Identification of current financial bubbles on the global real estate markets

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Abstract: The article relates to the topic of speculative price bubbles which arise on the real estate markets. High property prices, historically high inflation and rising construction interest rates have lately brought attention to the question whether a real estate bubble is currently present on the respective markets and if a housing market crash is coming. In order to develop an understanding of this, a theoretical basis of the phenomenon of financial bubbles is crucial. The main aim of the article was to then conduct a quantitative calculation of price valuation indicators of housing affordability and subsequently construct a comparative ranking table for the world real estate markets. Leading up to timeline of first half of 2022, the results indicate an occurrence of a possible financial bubble on the real estate markets of China, Western and Central Europe. Within the present effects of the so-called "bubble in everything", the results were justified by current investment conditions, limitations of the used indicators were considered and preventive measures were proposed.

1 Introduction

Currently there are a lot of expensive assets in the world economy. That is also partially due to the fact that over the past decade of loose monetary policy and constant central bank money printing, the infamous "bubble in everything" has been created. The financial bubble itself generally represents a state of overvaluation or deviation of asset prices from their true intrinsic value, with a future threat of a sudden drop in the market price. Throughout world history, we have already encountered several such bubbles, with the current milestone of already 385 years since the first tulip financial bubble in the Netherlands in 1637.

The exact cause of any financial bubble can be economic as well as behavioral in nature and is often accompanied by phenomena such as investor herd behavior or moral hazard. Such phenomena eventually escalate into panic buying of selected assets, which, in analogy with the new pandemic of the COVID-19 virus, spreads through the markets like a contagion, while without early identification of the occurrence of a bubble, it is not possible to prevent the significant negative effects of its later bursting. However, it is relatively easy to identify a financial bubble only in retrospect, but it is much more difficult to recognize it in real time, when it hasn't burst yet. Overall, can this article then, in addition to addressing the topicality of the issue, have the potential of a significant benefit not only for financial and state institutions capable of mitigating the effects of bursting bubbles, but also for everyday investors avoiding overvalued and looking for undervalued assets.

The term bubble is a very current topic in the media these days, whether on the domestic or international scene. In the context of the pandemic, we have been probably recently encountered so-called social bubbles more frequently, but within the more economic-financial focus, financial bubbles have been coming to the fore for several years, primarily as a reaction to the unstoppable rise in the prices of various assets across the global economy. In order to be elementarily able to look for the very phenomenon of the financial bubble on the real estate market, it is first of all crucial to define the researched term. At the outset, it is necessary to state that there is still no single clear definition of a financial bubble, as each author characterizes it with smaller or larger differences. The financial bubble itself is further referred to in the literature as: economic bubble, price bubble, speculative bubble, investment bubble or speculative mania (Sivák, 2019).

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One of the first economists to think more closely about asset price bubbles was John Maynard Keynes (1936), who concluded that bubbles primarily form because investors can behave irrationally. Subsequently, according to Siegel (2003), the bubble is explained as a deviation between the real value of the asset and its higher market price. This is also supported by Scherbina (2013), who states that a bubble can be characterized as a time period when speculative investments lead to an overvaluation of prices in a specific sector. It should therefore be emphasized that we understand financial bubbles in a simplified sense as a speculative overvaluation of the price of a selected asset, such as real estate, stock shares, currencies or other goods and sectors, while specifically in the article we will analyze this rate of overvaluation on the real estate markets.

All of the above-mentioned definitions have a common basis in high trading volume, where assets trade at a price or within a price range that significantly exceeds their underlying asset value (Scott, 2020). This basic or fundamental value is described as the present value of all future cash flows received from the asset (Uppal, 2017). Cash flows from shares can thus be measured by dividends paid. However, real assets such as gold or the real estate we are focusing on, do not pay dividends, and instead of dividends, they are, for example, cash flows from the house determined by construction costs and rent (Shiller, 2007).

As noted by Xiong and Scheinkman (2014), the economic consequences of such an asset market bubble can be over-investment, imprudent trading in boom times, as well as a financial crisis with the economy in a slump. These consequences are most likely to occur after the bubble bursts, when investors realize that buying real estate in a particular market is not as profitable, liquid and sustainable as they thought. As soon as it happens, valuations fall below pre-bubble levels (Chang, 2016). It is also essential to emphasize the behavioral and psychological aspects of financial bubbles. American economist and winner of the Nobel Prize in Economics, Robert Shiller, in his publication Irrational Exuberance, defines a bubble as "a situation where information about rising prices evoke enthusiasm that spreads like a psychological contagion from person to person, accompanied with stories that explain price increases and they attract a larger and larger group of investors who, regardless of their doubts about the value of the investment, are drawn into speculation partly due to envy of the success of others and partly due to the influence of gambling excitement." (Shiller, 2000).

Likewise, in the context of the current global COVID-19 pandemic, we can apply the definition to bubbles in parallel, where a speculative bubble is, in a certain sense, a social epidemic, the contagion of which is mediated by price movements (Shiller, 2012).

2 Methods

In an attempt to identify price bubbles on the real estate market before they burst, several financial indicators are mentioned in the academic literature, with the help of which it is possible to evaluate whether the assets on the given market are valued objectively or rather irrationally high above the historically established safe values, indicating the possible occurrence of bubbles. In the case of the real estate assets we are investigating, by comparing the current levels of the indicators with previous levels that proved to be unsustainable in the past (i.e., led or at least accompanied the subsequent bursting of the financial bubble), we can make a qualified estimate of whether the given real estate market is still experiencing a bubble.

The detection of bubbles in the real estate market is primarily accompanied by the housing affordability indicator, respectively the ratio of the real estate price to the income of the population in the given area. As a rule, it is the ratio of the average market prices of houses or the price per m² of real estate to the average annual family disposable income (Vogel, 2009).

$$Price\ to\ income\ ratio = \frac{median\ real\ estate\ market\ price}{median\ annual\ household\ income}$$

The first listed indicator of real estate affordability thus determines how much annual income must be saved for the purchase of real estate. The rule that real estate agents and buyers have long used is that you can afford a property if its total price is equal to roughly 2.6 years of your individual income or your household income (Florida, 2017). This ratio is based on historical national averages under healthy economic conditions. Thus, the index generally has a rating of "affordable" from 3.0 and below, to "worse affordability" when the value exceeds 5.0. The more years of family or household income a person has to allocate to the purchase of real estate, the lower the affordability. If the growth of house prices exceeds the growth of household incomes too much, it means that a bubble may develop and fewer households will be able to afford to buy a property, if we abstract from the change in credit capacity (Vogel, 2009).

$$Price\ per\ m^2\ to\ income = \frac{median\ market\ price\ per\ one\ m^2 of\ real\ estate}{median\ annual\ household\ income}$$

The literature also mentions the ratio of the average price for one m^2 of real estate to the average annual income, which determines in percentage terms how much of the annual income an individual must allocate to the purchase of one m^2 of real estate. In general, a value of 20% of the annual income is stated as the limit of affordability (Roberts, 2008). The mentioned indices can be applied to selected international real estate markets and then, according to the defined intervals of 5 years and 20%, it is possible to evaluate whether it is justified to consider a bubble forming in any individual real estate market. Research will utilize the mentioned two marginal limits of overvaluation, which in academic literature are considered the most suitable for uniform complex comparisons, especially in connection with their high indicative value during the last crisis in 2008, as was also further confirmed by the eminent American economist Robert Shiller in his publication Irrational Exuberance. However, in the case of further research, the statistical significance of research methodology could be supplemented also with individual comparative bases for selective countries or regions.

Selected property data drawn from one of the world's largest real estate databases, NUMBEO, are reported for the following specific property groups - Apartment (1 bedroom) in city centre, Apartment (1 bedroom) outside of centre, Apartment (3 bedrooms) in city center and Apartment (3 bedrooms) outside of centre. Taking into account the given categories, we can conclude that in the framework of the research we will have to abstract from the impact of age of the property as well as other residential types of property (such as family houses, villas, mansions, mountain huts, etc.).

According to the literature, the very occurrence of financial bubbles is most often observed retrospectively, primarily visually or mathematically on a graphic representation of the price development of a specific asset (Sornette & Cauwels, 2014). As we have already stated, the key component to start the process of unsustainable price growth is mainly positive feedback from investors. This is also called procyclicality in economics and is the exact opposite of negative feedback. But if there is exaggerated positive feedback, the dynamics of price growth will change drastically. Indeed, the growth rate is not constant or based on the real state of the economy, but begins to grow on its own, which leads to hyperbolic growth, which is faster than the exponential mathematically expressed by the equation $y = a^x$ (Porras, 2016). Such uncontrolled growth then continues until the moment when the price is so high that the model breaks or out of the blue, investors start selling in panic. In physics and mathematics, such a point is called a singularity. This point is then the moment of the bursting of the financial bubble, when a period of unsustainable price growth is followed by a steep fall. Therefore, as part of the research, in addition to quantitative indicators, we will also analyze the graphic portrayal of price developments on selected real estate markets.

3 Research results

The following chapter will be devoted to the interpretation of the quantitative results of the calculation of price indicators and the graphic display of price developments in selected risky countries.

As we have already stated in the previous part, when analyzing the real estate market, we will base our calculations on the table of two indicators of the affordability of real estate in relation to the income of the population. For selected areas with high values of the investigated indicators, we then also apply a graphic representation of the price development in order to determine whether an irrational growth trend can also be observed visually on the price development curve.

Based on the previously determined threshold values - for the total price to income of 5 years and for the price per m^2 to the annual income of 20%, we observe in the below presented table 1 that the global real estate market is overvalued in most countries based on these two indicators. Abstracting from this fact and focusing on the price of the "most dangerous" areas, we can primarily identify the Asian real estate markets, namely the Chinese market, followed by the markets of Central and Western Europe, as the areas with the lowest real estate affordability prevailing. To give an idea, this situation in the worst-priced area of Hong Kong, currently means in June of 2022 the need to save for at least 47 years to buy a property or save 95.5% of the annual income for the purchase of 1 square meter of the given property. Such a level of saving is unrealizable for the general population, and therefore the price level reflects rather irrational speculative demand leading to the formation of a price bubble.

**Table 1** Indicator values for selected real estate markets in 2021 and 2022

COUNTRY	Price to income 2021 (years)	Price to income 2022 (years)	Price per m² to income 2021 (%)	Price per m² to income 2022 (%)
Hongkong	44,81	47,11	91,5	93,1
China	28,27	29,31	62,7	67,7
Singapore	19,51	20,57	43,3	44,3
Czech Republic	14,65	17,67	28,5	31,7
Japan	12,84	12,93	27,1	29,3
France	12,49	13,01	25,2	26,3
Hungary	11,43	15,41	22,7	29,7
Slovakia	11,17	15,17	21,3	28,9
Austria	10,63	12,17	20,7	23,7
Poland	10,11	11,57	20,9	21,9
Luxembourg	10,07	14,77	19,7	20,9
Great Britain	9,67	10,33	19,1	19,9
Germany	8,96	9,97	17,8	18,9
Switzerland	8,36	9,11	16,6	17,5
Norway	7,79	9,33	11,7	16,3
Canada	7,49	8,03	14,5	15,5
Australia	5,26	6,07	13,9	14,7
USA	4,02	5,93	8,4	9,7
Limit	**5 years**		**20 percent**	

Source: Own processing according to data from UBS Global Real Estate Bubble Index 2021 study and NUMBEO database

When comparing the state of valuation on the real estate markets at the end of 2021 compared to the data from June 2022, we can assess that the rate of overvaluation as well as the probability of the occurrence of a financial bubble in the global real estate market have grown accordingly.

Not only has COVID-19 made the housing crisis worse, as buyers and renters looked for more space during lockdowns, with the emergence of the Ukraine conflict since late February of 2022, the inflation rates have globally seen the highest spikes in decades. This has driven up costs of company buildings as well as subsequent increases in profit margins of the real estate developers. With consumer inflation reaching values well over 10% in many European countries and its subsequent impact on decreasing purchasing power of nominal wages, it can be concluded that the housing affordability has significantly worsened even over only just the first 6 months of 2022.

Graph 1 Graphical comparison of real estate price development on the European and Asian markets

Slovakia and Germany - real estate prices

China - real estate prices
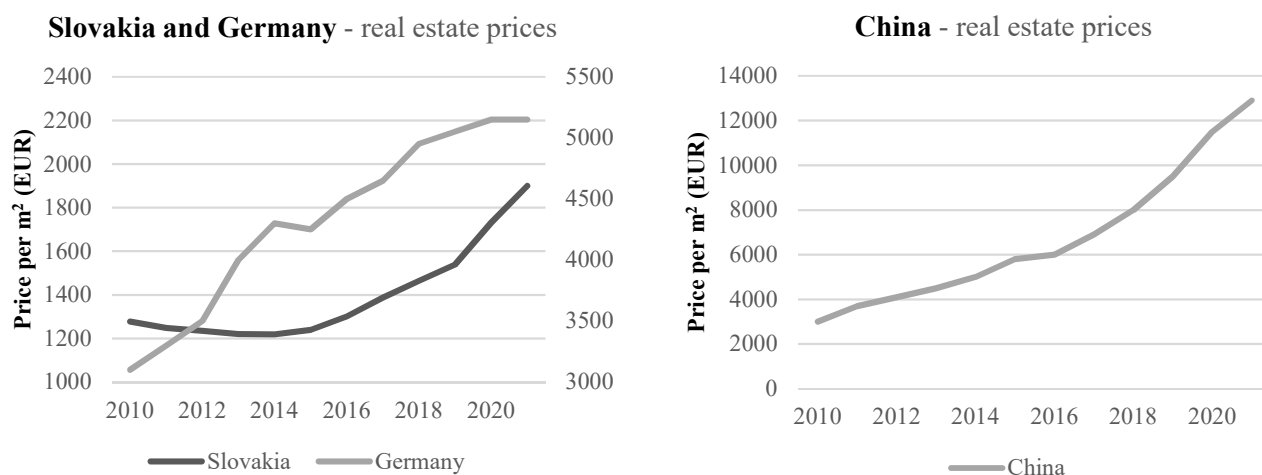
Source: Own processing according to data from National Bank of Slovakia, National Bureau of Statistics of China and DESTATIS Statistisches Bundesamt

When graphically comparing the representatives of two areas with a potential financial bubble on the real estate market, China for the Asian market and Slovakia for the Central European market, in both we observe a growing trend consistently since 2010, typically marking the end of the real estate crisis that has lasted since 2008. During the observed period the real estate prices in Slovakia have increased by 49% over the last 10 years, while in China there was an increase of over 302%. According to the National Bank of Slovakia, since 2019 there has been a significantly accelerating growth in real estate prices in Slovakia in values of 10 to 18% per year, which is also reflected in the steeper slope of the price development curve.

Based on the graphic comparison in graph 1, we can conclude that while in China, based on the indicator values as well as the slope and length of the rising trend curve, the price bubble on the real estate market seems to be already well developed, on the Slovak market we observe a bubble just entering the mania phase with a significant danger of any further increases in the future. When compared to Germany as a representative of Western Europe and Western developed countries, it can also be deduced that the latest price growth pace in the emerging economies of Central Europe and Asia is based on the convexity of the curve significantly faster, indicating a high level of housing inaccessibility further intensified by lower average incomes and, overall, representing a major problem surrounding the unsustainability of future growth.

In line with the current high volatility on the markets, it is necessary to insert the calculated values into the context of the economic environment. Data from the Federal Reserve show that over the past 50 years the interest rate on the 10-year US Treasury bond has averaged at 6%. Back during the heights of the Dot-com bubble and the 2008 crisis, the rate was even higher than average, around 6.5%. We can interpret this, that during the previous bubbles, investors had other good options for their money, but they still recklessly accumulated resources in stocks and real estate. Whereas today, the return on investing in safe assets like bonds is so small that you even lose money due to inflation. Therefore, today even risk-averse investors have to look for returns elsewhere, and low interest rates on government bonds force them to look for returns in riskier assets, which pumps up prices in the stock, cryptocurrency and real estate markets.

Regarding the setting of the economy and the implications for assets in the portfolio, it is also necessary to mention the correlation of price growth with inflation growth throughout 2022, as well as with a large amount of money in circulation due to previous quantitative easing of central banks. Price indicators are higher today also because interest rates on loans were on a 40-year secular downward trend until the current year. Lower rates lead to higher demand because there is a lot more money "looking" for investment. One of the basic economic foundations is price as a function of supply and demand, and if demand increases, so does price.

In recent years, the demand for investment assets has increased dramatically. And not only has the volume of money in mutual funds and hedge funds focused on real estate increased, but the great demand is also intensified by the growing presence of retail investors who, thanks to the digital platforms and mobile applications, can enter markets significantly more easily, which was unimaginable in the past.

However, with the current trend of interest rate growth and quantitative tightening not only in the United States, but most recently also announced by the European Central Bank, it is possible that the subsequent mortgage loan prices rise will be the moment that marks the peak of the current real estate bubble, followed by its long-awaited bursting.

4 Conclusions

In accordance with the current phenomenon of the "bubble in everything", the ongoing economic uncertainty caused by the COVID-19 pandemic and, on a global scale, unprecedentedly high inflation due to the ongoing conflict in Ukraine, the topicality and potential contribution of the researched issue is an ideal opportunity to delve deeper into the analysis of financial bubbles in the real estate markets, the bursting of which tends to trigger major economic crises.

Therefore, the main goal of the article was, based on our own analysis, to identify specific areas where the next real estate bubble is developing or could develop. To achieve the stated goal, we analyzed the calculated values of price indicators of real estate availability, specifically for real estate prices per m^2 as well as for the purchase of an average property. Based on them, we were able to identify three main areas at risk of a current or future financial bubble by the first half of 2022, namely the real estate markets of China, Western Europe and Central Europe. In the year-on-year comparison for the years 2021 and 2022, we also assessed that with the trend of high inflation, there was a significant increase in prices as well as a deepening of the unavailability of housing on the global real estate market.

The primary limitation in evaluating affordability in the real estate market is the individual market context. The market context is a key factor in real estate price indicators, whose affordability level is suitable for a general prediction of future demand, but for a more complex analysis, additional individual factors such as the influence of the location, the potential for future development or the economic situation of the country must be implemented. For example, the real estate market in China analyzed by us is also very specific in itself and requires taking into account the special factors of mass population concentration in small areas, natural conditions of the locations as well as the characteristic rapid growth of the Chinese economy in recent years, which can partly rationalize the country's price settings.

And how can this problem of real estate bubbles be solved? A striking failure of previous financial bubbles is the fact that central banks and governments reacted too late after the bubble already burst with so-called "ex post" measures, such as changing interest rates. But in the matters of financial stability, as in medicine, "prevention" is always better than "cure."

In the conclusion of the article, we would therefore like to propose a possible solution in a greater concentration of state authorities and financial institutions on "ex ante" measures, still in the beginnings of the bubble, such as the creation of government bonds with higher interest rates, issuing early warnings before the emergence of significant financial risks, supporting the BASEL III standard with a higher requirement for banks' liquidity, as well as to regulate excessively speculative investing by higher taxation of investment property, such as, for example, in the real estate market we focused on, often mortgage-financed purchases of second and other real estate assets far beyond what is necessary to secure basic housing for an individual.

Based on the presented facts, we can summarize that even though the areas identified by us are, according to the indicators, textbook examples of bubbles in the real estate market, the limitations of the indicators and the current economic fundamentals can provide a partial justification and mitigation of their seriousness. These arguments however do not trivialize the problem of the current real estate bubbles, but rather present new problems, such as the unsustainability of low interest rates, the continuous inflow of new money or the lack of alternative investment assets, which are currently collectively distorting the markets and increasing the indicators to such high values that, despite the aforementioned justifications, signal a clear occurrence of real estate bubbles.

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