## 内 容 の 要 旨
## Summary

### 1.1　　Main purpose

With the rapid increase in housing prices over the last 20 years in China, the housing bubble has become an important issue for the Chinese economy. Since 2020, there has been a major crisis in real estate due to this housing bubble. On August 23, 2020, the People's Bank of China and Ministry of Housing and Urban-Rural Development instructed the leading real estate enterprises to take steps to prevent and resolve the financial crisis in the real estate market.[1] Since 2021, the largest Chinese real estate firm (the Evergrande Group) has been experiencing a debt crisis. Moody's downgraded the bond rating of the Evergrande Group to the second tier ("Ca") on September 7, 2021.[2] This prompted the People's Bank of China and China Banking and Insurance Regulatory Commission to

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[1] http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/4075935/index.html

[2] https://www.moodys.com/zh-cn/credit-ratings/Hengda-Real-Estate-Group-Company-Limited-credit-rating-830343731/ratings/view-by-class

once again instruct the Evergrande Group to fulfill its debts to ensure the stability of the Chinese real estate market, on August 19, 2021.3

The activities of real estate enterprises were closely related to the housing bubble. Wan and Qiu (2020) discussed overinvestment in 13 housing-related industrial sectors in association with the housing bubble. The housing bubble raised non-performing loans (NPLs) (Wan, 2018a, 2018b) and has also encouraged speculative saving (Wan, 2015). Compared to other industrial sectors, as well as to households and banks, the real estate and construction sectors might suffer more from the housing bubble in China. Hence, in this study, we analyzed the impact of the housing bubble on real estate firms and investment in the construction sector.

In Chapter 2, we summarized and compared research on the "transmission" from housing prices (i.e., the housing bubble) to the producer price index (PPI). We found that the demand-side theory of Wan (2021a), which combined an input output table with neoclassic economics, was able to be used to analyze this transmission, as well as the broad impact of the housing bubble on real estate firms and the construction sector.

In Chapter 3, we discussed whether there was overinvestment in the real estate sector in China. Based on Wan (2021), Wan and Qiu (2021) and Wan and Qiu (2020), we analyzed data for 19 Chinese real estate firms to estimate the depreciation rate by Depreciation Expense as Accounting Item (DEAI) and Marginal and Average q. The latter two metrics helped identify overinvestment in the 19 real estate firms. We also compared the calculated Marginal and Average q with values from

3 bankdevelopmenthttp://www.cbirc.gov.cn/cn/view/pages/ItemDetail.html?docId=1002663&itemId=915&generaltype=0

Ogawa et al. (1994) and Chrinko and Schaller (2001) for Japan in the 1980s.

In Chapter 4, we summarized the theoretical and empirical literature on construction investment and housing prices for various countries. The ratio of housing construction-related gross domestic product (GDP) to total GDP was 28.7% (Rogoff and Yang 2021). The construction sector accounted for 6.69% of China's total workforce in 2021.4 We found the demand-side theory was vital for analyzing the relationship between construction investment and the housing bubble in China.

In Chapter 5, we discussed whether there was overinvestment in the construction sector in China. We estimated the depreciation rate by DEAI and Marginal q of the construction sector in China by macro data. We analyzed the impact of the housing bubble on construction investment based on the Marginal q. We also compared the DEAI calculated in this study with those for the U.S. and Japan obtained by Suga and Nomura (2018), and that calculated by Ogawa et al. (1994) for Japan in the 1980s.

## 1.2    Main objectives

The main objective of this dissertation was to analyze overinvestment in real estate firms and the construction sector in China, and the impact of the housing bubble. Chapter 2 clarified the transmission mechanism from housing prices to the PPI in various countries via a literature review. We also clarified transmission from housing prices to households and the banking sector. Chapter 3 introduced the top 19 real estate firms in China in Table. We collected panel data from balance sheets available on the homepages of the websites of all of

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4  Estimated based on data from the National Bureau of Statistics of China. http://data.stats.gov.cn/

the firms. Chapter 4 characterized the construction sector, with a focus on investment therein. Finally, Chapter 5 characterized construction firms in China.

## 1.3    Main research methods

We estimated the DEAI for the 19 real estate firms and construction sector based on Wan and Qiu (2021). We also estimated the before-tax Marginal q for the construction sector based on Wan and Qiu (2020). The before- and after-tax Marginal and Average q values of the 19 real estate firms were based on Wan and Qiu (2020) and Tobin (1963; 1969). We analyzed panel data to determine whether the DEAI for the 19 real estate firms and construction sector can be explained by economic depreciation theory (Wan 2019). We also assessed whether investment can be explained by the before- and after-tax Marginal and Average q for the 19 real estate firms, and by the before-tax Marginal q for the construction sector.

## 1.4  Main results

In Chapter 2, we found that PPI may be affected by housing prices in China, according to the Granger causality test and based on demand-side theory (Qiu and Wan, 2018; Wan, 2021a).

In Chapter 3, depreciation rate by DEAI of 19 listed firms in China was able to be explained by the economic depreciation theory of Wan (2019). The before-tax Marginal and Average q values were close to those calculated for Japan in the 1980s by Ogawa et al. (1994). The before- and after-tax Marginal q values were also higher than the Average q obtained by a different test. A high Marginal q value implied profit from the housing bubble. We also estimated the overinvestments and fundamental investments for Evergrande Group by Wan (2021c).

Investment in the 19 real estate firms was able to be explained by Tobin q theory. The before- and after-tax Marginal and Average q values were lower than the Marginal q for industrial sectors reported in Wan and Qiu (2020). Further, in Chapter 4, we found that literature on construction investment and housing prices in China was somewhat lacking, and that the demand-side theory of Wan (2021a) was able to be used for analyzing the transmission from housing prices to the construction sector in China. Finally, in Chapter 5, the depreciation rate by the perpetual inventory method (PIM) was not able to be applied to the construction sector in China, because machinery leasing reduces investment in fixed assets in the construction sector. We estimated the depreciation rate by DEAI and before-tax Marginal q for the construction sector during the period 2006-2019 based on Wan and Qiu (2021) and Wan and Qiu (2020), respectively. The mean depreciation according to the DEAI was close to that in the U.S. and Japan estimated by Suga and Nomura (2018). The mean value of before-tax Marginal q was close to that for Japan during the 1980s reported by Ogawa et al. (1994). The depreciation rate by DEAI and investment in the construction sector in China was able to be explained by economic depreciation theory and Tobin q theory.

## 1.5 Main conclusions

Overall, this study showed that overinvestment caused by housing bubbles exists in the real estate and construction sectors in China. A soft landing policy was able to resolve the moderate housing bubble crisis currently occurring in China, according to Wan (2018c, 2021b).

The Chapter 2 showed when a housing bubble occurs in China, housing prices may affect housing-related industries and firms according to the transmission

hypothesis of Wan (2021a). A housing bubble might lead to overinvestment in housing-related industries and firms.

In Chapter 3, the high Marginal q of the 19 real estate firms implied that they could obtain additional profit from housing bubbles, in accordance with the demand-side theory of Wan (2021a). A proportion of the investment in these firms may actually be overinvestment. The overinvestments in the housing bubble has been defined in Wan (2021c), and the Tobin q theory has been combined with the definition of overinvestments. We followed the Wan (2021c) the overinvestment and fundamental investments in 19 real estate firms by the completed property. The before-tax Marginal q was higher than the after-tax Marginal and Average q values, with the former being associated with greater potential profit. Similarly, as the after-tax Marginal q was higher than the Average q, the former was associated with higher potential housing bubble-related profit. According to Wan (2018c), a stock market crash could lead to housing bubbles being "squeezed out" in China; this could explain why the Marginal q was higher than the Average q for the 19 real estate firms, where the housing bubble was currently ongoing in China. This was similar to the situation in Japan in the 1980s according to Ogawa et al. (1994), but opposite to the results of Chirinko and Schaller (2001). Compared the elasticity values (before- and after-tax Marginal and Average q) in this study with the Marginal q of Wan and Qiu (2021), the lower values here implied overinvestment in the 19 real estate firms in China.

In Chapter 4, we also demonstrated that construction sector investment and the housing bubble in China was able to be analyzed based on the Marginal q approach. Finally, in Chapter 5, Tobin q theory was able to explain the investment

behavior of the construction sector, in construction with demand-side theory (Wan 2021a), when a housing bubble occurred in China. In particular, overinvestment in the construction sector caused by the housing bubble was able to be explained by demand-side theory.

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審査の結果の要旨

Summary

## 1 Purposes, objects, methods

**(Purposes)** With the rapid increase in house prices over the last 20 years in China, the housing bubble has become an important issue for the Chinese economy. Since 2020, there has been a major crisis in real estate due to this housing bubble. On August 23, 2020, the People's Bank of China and Ministry of Housing and Urban-Rural Development instructed the leading real estate enterprises to take steps to prevent and resolve the financial crisis in the real estate market. Since 2021, the largest Chinese real estate firm (the Evergrande Group) has been experiencing a debt crisis. Moody's downgraded the bond rating of the Evergrande Group to the second tier ("Ca") on September 7, 2021. This prompted the People's Bank of China and China Banking and Insurance Regulatory Commission to once again instruct the Evergrande Group to fulfill its debts to ensure the stability of the Chinese real estate market, on August 19, 2021. The activities of real estate enterprises are closely related to the housing bubble. In the applicant's Master thesis, housing bubbles in China were empirically identified and overinvestments in 13 housing-related industrial sectors in association with the housing bubbles were identified. The housing bubble has raised non-performing loans in banking sector and has also encouraged speculative saving in household sector. Compared to other industrial sectors, as well as to households and banks, the real estate and construction sectors may suffer more from the housing bubble in China. Hence, in this dissertation, the impacts of the housing bubble on real

estate firms and investment in the construction sector were analyzed.

(**Objects**) The main objects of this dissertation were the physical investments in real estate firms (19 listed firms) and the construction sector, as well as housing bubble in real estate market in China.

(**Methods**) Literature survey, economic depreciation theory, Tobin's Marginal and Average $q$ theory, housing bubble test, and panel estimation were used. The panel data were collected from balance sheets available on the homepages of the websites of all of the 19 listed firms as well as National Bureau of Statistics in China.

## 2 Empirical results

(**Chapter 2**) By the literature survey, it was found that Producer Price Index (PPI) may be affected by house prices in China, according to the Granger causality test and based on demand-side theory.

(**Chapter 3**) Depreciation rates of 19 listed firms in China were estimated and these estimated values were able to be explained by the economic depreciation theory. Then the before-tax Marginal and Average $q$ values were estimated and these values were close to those calculated for Japan in the 1980s. The before- and after-tax Marginal $q$ values were also higher than the Average $q$ obtained by a different test. A high Marginal $q$ value implies profit from the housing bubble. The investments in the 19 real estate firms were able to be explained by Tobin $q$ theory. Because bubble profits were included in the $q$ values, it was concluded that there were overinvestments in these 19 listed real estate firms in China.

(Chapter 4) The theoretical and empirical literature on construction investment and house prices for various countries were summarized. The ratio of housing construction-related gross domestic product (GDP) to total GDP was 28.7%. The construction sector accounted for 6.69% of China's total workforce in 2021. By literature review, it was found that literature on construction investment and house prices in China was somewhat lacking, and that the demand-side theory was able to be used to analyze the transmission from house prices to the construction sector in China.

(Chapter 5) It was found that the depreciation rate by the perpetual inventory method (PIM) could not be applied to the construction sector in China, because machinery leasing reduced investment in fixed assets in the construction sector. The depreciation rate by Depreciation Expense as Accounting Item (DEAI) and the before-tax Marginal $q$ for the construction sector during the period 2006-2019, respectively. The mean depreciation according to the DEAI was close to that in the U.S. and Japan. The mean value of before-tax Marginal $q$ was close to that for Japan during the 1980s. The depreciation rate by DEAI and investment in the construction sector in China was able to be explained by economic depreciation theory and Tobin $q$ theory. Also because bubble profits were included in the $q$ values, it was concluded that there were overinvestments in construction sector in China.

## 3 Main conclusions and contributions

Overall, this dissertation empirically showed that overinvestments had been caused by housing bubbles in the real estate firms and the construction sector

in China. A soft landing policy could resolve the moderate housing bubble crisis currently occurring in China.

## 4 Main issues left for future research

Identifying a bubble has been an empirical issue for long time in the literature. The identification of the associated bubble profit should be discussed in more detailed manner in this dissertation. More clear identification between bubble profits and fundamentals (non-bubble term) based on more detailed data is expected to be performed in the future study.

## 5 Evaluation

Based on the significant contributions from the empirical results of this dissertation, it is worth giving the applicant Ph. D degree.