house prices down momentarily.

At the same time the big cities also grow at a rapid pace. The population in Munich for instance rose from 1.36 million to 1.53 million between 2009 to 2017 (Deutsche Bank Research 2018). This also leads to a vacancy rate of apartments and houses of nearly zero per-cent. In the banking city of Germany, Frankfurt, the situation is similar with a shortage of 50.000 home spaces in 2017. Germany as a whole is short of at least one million living spaces (Deutsche Bank Research 2018). Especially in Munich and Frankfurt the economic growth and working opportunities provide people with enough incentives to trump the high price entry barriers for housing. Construction of new houses cannot even begin to cover the high demand of new places of living.

If we look in the near future, it has been forecasted that German overall population will decline by 4% till 2025. Just by this figure, one might foresee a demand drop sometime soon. Though that might not even be the case. The reason for that is the growing number of single households in Germany, especially in bigger cities. For instance, in Munich, the ratio of people living on their own already exceeds 50 percent (Münchener Hypothekenbank 2017).

Global Property Guide (2017) names further reasons for the sudden increase in house prices: “strong economic growth, 1.1 new million refugees in Germany, high work-related immigration, record-low unemployment, weak construction supply and low interest rates” . Especially the high immigration in the last years further accelerated the demand for housing in the previous years.

3.2 Real estate finance and monetary policies

The European Union (EU) as the patron and policy designer for all partners largely influences the situation on the financial market in Germany. In turn, also the housing market is largely affected. Though, because of the sovereignty of each country, not every financial market in the EU looks the same. There is a huge discrepancy and heterogeneity concerning the economic power and the construction and regulation on the financial markets in the different countries of the EU. Hence, it is important to look at what influence the European Union has on the mortgage market in Germany but also at the special characteristics of the mortgage market in Germany.

3.2.1 Monetary policies in the EU and their implications for the housing market in Germany

Germany, like every country in the European Union, is largely dependent on the guidelines the European Central Bank (ECB) gives out. These guidelines are for example the low key interest rate they set. The low key interest rate determines at what rate local banks give out bank loans or in our special case mortgage loans. As mentioned earlier short term interest rates also influences house prices,

thus the monetary policies the ECB enforces highly influence the German economy and in turn the housing and the mortgage market. As long as the financial crisis concerns Europe, the ECB holds the key interest rate at a minimum. This has serious consequences for all financial institutes as maturity transformation was one of their key sources of revenue. Maturity transformation means to borrow short term from other financial institutes or a central bank and, on the other hand, lend long term. The difference in interest rate for long and short term loans then is the revenue for banks. In recent years this deviation has sunk down, cutting a huge part of banks' business (Desjardis Economic Studies 2017). Financial intermediaries now have to adapt to the new circumstances. Also, small and big investors have to adapt to the limited investment opportunities nowadays. Saving money gets less and less attractive which should increase spending and thus demand. This could also be reflected in higher prices for houses because of an accelerated demand.

3.2.2 Mortgage market in Germany

Considering the mortgage situation in Germany first of all the term "mortgage market" will be shortly defined to clarify any obscurities. In all the remarks about the mortgage market, we concentrate solely on the primary mortgage market. The definition for the primary mortgage market is as follows: "The mortgage market in which loans are originated and consisting of lenders such as commercial banks, savings and loan associations, and mutual savings banks" (Businessdictionary 2018).

The German real estate market is unique in many ways because of cultural and economic reasons. The following section investigates how the German housing market differentiates compared to other countries in the world. Compared to other countries like the United States the real estate finance market shows two distinct differences. Firstly, the interest rate is locked long term, so there are no sudden changes during the lending period. About two third of all loans show a locked loan rate for at least five years. (Münchener Hypothekenbank 2017). Secondly, there is a value assessment in place, that screens for the long term real

estate value without market fluctuation before the credits are given out. (Münchener Hypothekbank 2017) This valuation beforehand ensures that banks have enough collateral in case of credit default. This also makes it much harder for households to acquire mortgage loans in Germany compared to, e.g., the United States.

On average, a home buyer in Germany borrows approximately three quarters of the entire residential price volume. This number has slightly increased during the past years due to the historically low interest rates. The aggregate volume of the bank loans in Germany account for a volume of 1.1 trillion Euros (Münchener Hypothekbank 2017). The recent development of real estate finance is stagnating or even slightly decreasing for real estate finance providers at present. In the future, 46% of those providers expect growing business in the real estate sector while 40% expect stagnation (Allen & Overy 2017). Considering the seemingly never ending growth in real estate demand especially in bigger cities this outlook sounds remarkable. Nevertheless, it shows the huge gap in supply and demand on the housing market. It is not likely that someone applies for a mortgage loan who does not have a chance of purchasing a homestead. So the shortfall in construction means that also financial institutes suffer the consequences of insufficient supply.

The distribution channels have also shifted in recent years. Still a huge amount of mortgage loans is distributed over the classical bank counter. For years only offline channels have been available to get informed and to attain bank loans. Now, with the internet as a huge informative medium the way how communication and sales work has shifted. In this day and age the new phenomenon is the "ROPO-Effekt" ... „Research Online, Purchase Offline“ (Postbank 2017). In other words customers go online in order to gather information about a banking product they want to purchase, but in the end go into the banking subsidiary and purchase offline. Over 89 per cent of people in the banking sector research banking products beforehand. For mortgage loans

76 percent of the customers decide to place the transaction offline (Postbank 2017).

4 Data

The purpose of this paper is to investigate the relationship between bank loans and house prices in Germany. The following segment describes the empiric analysis constructed for this purpose.

The data set used is constructed from public data for house prices and reported data from banks. On the one hand, we have data showing the development of the house price indices from 2003 to 2017 in the 7 biggest cities in Germany, where house prices are also considerably high. These cities are Berlin, Munich, Stuttgart, Frankfurt, Cologne, Dusseldorf and Hamburg. On the other hand, we have data from the banking side, stating records of the net loans banks gave out in the period between 2003 and 2017. We can also distinguish between net loans in general and mortgage loans the banks give out. The data is on a granular level so there is a distinction between the data of every bank. Because of the fragmented German banking market, there is data available from 86 different banks. With this large amount of different entities in place, it is obvious that not every bank provided data for the full observation period. Another fact we know is where the different banks are headquartered. For the house price data, indices were already available. However, for the bank data, there was only raw data available and many measuring points were missing, especially for the first three years from 2003 to 2006. Therefore log averages were used for the bank loans to make the data smoother and more comparable to the house price indices. In addition to that the years 2003 and 2004 were disregarded from the analysis because of a lack of data.

The number “net loans” of a bank, as we find it in our data, describes the quantity of loans a bank gives out in Germany in general. However for the sake of our argument we assume that most of this money is distributed in the city the banks are headquartered in. This seems kind of a far stretched assumption to be fair,

but it is necessary in order to match the data properly. Also it is nearly impossible to capture the sheer complexity of the banking system and the money flows that go on in a market economy as big as Germany so we have to make some kind of simplistic assumptions. The data set contains figures of the seven biggest cities in Germany where the smallest city (Dusseldorf) has still over 600000 citizens and the biggest (Berlin) has over 3.5 Million citizens . So it seems suitable to assume that these banks make most of their business in the cities they are based in. In that regard it makes sense to make this assumption.

In the next step, the development of net loans and mortgage loans with the development in house prices in the cities were matched. The objective of the analysis is to observe correlation for both the aggregated data and the data on an individual city level in order to get clearer insights about the implication and to observe possible differences within the observations.

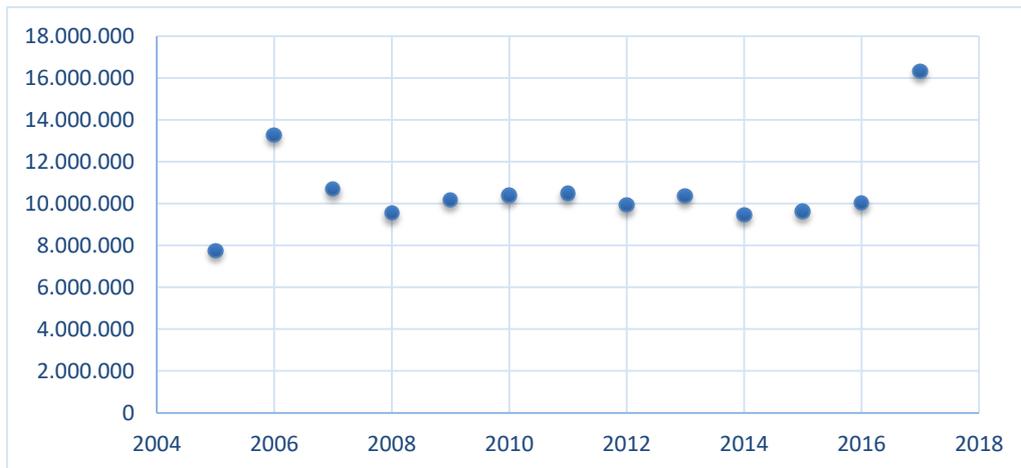
5 Analysis

5.1 Descriptive analysis

In order to understand the situation of German banks in the period from 2005 to 2017 better we first look at the development of some financial figures of banks in this case the mortgage loans, the total assets and the total loans.

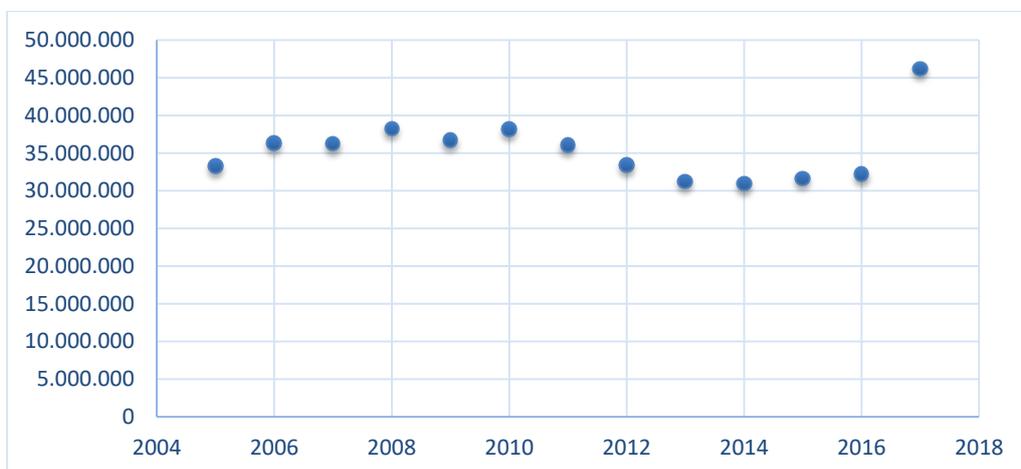
Considering mortgage loans (table 7), a drop during the financial crisis for 2007 and 2008 is observable but afterwards they stabilize and stay constant, though there are outliers in the data in 2005 and 2017.

figure 7: Average mortgage loans (in Euro) in Germany from 2005 to 2017 (own diagram)



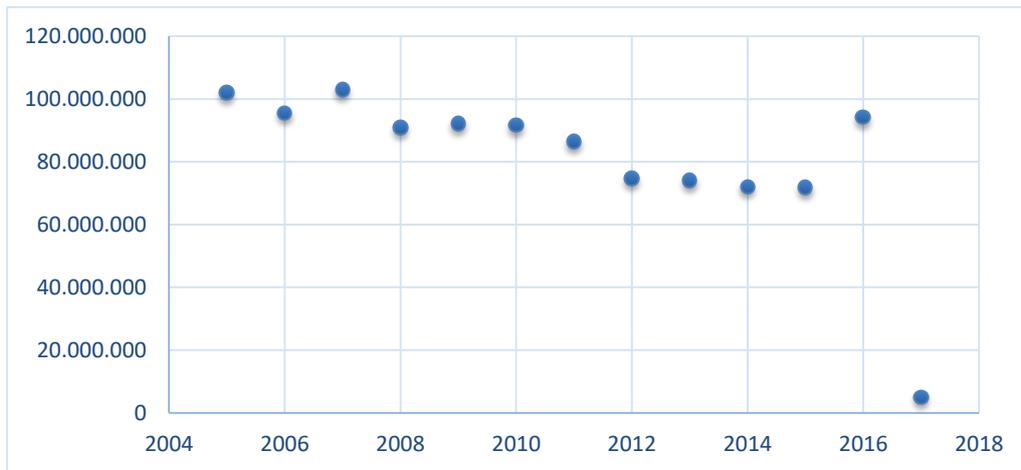
For bank loans in total, the “crisis-development” is different for mortgage loans. There is also a nearly not noticeable drop in loans from 2006 to 2007. After 2007, the net loans seem to be at a constant level until they start dropping from 2010 to 2013. Like the mortgage loans, the total bank loans also increase drastically from 2016 to 2017.

figure 8: Average net loans (in Euro) from in Germany 2005 to 2017 (own diagram)



The average assets drop from 2005 to 2015 except in 2007. In 2016, the assets rise considerably. An outlier in this context is the year 2017. There, the total assets and both mortgage loans and total loans follow a reverse trend.

figure 9: Average bank assets (in Euro) in Germany from 2005 to 2017 (own diagram)

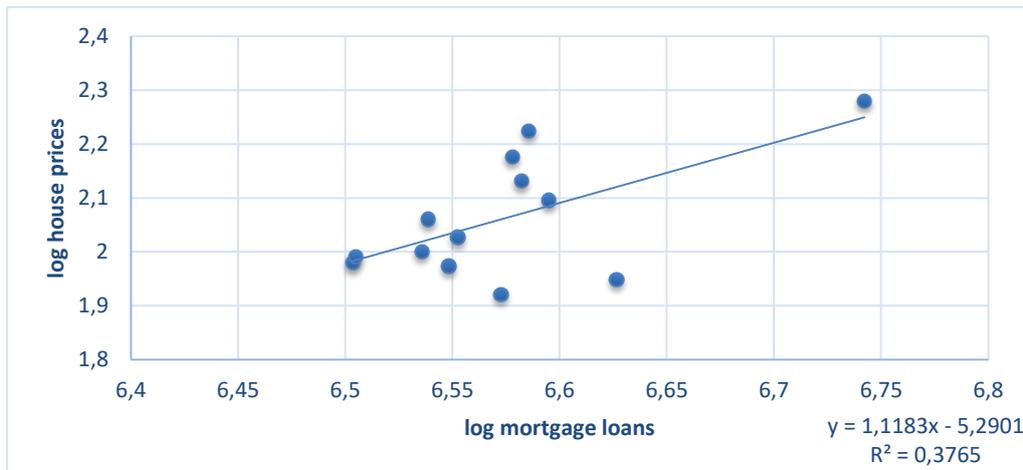


The extremely high number of total loans and mortgage loans and the reverse trend for assets in 2017 can be explained by a sudden drop in reported data for the year 2017.

5.2 The relationship between house prices and Bank loans in Germany

As the literature suggests the supply of bank loans has a significant impact on house prices. The interesting part is whether this hypothesis also holds for the German house and mortgage market. When looking at the data, a positive correlation is observable for most cities. Though, there are cities where the data suggests no correlation or even a negative correlation. Explanations or reasons for that will be presented later. Firstly, let us look at the aggregated data from the seven cities with the biggest population in Germany (table 10).

figure 10: Log mortgage loans vs. log house price index on an aggregate level (own diagram)



There is definitely a positive correlation for mortgage loans and house prices. The p-value of 0.026 suggests that this correlation is significant. For the cities of Hamburg (table 11), Frankfurt (table 12) and Stuttgart (table 13), we have a significant positive correlation between the log average of the mortgage loans and the log house price index with a p-value below 0.01. The p-value for the correlations are approximately 0,00005 for Hamburg, 0.00007 for Frankfurt and 0.009 for Stuttgart.

figure 11: Log mortgage loans vs. log house price index in Hamburg (own diagram)

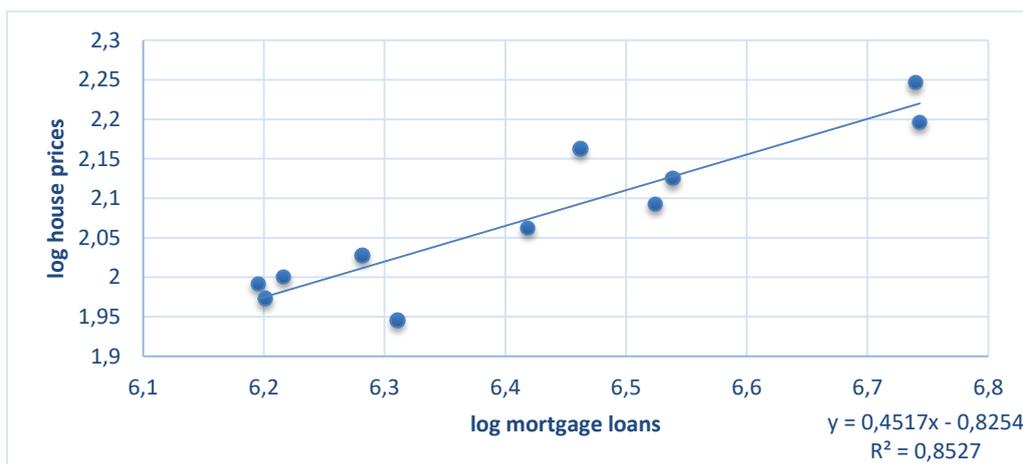


figure 12: Log average mortgage loans vs. log house price index in Frankfurt (own diagram)

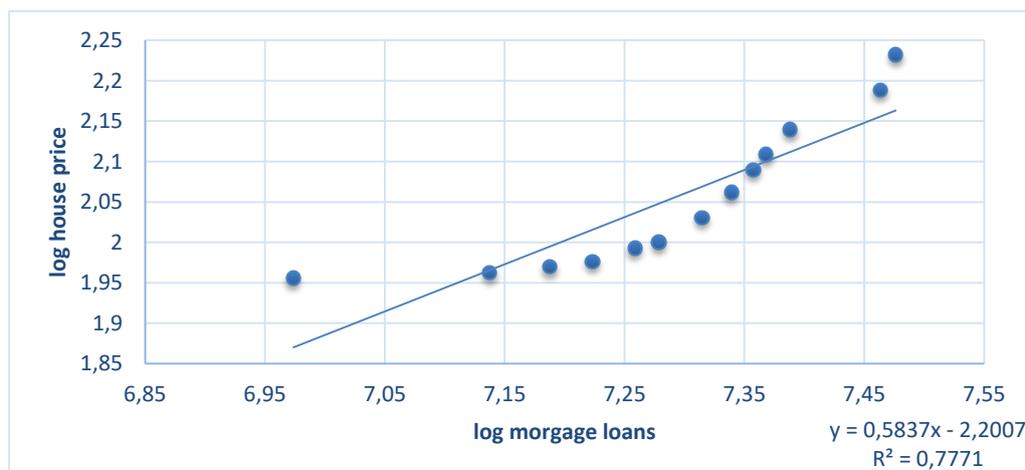
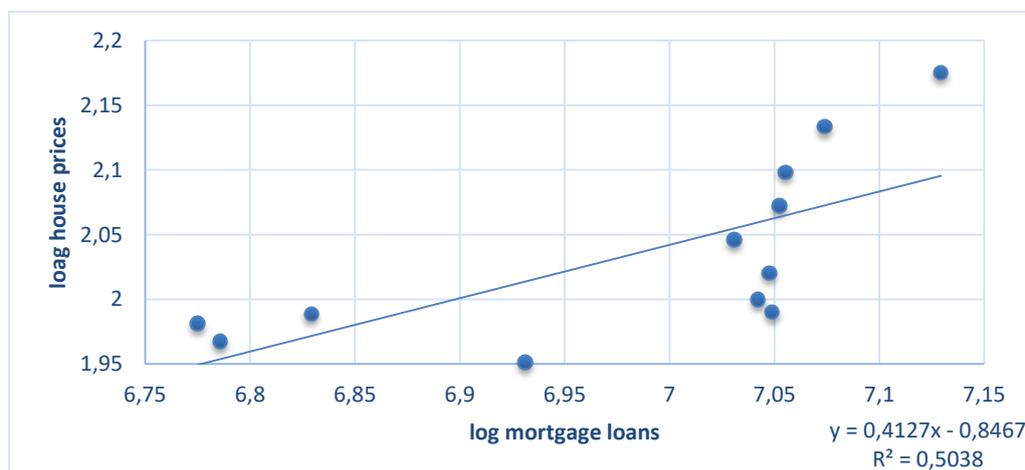


figure 13: Log average mortgage loans vs. log house price index in Stuttgart (own diagram)

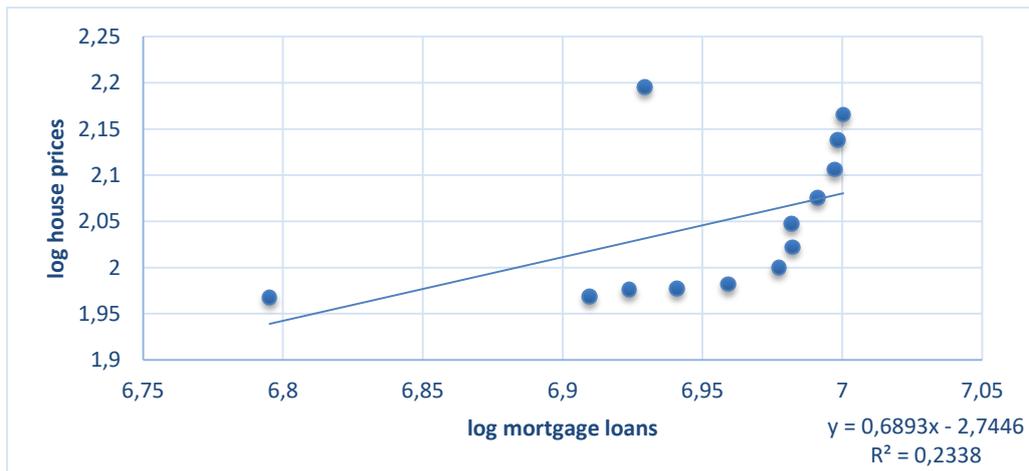


For Munich (table 14), we can see a positive correlation with p-values below 0.05. The p-value for the correlations is 0.016. The data for Cologne (table 15) also suggests a positive correlation and is also significant at the 10% level with a p-value of 0.094.

figure 14: Log average mortgage vs. loans house price index in Munich (own diagram)



figure 15: Log average mortgage loans vs. log house price index in Cologne (own diagram)



For Dusseldorf (table 16) and Berlin (table 17), on the other hand, we observe a negative correlation which is counter-intuitive and not in line with what the literature suggests. Moreover, at least the correlation for Dusseldorf appear to be statistically significant with a p-value of approximately 0.009 for Dusseldorf. For Berlin it is a different story. The p-value of 0.4 clearly indicates no correlation.

figure 16: Log average mortgage loans vs. log house price index in Dusseldorf (own diagram)

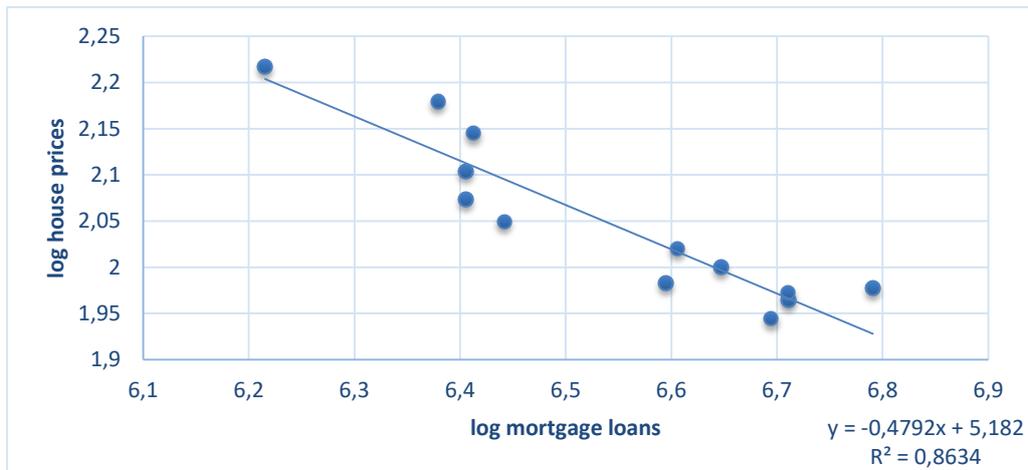
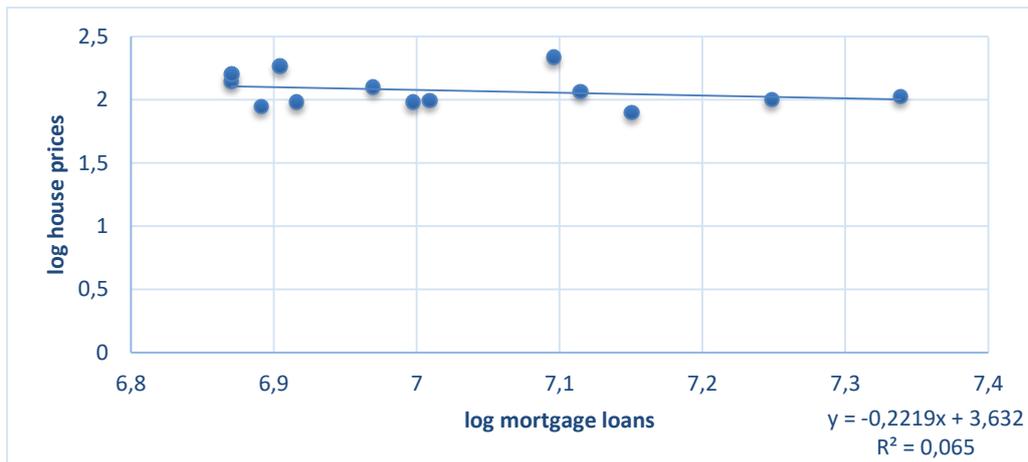


figure 17: Log average mortgage loans vs. log house price index in Berlin (own diagram)



All in all, there are clear indications that bank loans are positively correlated to house prices also in the German housing market. This means that, when the supply for bank loans increases, households hold more purchasing power, which increases demand for real estate and thus with supply staying constant (in the German housing market context already tight), the prices increase further. Most cities show the exact pattern the literature suggests, and the correlations are moreover significant. This indicates that for the specific case of Germany there is in fact also a positive correlation between mortgage loans and house prices. Still, because of the special characteristics of the German housing market (as mentioned earlier), the correlation might be limited especially in the bigger cities

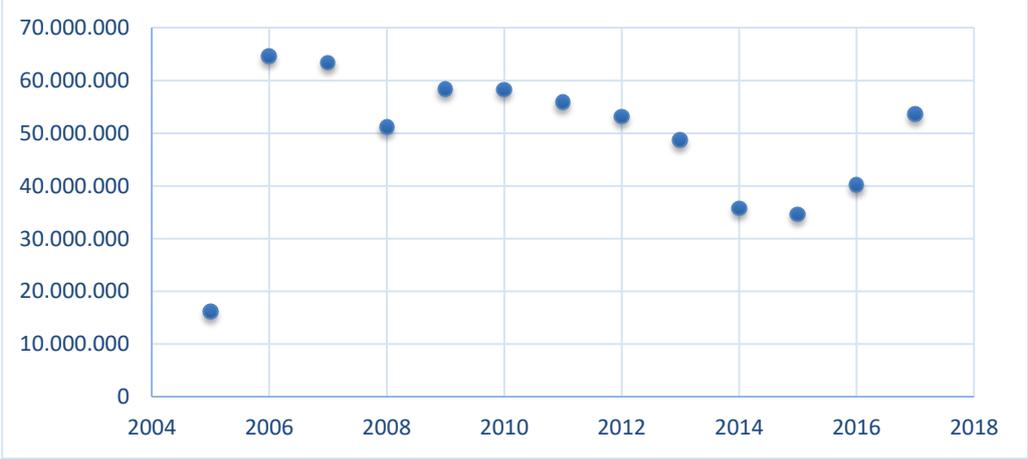
where living space is not sufficiently available and supply falls short. In this case, even private household that hold more bank loans cannot buy more housing. This in turn might limit or even cancel out the effect that an increased supply of bank loans has on house prices. The steadily rising house prices also leave room for speculations whether the low key interest rate is too low for the strong German economy. While the financial crisis apparently did not affect the German house market as much as in other countries, researchers at the same time suggest that the monetary policy of the ECB is “too loose for some countries while too restrictive for others” (Zhu et al. 2017, p. 16). In case of Germany, the ever growing house prices suggest that the low interest rates are too restrictive and thus, according to the Taylor rule, cause an inflation. Especially in the already overheated market in Germany, this policy might be a vicious circle for the German housing market with two driving factors. One is the short supply in housing in big cities and the other is the low interest rates in the EU-area.

5.3 Implications of the financial market for the mortgage market

Let us also take a closer look how the financial crisis influenced the mortgage market, which could in turn also explain some of results shown in correlation graphs. Like mentioned earlier, if we look on a more aggregate level (table 7), there is a noticeable drop in mortgage loans from 2006 to 2007 and another one from 2007 to 2008. From 2008 to 2009, there is a slight increase in the number of bank loans and from the years onwards, there seems to be an increase leading up to 2013 until the development stagnates. The development of house prices was already analyzed in a previous section. The conclusion was, the house prices in the big cities continue to grow even in crisis times (table 4 and 5). This means, the house market in total seems to have suffered from the financial crisis. However, if we look at the mortgage market, the picture is a little different. In the three representative cities Frankfurt (table 18), Berlin (table 19) and Munich (table 20), the financial crisis did have a different impact on the amount of mortgage loans provided. For Frankfurt (table 18), there was a decrease in mortgage loans from 2007 to 2008. Yet they rose again in the next year. From

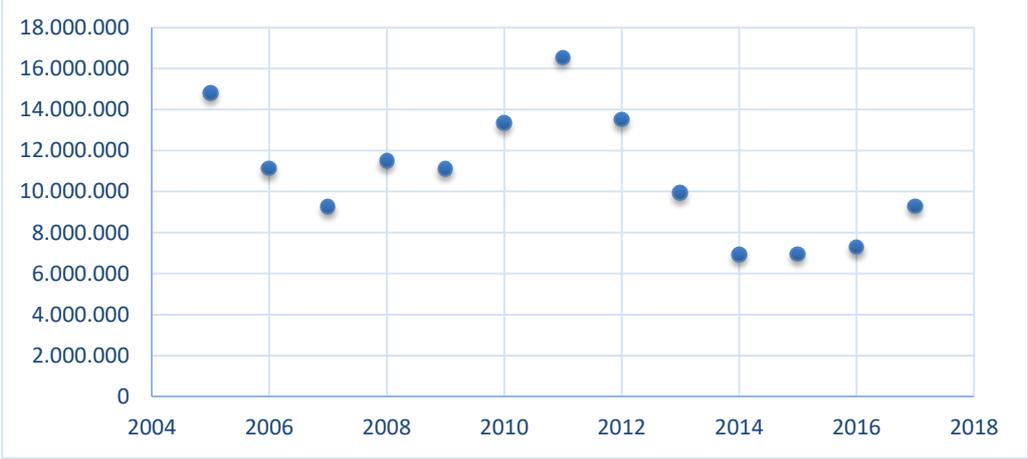
2011 to 2014, the trend is downward. Still, this is already post-crisis. Taken together it seems that the financial crisis did not seem to have such a big impact on the mortgage market in Frankfurt.

figure 18: Mortgage loans in Frankfurt from 2005 to 2017 (own diagram)



For Berlin (figure 19) we can even see an overall positive trend in mortgages from 2007 to 2011. Though there is the same trend of falling mortgage loans after 2011.

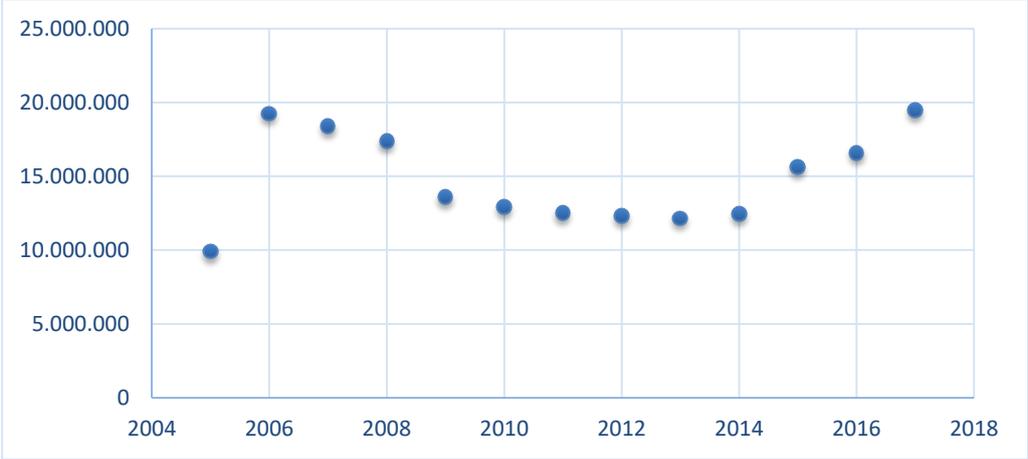
figure 19: Mortgage loans in Berlin from 2005 to 2017 (own diagram)



For Munich (figure 20), the development is quite different. From 2006 to 2008, the amount of mortgage loans seems to be quite constant. After 2008, there is a

striking drop. After that, from 2010 to 2014, the mortgage loans remain quite constant until they start rising again from 2014 to 2017.

figure 20: Mortgage loans in Munich from 2005 to 2017 (own diagram)



It looks like the financial crisis did not impact the mortgage market in an expected way. The drops observed in the cities during the time seem to be considerably low. Maybe the low interest rates were exactly the right instrument to lower the impact of the financial recession in Germany. The low interest rates stimulated the demand for mortgage loans. Years after the crisis, while the German economy is growing and growing, the interest rates seem to be one of the main drivers for the house prices in Germany. It is likely that even in times of crisis, the demand for residential property was still high in this economically really strong cities. In times of boom, the demand for residential property in these cities by far exceeds the supply. That is why the demand was most likely still high enough even in times of recession where the baseline behavior of private households is to reduce consumption because of budget constraints and also worse future projections.

5.4 Comparison of growth rates of house prices and bank loans

Lastly, the comparison of the growth rate of house prices and the growth rate of mortgage loans brings all arguments together in one graph (figure 21). It is interesting to observe that during post crisis times, between 2009 and 2010, the

growth rate of mortgage loans is higher than the growth rate of house prices. This means low interest rates did increase the demand for mortgage loans while at the same time holding the growth rate for house prices constant. After 2011, when the economy had mostly recovered from the negative effects of the financial crisis, the growth of mortgage loans was constantly low. We can also observe that except post-crisis times, the house prices growth rate is much higher than the growth rate of mortgage loans. Two of the reasons for that are: first, as described earlier, the housing market was and is saturated, which is why house prices grow rapidly even if not in line with the growing mortgage loans. Second, the low key interest rate did not result in ever growing mortgage loans because the supply for houses did not seem to meet the high demand for living space in the big cities. This made the demand for real estate very inelastic which means that even if house prices increase exponentially, the demand would still be very high. This is also why the interest rate set by the ECB is not a valuable instrument of monetary policies anymore. The interest rate of bank loans largely effects the total amount of bank loans because it influences the demand. With the low key interest rate, there is no margin for banks to maneuver when it comes to the supply of bank loans. Though, the ever rising house prices are a worrisome development considering the risk of a house price bubble which would stop the rising house prices all of a sudden and would reverse the trends of the previous year. One cautionary example is the collapse of the US housing market during the recession in 2007/2008. The trend was similar to the one we can observe in Germany now. All of the sudden house prices dropped down. For the US, house prices fell 18% from 2007 to 2008 in only one year (CNN News 2008). This had serious implications for the whole economy as many other markets also depend on a stable housing markets. However there is one big difference between then (in the US) and now (in Germany) which is the fact that banks in the US also gave out faulty credits accelerating the bust.

figure 21: Comparison between the growth rates in house prices and bank loans



5.5 Limitations

Limitations of the research are on the one hand the somewhat restricted data available. The data set was at some points, especially at the banking level, not complete which could also be an explanation for some of the counter intuitive results for Berlin and Dusseldorf. For Berlin, it was only possible to get a full set of data for one bank and only five banks in total, which is not representative for a city with over three million inhabitants. This is why the results for this city can be disregarded from the findings without further acknowledgement of any implications. When taking a closer look at the results obtained for Dusseldorf, the data suggests a highly significantly negative correlation for mortgage loans and house prices. In this case, there was data available from five banks but also only one with a full set of data points, which also raises questions about the validity of the results. Nevertheless, to be fair, this argument also holds true for some of the cities where the results showed a highly significant positive correlation. On the other hand, there are other factors driving house prices that were not taken into consideration in this analysis. These range from the prices for interest rate level to psychological phenomena that influence households' decisions. But further analyses of those factors are beyond limits for this paper. It could be the case, that these other factors account for the negative correlations

observed for Berlin and Dusseldorf, if these counter-intuitive correlations even exist (as mentioned before).

Another aforementioned limitation concerns the data used. Because of limited access to granular data of mortgage loans of every city, I had to implement certain assumptions. One of these assumptions is that the mortgage loans are only given out in the city the bank is headquartered in. Especially in the splintered banking market in Germany, with branch offices in nearly every city, this assumption is a stretch. Still it is just to assume that most of the business of the major banks is made in the biggest cities, where house prices are especially high. All in all, this adoption is necessary because of the lack of data available but still it impacts the quality of the results the analysis revealed.

6 Conclusion

There are clearly characteristics that make both the mortgage and the housing market special in Germany. For the housing market, it is the shortage of supply of residential property especially in the bigger cities. For the mortgage markets, it is the fact that banks require much more collateral for mortgage loans. Still, there is a positive correlation for house prices and bank loans. Everything else would be counter intuitive. When looking at the counter-factual, this point becomes clearer. A negative correlation of these variables would mean that if the supply of bank loans increases, the house prices would drop. However, arguably, if we look at the data used for this paper, the correlation is not as clear as expected. Reasons for that are on the one hand the mentioned shortage in supply on the housing market which makes the market inefficient to function and thus the effect of an increase of bank loans does not become that apparent. The other reason is the constantly low key interest rate that is apparently too low for a sound economy. According to the Taylor Rule, an economy has to balance output and inflation rate. The instrument of choice is normally the interest rate set by the central bank. Nowadays, with interest rates at a constant low, this tool

of balance of the two factors is eliminated. Consequences are ever rising house prices that are not proportional to the at the same time growth in mortgage loans.

The good news for households holding real estate in the big cities in Germany is that because of the rising trend in prices the money is well invested. At this point, it looks like it is going to stay that way at least for some time. To quote the former chief banking supervisor of Deutsche Bundesbank Andreas Dombret, “the good news is that there is currently no real estate bubble that threatens financial stability in Germany” (Global Property Guide, 2017). The only reason to worry could be that a house price bust makes the housing market suddenly collapse. With a rising population due to immigration, the demand will still be high in the next years. In contrast, there is also the forecast by analysts that the German population will decline by 4% till 2025. Even if the mortgage market in Germany is kind of on a rough path at the moment, it is still stable and thus supports households with the means to finance real estate. Still, banks will need to adapt to the new realities. How all these factors influence house prices and the demand for mortgage loans remains speculative at this point in time. It is a highly relevant topic and that is why one bit of research in this area may not bring the all-in-one solution but might clear up a fragment of the complex picture.

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9 Appendix

figure 22: Households owning real property in Germany

Assets, debts

Households owning real property of households on 1 January

Households owning real property	Germany			Former territory of ¹ the Federal Republic			New Länder and ¹ Berlin		
	2003	2008	2013	2003	2008	2013	2003	2008	2013
Households projected (1,000)	37,931	39,077	40,032	30,861	31,770	31,440	7,070	7,306	8,592
In percent ¹									
Households owning real property	48.8	48.0	47.5	51.1	50.1	50.3	39.2	39.0	37.2
Data provided on type of real property	.	46.1	47.2	.	48.2	50.1	.	36.6	37.0
Non-built-up land	5.9	4.6	3.9	6.0	4.6	4.1	5.6	4.2	3.5
Single-family homes	28.6	28.9	30.1	29.8	29.9	31.7	23.9	24.4	24.3
Two-family homes	6.8	5.2	5.3	7.3	5.7	5.9	4.3	3.3	3.4
Residential buildings comprising 3 or more dwellings	2.7	2.1	2.0	2.9	2.3	2.2	1.4	1.3	1.2
Freehold/owner-occupied dwellings	12.8	13.3	13.8	14.6	15.2	15.8	4.5	4.7	6.2
Other buildings	3.6	3.3	3.0	2.7	2.5	2.3	7.4	6.5	5.5
No data provided on type of real property	1.6	2.0	0.3	1.7	1.9	0.2	1.1	2.4	0.3

¹ Before the sample survey of income and expenditure 2013, West Berlin was part of the former territory of the Federal Republic and East Berlin was part of the New Länder.

. = Numerical value unknown or not to be disclosed.

Source: Sample Survey of Income and Expenditure.

https://www.destatis.de/EN/FactsFigures/SocietyState/IncomeConsumptionLivingConditions/AssetsDebts/Tables/HouseholdOwningRealProperty_EVS.html (29.06.2018)

figure 23: Income and expenditure in Germany

Assets, debts

Sample Survey of Income and Expenditure

Financial assets, real property and debt of households on 1 January¹

Financial assets and debt	Germany			Former territory of the Federal Republic ²			New Länder and Berlin ²		
	2003	2008	2013	2003	2008	2013	2003	2008	2013
Averages per household in Euro									
Gross financial assets	40,300	47,700	46,800	43,500	52,000	51,100	23,200	28,700	30,900
Consumer credit residual debt	1,400	1,700	1,800	1,400	1,700	1,800	1,300	1,600	1,800
Education credit residual debt	.	300	500	.	300	500	.	300	500
Net financial assets	38,900	45,700	44,500	42,100	50,000	48,800	21,900	26,700	28,600
Current market values	109,700	96,400	103,600	122,600	109,100	119,600	47,500	41,000	44,900
Mortgage residual debt	25,600	24,500	24,800	27,800	27,100	28,200	14,700	13,200	12,300
Total gross assets	150,000	144,100	150,400	166,100	161,200	170,800	70,700	69,700	75,800
Total debt	27,000	26,500	27,100	29,200	29,100	30,500	16,000	15,200	14,600
Total net assets	123,000	117,600	123,300	136,900	132,000	140,300	54,700	54,600	61,200

¹ The results for 2013 have been revised.

² Before the sample survey of income and expenditure 2013, West Berlin was part of the former territory of the Federal Republic and East Berlin was part of the New Länder.

. = Numerical value unknown or not to be disclosed.

Source: Sample Survey of Income and Expenditure.

https://www.destatis.de/EN/FactsFigures/SocietyState/IncomeConsumptionLivingConditions/AssetsDebts/Tables/FinancialAssetsDebt_EVS.html (29.06.2018)

figure 24: Development of house prices in the top 7 cities in Germany from 2004 to 2017

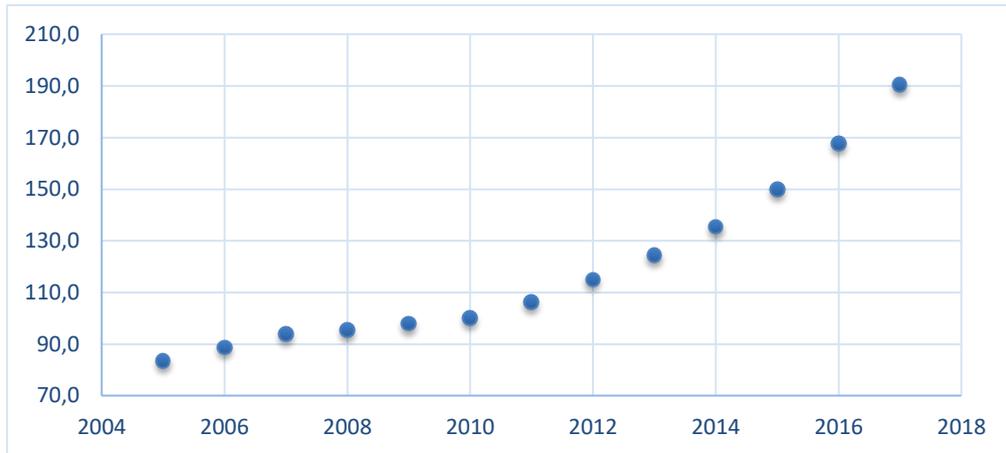


figure 25: Development of house prices in Berlin 2004 to 2017

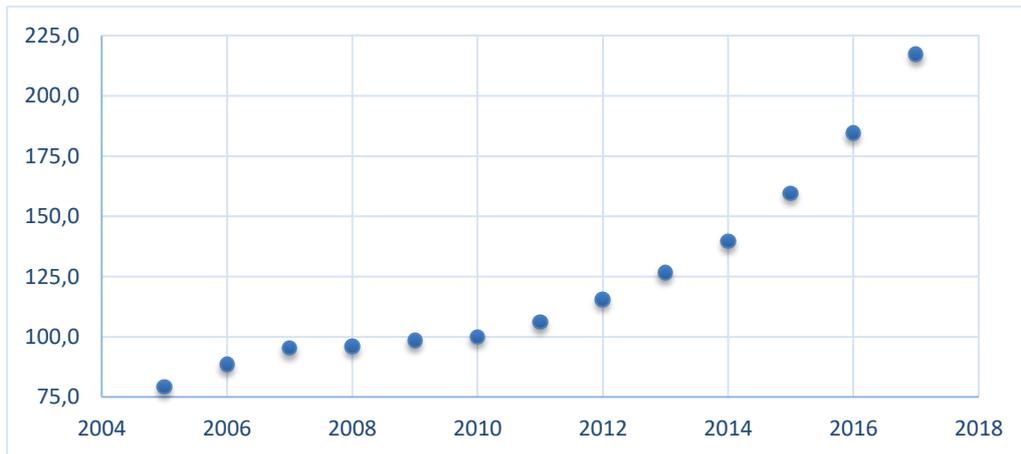


figure 26: Development of house prices in Hamburg 2004 to 2017

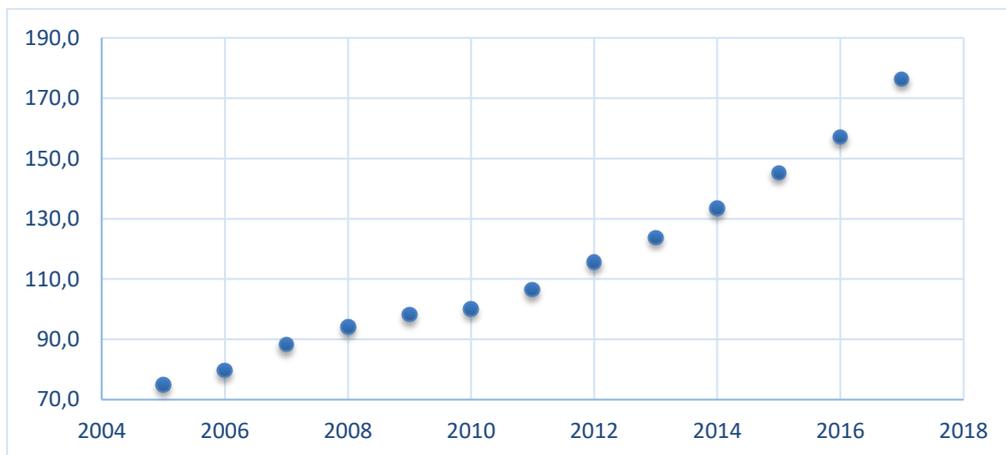


figure 27: Growth rate of house prices from 2006 to 2017

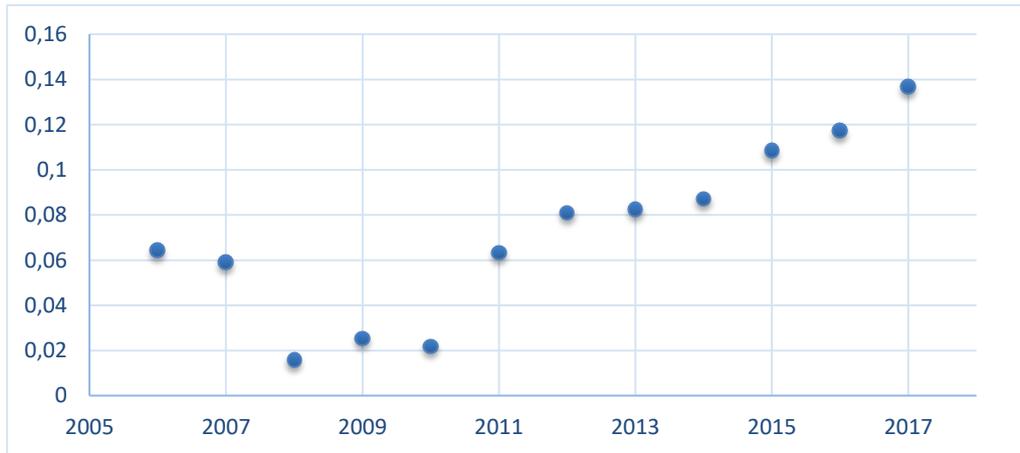


figure 28: Average mortgage loans (in Euro) in Germany from 2005 to 2017

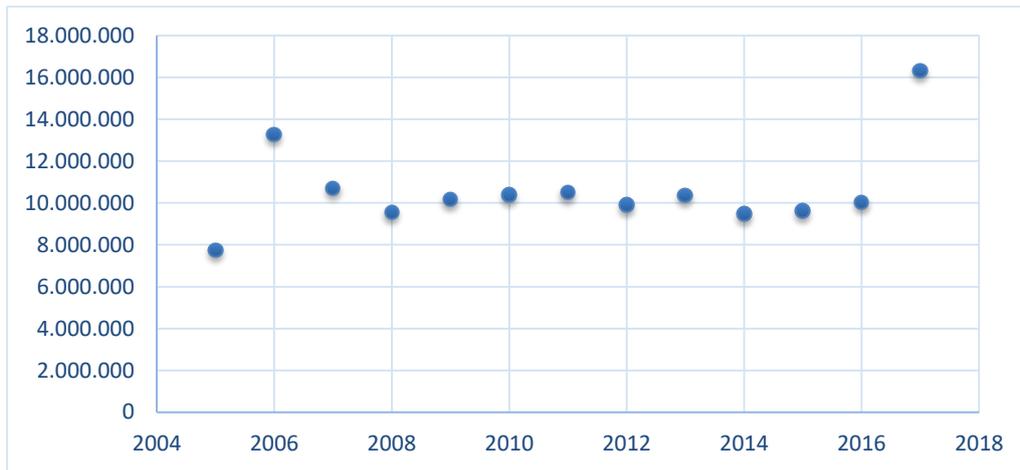


figure 29: Average net loans (in Euro) from in Germany 2005 to 2017

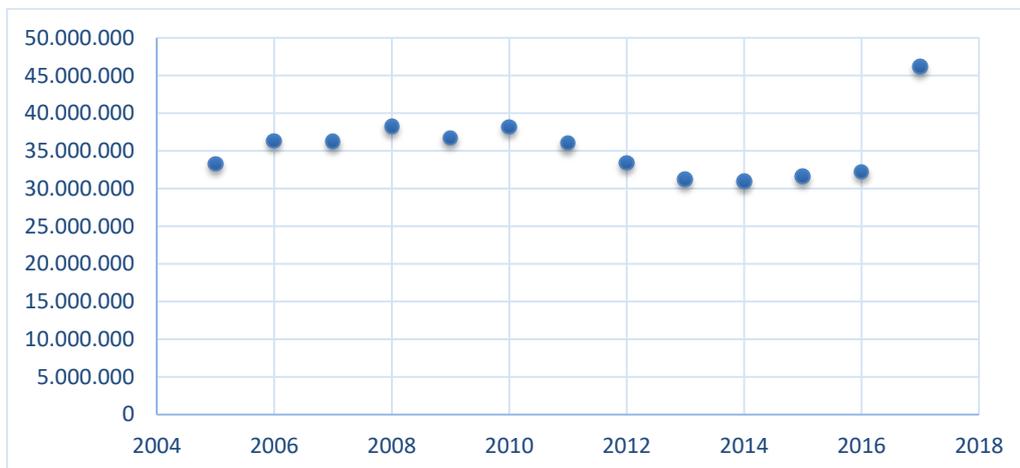


figure 30: Average bank assets (in Euro) in Germany from 2005 to 2017

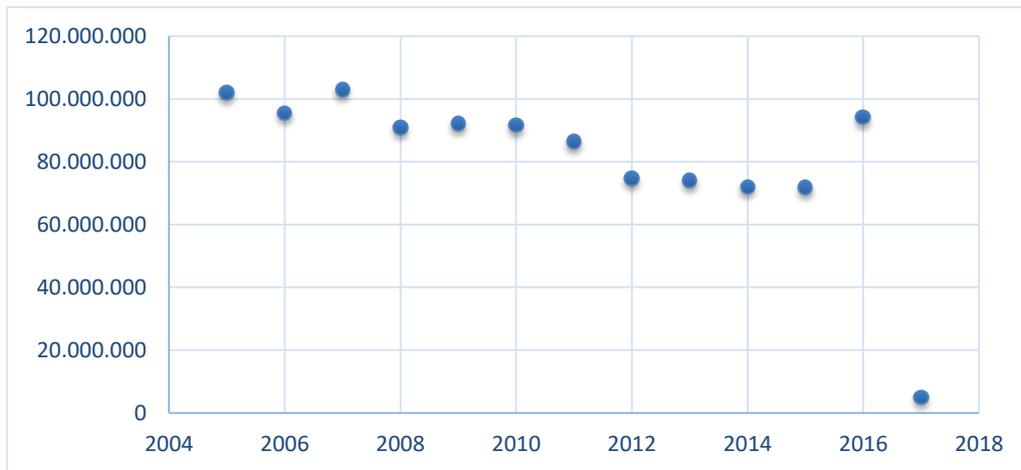


figure 31: Log mortgage loans vs. log house price index on an aggregate level

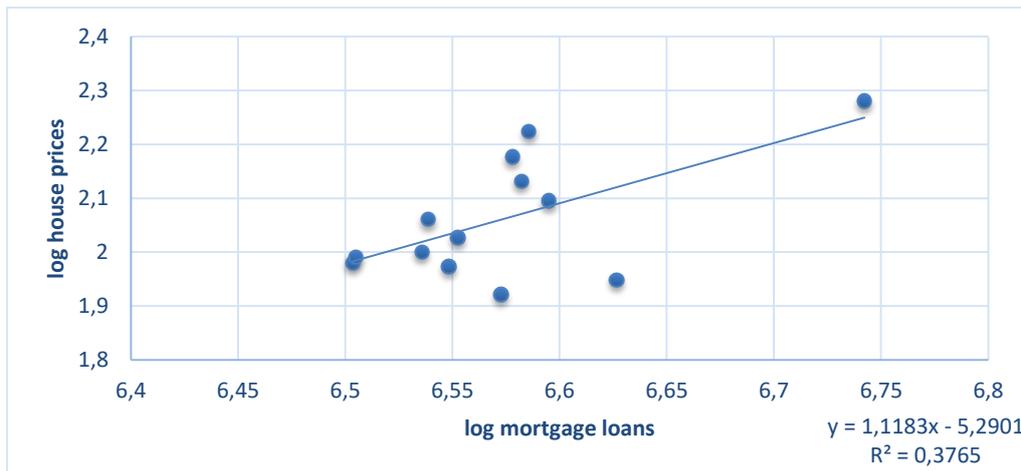


figure 32: Log mortgage loans vs. log house price index in Hamburg

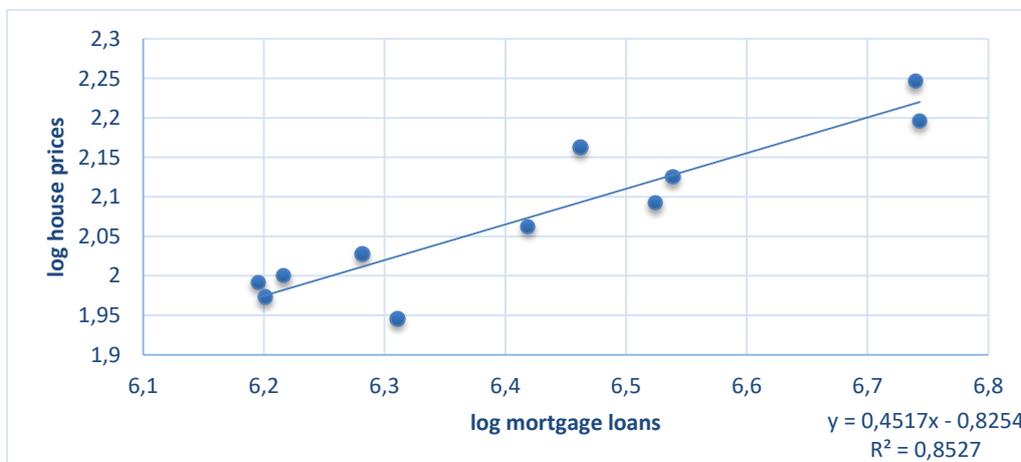


figure 33: Log average mortgage loans vs. log house price index in Frankfurt

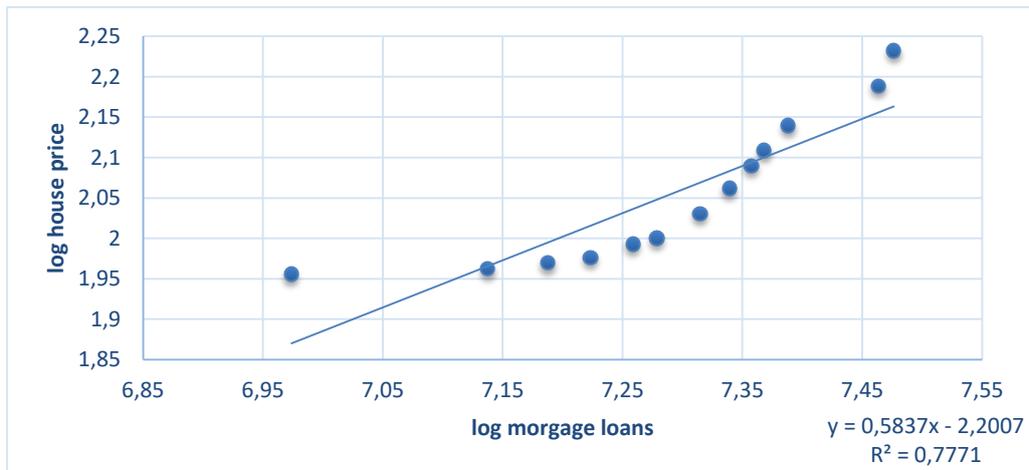


figure 34: Log average mortgage loans vs. log house price index in Stuttgart



figure 35: Log average mortgage vs. loans house price index in Munich

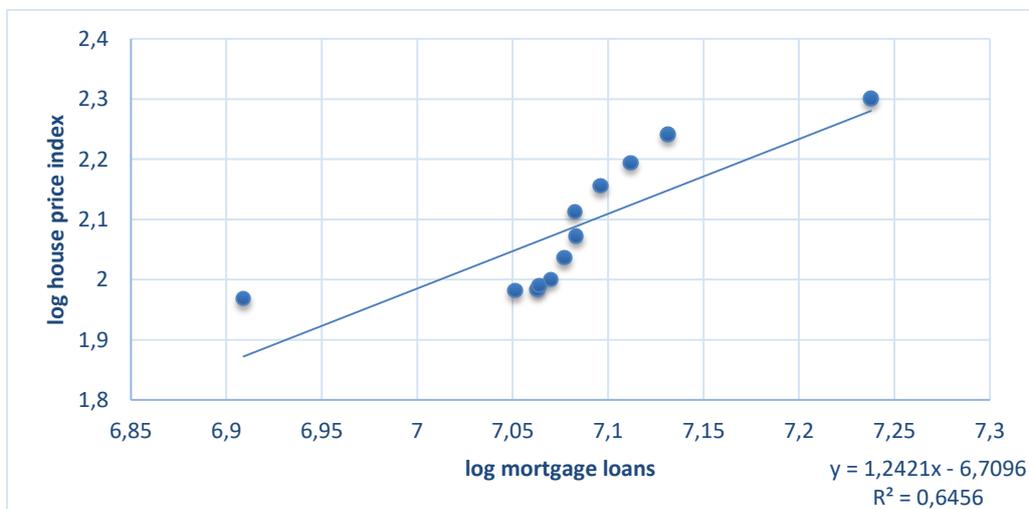


figure 36 Log average mortgage loans vs. log house price index in Cologne



figure 37: Log average mortgage loans vs. log house price index in Dusseldorf

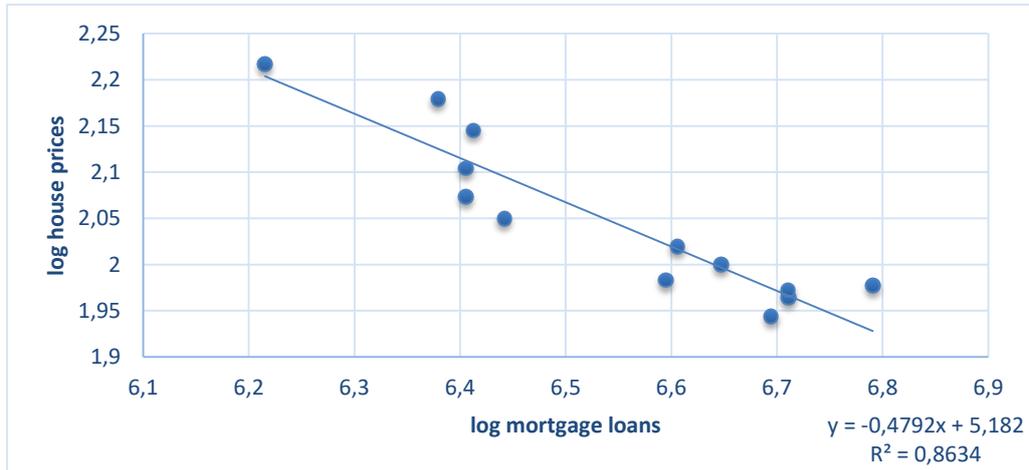


figure 38: Log average mortgage loans vs. log house price index in Berlin



figure 39: Mortgage loans in Frankfurt from 2005 to 2017

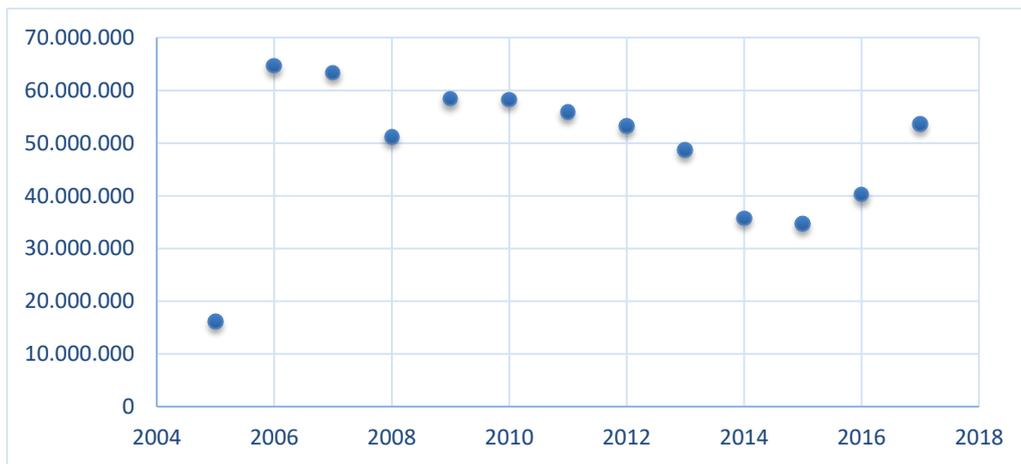


figure 40: Mortgage loans in Berlin from 2005 to 2017

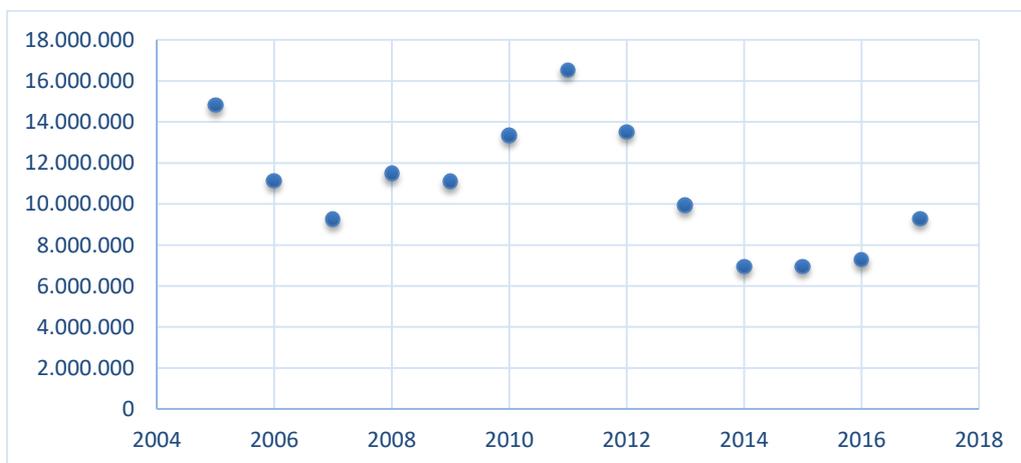


figure 41: Mortgage loans in Munich from 2005 to 2017

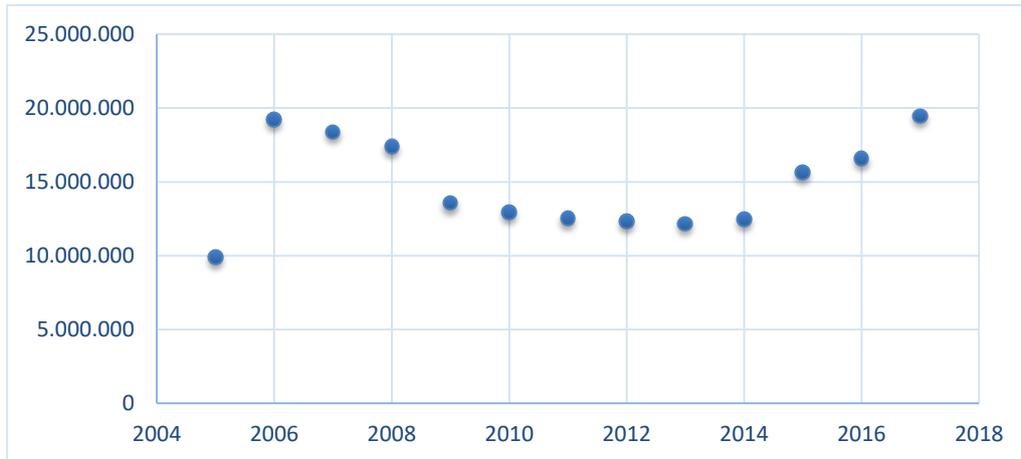
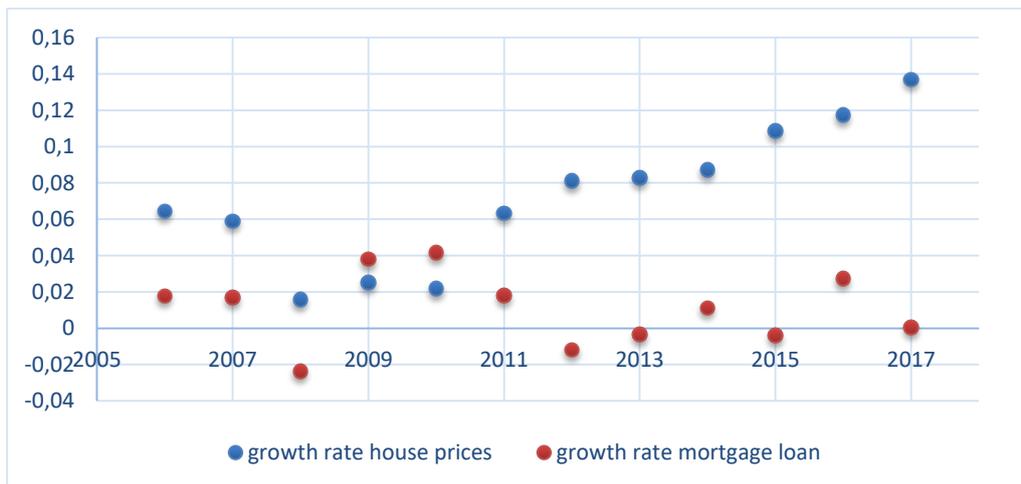
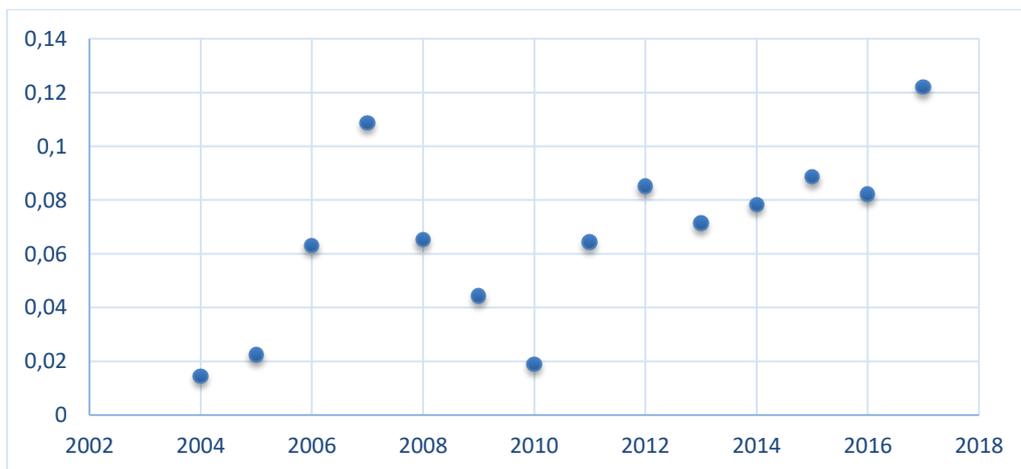


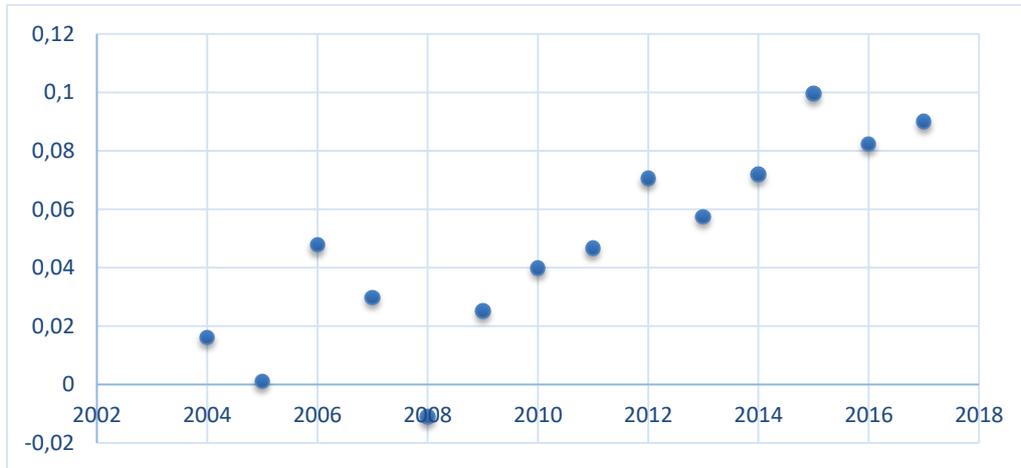
figure 42: Comparison between the growth rates in house prices and bank loans



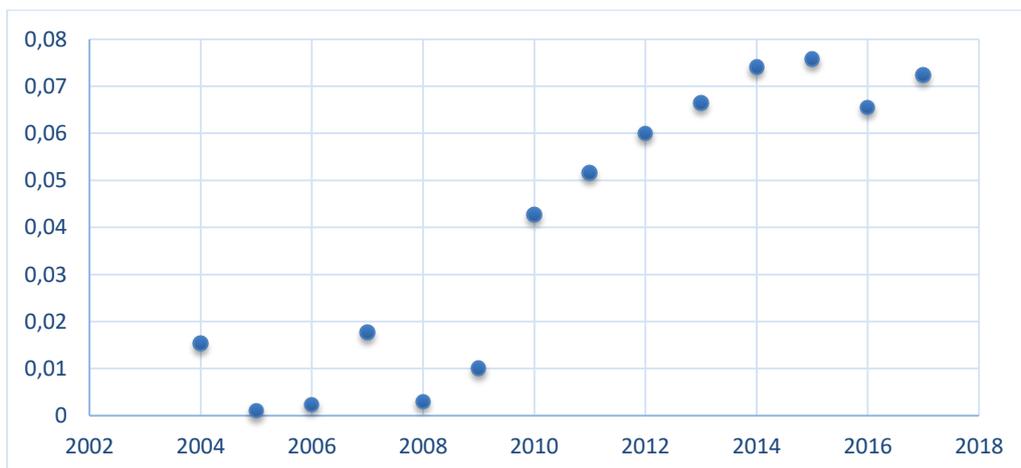
Growth rates in house prices for Hamburg



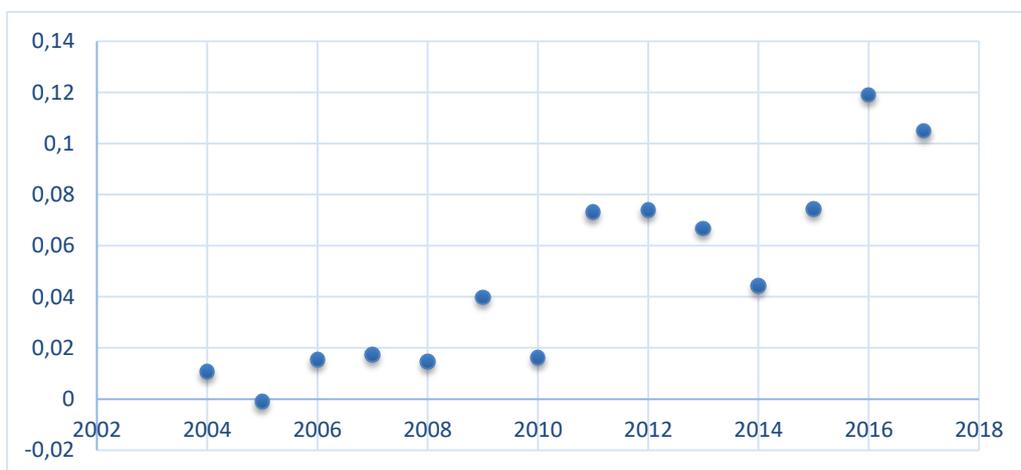
Growth rates in house prices for Dusseldorf



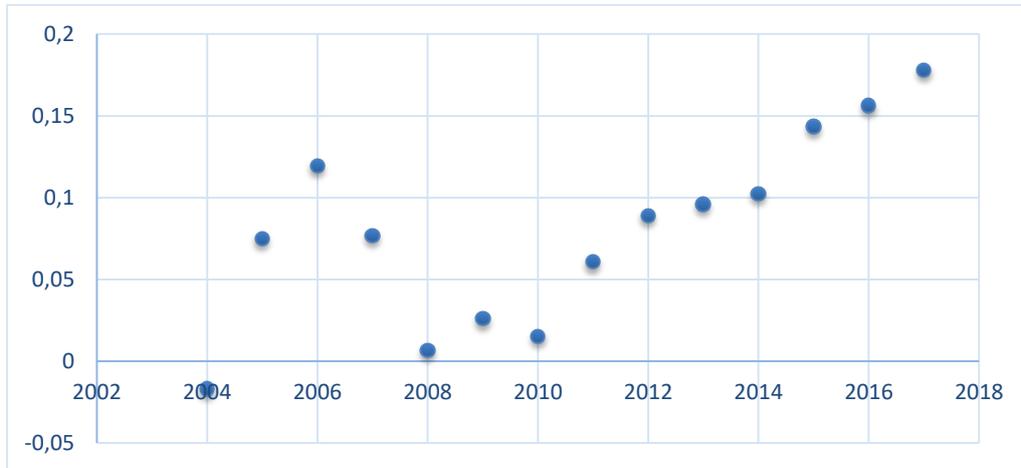
Growth rates in house prices for Cologne



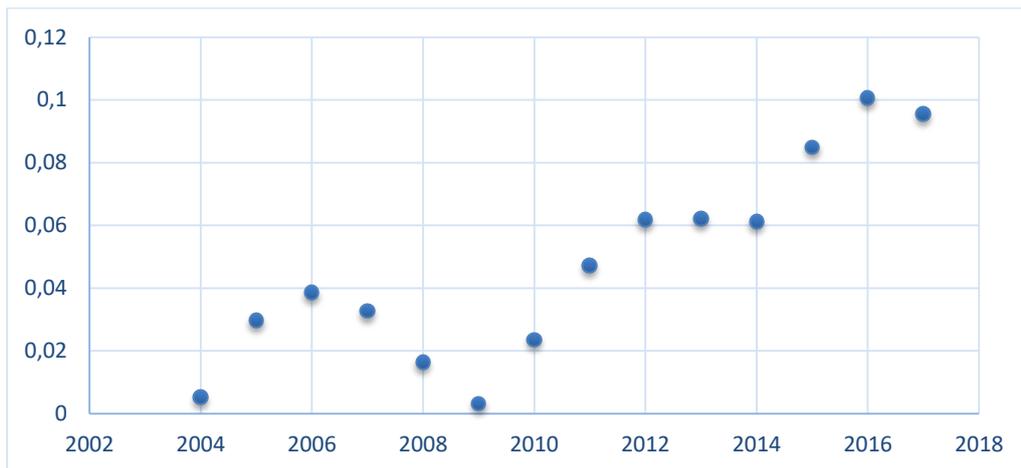
Growth rates in house prices for Frankfurt



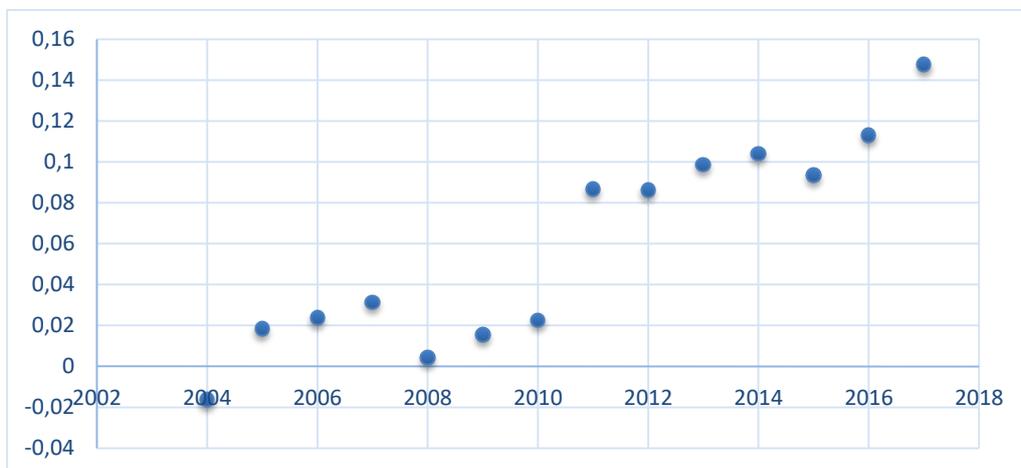
Growth rates in house prices for Berlin



Growth rates in house prices for Stuttgart



Growth rates in house prices for Munich



10 Statutory declaration

A statutory declaration is to be included at the end of every written work (e.g. Seminar paper, Bachelor's or Master's thesis). The translation is as follows: Statutory Declaration "I herewith declare that I have composed the present thesis myself and without use of any other than the cited sources and aids. Sentences or parts of sentences quoted literally are marked as such; other references with regard to the statement and scope are indicated by full details of the publications concerned. The thesis in the same or similar form has not been submitted to any examination body and has not been published. This thesis was not yet, even in part, used in another examination or as a course performance."

Place, Date:

Signature:

In case of written work, which is also to submit on a data carrier, the translation is as follows: Statutory Declaration "I herewith declare that I have composed the present thesis myself and without use of any other than the cited sources and aids. Sentences or parts of sentences quoted literally are marked as such; other references with regard to the statement and scope are indicated by full details of the publications concerned. The thesis in the same or similar form has not been submitted to any examination body and has not been published. This thesis was not yet, even in part, used in another examination or as a course performance. Furthermore I declare that the submitted written (bound) copies of the present thesis and the version submitted on a data carrier are consistent with each other in contents."

Place, Date:

Signature: