A draft on The introduction, literature review and methodology

Introduction

Has the question ever been raised regarding the prices of different condominiums in the area of the capital of Thailand, Bangkok. The level of monocentric urbanization in Thailand especially in the Bangkok area has been the issue since several decades ago. It is undeniable that the development of Bangkok has gone way ahead of the rest of the country, giving birth to a concrete jungle of department stores, business districts, Habitats, and many more. Condominium is one of the most significant development signals of Bangkok. Since these apartments can be seen as long-term or short term habitats for the residents or the workers of Bangkok, especially the ones around the BTS sky train line that facilitate the convenience for the residents.

The sense of individualism that has risen in the culture of Thailand's population also gives more significance to this research paper as more Thai population choose to live separately from their family or settling down as a small family instead of a compound one with many generations. These factors have influenced the Thai population to choose to stay in condominiums along the BTS lines for the sake of convenience and cultural preference. It also suits the lifestyle of most of the Thai population in the present days even more as well(2019). However, the prices of these condominiums along the BTS line can range from extremely expensive to surprisingly cheap even if they are only a couple of hundred meters apart from one another. So what factors actually determine the differences in the prices among these condominiums?

This paper will be a useful tool for the upcoming Thai population searching for condominiums as it will estimate the impacts of different factors that determines the prices of condominiums located along the BTS sky train line in Bangkok. The most significant pattern of

rooms that should be growing in demand the most in the future would be the one bedroom plus one bathroom type as more of the individual workers would try to find this pattern of rooms to live alone so the type is the most sufficient for a person to live comfortably and more condominiums are offering more rooms of this type than the others as well.

The condominiums are growing at a significant rate in the real estate industry, as the trend of the consumers spending on the housing projects are shifting away towards the condominiums in the city as it suits the preference of the newer generation of the Thai population better than traditional houses. But what really determines the prices of these condominiums still remain the big question. Little research has been done in the past as the trend of condominiums have just been exploding in the last decade.

This paper will be divided into … parts, after the introduction, there will be a literature review followed by methodology explanations, findings and interpretation and conclusion. In the end, the condominium's attributes will be observed individually to determine the impact on the final price offered to the consumers in the time of present year(2019).

Before any analysis begins, some terms need to be defined first in order to clear up any misunderstanding or any misconception and be on the same page. The term “condominiums” would refer basically to a building similar to an apartment but each unit is owned separately by each individual owner while containing some shared areas such as amenities and reception areas. The main difference between apartment is basically ownership of the residents where the owner of an apartment is usually the owner of the building renting out the rooms for the residents while the owner of a condominium is basically each individual owners co-owning each units and the

building managed by HomeOwners Association(HOA) (Cambridge dictionary, 2018; Lesly Gregory, 2018).

Literature review

There has been a very similar paper that studied very similar objectives in the past. The paper studies the influence of rail mass transit on the condominium prices in Bangkok (Thamrongsrisook, 2011) by using the hedonic price model approach. The Hedonic price model is an approach that treats differentiated products as a bundle of attributes which was used as a model for many prior similar studies(Disphanurat, 2017). The paper tried to focus and identify the magnitude of the influence of Rail Mass Transit(RMT) on the pricing of the condominiums in Bangkok which included the Bangkok Mass transit system(BTS) and the Metropolitan Rapid Transit(MRT) along with the structural attributes of the condominiums itself which is a very similar approach to this research. The location variables in the multiple linear regression of the paper consists of the distance from the condominiums to the nearest RMT station. This is the main variable that indicates the influence of the RMT on the dependent variable which is the condominium price. The structural attributes that come from within the condominium were also included in the multiple regression model as other kinds of attributes in hedonic pricing. These attributes included the size of the smallest rooms offered, the developers reputation(Top 10 as dummy variables) and the views. Another kind of attribute was the neighborhood attributes which indicates the amount of public facilities to be higher than 3.

The result of the research shows significant signs of inverse correlation between the distance from the RMT station and the price of the condominiums according to the regression. This indicates that the larger the distance between the RMT station and the locations of the

condominiums, the lower the prices of the condominiums will be. This is directly correlated with the expected results of the author in this research paper. However, there are some improvements on the paper that can be made. The paper was dated back in 2011 so the number of observations collected by the author was statistically insufficient(63) as in that year, the growth of both the condominiums and the mass transit was not as high as today where the range of extension almost doubled and covered a much wider area compared to that research. The number of extensions should be more than sufficient this year(2020). Some of the attributes such as view were not as significant as others in order to represent amenities which can be more relevant than qualitative attributes such as views, or the possible collinearity between the BTS and MRT in terms of distance towards the central business districts. Some of the aspects can be further explored and improved in the future.

In another similar research paper, *Peson Sirikolkarn* (2008) tried to illustrate the effects of mass transit systems on price of condominiums in Bangkok which the author aimed to identify the impact of BTS and MRT on the residential properties in the Sukhumvit areas and Ratchada areas. The author also took the hedonic price model approach to conduct a multiple linear regression as well by using the price of the condominium as the dependent variables measured by price per square meters while classifying independent variables into three similar categories as the paper by *Thamrongsrisook,* (2011). The first category is location variable which is the distance between the condominiums and the closest mass transit station. The second category is the structural variables which consist of the age, room size(minimum), views, garden, and the developers reputation. The final category also the neighborhood variables. Which offers more reasonable attributes than the prior study mentioned since it also includes the condition of the

condominiums such as age and the number of observations is higher even though the samples are collected from only two central business districts.

The result of the regression also shows similar signs as the research paper in 2011 and the expectation of the author as, from the hedonic price model through multiple linear regression, the result suggests that the distance between the condominiums and the closest mass transit has inverse relationship and the influence of the location variables is statistically significant. However, there are some gaps in such research since different business districts and different stations from different areas can also have the same or different impact on the condominium prices as well as the distance on the prices as well as the distance in terms of meters or number of stations. There can also be omission of variables which can cause the result to be biased.

-***will add more of the foreign literature review***

Methodology

The objective of this research is to observe and determine the "Factors affecting and driving the condominium prices along the BTS line in the area of Bangkok". The paper will try to understand the impacts of the factors that determine the way the condominium developers and the sellers determine the price according to certain characteristics or attributes from the condominiums itself and the factors around the condominiums. This research paper will also utilize the hedonic pricing model in order to analyze the pricing of the condominiums as a bundle of different attributes in terms of the product differentiation. The data will be collected from secondary sources to complete the study of hedonic pricing to observe the pricing of developers. The data will then be treated with multiple linear regression to observe the impacts of each

variable on the targeted variable which is price to observe the significance and degree of impact of the variables and answer the research question to the paper.

1.)The Data

The data of condominiums were collected via thinkofliving.com which is the biggest source of data and the biggest player in the real estate intelligence market in Thailand as a secondary data collection. It is Bangkok's condominium data source that provides the deep-type review and information of the condominiums in Bangkok. The samples were collected from the condominiums that are located within 1000 meters or 1 kilometers walking radius of the closest BTS station along the BTS line to take into account the impact of mass rapid transit. To avoid biases of the data, some criteria were imposed to the collection of the data. Firstly, the type of the room in the samples is standardized as one bedroom and one bathroom according to the individualism trend and the reducing trend of the household size making more of the population living alone. The price data was collected on the selling price during the month of March to April 2020 to avoid the time lag which can result in many intervention forces such as inflation or other complications which can have impacts other than the collected variables and hinder the final results.

The condominiums were collected within the walking range of 1000 meters radius of the BTS station to the condominium along the BTS line which goes through the areas that are both Central Business Districts(CBDs) and residential areas. The central business districts include Central Business districts, Northern Central Business Districts and Extended Business Districts. The dependent variable in this research which is the price can sometimes be found as a

promotional price as a promotional method launched by the developers. The prices in this paper will be assumed full price as a non-promotional price with no discount.

The number of the observations that were collected is 200 condominiums collected in 2020 which was collected to go beyond past papers which the number of the samples were insufficient, in this paper, the number and the observations will be updated with extended network of rapid transit

2.) Variables

The variables in this paper will be separated into two types with variable pricemb as the dependent variable in the research question. For the independent variables, the attributes of the condominiums can be separated into two types which are structural variables which concerns the variables that are internal to the observations while the other type is the locational attributes of the condominiums which concerns the variables that are external to the condominiums. The internal attributes of the condominiums are variables that mainly include what can determine the quality within the condominiums which include the size of the room which is represented by the variable sizesqm to see if the size has impacts on the price or not. The yearsopened variable is also collected as the year to which the condominiums started selling in order to see the impact of the age of the condominium on the price. Common fees per square meter that is collected in order to maintain and keep the condominium's facilities and the well-being of the condo was also collected to represent the quality of the materials and the facilities' impact on price and is represented by variable fee. Parking space as a percentage was also collected in order to see if the parking space designed offered by the developers have any impacts on dependent variables or not and is represented by variable parking. The other one that needs to take into consideration is

the impact of the developers' brand on the consumers' perception on the price which will be represented by a dummy variable firm that takes into account whether the developer of the project belong to the top 10 real estate developers in Thailand or not according to the ranking by Agency for Real Estate Affairs(AREA) (see appendix) to see its impact on price. The final structural attribute to be observed is the class given by the reviewers in thinkofliving.com which range from Super economy to Ultimate Class consecutively.

The second type of the quality of the condominium is the Locational attributes which concerns what is around the condominiums that can be the locational variables which can have impacts on prices of the condominiums do to their locations. The first variable is the distance from the condominiums to the nearest BTS stations. This is due to the availability of the data from thinkofliving.com that only provide condominiums near the BTS stations which the distance from the condominiums to the BTS stations will not be higher than 1000 meters because of the standard of collection set at the beginning. The variable will be represented by variable BTS. The other locational variable is the distance from the condominium to the closest MRT station which has a unit of meters and a variable name MRT. The final locational attribute is the distance in number of stations required to travel to the closest CBD from the nearest BTS station. The CBD classified for this variables will be divided into three areas which are Northern CBD(Mo Chit), main CBD(Rachathewi to Chidlom), and Extended CBD(Thong lo to Ekkamai). This is according to the classification by CBRE which is the global real estate agency. The variable will be represented as CBD.

Table 1.) Variables used in equation and definition

Variables	Description	Unit	Type of data
Size (β_1)	Size of the Condominium's 1 bedroom type	Sqm	continuous(+)
Fee (β_2)	Common fees paid yearly	Baht per Sqm	continuous(+)
Year (β_3)	Years Opened(Age)	years	continuous(-)
Parking (β_4)	Parking space in percentage of residence	%	continuous(+)
Firm (β_5)	Whether the developers belong to top 10 or not	0/1	Dummy(+)
Class (β_9)	Classification given by reviewers	-	Dummy(+)
BTS (β_7)	Distance to the closest BTS station	meters	continuous
MRT β_8)	Distance to the closest mrt station	meters	continuous
CBD (β_6)	Stations travelled needed to reach CBD	stations	discrete

3.) Statistical treatments of the data

The data that was collected for over 200 observations were data that was ready to regressed by using the multiple linear regression model to observe the significance of the impacts of different variables on the dependent variables which is the price in order to answer the research question as to what are the factors that affect the condominium prices in Bangkok. The regression model used in this paper will be regressed according to the equation below.

$$\textbf{Pricemb} = \beta_0 + \beta_1(\textbf{size}) + \beta_2(\textbf{fee}) + \beta_3(\textbf{Year}) + \beta_4(\textbf{Parking}) + \beta_5(\textbf{Firm}) + \beta_6(\textbf{CBD}) + \beta_7(\textbf{BTS}) + \beta_8(\textbf{MRT}) + \beta_9(\textbf{Class}) + \textbf{u}$$

Where dependent variable price is on the left side with 9 more dependent variables on the right side. The dependent variable is a continuous variable so the OLS estimator is sufficient to observe the impacts of the independent variables on the dependent variables as many of the research that observe condominium prices in the past since the independent variables show significant effect on price so the OLS should be sufficient.

https://www.investasian.com/2018/10/18/thailand-property-developers/

Results

In the table below is the summary of the statistics of all of the variables with over 200 observations collected from the population in table 2.). Table 3.) shows the correlation among all of the variables included in this research paper's regression model among 200 observations collected in the data. Note that an extra variable of average price in condo of 2019 is also

included but since it can not be used as another dependent variable, the variable has been dropped from the model.

Table 2.) Summary Statistics***(will change to actual table later krub)

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. summarize
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Variable	Obs	Mean	Std. Dev.	Min	Max
pricemb	200	6.238905	3.816229	1.39	26
sizesqm	200	39.29433	11.57158	21.43	107
commonfeeb~m	200	57.635	17.45149	24	110
yearsopened	200	4.61	3.038761	0	11
parking	200	71.37415	35.49241	30	300
developers~k	200	.43	.4963181	0	1
cbdstations	200	1.77	2.048924	0	9
distbtsm	200	520.905	271.3886	12	1000
distmrtm	200	2817.135	1658.676	20	10200
pricepe~2019	200	178631.7	64701.32	45442	370508
classvalue	200	5.405	1.446178	1	8

Table 3.) Correlation among the variables***(Will also change to actual table later krub)

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. corr
(obs=200)
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	pricemb	sizesqm	common~m	yearso~d	parking	develo~k	cbdsta~s	distbtsm	distmrtm	pri~2019	
pricemb	1.0000										
sizesqm	0.7684	1.0000									
commonfeeb~m	0.7089	0.4107	1.0000								
yearsopened	-0.1978	0.1865	-0.4271	1.0000							
parking	0.6558	0.7542	0.4576	0.0859	1.0000						
developers~k	-0.0798	-0.1130	-0.1454	0.0651	-0.1527	1.0000					
cbdstations	-0.3944	-0.2537	-0.3977	-0.0088	-0.2346	0.0187	1.0000				
distbtsm	-0.0210	-0.0051	0.0447	-0.0453	0.1136	-0.2518	-0.1866	1.0000			
distmrtm	-0.3390	-0.2505	-0.2476	0.0014	-0.2738	0.0615	0.2036	-0.1811	1.0000		
pricepe~2019	0.8500	0.5106	0.7212	-0.2995	0.4758	-0.0113	-0.5289	-0.0433	-0.3698	1.0000	
classvalue	0.7815	0.4628	0.7103	-0.2509	0.4434	-0.0268	-0.5755	-0.0354	-0.3929	0.8772	

The Multiple linear regression has been run in three different types of models. The first one is the Big model where all of the variables from both structural and locational attributes in order to observe overall impacts from each variable and then run separately with one model that includes only structural attributes and another model that includes only locational attributes to see if the results of each of the models are in consensus. Also to avoid heteroskedasticity problems, after running a white test, I decided to use the robust standard error in order to avoid the problem of heteroscedasticity so all of the standard error numbers presented in the results in this paper are all robust standard errors.

In Table 4.) is the result of the multiple linear regression of the big model with two columns representing variables and the coefficient along with standard errors. The big model can explain up to 86.23% of the whole samples of the attributes that are affecting the price which is the dependent variable and its variance. There are nine independent variables in this model in which only five of them are statistically significant on impact on the dependent variable or the price of the condominiums. The most significant among the nine are size, years opened, and classifications given by reviewers. All of the three have statistically significant impact on the

price at 99% level of confidence which is the highest. The second most impactful is the common fees that are paid in Baht per square meter in order to determine the quality of the facilities provided by the condominium and the materials used for the condominiums. This is significant at 95% confidence interval. The last one that is significant is the brand of the developer of the condominium. The brand also plays an important part in consumer's perception as well with this variable significant at 90% confidence interval. The external or locational variables show no significant impact on the dependent variables which is as close to the assumption set for the locational attributes.

Table 4.) Big Model regression result

Variables	**Result**
size(β_1)	0.1770*** (0.1961)
fee(β_2)	0.0330** (0.0110)
Year(β_3)	-0.1753*** (0.0479)
Parking (β_4)	0.0031 (0.0065)
Firm (β_5)	0.1869* (0.2278)
CBD (β_6)	-0.0001592 (0.00041)
BTS (β_7)	-0.0000361 (0.000062)

MRT (β_8)	0.06165 (0.0589)
Class (β_9)	1.0320*** (0.1535)

R- squared = 0.8623

In table 5.) shows the result of the regression with only the variables that belong to the structural attributes or the internal variables of the condominium only. The small structural model explains almost as high in percentage as the big model with the model being able to explain 86.12% of the variance in the dependent variable which is price. There are six independent variables that are included in this model. The results of the second model is going in a similar direction as the regression with the big model with three variables came out as the most significant which are size, year, and class which are the same as the big model regression and also significant at 99% level of confidence followed by common fee that is statistically significant with 95% level of confidence. The only difference from the big model is the significance level of the firm that is no longer significant but the whole model's result is still similar to that of the big model in Table 4.).

Table 5.) Structural Attributes small regression model

Variables	**Result**
size(β_1)	0.17849*** (0.0202)
fee(β_2)	0.03185** (0.0110)

Year(β_3)	-0.1832*** (0.0463)
Parking (β_4)	0.0032 (0.0064)
Firm (β_5)	0.2056 (0.2276)
Class (β_9)	0.9987*** (0.1128)

R-squared = 0.8612

Table 6.) Locational Attributes small regression model

Variables	**Description**
CBD (β_6)	-0.001984 (0.0010)
BTS (β_7)	-0.0007*** (0.00014)
MRT β_8)	-0.6733 (0.0711)

R-squared = 0.2442

In table 6.) shows the results of the final model that I used to run multiple regression. This model is the model that includes only the locational attributes of the condominiums as another small regression model. The only independent variables included are distance to the closest BTS and MRT station and the number of stations needed to travel to the closest CBD areas. The first problematic result of this model is that the model is only able to explain only 24.42% of the variance of the dependent variable which is the price. The result shows that only

the distance to the closest BTS station is the only significant variable in this model with 99% level of confidence while the other two variables are not statistically significant in any of the models used in the multiple linear regression in the paper at all.

After the process of multiple linear regression, the results can be interpreted that the main driver of the price in condominiums along the BTS line in Bangkok all belong to the internal side of the variables of the condominiums. The variables that result in the most significance in every model during the regression process are areas, age , and classification given by the reviewers which are found to have the most significant impact on dependent variables. The other statistically significant variable that has the impact on price is the age of the condominium but not as high as the most three variables. These four variables are seen to have the most significant impact in pricing the condominium by the developers according to the hedonic pricing model while the other internal attributes such as parking space percentage, and developers' firm seem to have not as much significance on the price of the condominiums. Although the developers' firms' level of significance is still ambiguous. As for the locational attributes, none of the attributes seem to have a statistically significant impact on the dependent variable which is not going in the same direction as the assumption that says the location should have a significant impact on the price of the condominiums.

Conclusion

- Internal attributes seem to have more significant impact on condominiums along the bts line as a whole rather than locational attributes such as the distance to the mass rapid transit stations or the distance needed to travel to the nearest CBD. which can be a misleading myth or only apply to a small group of sample

compared to the whole population of condominiums along the BTS line in Bangkok.

References

- Will put some more in the APA format