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MEASURING HUMAN BEHAVIOUR ON INFORMATION ASYMMETRY – A CASE STUDY ABOUT SHRINKAGE OF FLAT SIZES IN HONG KONG FROM NEW INSTITUTIONAL ECONOMICS PERSPECTIVE

MA YUEN TUNG

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The Hong Kong Polytechnic University

Department of Building and Real Estate

**Measuring Human Behaviour on Information Asymmetry –
A Case Study about Shrinkage of Flat Sizes in Hong Kong
from New Institutional Economics Perspective**

Ma Yuen Tung

A thesis submitted in partial fulfilment of the requirements

for the degree of Doctor of Philosophy

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MA Yuen Tung

To God, my parents and my beloved husband, Anson

"Trust in the Lord with all your heart, and lean not on your own understanding. In all your ways acknowledge Him, and He shall direct your paths." Proverbs 3:5-6

ABSTRACT

Information asymmetry, a condition in which one party holds more or better information than the other in making decisions in transactions, exists in Hong Kong real estate market. Prior to the enactment of the Residential Properties (First-hand Sales) Ordinance to regulate the flat size description in the first hand sales market in April 2013, news reports had revealed that the actual useable areas of some presales housing units only accounted for 50% of the gross floor areas proclaimed in the sales brochures. Notwithstanding the alarming figures, shrinkage of flat size is in fact a lawful act in Hong Kong. Such imbalance share of information between housing developers and buyers in transactions is known as the flat shrinkage problem in Hong Kong. The flat shrinkage problem has aggravated when the property price continues to rise. Akerlof (1970) suggests that under information asymmetry, lemons tend to crowd out non-lemons.

Seeing the paucity of empirical tests supporting the Lemon Theory (Akerlof 1970) in the real estate market, and even less attending to the pricing effects, this study attempts to investigate whether adverse selection process is taking place in Hong Kong's housing market with reference to the shrinkage phenomenon. An analysis of overpricing premium (if any) commanded by the housing developers arising from the asymmetric information for each class of properties in accordance to the unit sze was also conducted. On top of the Lemon Theory (Akerlof 1970), this thesis attempts to test empirically whether the Prospect Theory (Kahneman and Tversky 1979), in

particular the psychosocial behaviour, applies to the flat area shrinkage problems in this market.

To measure flat area shrinkage, 13 mass housing developments located on Hong Kong Island were selected, and a total number of 16,946 flats were investigated. The empirical test results in this study show that the market was full of lemons due to the government delay in response of the law governing sales of first hand properties. It was found that the carpet areas of these housing developments had fallen short of 23% to 49% to the proclaimed gross floor area specified in the sales brochures. Analyzing a total number of 55,227 transactions between 1991 and 2013 of the subject premises, it shows that the turnover rates of units with the higher shrinkage ratios were higher than those with smaller ones. ANOVA tests have been carried out and illustrated that there are significant variations between each tenth percentile of the flats in accordance to the flat shrinkage ratios.

The hedonic price model shows that every 1% fall short of area resulted in a drop of the property price by 0.8% for Class A properties, 0.15% for Class B properties and 0.04% for Class C properties in the second hand market. In other words, the developers pocket the highest de facto overpricing premium for the small size units. The model also shows that an additional reduction would be reflected in the second hand market if the flat are lemons. It means the sellers sell the units with higher shrinkage ratio, i.e. lemons, in lower prices in secondary market.

A new modified model referencing the Prospect Theory Model by Kahneman and Tversky (1979) is developed attempting to quantify the human behavior in terms of

housing price. The results manifest graphically that losses cause grater emotion impact on individual than does an equivalent amount of gains and it coheres with the principle of the Prospect Theory.

The present study is one of the first pioneers of analyzing the information asymmetry from both new institutional economics and behavioral economics in the real estate market. This thesis contributes to the current limited empirical research on the Lemon Theory in the real estate market in Hong Kong by measuring the adverse selection as well as the overpricing premium. Base on the empirical result, the study conveys a possible forthcoming situation Nano flats first hand buyers need to face in case of economic downturns and suggest some possible approach to ease the flat size shrinkage problems. It also develops a modified model to analyze information asymmetry from the psychological context. Through the lens of new institutional economics, this study unveiled why series of new institutions were called for to tackle the asymmetric information in the past decade and also explain the evolvement of the government interventions in the past decades are being reviewed.

PUBLICATION ARISING FROM THE THESIS

Upcoming Journal:

Soei Y.T. Ma, Edwin H.W. Chan and Lennon H.T. Choy, "Evolving institutions to tackle asymmetrical information problems in the housing market: A case study on 'shrinkage' of flat sizes in Hong Kong", *Journal of Habitat International* (accepted)

Conferences Presentation:

Soei Y.T. Ma, "Price Reaction under Area Expectation Variance", *Ronald Cost Workshop 2012 in Beijing*

Soei Y.T. Ma, "Pricing Reaction under Area Inflation : New Institutional Economics Perspectives", *Asia Pacific Conference on Advanced Research 2015 in Adelaide*

Soei Y.T. Ma, Edwin H.W. Chan and Lennon H.T. Choy "Evolving Institutions to Tackle with Asymmetrical Information Problems in Housing Market : A Case Study about Shrinkage of Flat Sizes in Hong Kong", *Planning Law and Property Rights 2017 in Hong Kong*

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Mark 10:27

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GLOSSARY AND ABBREVIATIONS

Behavioural Economics	A study of psychology of human behaviour relates to economic decision making processes of individual
Carpet Area	Net effective covered area within any given unit, exclusively enjoyed by the occupier, excluding balconies, utilities platforms, bay windows, air conditioning platforms and other similar fixtures. The carpet area is to be measured from the internal face of the unit, excluding the columns, load-bearing walls, and internal partitions. This is the net effective usable space that an occupier can actually enjoy.
GFA	Gross Floor Area
GFA in Sales Brochure	Usable floor area of a unit and a share of all the 'common areas' within the entire housing development, including common corridors, lift lobbies, clubhouses, and so on.
GFA in Building Ordinance (Cap.123)	*"the area contained within the external walls of the building measured at each floor level (including any floor below the level of the ground), together with the area of each balcony in the building, which shall be calculated from the overall dimensions of the balcony (including the thickness of the sides thereof), and the thickness of the external walls of the building."*
GFA under lease	The maximum area that can be built at the site between the contract between the government and the lessee.

Information asymmetry	A condition in which one party holds more or better information than the other when making decision in transactions.
Nano Flats	Flats with saleable area less than 200 square feet.
New Institutional Economics (NIE)	*"Incorporates a theory of institutions into economics. It has developed as a movement within the social sciences, especially economics and political science, that unites theoretical and empirical research examining the role of institutions in furthering or preventing economic growth. It includes work in transaction costs, political economy, property rights, hierarchy and organization, and public choice. "*
SA	Saleable Area
Saleable Area	*"Saleable area means the floor area of the residential property, which includes the floor area of (i) a balcony, (ii) a utility platform and (iii) a verandah so long as it forms part of the residential property. However, it excludes an air-conditioning plant room, a bay window, a cockloft, a flat roof, a garden, a parking space, a roof, a stairhood, a terrace or a yard even it forms part of the residential property."*

CHAPTER 1 INTRODUCTION

1.1 The Research Focus Problem

Currently, there is limited empirical research analyzing the pricing behaviours in the light of information asymmetry and the institutional constraints from the New Institutional Economics as well as the Behavioural Economics perspectives. This thesis attempts to contribute to the knowledge of such pricing behaviours within these two perspectives. In this study, information asymmetry refers to a condition in which one party holds more or better information than the other when making decision in transactions. As such, the transacting parties are facing positive and differential information costs. Due to this information asymmetry, the Lemon Principle (Akerlof 1970) suggests that the bad products finally edge out the good products in the market. Yet, arising out of its very nature, empirical tests evidencing the Lemon Principle at work in markets are limited. Thus, measuring the Lemon Principle is one of the major focuses for this study.

The act of taking advantage of the information asymmetry may apply in every market, so that the actual price agreed between parties may be varied (upward, in their favour) by the actions of informed sellers to hide or disguise real (and lower) value. Yet, the overpricing of inferior products and concealing their adverse attributes by the more

informed sellers are observable, irrespective whether the common law doctrine of *caveat venditor* (let the seller beware) or *caveat emptor* (let the buyer beware) is applied (Chau and Choy 2011). Under the *caveat venditor*, the seller is liable for any defects sold and hence an intention to keep the adverse attributes salient. While on the other hand, the seller has no liability on the products or duty of information disclosure under *caveat emptor*, which also serves as a temptation to the seller to conceal the adverse attributes. Indeed, the sellers tend to overprice the inferior products irrespective which legal doctrines are applied.

This study will investigate the pricing behaviours under conditions of information asymmetry as well as the pricing strategy of the more informed seller of the inferior products. Through the lens of New Institutional Economics, this study unveils why new institutions were called for in past decades to tackle the asymmetric information. Attention has been put upon the effects of mandatory, voluntary, and third party information disclosure. The evolution of institutions tackling the problems is also discussed, as this is important to the whole context of this area of study.

On top of filling the empirical research gap for the Lemon Principle, this study analyzes the information asymmetry from a fresh approach, namely Behavioural Economics. Human behaviour is an unavoidable parameter in analyzing economic phenomenon. Behavioural Economics relates to individuals and institutions economic decision making process in the context of psychology. Owing to the fact of the limited capabilities of the

human brain, people cannot calculate or predict all possible contingencies of future events. Williamson (1988), Kahneman and Tversky (1979) suggested that human behaviour is not very rational, people naturally protect their self-interest and tend to seek comparatively easier ways of preventing losses when making decisions. The Prospect Theory developed by Kahneman and Tversky (1979) appertains to the psychological context by which people will case on the potential value of losses and gains to make decisions when involving uncertainty and risks, rather than the final outcome. This is an interesting question to see how people behave in respect to the asymmetric of information in the market where uncertainties are involved.

In this study, a modified model referencing the model in Prospect Theory by Kahneman and Tversky (1979) is developed to quantify the human behaviour in terms of price when people facing losses and gains.

1.2   The Empirical Study

Empirical studies on information asymmetry are limited and also difficult to carry out, due to the exorbitant expenditures involved in conducting research required to obtain the relevant measurements. The empirical studies on the Lemon Principle have largely been dominated by the investigation of the sales volumes among lemons and non-lemons while assuming their prices are identical. This is based on the assumption that the buyers are unable to differentiate the intrinsic qualities and thus pay the same price. Hong Kong's

housing market is an ideal test bed due to its ample amount of transaction records that are traced over time[1] and with a high transaction volume.

This study has carefully chosen an element to focus on for the empirical test – 'flat size shrinkage', in the Hong Kong housing market. Flat size shrinkage has long been a hot debate issue in Hong Kong and the reasons behind why this asymmetric information of flat size is important are illustrated below. In addition, the different legal institutions among the pre-sale and second-hand markets in Hong Kong have also provided an appropriate natural experimental setting to test the hypotheses and models.

Hong Kong is a small city with a total land area of about 1,100 square kilometres. However, the developable land area for housing a huge 8 million population is only less than half of this area due to the mountainous topology. Due to this geographical constraint, Hong Kong has become one of the most densely developed cities in the world (Li and Cheung 2016). According to the Annual Demographia International Housing Affordability Survey 2017, Hong Kong was ranked as the most unaffordable housing market in the world in 2016, with average flat prices at 19 times the gross annual median income, the highest ever measured in the US in the past 11 years. The house price-to-income ratio rose approximately 275 percent between 2002 and 2014 in accordance to The Chinese University of Hong Kong's Quality-of-Life Index. Due to these sky-rocket property prices, every square foot of land in Hong Kong is costly and expensive. This is

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[1] Hong Kong exercises a registration system on real properties title. Property transactions are registered at The Land Registry in Hong Kong.

the reason why the asymmetric information of flat size aroused much public attention and was under the spot light.

The enactment of the new institution of Residential Properties (First-hand Sales) Ordinance came into effect on 29 April 2013. Prior to this, in the Hong Kong presale market, regulations governing the descriptions of flat size were ambiguous and inadequate. Presale market refers the market where transactions take place before the developments are completed. Developers held more information than the buyers. In some cases, the actual usable area of a housing unit only accounted for 50% of the proclaimed flat size in the sales brochure. On the other hand, the second hand market refers the market where actual usable area of a housing unit can be revealed when potential buyers are eligible to inspect the units physically. Hence, the information held by the sellers and buyers become equal in the second hand market and the problem of information asymmetry is no longer existed.

Notwithstanding the huge discrepancies in figures which are alarming to potential buyers, it is, in fact, lawful to build a new unit with a smaller useable floor area than is stated in a sales brochure in presale market. Such imbalance share of information between housing developers and buyers in transactions in terms of flat size is known as the *flat size shrinkage problem* in Hong Kong. While it is wise for buyers to calculate an exact square foot price, it is informational costly to discern the actual usable area of a flat before they entered into a sales agreement. Different developers would have their own approach on presenting the flat size during presale stage. In other words, the actual usable

area for the units with same flat size described in the sales brochure would be of large variance when the prospective buyers could not inspect the flats physically.

To the author, being a professional building surveyor and working in one of the largest developers in Hong Kong, the magic of flat size calculation is well known. Several factors may give rise to the variance in flat sizes; the thickness of the load-bearing wall inside the flats, the provisions of bay windows, curtain walls, room divisions, external hallways, and public areas. Construction projects carried out by different developers exemplify significant variances in terms of floor area efficiency.

As a result, there would be an expectation variance of flat size between the presale market and the second hand market where the flats could be inspected physically and checked on site. Thus, the asymmetric of information of flat size between presale market and the second hand market is the key attribute in this study.

It is believed that this is one of the first pioneer studies in the research field of analyzing the information asymmetry problem from both the New Institutional Economics and Behavioural Economics perspectives.

1.3   Motivations for the Research Study

There are several motivations that enlightened the development of this study,

a. The Real Estate Sector has a key role in the economic system, and so it's important that we understand this role more fully.

b. Hong Kong was found to have the most unaffordable housing market in the world. Due to the exceptionally high housing prices in Hong Kong, each square foot of property is crucial as it accounts for a major proportion of average denizen's wealth.

c. Flat size shrinkage is a problem in the spotlight and it has received wide media coverage. As a building professional, the author understands well the magic behind this situation and perceives there is a lack of empirical work that has tested the hypothesis for this current phenomenon.

d. Complaints about the problems of information asymmetry in the Hong Kong Real Estate Market were well received by the government. In the past decade, a series of new institutions were enacted to improve market transparency and alleviate the Lemon problems as well as the soaring property prices. Questions arise as to root causes. Was there a market failure? What's the impact of the government intervention on the market? Can the government measures already implemented fix a market failure (if any) when one occurs?

e. The pricing strategy of the developers in view of the flat size shrinkage is also an interesting question. Is the strategy different for different classes of properties in terms of unit size? The overwhelming supply of 'Nano flats' has been attracting public attention recently. Nano flats refer to the units with saleable area less than 200 square feet. Is the evolution of this type of property related to the developers' pricing strategy? What would be the pricing effect when the Nano flats could be inspected physically? What would happen to the first-hand buyers of these Nano flats?

f. Human Behaviour is highly related to the decision-making process. How do people behave when facing the flat size shrinkage problem where information asymmetry occurs? Can human behaviour be converted and quantified as are housing prices?

1.4   Research gaps to fill

Following the aforementioned motivations, this thesis aims to contribute and investigate the existing research gaps as below,

a. Seeing the paucity of empirical tests supporting the Lemon Principle (Akerlof 1970) in the real estate market, and even less attending to the pricing effects, this thesis intends to identify the durable lemons in Hong Kong real estate market and to study whether Akerlof's (1970) adverse selection problem is lingering in the market.

b.   Following Chau and Choy (2011), this thesis attempts to carry out an analysis of the overpricing premium commanded by developers, arising from the utilization of asymmetric information, and study the pricing strategy they use for different classes of properties according to unit sizes.

c.   By studying the pricing strategy, the phenomenon of overwhelming trend of Nano Flats is further investigated. Are there any forthcoming predictions that will contribute to the government or society? So far, there is no empirical testing or research focusing on this new type of property.

d.   In addition to the Lemon Principle, the psychological behaviour resulting from information asymmetry has been overlooked in previous research. In this study, a modified model to quantify human behaviour in terms of information asymmetry will be developed by referencing the model in Prospect Theory by Kahneman and Tversky (1979). This is believed to be the first study of its kind, by measuring and analyzing information asymmetry from a psychological context.

e.   The government has implemented new institutions with the view to ease the Lemon problems as well as to stabilize the soaring property prices; the evolving institutions of the government intervention will be discussed and reviewed in this study.

By achieving the above targeted results, it is believed that this thesis is one of the first studies in this field of research of analyzing information asymmetry through both New Institutional Economics and Behavioural Economics perspectives.

1.5   Research Hypotheses

In response to the research gaps, the major research proposition is,

"Under information asymmetry, the more informed sellers tend to take advantage of the asymmetric information and overprice the inferior products through ostensible underpricing strategy. Price reduction will be reflected in the market where the adverse information becomes public and information asymmetry no longer exists. The level of overpricing premiums is positively related to the adverse level of the attribute. The more adverse the attribute is, the higher the overpricing premium will be. The ostensible underpricing strategy is closely related to the legal regime governing the market, where more liability is imposed to the sellers."

The ostensible underpricing strategy refers to strategy that the inferior products were perceived underpriced in the market, but in fact overpriced (Choy 2007). The intrinsic

value of the products can be identified by comparing the price reduction reflected in the market where information become public and the price reduction given to the buyers in the first hand. The more informed seller tends to overprice the product in response to the adverse level of the attribute. Here, it refers to the flat size shrinkage. The higher the flat size shrinkage, the higher the overpricing premium.

Base on this main research question, the following hypotheses are developed,

a.   Research Hypothesis 1 (H_1)

"Durable Lemons exist in the Hong Kong Real Estate Market due to the asymmetric information of flat size"

If there is a range of flat size shrinkage ratios being detected due to the asymmetric information of flat size, then durable lemons exist in the Hong Kong Real Estate Market.

By understanding the different terminology of the area descriptions, the flat size shrinkage ratios for the selected subject mass developments could be reconstructed to detect durable lemons in the market. By finding the median of the flat shrinkage ratios, the general acceptance level of the flat size shrinkage ratio could be found. Flat size

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shrinkage ratios higher than the general acceptance level will be identified as lemons, and vice versa.

b.   Research Hypothesis 2 (H_2)

"Adverse selection exists in the Hong Kong Real Estate Market due to the asymmetric information of flat size."

The Lemon Principle (Akerlof, 1970) suggested that *"buyers tend to pay less for a used car because they are unable to tell whether a used car is good or bad. As a result, the more informed sellers will only sell off the lemons and the market will collapse eventually due to the adverse selection problem."*

To test the hypothesis whether adverse selection exists in the market, the turnover rates of the subject housing units between 1991 and 2013 were calculated by splitting them into tenth percentiles; specifically, 10th, 20th, 30th up to the 100th, in terms of the flat size shrinkage ratios.

If adverse selection is present, then the turnover rate for the lemon flats will be higher than that of the non-lemons. The lemons refer to the flats with percentiles over 50 in terms of flat size shrinkage ratio, while non-lemons refer to the flats with percentiles

below 50. The higher turnover rate indicates the market has more lemons than the non-lemons, so it is evident that adverse selection is occurring in the market.

In order to show that that the average turnover rates are statistically different between groups, an ANOVA Test was carried out. The null hypothesis carries the following form:

$$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8 = \mu_9 = \mu_{10}$$

Whereas μ_1 is the mean of the 10th percentile, μ_2 is the mean of the 20th percentile, and so forth.

c.   Research Hypothesis 3 (H₃)

"In presale market, it is hypothesized that the pricing strategy for the seller tends to underprice the lemons in order to seduce buyers to overlook the adverse attributes and purchase the lemons, but in fact the flats are being overpriced taking advantage of the information asymmetry in terms of flat shrinkage."

If the price reduction for the flats during presale market is less than the reduction in the second hand market due to the flat size shrinkage, then the developer has overpriced the

lemons through the ostensible under-pricing strategy. The ostensible underpricing premium given to the first hand buyers had induced them to flip the lemons into the secondary market, not the second hand market where flats could be inspected physically, but before the adverse information became public. In other words, the developer can pocket the private information taking advantage of the information asymmetry in the first place and discharge themselves from the doctrine of *caveat venditor* regime.

To test the hypothesis, a hedonic price (PDHP) model would be carried out to test the change in property price in respect of the flat size shrinkage. If the coefficient for the flat size shrinkage is negative, then it means the property price has a negative relationship with the flat size shrinkage. If the negative coefficient is smaller in the presale market as compared to the second hand market, it means the flats are being overpriced through the ostensible under-pricing strategy by the developers due to the flat size shrinkage.

d.   Research Hypothesis 4 (H_4)

"*It is hypothesised that there is an additional price reduction in the second hand market for the durable lemons, i.e. flats with high flat size shrinkage*"

When the information becomes public and information asymmetry no longer exists in the second hand market, the actual market value of the product will be revealed. Hence, if

durable lemons exist, there will be an additional price reduction in second hand market when the information becomes public. The Lemon Principle suggested that buyers tend to pay less for a used car, and the informed sellers will only sell off the lemons. Hence, it is hypothesised that the property price for the lemon flats are lower than the non-lemons.

To test the hypothesis, a hedonic price (PDHP) model would be carried out to test the change in property price in respect of the flat size shrinkage for the lemons. If the coefficient for the flat size shrinkage higher than the norm carries a negative sign, it means there will be additional property price reduction for the lemon flats.

e.   Research Hypothesis 5 (H_5)

"*The overpricing pricing strategies by the Developers are different for each class of properties in terms of difference in unit size. It is hypothesised that the overpricing is greater for the small size units.*"

Due to the severe imbalance supply and demand housing market and the soaring property price in Hong Kong, people are eager to purchase small size units of small lump sum in the private residential market in order to fulfil the accommodation purpose. This allows developers to exercise high monopoly power and to overprice in greater extent over the small size units. If the price reduction in the second hand market is the largest for the

Class A properties when comparing it with the presale market, then the overpricing pricing strategies by the developers (if any) is greater for small size units and the developers capture the highest overpricing premium for the small size units. Class A properties refer to the smallest unit size group in accordance to the Rating and Valuation Department.

To test the hypothesis, a hedonic price model to test the change in property price in terms of different class of properties is formulated. By comparing the coefficients of the flat size shrinkage for different class of properties between presale market and second hand market, the overpricing premium can be identified (if any).

f.   Research Hypothesis 6 (H_6)

"The relative housing price reduction in the second hand market for the lemons with higher flat size shrinkage will be greater than the relative housing price gains for the non-lemons of an equivalent amount. The slope for the losses will be steeper than that of the gains"

People make decision based on potential losses and gains. The concept of Prospect Theory (Kahnmen and Tversky 1979) in a psychological context is applied to measure human bahaviours. In this study, the potential losses and gains are interpreted in terms of

flat size shrinkage. Losses refer to the flats with relative high flat size shrinkage as compared with the norm, while gains refer to the flats with relative low flat size shrinkage compared to the norm. The value function of human behaviour has been quantified as the change in housing price. People value losses more than gains. It is hypothesized that losses cause greater emotional impact to an individual than do an equivalent amount of gains. The possible reason behind this is that it is natural that people do not want to lose or are eager to reduce risks. While the potential subsequent buyers would tend to pay less for flats with higher shrinkage in the second hand market, sellers are more willing to sell the flats with a comparatively low price in order to complete the transaction. While at the same time, sellers would like to flip the flats since they know the flats are lemons to avoid loss. The rationale behind is due to the loss aversion. Hence, the slope for the losses will be steeper than that of the gains. On the contrary, the slope for the value function is not expected to be acute for the gains portion. If sellers know that their flats are above average, they will value their units more highly than others. Hence, they will demand more money to compensate for the "sense of loss" so as to forgo their flats with higher private value. Otherwise, they would rather stick to their endowment. Hence, transactions for the gains achieve a relatively higher price in the second hand market while the transaction volume is comparatively lower which coheres with the results demonstrate in the adverse selection section.

In order to test whether Prospect Theory applied when people are facing asymmetric information, a modified model will be developed, based on the empirical results arising from a hedonic price model, to test whether losses are more painful than gain in terms of

the asymmetric information on flat size shrinkage, while the emotional impact would be quantified as housing price.

A hedonic price model will be carried out to investigate people's emotions in terms of housing prices with the comparative gains and losses in terms of the flat size shrinkage in the second hand market. The independent variable "NORM" represents the flat size shrinkage less than the norm, i.e. the Non-Lemons. It represents the percentage of gains relative to the norm of the flat size shrinkage. This variable captures the gains relative to the norm flat size shrinkage, which is 34%. The coefficient is expected to carry a positive value to reflect the relative housing price gain in percentage in the second hand market.

While another independent variable "NORM<0" represents the flat size shrinkage larger than the norm, i.e. the Lemons. It is the percentage of losses relative to the norm of the flat size shrinkage, i.e. 34%. Hence, the coefficient is expected to carry a negative value that reflects the losses in a percentage.

If the magnitude of the coefficient for NORM<0 is larger than NORM, then the price reduction in housing price for the Losses is larger than that of the Gains. The slope for the Losses will be steeper than the Gains.

1.6   The Approach

The thesis will engage a building professional to systematically measure the actual carpet area, as a proxy of actual usable area, by utilizing established consistent procedures. This information has never been released into the public domain by any means, neither in the first-hand pre-sale market nor the second-hand market. This hidden information will not be revealed until physical inspection and measurement of the flats is feasible. This systematic process will enable us to expose the durable lemons in the Hong Kong housing market.

For the empirical test, this thesis analyzes the transaction records through a panel data hedonic price (PDHP) model. After controlling the time and quality factors, the PDHP model will test the various hypotheses established concerning the different level of overpricing premium for different classes of properties in terms of unit size regarding the flat size shrinkage. There are two markets where information asymmetry occurs,

i.   The pre-sale market where buyers can only obtain information from sales brochures in which the flat size description is ambiguous

ii.   The second hand market where the flats could be inspected physically and the flat size shrinkage is being revealed

It is hypothesized that the change in housing price has a negative relationship with the flat size shrinkage no matter in presale market or second hand market. If the price reduction level of (ii) is higher than (i), it illustrates an ostensible underpricing strategy has been adopted by the developers. By comparing the results for different classes of properties may demonstrate the pricing strategies by the developers for each class. Since there is a change of legal institution in the presale market and the second hand market, where more liability is imposed to the seller in the presale market and vice versa, the empirical results can interpret the pricing strategy under these legal frameworks.

The transaction data in this study is extracted from an organized and well-established database called EPRC. EPRC provides transaction records registered in the Land Registry with associated of information of the trassaction date, date of issuance of occupation permit, address of properties, gross floor area, floor level, saleable area and the unit price (Li, Cheung and Sun 2015).

In respect to the psychological context, another PDHP model will be carried out to study the magnitude of the housing price change with reference to the relative gains or losses in relation to the norm of flat size shrinkage for the second hand market. The empirical test results are used to develop a modified model referencing the model in Prospect Theory to test whether losses are more painful than gain in relating to the asymmetric information on flat size shrinkage, while the value function can be quantified in terms of the housing price.

1.7   A Caveat

Nevertheless, this empirical study is limited to the fact that the regulations and flat selling doctrines apply to the jurisdiction of Hong Kong. However, the real estate sector has a key role in economic systems worldwide. This study measures the information cost by empirical tests and serves as an illustration on the impact of information asymmetry that sheds light to similar real estate market worldwide.

1.8   The Significance

This thesis is one of the first of its kind researching information asymmetry from both the New Institutional Economics and Behavioural Economics perspectives. It not only fills in gaps in the research field by providing empirical studies to test the Lemon Principle, including adverse selection, and the measurement of overpricing premium, and hence the pricing strategy by the developers; it is also a response to the rising public concern on the flat size shrinkage problems from an institutional perspective. As the author writes from first-hand experience as a full time project manager in one of the largest developers in Hong Kong, and the interpretation of the flat size description is always confusing to the public, this thesis contributes and clarifies facts according to current market practices. The 'carpet area' measurement has never been revealed in any public channel, no matter during presale or in the second hand market, unless a building professional is engaged to measure them specifically.

The study also demonstrates why institutions were being called for to tackle the asymmetric information problems, the evolvement of the government interventions over the past decades are being reviewed. Through the empirical test results, the study has unveiled the possible reasons for the emergence of a new product - Nano flats are increasing in demand. Nano flats refer to the flats with saleable area less than 200 square feet. There are much hilarious international news about Hong Kong people being willing to pay their life's income to buy a flat smaller than a car parking space. Some international news reports express shock as to why Hong Kong residents are so eager to pay such high property prices to live in flats comparable to the size of a prison cell. This thesis demonstrates a possible forthcoming situation that the first hand buyers of Nano flats need to beware in case of economic downturns, and so more actions need to be taken on possible approaches to ease the flat size shrinkage problems, especially for Nano flats.

This thesis also analyzes the information asymmetry by taking into account of the psychological context, so it is a fresh approach of studying information asymmetry from a behavioural economics framework. Combing the Lemon Theory and Prospect Theory is believed to be one of the 'sparkling' approaches in the real estate research field.

1.9   Thesis Structure

The thesis contains six chapters as summarized as below,

Chapter 1 introduces the research, which includes the problem, the motives for the research, gaps in research field to fill, the hypotheses and the significance of the research. The structure of the thesis is also outlined. A review of relevant scholarly studies is found in Chapter 2. Based on the research gaps to fill, three research chapters have been consolidated. Chapter 3 examines the presence of lemons and adverse selection in the Hong Kong real estate market. Chapter 4 measures the overpricing premium by the developers. Chapter 5 measures human behaviour in the lemon market. Each chapter includes its own methodologies, empirical findings and summaries. Chapter 6 is a discussion on evolving institutions with a discourse on the psychological context of the research, followed by a conclusion.

-   End of Chapter 1 -

CHAPTER 2 LITERATURE REVIEW

2.1   Introduction

This chapter will discuss the key literature used to help formulate the research questions and propositions of this thesis. It starts with a discussion on the studies of information asymmetry, follow by the adverse selection problems as well as the counter remedies driven by voluntary market forces of signaling, guarantees and mandatory non-market forces of information disclosure stipulated by the institutions. Owing to the heterogeneity nature of the real estate market, information distribution is crucial. A brief summary of the relevant information asymmetry is also reviewed. Prior the introduction of the implemented institutions, market efficiency is a crucial concept to be explored. The soaring housing price makes every foot of unit size in Hong Kong matters, the evolution of the institutions implemented in past decades attempting to increase market transparency, ease the information asymmetry problems as well as the property price in Hong Kong housing are being discuss. Psychological context of human behavior to information asymmetry is also been explored.

2.2   Information Asymmetry

Information can be exploited to reduce uncertainties in making decisions. Following Coase (1937), subsequent studies such as Williamson (1973, 1985 and 1993) suggest that transaction costs exist in acquiring information, negotiating, monitoring, signing and enforcing contracts.

Barzel (1982, 1985) suggested that it is costly to obtain product information and it contributes to the key reason that gives rise to the transacting problems in this world of positive transaction cost. Cohering to Coase (1937), Barzel (1997) further defined transaction costs as *"the costs associated with the transfer, capture and protection of rights".* Eggertsson (1990) observed that transaction costs arise when individuals enforce their exclusive rights and exchange the ownership rights to economics assets. They shared the same view that transaction costs arise between various activities in relation to the exchange of property rights, given that the information is costly. Examples are the searching for information of the price and quality of any goods, the searching of potential buyers and sellers, and analyzing their possible behavior under different circumstances.

The importance of Information Economics was stipulated by Joseph E. Stiglitz, together with George A. Akerlof in their Nobel Prize Lecture in 2001. Stiglitz ideas cohere with

the New Institutional Economics (NIE) that the market efficiency of the economy is closely related to the relationship between the government and the market. The government implements laws and regulations while the market comprises its own customs and norms.

Uneven distribution of information in the marketplace is the key reason for the existence of asymmetries (Philips, 1988). Information Asymmetry is a kind of friction that deters buyers and sellers from making mutually beneficial trades in a free market (Wong, Yiu and Chau 2012). Information asymmetry may occur under different circumstances. The sellers can take advantages under these circumstances. For instance, in some economies, producers and manufacturers are reluctant to reveal completely transparent information to consumers, despite such information being available in their possession. The vendor motivation behind this is for greater financial gain and profitability; the more information is not available to the consumers, the greater the leverage the sellers have to realize higher sales pricing. Due to the lack of complete information, the consumers stand to make imprecise judgments of the real value of products. Ultimately, the number of transactions within a market will eventually diminish due to a lack of confidence by consumers to purchase goods and services. However, the institutions and policies that govern that market and the economic environment also matter to the results. In Hong Kong housing market, due to the severe imbalance supply and demand of housing, neither the total number of transactions nor the prevailing housing price reduce notwithstanding the existence of information asymmetry. In other words, the losers under the asymmetric information environment may still gain money, just not as much as the

others. This phenomenon evidences that the institutions, political as well as economic factors are closely interrelated with the market performance. The land market in Hong Kong will be briefly discussed in a later section.

Asymmetric information leads to problems such as moral hazard and adverse selection. Williamson (1985) suggested that information impactedness is another complication that is the result of information asymmetry. Information impactedness arises in complex contracting situations, in which the buyer and the seller possess private knowledge and information respectively. Opportunism is a possible outcome which leads to contract hazards, of which the transaction costs could be prohibitively high to overcome and hence lead to market failure.

By understanding the world is of positive transaction costs and information is costly, information asymmetry is one of the consequences arises from the uneven distribution of information. This study attempts fill the research gap to measure and empirically test whether information asymmetry exists in the Hong Kong real estate market.

It is noteworthy that information asymmetry leads to problems of adverse selection, the following section will explore why adverse selection is a problem.

2.3   Adverse Selection Problems

Adverse selection problems have been elicited from Akerlof's (1970) seminal paper on information asymmetry. Based on the observations in the used car market in the US, Akerlof contends that since it is difficult for buyers to discern the latent defects, irrespective of the quality, they tend to offer a lower price for a used car as self-insurance. Sellers of high quality used cars, usually with higher private valuations of their vehicles, are thus driven out of the market. Akerlof terms this adverse selection process as the "Lemon Principle", which could eventually lead to market collapse with a loss to both buyers and sellers.

Empirical studies of the Lemon Principle are considered less affluent than the theoretical work. It is largely due to the high measurement costs pertaining to the qualities of the subjects. Barzel (1982) stated that the cost of measuring adverse selection are high and resulting errors permit people to transfer wealth to themselves at a resource cost. Costly measurement is a factor common to these instances where individuals and joint maximization do not coincide. In the insurance industry where the idea of adverse selection originated, some empirical evidence that is contrary to Akerlof (1970) has been produced. Maynes and Assum (1982) argued and presented evidence that there is a positive correlation between price and quality. The more superior the quality of the products, the higher the price they can command. On the contrary, a negative correlation has been observed by numerous studies (Sproles 1977; Riesz 1978, 1979; Dardis and

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Gieser 1980; Hjorth-Anderson 1984; Tellis and Wernerfelt 1987). Using the data in French automobile insurance market, Chiappori and Salanié (2000), found neither adverse selection nor moral hazard problems in the industry. By analyzing the data of the National Medical Expenditure survey in the US, Cardon and Hendel (2001) showed no empirical evidence that less healthy people had subscribed to a higher coverage of medical insurance products, and thus rejected the notion that adverse selection took place in the market. Nevertheless, Keane and Stavrunova (2016) concluded that there was adverse selection in the US Medigap insurance market, but that the effect was negligible.

Contrastingly, several studies have come to conclusions based on empirical evidence affirming the Lemon Principle. For example, Engers, Hartmann and Stern (2009) in the automobile market; Mocan (2007) in the child-care market; Downing, Jaffee and Wallance (2009) in the mortgage-backed securities market; Lambert and Wilson (2003) in the wheat market, Gilligan (2004) in the aircraft market. In a recent paper by Bajari et al (2014) which deploys a semi-parametric analysis on insurance claim data of a large-scale self-insured employer, found statistical evidence of moral hazard (overconsumption of healthcare services) and adverse selection (higher premium plans to attract more employees with latent health problems). Cohen and Siegelman (2010) also conducted comprehensive empirical studies and reviews of adverse selection and moral hazard in other insurance markets.

Genesove (1993) has examined the features of Akerlof (1970) and explained why the adverse selection phenomenon was not applicable to all products. There are five conditions that validate the Akerlof model. The first one is the information asymmetry assumption. It is not for all the products in the market that sellers are the more informed parties of the products than the buyers are, they may share the imperfect information same as the buyers (Heinkel 1981). The possible reasons may be the sellers are just dealers or middlemen in the trade, and they are not experts of the products. Secondly, both sellers and buyers must value the quality. Sellers value the quality because of the buyers. If the buyers cannot verify or inspect the quality, the sellers tend to overprice inferior products as if they were of high quality.

Thirdly, the more informed party is not the one to pay for the products. Wilson (1980) suggested that the allocation of goods might be sensitive to how prices are set in the markets where adverse selection is serious. The equilibrium in Akerlof's model is the outcome generated by the third party, meaning an auctioneer, so they are neither the sellers nor the buyers. This is because signaling the quality may occur if sellers set the price, they will stick to high pricing as signaling the high quality of goods whereas comparatively low prices would be associated with low quality. Wolinsky (1983) suggested that this price signal may alleviate the adverse selection problems to some extent.

Fourthly, the ownership of used goods needs to be independent of the buyers' preference. There are two types of buyers, one has a higher valuation to self-select products and are sensitive to quality, while the other type has a lower value of self-select products. Since durable goods may deteriorate with age, and might require maintenance more frequently, the high valuation of self-select owners would like to sell the used goods to update their own preferred quality more often (Bond 1982). The coexistence of new and used goods in the market is called the dilution effect of adverse selection which is absent from the Akerlof's model. However, it depends on the type of products, whether there is a significant valuation difference between the new and the used applies (Hendel, Lizzeri, and Siniscalchi 2005). In the real estate market, the dilution effect is limited due to the product nature. In contrast to the car market, the quality depreciation is limited for a 5-year-old flat compared to a new one. In some circumstances, the demand of the products may be affected by the exogenous changes in buyers' preferences (Porter and Sattler 1999).

Lastly, the emerging of information disclosure institutions is insufficient for buyers to identify the true quality to purchase. Heal (1976) suggested that sellers would refuse to ignore the buyers in order to protect the long-term interest of repeat business. Reputation and warranties serve as an indirect signaling mechanism. This is true when the seller wants to maintain repeat business in the same market over a period of time (Shapiro 1983). Earning profits through cheating can destroy the reputation of sellers and result in the loss of future sales. Lacko (1986) tested the effectiveness of reputations and warranties in overcoming the lemon problems by comparing cars purchased from sellers

with different information incentives. Similar to Bond (1984), he found the evidence of adverse selection in the older used car market, whereas there was no evidence of asymmetric information in the newer used car market. He also found evidence that the effect of reputation in helping overcome the adverse selection problems is higher than the quality warranty.

In fact, Akerlof (1970) also suggested two "counteracting institutions" himself, namely guarantees and brand name, in which good products can find ways to compete with the bad ones. The concept was similar to the warranties and reputations suggested by Heal (1976), and of which lack of these might serve as one of the conditions that lead to adverse selection problems. Chau et. al. (2001) found that reputable housing developers had been commanding a higher premium in Hong Kong. Barzel (1982) proposed that the problems and costs of measurement pervade significantly affect all economic transactions. Since the values of equally priced items are different, people will spend on resources to find out the difference. Barzel expected that some readily obtainable information will be suppressed to preempt opportunities for excessive measurement. He concurred with Akerlof and stressed the importance of measuring and enforcing property rights to the specific attributes of complex assets and used this analysis to explain a wide variety of market phenomenon, including warranties, brand names, retail packaging, share contracts, vertical integration, and the like, also lower the need for costly measurement. Stiglitz (2001) also suggested a decision by a firm to provide a guarantee is not just a matter that the firm is better able to absorb the risk of a product failure, but its

willingness to provide a guarantee conveys information about their confidence in the product. It is the signaling gesture to mitigate adverse selection.

Janssen and Roy (2002, 2004) suggested that owners of higher quality cars would like to wait longer to achieve a higher price. Engers, Hartmann ad Stern (2009) suggest the use of lengths of ownership as an alternative signal. Consumers can use the number of times a product has been resold to infer quality that is unobservable to them (Hendel et al. 2005). The higher the number of re-sale transactions will represent lower car quality.

Wong and Chau (2012) suggested that adverse selection problems occur more frequently in the second hand housing market, the sellers who have owned or used their flats for a period of time are better informed about the state of their flats than buyers. Since buyers usually cannot observe a flat's true quality, unscrupulous sellers have an incentive to sell lemons for the price of good flats (non-lemons). But buyers who are aware that they could be cheated would not pay a price as high as that of good flats, and this would make sellers of good flats less willing to sell. Eventually only bad flats (lemons) would be available for trade, leading to adverse selection. On the contrary, the first-hand housing market is not faced with the adverse selection problem as much, since new goods have the cost of counteracting information asymmetry, such as warranties and brand names. Hence, Akerlof (1970) argued that products depreciate in value not just due to deterioration and obsolescence, but also due to the increasing cost of counteracting

information asymmetry such as signaling (Spence 1973) and screen (Rothschild and Stiglitz 1976).

Apart from reputations, warranties, guarantees and brand name serving as quality signaling methods to distinguish the good from the bad, a third party expert is another alternative solution. Experts will emerge if the provision of information can benefit them, and will also solve the information asymmetry problem (Chau and Choy 2011). Social media is a popular tool to convey sales information, reviews and analyses of properties to prospective buyers nowadays. However, similar empirical evidence showed that third-party agencies failed to reduce the information asymmetry and provide accurate information (Easley et.al 1996; Firoozi, Hollas and Rutherford 2006; Levitt and Syverson 2008).

Apart from the voluntary counteractions driven by the market itself, implementation of institutions to impose mandatory disclosure of information by sellers is another remedy. Prospective buyers are able to acquire more information concerning the product and reduce the search costs. However, the extent of mandatory information disclosure is a difficult question. Grossman (1981) argues that the duty of disclosure may lead to an overinvestment in producer insurance and general prices may increase as a consequence if the sellers don't know what specific pieces of information to disclose. Sometimes, although search costs for the buyers are reduced, extra time may be needed to process the information if they are overly provided with technical terms and useless information.

Whether the institutions achieve market efficiency and benefit society depends on if the total transaction costs are lowered.

Comparing the efficiency between two legislative regimes on the caveat venditor (let the seller beware) and caveat empitor (let the buyer beware) resemble each other in various ways and were both introduced to ease information asymmetry. The key question is to discern which side of the transaction is the cheaper information provider, the sellers or the buyers. Friedman (1983) suggested contract freedom, costless negotiation and enforcement can lead to equivalent outcomes for these two doctrines. However, in this positive transaction cost world, these two never converge. Positive transaction cost is the reason for information asymmetry existing and resulting in the lemon problems. Posner (1983) opined that it would be cheaper for sellers to provide quality insurance in primitive societies since trade is infrequent and simple. However, it is not always the case in modern societies. Lefcoe (2004) found the opposite results.

Numerous studies focus on the law of property condition disclosure and the associated influence on the real estate price. (Moore and Smolen 2000; Johnson and Anderson 2003; Lefcoe 2004). Nanda and Ross (2008, 2012) found that a seller's property condition disclosure law in the US improves the information transparency and a higher sales price results. Chau and Choy (2011) conducted a comprehensive empirical study on comparing the efficiency of two legislative regimes, namely the caveat venditor (let the seller beware) in presale market and caveat empitor (let the buyer beware) in second hand

market. They demonstrated there is a 32% increase of overpricing premium switching from caveat venditor rules to caveat emptor principle. However, they did not suggest caveat venditor is a more efficient doctrine since there are different implications to the total information cost under these two legal regimes.

In summary, the degree of adverse selection problems arising from the information asymmetry mainly depends on the type of market as well as the associated voluntary and mandatory information disclosure that has evolved with the aim to ease the problem. There are five conditions contributing to the adverse selection problems in Akerlof's model. The effectiveness of the measures is closely related to whether the overall transaction costs can be lowered and which party is the more economical information provider.

Since the empirical tests supporting the Lemon principle in real estate market are limited and even less attending to the pricing effects, this thesis intends to identify the durable lemons in Hong Kong real estate market and to study whether Akerlof's (1970) adverse selection problem is happening in this market. The information asymmetry in real estate market will be further discussed in the following section.

2.4   Information Asymmetry in Real Estate Market

Compared to the car market, the real estate market is far more imperfect due to the limited information availability (Clapp, Dolde, and Tirtiroglu 1995) and the heterogeneous nature of properties. In the field of real estate, empirical studies on information asymmetry are also scanty. Clapp et al. (1995) provide evidence of housing price diffusion. Dolde and Tirtiroglu (1997) established a model to examine information diffusion in relation to real estate prices. Chau et al. (2002) found no empirical evidence of adverse selection in Hong Kong's housing market between 1995 and 2000. They argued that the most influential piece of information affecting property prices is the cost of land, which is rather symmetrical information in nature. More recent studies by Bayer, Geissler, Mangum and Roberts (2011), Cheng, Raina and Xiong (2014), Chinco and Mayer (2016) investigate the effect of housing prices by the more informed parties taking advantage of proceeding the information in the speculator housing market.

There are studies investigating first hand presale and second hand real estate markets. Ong (1999) found the adverse selection problem happen to buyers in the presale market, whereby buyers are unable to differentiate the property quality before the development completion. However, developers can signal the quality of their properties by obtaining a good reputation. Chau et al. (2007) found evidence that developers' reputation can serve as a reliable signal in the presale market and they found the reputable developers always command a higher premium.

In the second hand market, the sellers always acquire more information about the structural attributes as well as the neighbourhood attributes than the prospective buyers. Garmaise and Moskowitz (2004) and Kurlat and Storebel (2015) concentrated their studies on information asymmetry arising from the neighbourhood attributes. Choy and Chau (2006) contended that the higher the degree of the information asymmetry for housing attributes (e.g. view), then the higher the chances of mispricing occurring, in comparison to the more homogenous attributes with lower information asymmetry such as floor level and flat size.

One of the popular research areas in the real estate market is the use of real estate brokers. Studies consistently demonstrated that the use of third-party agents cannot reduce the information asymmetry, but rather increase the transaction costs by maneuvering the information (Garmaise and Moskowitz 2004, Firoozi, Hollas and Rutherford 2006, Levitt and Syverson 2008, Ling, Naranjo and Petrova 2016).

Referencing an empirical test on Hong Kong's housing market, Chau and Choy (2011) investigated problems from information disclosure perspectives. Results suggested that even if the transacting parties are forced to disclose adverse information, this does not necessarily increase efficiency; but it may render desirable effects if the total social costs can be saved by such disclosure. For specific information that is very costly to research and obtain, a compulsory disclosure requirement might suffice. For example, the

presentation of flat size by property developers. The current regulations require property developers to disclose the unit size in a specific format during pre-sale. Prior to April 2013 there was no standard definition or prescribed format to convey the information on the size of the flat to the buyer. This can and has resulted in considerable variance in the flat size buyers perceived during the pre-sale and what they realized upon completion when seeing the actual flat. Several factors may give rise to the variance in flat sizes; the thickness of the load bearing wall inside the flats, the provisions of bay windows, curtain walls, room divisions, external hallways, and public areas. Construction projects carried out by different developers exemplify significant variances in terms of floor area efficiency.

In view of the lack of empirical testing of information asymmetry and adverse selection in the real estate market, this thesis attempts to fill this research gap by testing the presence of lemons and adverse selection in the Hong Kong real estate market from the New Institutional Perspective, focusing on the evolution and the effects of mandatory, voluntary and third party information disclosure.

Market efficiency is the ultimate goal that enacting or changing of new institutions should be achieved. The aim is to benefit the society at the end. Understanding market efficiency is crucial to study the evolution of new institutions. The New Institutional Economics and the market efficiency will be further elaborated in the following section.

2.5   Market Efficiency

It was mentioned previously that the institutions can achieve market efficiency and benefit society are the most desirable effect. Market Efficiency was an intrinsic feature in neoclassical economics due to the perfect market assumption. Pareto efficient resources allocation can be achieved through perfect competitive mechanism. However, it was assumed that homogenous commodities are traded at a point in space and the buyers are fully informed regarding every detail of the products, all commodities must be traded at a uniform price (Barzel 1985). This is the reason why neoclassical economics was conceived assuming that an imperfect market will render market inefficiency provided that the institutional cost is zero.

In contrast, Coase (1937) criticized that the world has a positive transaction cost and information cost is one of them, which was later termed as the New Institutional Economics (NIE). Through the lens of NIE, market efficiency can be achieved if all institutional constraints leading to the imperfect market can be identified. In other words, market imperfection and market inefficiency is not necessarily synchronized. Stiglitz (2001) also suggested that the appropriate relationship between the market and the government determines the efficiency of the market economy. Adam Smith (1776), the founder of modern economics, coined the famous quote that "free markets lead to efficient outcomes as if an invisible hand." He opined that it is the best for the world with a market without government intervention. There was, at best, a limited role for

government. When resources are incorrectly allocated and prices do not reflect true costs and benefits, this leads to market failure.

However, government plays an important role when "market failure" occurs. Economists over the preceding three decades have identified important market failures such as the externalities, which required government intervention. There were interventions in the market that made all parties better off. Barzel (1985) argued that people are able to gain, at each other's expense, in the positive transaction cost world. In order to minimize the possible losses, people will agree to restrain themselves by erecting social institutions to impose and enforce the restraints. He proposed all people expected to gain through trading with each other or spending resources attempting to capture a greater share of gain when transacting is costly. Traders' identities can lower the cost of exchange. Benham and Benham (2000) defined the cost of exchange as the opportunity cost born by an individual when obtaining a good within the institutional framework. The cost includes both the cost of the good itself and the transaction costs incurred when obtaining the good.

NIE scholars are interested in studying the inefficient institutions. They query the evolvement and suggest on establishing more efficient institutions and the conditions for the institutional changes. In other words, in the world with positive transaction costs, the market is imperfect, but efficient institutions can decidedly improve matters that lead to

the market efficiency. Studies on institutional changes and policy implications towards efficient institutions are the main agenda of NIE.

This thesis deploys from the NIE perspective because it opens up a new perspective on the meaning of efficiency. The Coase Theorem (1959, 1960) demonstrates that the existence of institution does not necessarily lead to market inefficiency, but entails the lowest total social cost. According to North (1990), *"institutions are the rule of the game in a society or, more formally are the humanly devised constraints that shape human interaction."* Efficient market function can be found in a competitive market. However, institutions are not always efficient. Eggertsson (1990) found that lower cost institutions tend to supersede the higher ones. North (1981) found many historical situations where property rights arrangements devised by the rulers were favoring their own interests only. North (1990) suggested inefficient institutions persist because of the increasing returns to institutions and path dependence. He believed that institutional changes depend largely on the adaptive efficiency, which concerns the willingness, ability and effectiveness of a society to devise productive rules in response to economic, social and political constraints through time. Krabben and Buitelaar (2011) analyzed the relationship between the market outcome and its institutional order systematically in Netherlands for the industrial land and property market. They demonstrated that the changes in the institutional order of the market may be considered to arrive at more desirable market outcomes.

This thesis carries out empirical tests to measure the overpricing premium, pricing strategy as well as the human behavior with relation to asymmetric information of flat size shrinkage in the Hong Kong real estate market. Benham and Benham (2001) suggested, if a transaction cost needs to be reduced, then it must be measured. When some constraints are altered, institutional changes will take place. A series of institutional changes in the market were implemented, trying to restore the market efficiency.

One of the reasons why this study is worthy to conduct is the continuous skyrocket high property price in Hong Kong market which leads to every square foot matters, and hence the flat size shrinkage issue. By understanding the property price in Hong Kong housing market helps to explain why this thesis is conducted.

2.6   Property Price in Hong Kong Housing Market

According to the Annual Demographia International Housing Affordability Survey 2017 by the New Zealand Initiative, Hong Kong has been ranked as the most unaffordable housing market in the world in 2016, with average flat prices at 19 times gross annual median income, the highest ever measured in the US in the past 11 years. According to The Chinese University of Hong Kong's Quality of Life Index, the house price-to-income ratio rose approximately 275 percent between 2002 and 2014. Hui and Seabrook (2003) indicated that Hong Kong's housing prices have been driven considerably higher by restrictive land-use regulations.

Due to the skyrocketing property prices and the high level of housing unaffordability, every single square foot of property matters in Hong Kong. Although information asymmetry on the flat shrinkage problem exists and raises a lot of public concerns, the property prices are still increasing rapidly.

2.6.1   Supply and Demand in Hong Kong Market

The land economy is one of the areas where one would find market operation and government intervention interacting with each other intensively. Expectations by the society that the government should step into the land and housing market whenever there is a feeling of mismatch in supply and demand may lead to unjustified price movements. This expectation is even stronger when society feels that the government has the power to regulate and control over market supply variables. (Li et al 2016). Huang (2013), Kalia (2013) and Mayer et al. (2013) suggested that such expectations contribute to market volatility in the housing sector, not the least due to the element of psychological influence of market expectation on the housing sector.

Li (2016) argued that when housing prices rise continuously, a general expectation from society is the implementation of stabilizing measures by the government to cool down speculative activities or excessive demand so that the housing price level could become

more affordable. Government under such expectations from society is expected to be heavily involved in the housing market from both social and political perspectives. When the government starts to intervene, the market may start to fluctuate.

Many people argue that it is the imbalanced supply and demand that leads to soaring property prices to continue booming in Hong Kong. Even though there are information asymmetries in flat shrinkage, the lemons are still always sold out. Is there a market failure? Why can't Adam Smith's invisible hand work here? Are the newly implemented institutions effective? Are the government interventions leading to the market failure or vice versa?

The supply and demand mechanism in the Hong Kong land market is explored as below for a greater understanding of this economy.

a.   Land Supply in Hong Kong

The Hong Kong government, as the sole owner of most of the land in Hong Kong, can strongly influence and decide on the quantity of land supplied for housing development. The supply of the properties depends on the supply of developable urban land. This relationship becomes an important policy tool under the leasehold land tenure system in

Hong Kong. All new land is sold to private property developers or land users through competitive auctions or tenders by the authority that conveys the land lease rights only, not the ultimate land ownership. This leasehold system gives government a great amount of controls on the supply end, and thus the power to affect the total supply of housing developments. The combination of public ownership of land within one of the freest market economies in the world came into existence over a hundred years ago when the British began their administration of Hong Kong. Upon the return of Hong Kong to Chinese sovereignty, the era of a semi-autonomous state began in 1997 (Li et al, 2016).

The supply of land in Hong Kong is mainly through direct control of public authority to developers and indirect control by government in terms of zoning and planning controls. Li et.al (2016), Britton et al. (1989) and Davies (1977) suggested that due to the administrative and political agendas, the government intervention in controlling the land supply and use, acted as the main engine for pushing higher land prices and thus higher development costs. Owing to the high development costs, the property prices rarely ever fall.

The Hong Kong government sells land through public auction, tender and private treaty grants. Before 1997, land auctions were initiated by the government and held periodically. The public land supply basically depended entirely on the frequency of the land auctions held. It was a supply-oriented model. The application list system and the demand-oriented model were then introduced in 1998 so that the government could just wait for

developers to approach them with proposals for selling developable land on a list. Nevertheless, the system was suspended and reverted to the supply-orientated model in 2013. This was because the total number of new housing units supplied from land auctions, after the implementation of application system, was merely about half of that compared to the previous decade. Increasing the land supply to stabilize the housing price situation has become the top priority since 2012.

On 20 December 2016, Professor Anthony Cheung, the Secretary for Transport and Housing, announced the Long Term Housing Strategy Annual Progress Report 2016. The government updates the long term housing demand projection annually and presents a rolling ten-year housing supply target. But the government faces a lot of challenges in the planning process as well as plenty of local views and objections to the targets, putting the government under great pressure. In 2017, the Secretary of Development, Eric Ma announced the land supply for the financial year 2017 -2018 has exceeded the government targets and the government shall continue with the land supply plans. Will the increase of land supply curb property prices? We shall wait and see.

Skeptically, Li et al (2016) suggested that the proactive supply of land might not have impact on the housing market price levels as society or the government would have hoped. Likewise, Wong (2015) shared the same view that the scarcity of land in Hong Kong is not the reason property prices are high. He suggested that the real problem is the planning rules and regulations that made most land unavailable for development or

subject to long and uncertain delays that deter development. He opined that the numerous regulatory-related transaction costs involved in property development, including navigating planning rules, complying with building codes, negotiating costs associated with land acquisition due to holdouts and holding public consultations that often result in long delays. These uncertainties make development more costly. Professor Edward Glaeser also agreed that the cost of development can be driven up by the government regulations in the form of planning, zoning, building restrictions and other transaction costs. Therefore, properties are expensive due to the artificially created restrictive regulations on developments and constructions.

All in all, the government plays an important role in providing the land supply by direct release and indirect administrative procedures. Reducing transaction cost, again, is the key issue to achieving market efficiency as well as attaining stability in the economy.

b.   Demand of housing in Hong Kong

Since the housing market possesses two identities, accommodation and speculation, the factors that affect the demand are difficult to forecast. For an open city like Hong Kong, where there is no control of hot money, the non-domestic sources as well as the business cycle are external factors that inevitably play an important role in influencing housing demand.

Under the traditional economic framework of supply and demand, the government has since 2011 implemented series of institutions to suppress the demand, as mentioned in the earlier section. These measures include tightening mortgage credit availability, additional tax on non-local purchased property, and tax on short-term speculative gains. These measures are described by the government as "Demand-control", orientated so that financing for home purchases will be limited, with an increased holding cost for speculating on housing properties. The government has emphasized that they prefer not to administratively intervene into market price movements directly and have no intention of administratively capping housing prices at any level as this goes against the reputation of the free economy system adopted in Hong Kong. Hopefully, by suppressing the demand, while increasing the land supply, it will lead to a downward adjustment to the market price level and to the equilibrium. However, it is interesting to ask; will these series of institutions and intervention really lead to market efficiency and be a benefit to society?

Li et al. (2016) suggested that the housing policy that initially aims at controlling housing demand to pull down the housing price may not work. This is true to the current circumstances, the property price is still booming. While Wong (2015) opined that curbing the speculative market only has a temporary effect, speculation is the result of anticipated property price increases. He showed evidence that speculation is not the main cause of surging prices by the history of the government attempting to curb it. Every time

a measure is introduced, it is followed by a short correction, and then the prices surge again. Wong et al. (2006) found that anti-speculative measures have actually made the property market more volatile. It is believed that when speculators expect market supply is going to increase substantially due to the government intervention, immediate demand is likely to reduce as over-supply may suppress the market in the immediate future.

To conclude, effective institutions initiated by the government will lead to the market efficiency, and vice versa. If the institutions implemented in the past decade were aiming at the wrong target, this will not only increase the transaction cost, but will also lead to market failure.

Li et al. (2016) opined that considering the special characteristics of the market structure, such as the lack of a central trading market, homogeneity of product and high transaction costs in search for the best product, the housing market has been infamous for its inefficiency. In view of the inefficiency, a player's mentality becomes instrumental to fluctuations of market prices (Evans 1995). Human behavior, in other words, plays an important role in the market.

In view that human behavior is inevitable in any economic systems, this thesis attempt to study the information asymmetry from the pshycological context, i.e. Beahvioural Economics, and to quantify human emotion when facing asymmetric of information.

2.7   Behavioral Economics – The Prospect Theory

Behavioral Economics is a partnership between economics and psychology. Many economists such as Akerlof & Shiller (2009) opined that economic analysis should not be restricted to neoclassical economics, but should incorporate insights from behavioral economics. The neoclassical models have assumed that we are "rational" agents. That means we act in ways which maximize our expected utility (happiness), based on a full set of information available to us. However, the market is imperfect in the real world. As introduced in an earlier section on New Institutional Economics (NIE), asymmetric information and transaction cost exist in the real world. It is especially true in the housing market where heterogeneous products and asymmetric information make the market inefficient.

Behavioral Economics arises when economists started to criticize the assumption that people act as rational agents, including Tversky & Kahnemann (1974, 1979). Shiller (2000), Akerlof & Shiller (2009), and Stiglitz (2010) claim that there is a need to rethink the way economic modeling is approached, with more emphasis on the non-conformity of human actions. Behavioral economists claim that we can understand economic behavior better, if psychology insights are included. Fudenburg (2006) and Stefano (2009) think psychology, in harmony with economics, can explain behavioural anomalies in property markets and stock markets. Keynes (1936) used the term "Animal Spirits" for economic agents, to explain irrational exuberance or pessimism in an economy. This term has been

more recently adapted and reinvented, as a way to explain many factors that are not explained by neoclassical economics.

Oliver Williamson explained how transaction costs create problems in the smooth functioning of the market. The information cost produced from the asymmetric information of flat size is one of the examples. There were two basic behavioral assumptions stated by Williamson (1988), which are Bounded Rationality and Opportunism. Bounded Rationality means the human brain has limited capabilities and cannot calculate all possible contingencies in the future. Opportunism, on the other hand, is defined as "self-interest seeking with guile". These are the reasons why information asymmetry creates problems. There is some kind of linkage between NIE and Behavioral Economics, whereby the real world is full of uncertainty, positive cost and the market is not perfect. Most importantly, regardless of whether we are talking about institutional economics or behavioral economics, they both involve humans and humans are limited in their abilities.

Due to the limited information revealed and the limited capabilities of the human mind; humans must seek efficiency when solving problems and overcoming difficulties (Newell and Simon 1972). Kahneman and Tversky (1979) coined the Prospect Theory, from a psychological context, stating that when people are making decisions involving uncertainty and risks, they will base the decision on the potential value of losses and gains rather than the final outcome.

Barberis (2013) found that the application of the Prospect Theory in economics is difficult, thus rendering it very limited in nature. The field of economics where the Prospect Theory has been most extensively applied is in finance and insurance. More recently it has been extended to industrial organization, contract theory, and so on. Nevertheless, most of them are based solely on "experimental" findings. Such empirical studies are far from adequate. The difficulties in applying Prospect Theory are that it is unclear what a gain or loss represents in any given situation.

The value function graph developed by Kahneman and Tversky in 1979 is shown as below,
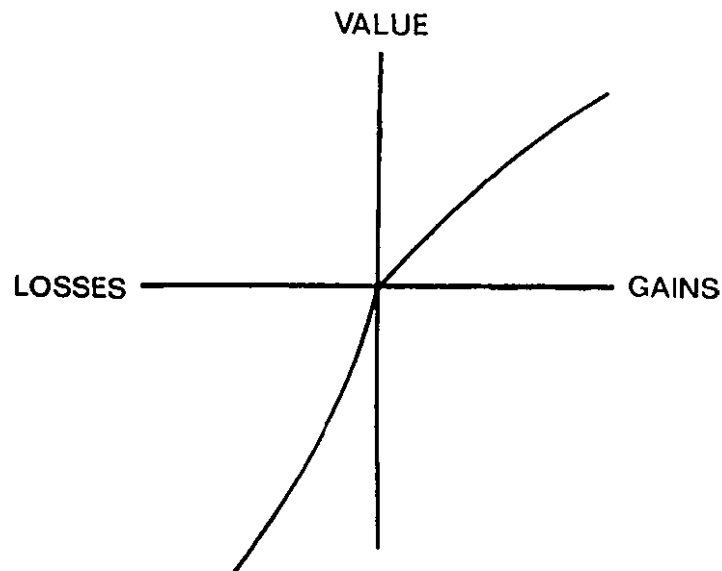
Figure 1 Hypothetical Value Function proposed by Kahnman and Tversky (1979)

They proposed that the value function is i) defined on deviation from reference point; ii) generally concave for gains and convex for losses; iii) steeper for losses than for gains.

In 1992, Kahneman and Tversky developed a modified version of their theory known as the "Cumulative Prospect Theory". They further illustrated four elements of the Prospect Theory: 1) reference dependence, 2) loss aversion, 3) diminishing sensitivity and 4) probability weighting. Reference dependence means people derive utility from gains and losses, measured relative to some reference point, rather than from an absolute level of wealth. A reference point refers to people's expectations. However, it is often a complex challenge as Kahneman and Tversky offered little guidance on how to determine the reference point so as to determine the amount of loss or gain. Secondly, loss aversion is the idea that people are much more sensitive to losses than to gains of the same magnitude. As an example, in gambling, the pain of losing $100 far outweighs the pleasure of winning $110. Thirdly, the value function is concave for gains but convex for losses. This was renamed as diminishing sensitivity because it implies that, while replacing a $100 gain or loss with $200 gain or loss has significant impact; replacing a $1000 gain or loss with $1100 gain or loss has smaller impact (Barberis 2013). The gains and losses are referring to dollars gained or lost.

Often, when studying behavioral economics in real estate, the question is usually, are there any housing bubbles? And the housing price would be at the axis of gains and losses. Bokhari and Geltner (2011) suggested that a key factor affecting housing prices is "loss aversion". This is where homeowners are affected by reference points such as the purchase price, and are unable to cope with selling their house at a loss. Perfectly rational sellers and buyers would ignore the initial buying price when assessing the current price, but Paraschiv and Chenavaz (2011) found this is not the case, the reference point of a house purchase has greater weighting than the current market price. DeWeaver and Shannon (2010) suggested a similar approach called "disposition effect", where investors tend to be willing to sell high-return assets, but too unwilling to sell loss-making assets. This may also explain why the housing prices rarely fall (Odean 1994).

This thesis endeavors to measure human behavior under information asymmetry. A new modified model has been developed referencing the Prospect Theory model by Kahneman and Tversky (1979) attempting to quantify the value function in the housing price while the losses and gains refer to the losses and gains of flat size shrinkage with reference to the norm. People naturally prefer to focus on avoiding losses rather than acquiring equivalent gains. People tend to pay less to prevent loss in the purchase of lemon flats, and this is reflected in the value function in terms of housing price. Contrarily, the sellers of the non-lemon flats will demand more money to compensate the "loss feeling" due to the endowment effect. They would rather stick to their own endowment. Accordingly, the slope for the value function of losses is expected to be steeper than that of the gains.

2.8   The Gap

With more and more literature showing that the real estate market is informational inefficient, this thesis attempts to fill the gaps in research from the limited empirical studies conducted on information asymmetry in the real estate market from an NIE perspective.

This study argues that durable lemons as well as adverse selection exist in the market. The sellers will take advantage of the information asymmetry and pocket the overpricing premium by using ostensible underpricing strategy. The level of information asymmetry will reflect in housing price corresponding when the information become public. Nevertheless, institutional changes were evolved to ease the lemon problems as well as soaring property price since 2010. This thesis attempts to unveil the reasons behind the current housing price situation in Hong Kong.

Human behavior is unavoidable in every market. This thesis also contributes as a base for further research on human behavior relating to information asymmetry, and is believed to be the first kind. The following chapters present the empirical models and results to test and answer the research questions.

- End of Chapter 2 -

CHAPTER 3

EXAMINATION THE PRESENCE OF LEMONS AND ADVERSE SELECTION
IN THE HONG KONG REAL ESTATE

3.1   Introduction

Adverse selection problems have been elicited in Akerlof's (1970) seminal paper on
information asymmetry. Based on observations in the used car market in the US, Akerlof
contends that since it is difficult for buyers to discern latent defects, irrespective of
quality, they tend to propose a lower price for a used car with the view of attaining some
level of self-insurance. Thereafter, sellers of high quality used cars, most usually with
higher private valuations of their vehicles, are thus edged out of the market. Akerlof
terms this adverse selection process as the "Lemon Principle", a circumstance that can
eventually lead to the collapse of a market.

Empirical tests evidencing the Lemon Principle at work in markets are limited. Most of
the early studies of lemons (Arrow, 1963; Pauly, 1974; Rothschild and Stiglitz, 1976)
were concerned with the insurance industry; this is where the term "adverse selection"
originated. More recent empirical tests that affirm presence of the Lemon Principle
include Kaena and Stravrunova (2014) in the health insurance market; Cohen &
Siegelman (2010) in the general insurance market; Gobbi and Lotti (2004) in the banking

industry; and Lambert and Wilson (2003) in the wheat market. Chau and Choy (2011) found that in the real estate market, durable lemons are overpriced under different legal institutions governing sales information. Despite the aforementioned investigative studies, it can be ascertained that detailed empirical investigations of the adverse selection problem in real estate markets is far from adequate.

Hypothetically, the key rationale that can be attributed to the insufficiency of empirical tests on the housing market are the exorbitant expenditures involved in conducting research required to obtain the relevant measurements. Hong Kong's housing market is an ideal test bed for the Lemon Principle due to its high transaction volume. Nevertheless, this is based on the premise that measurement costs researching the housing attributes be kept affordable. A carefully chosen element has been focused on in order to carry out an empirical test of adverse selection – unit size. Continuing area shrinkage of newly completed residential units has long been known as a hot issue of debate in Hong Kong's housing market. Prior to the ratification of the Residential Properties (First-hand Sales) Ordinance (SRPO thereafter) that came into effect on 29 April 2013, regulations governing the descriptions of unit size were ambiguous and inadequate. Maximizing usage of the regulation limitations, property developers lawfully built housing projects with smaller useable floor area than was presented in sales brochures. However, for the buyers, the information provided by property developers proved to be a costly concern; the buyers could not precisely calculate the actual usable area their flats would have prior to entering into a sales purchase agreement.

By engaging a building professional to conduct assessments, and by utilizing established consistent procedures; this thesis aims to systematically measure the actual carpet area, as a proxy of actual useable area, of 16,946 selected housing units on the Hong Kong Island. This information has never been released into the public domain by any means, neither in the first-hand pre-sale market nor the second-hand market. This systematic process will enable us to expose the durable lemons in the Hong Kong housing market.

Once the durable lemons have been identified, we can then study whether Akerlof's (1970) adverse selection problem is persistent in the Hong Kong housing market. This study will trace 55,227 completed transactions of the subject premises between 1991 and 2013; then verify whether or not the turnover frequencies of the lemons are statistically higher than that of the non-lemons. This thesis postulates that durable lemons in the Hong Kong housing market can be identified by measuring the flat size shrinkage rates. Since previously there was no legitimate and standardized measurement method of area prior to the enactment of the Residential Properties (First-hand Sales) Ordinance, the public had always been confused and misled. Understanding key terminology used in the practice of area measurement, we can better understand the methodology implemented to do so in Hong Kong.

This chapter outlines the terminology of area measurement in Hong Kong, the methodology and data sources to conduct the research, a discourse on the empirical findings, and references to the laws governing the scales of properties in Hong Kong.

3.2   Demystify of area measurement in Hong Kong

Prior to the enactment of the Residential Properties (First-hand Sales) Ordinance in April 2013; legal regulation regarding flat size descriptions for first hand sales only contained Gross Floor Area (GFA) and Saleable Area (SA); there was no other detailed information buyers could gain access to from sales brochures. Ironically, the term "Gross Floor Area (GFA)" could be found from a variety of different information sources but with very different definitions. This is the reason buyers often became confused and misled. As a professional building surveyor working in one of the largest developers in Hong Kong, relevant terminology is clearly explained as below,

3.2.1   Gross Floor Area (GFA) stated in sales brochures

The Gross Floor Area (GFA) as stated in sales brochures comprises of the usable floor area of a unit and a share of all the 'common areas' within the entire housing development, including common corridors, lift lobbies, clubhouses, and so on. Therefore, the total GFA of all units embraces every single inch of buildable area within a housing development. However, since there is no official and consistent definition of GFA in the regulations governing sales of first-hand premises, the information displayed on sales brochures is by and large self-regulated. The GFA indicative calculations help to figure out the net size of units for sales purposes. The cost per unit floor area could be worked out and provided to prospective buyers for reference.

Akerlof (1970) suggests that the development of a good reputation is a self-evolving institution used to tackle the lemon problem. The influence of reputation is clearly evidenced by the housing market in Hong Kong; the reputable developers plan and produce units with higher efficiency ratios than their competitors. These developers tend to command higher premiums. Through many techniques, lowering the GFA figures in sales brochures can give the impression of higher efficiency ratios. After the enactment of the SRPO in 2013, the GFA can no longer be displayed in sales brochures. The enactment of the ordinance was a measure to prevent misleading information being shown in sales brochures.

3.2.2   Gross Floor Area (GFA) stated in the Buildings Ordinance (Cap. 123)

The purpose of this GFA is for the Buildings Department to control the building bulk and ensure the health and safety of buildings. This GFA is never used in any sales brochures or for flat marketing purposes.

In accordance to Buildings Planning Regulation (Cap. 123F), 23(3)(a) under the Buildings Ordinance (Cap. 123), Gross Floor Area refers to

"the area contained within the external walls of the building measured at each floor level (including any floor below the level of the ground), together with the area of each balcony in the building, which shall be calculated from the overall dimensions of the balcony (including the thickness of the sides thereof), and the thickness of the external walls of the building."

This GFA is further sub-classified into disregarded GFA, exempted GFA and non-accountable GFA. These kinds of GFAs serve as one of the contributions to the flat size shrinkage, for instance, the balconies, utilities platforms, bay windows, and so on. Details could be referred to in the Buildings Ordinance.

3.2.3   Gross Floor Area (GFA) stated in the lease

All lands in Hong Kong are leasehold, except the St. John's Cathedral, the government is the sole owner of all the land in Hong Kong.

A lease is a contract between the government and the lessee. The GFA stated in the lease is the maximum area that can be built at the site. The government uses this GFA to calculate the valuation of land prices and premiums.

Again, this GFA is never used in sales brochures or for marketing purposes.

3.2.4   Saleable Area (SA)

Contrarily, saleable area (SA) has a much more clear and concise definition than GFA. The standardizing of a definition for SA is a result of a joint effort between the government, professional bodies and the Consumer Council. It excludes the common areas of residential developments that are the shared areas by each unit in the GFA.

Prior to the enactment of SRPO, saleable area did not have statutory definition. The guided definition is as follows,

"The floors are exclusively allocated to the unit including balconies, utility platforms and other similar features but excluding common areas such as stairs, lift shafts, pipe ducts, lobbies and communal toilets. It is measured to the exterior face of the external walls and walls on to common parts or the center of party walls. Open yards, bay windows, air-conditioning plant rooms, flower boxes, open terraces, attached roofs and carports are excluded."

Under The Residential Properties (First-hand Sales) Ordinance (Cap. 621) after April 2013, the saleable area became the only legitimate unit to describe a unit size. The definition is as below,

"Saleable area means the floor area of the residential property, which includes the floor area of (i) a balcony, (ii) a utility platform and (iii) a verandah so long as it forms part of the residential property. However, it excludes an air-conditioning plant room, a bay window, a cockloft, a flat roof, a garden, a parking space, a roof, a stairhood, a terrace or a yard even it forms part of the residential property."

It is noted that the saleable area definition is the same before and after the Ordinance came into effect. The only difference is that it was being used on a voluntary basis to follow the guided definition prior to SRPO came into effect. Hence, a variance in the definition of SA existed among different developers.

SA has long been construed as the exclusive useable floor area of a unit; until new building methods and layouts were deployed in recent decades and rendered some units significantly smaller than others, despite comprising of an identical SA. The "vanishing" areas include the exterior and internal walls, and the extensive use of balconies, utility platforms for air-conditioners, electrical and other utility installations. Although SRPO has refined the definition of SA by segregating various components, including balcony

and utility platforms to be displayed in the sales brochures, the reality is that the actual useable floor areas have not been truly reflected by the SA proclaimed.

3.2.5   Carpet Area

Information asymmetry often arises in Hong Kong's first hand property market because the units sold are incomplete. It is impossible for prospective buyers to inspect the units; hence they have no choice but to rely on the information provided by the developers and agents. The developers possess a great deal more information, giving them advantages over the buyers. Although the developers provide GFA and SA information for legal compliance, the exact actual useable floor areas are never made known to buyers in the first hand market. Thus, this study includes focus on the measurement of 'carpet area' to reflect the actual usable floor area of the units in the subject development projects.

For the purpose of this study, "carpet area" refers to the net effective covered area within any given unit, exclusively enjoyed by the occupier, excluding balconies, utilities platforms, bay windows, air conditioning platforms and other similar fixtures. The carpet area is to be measured from the internal face of the unit, excluding the columns, load-bearing walls, and internal partitions. This is the net effective usable space that an occupier can actually enjoy.

There is no public information explicitly revealing the actual useable floor areas of the units in developments in Hong Kong, neither from statutory bodies nor developers. Especially for this study, a building professional was hired to measure the carpet areas of the targeted developments under my supervision.

3.3   Terminology of Efficiency

3.3.1   Sales Efficiency

Prior to 2013, as both GFA and SA figures were displayed in sales brochures, the public would commonly refer to the efficiency of the floor area as the 'sales efficiency', so that

*Sales Efficiency = (Saleable Area / GFA)*100%*

The sales efficiency typically ranges from 70% to 80% for mass housing developments in Hong Kong.

3.3.2 Carpet Efficiency

In this study, by measuring the carpet area for each unit, the efficiency as compared to GFA is redefined as carpet efficiency:

Carpet Efficiency = (Carpet Area/GFA)*100%

3.3.3 Net Carpet Efficiency

The efficiency as compared to Saleable Area is redefined as net carpet efficiency:

Net Carpet Efficiency = (Carpet Area/Saleable Area)*100%

3.3.4   Flat Shrinkage Ratio

Flat Shrinkage Ratio is the key attribute in this study. The GFA in sales brochures is the information that the public can obtain, and it is the common terminology people use to interpret the size of a flat prior to 2013. The GFA flat shrinkage ratio is defined as,

GFA Shrinkage Ratio = [(GFA – Carpet Area) /GFA]*100%

3.4   Illustration of the vanished area

For a better understanding of the vanished area, Figure 2 and Figure 3 display a comparatively low shrinkage flat and a high shrinkage flat of a similar GFA.

Figure 2 : Floor Plan of Unit A (comparatively low shrinkage ratio)
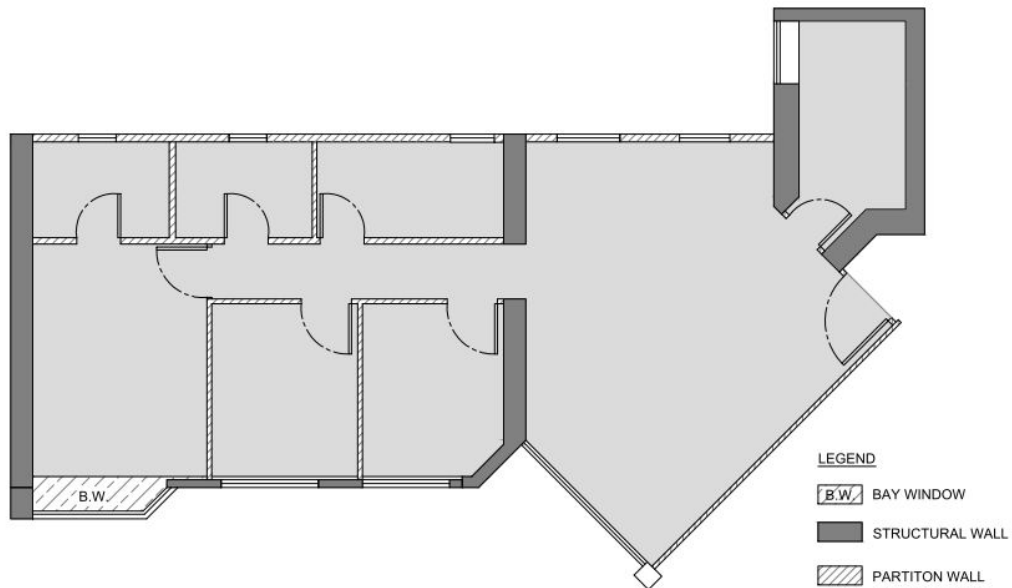
The GFA of the unit in Figure 2, Unit A is 1,060 s.f., while the saleable area is 878 s.f., respectively. It comprises of i) the exclusive usable floor area (i.e. carpet area in grey color) of 760 s.f., ii) the structural walls and internal partition walls of 106 s.f., iii) the bay windows of 12 s.f.

Items ii) and iii) take up an area of 118 s.f. in total. By adding the common area allocated to the unit of 182 s.f., the total vanished area is approximately 300 s.f. The GFA shrinkage ratio of Unit A is about 28%.

Figure 3: Floor Plan of Unit B (comparatively high shrinkage ratio)

LEGEND

BAL.	: BALCONY
U.P.	: UTILITY PLATFORM
B.W.	: BAY WINDOW
███	: STRUCTURAL WALL
▨	: PARTITION WALL

Sources : Buildings Department and the authors

In comparison, the GFA of the unit in Figure 3, Unit B, is 1,030 s.f. and the saleable area is 750 s.f. It comprises of i) the exclusive usable floor area (i.e. carpet area in grey color) of 530 s.f., ii) the structural walls and internal partition walls of 130 s.f., iii) the bay windows of 45 s.f.,, iv) balcony of 25 s.f., and v) the utility platform of 20 s.f.. Items ii)

to v) take up an area of 220 s.f. in total. By adding the common area allocated to the unit of 280 s.f., the total vanished area is approximately 500 s.f. The GFA shrinkage ratio of Unit B is about 49%.

By comparing the vanished areas for these two flats with a similar GFA, i.e. 300 s.f., for Unit A and 500 s.f., for Unit B, the difference is approximately 200 s.f., respectively. The current market price for these types of flats is about HK$16,000 p.s.f. (US$ 2,051 p.s.f.). The difference of the GFA shrinkage between these two flats is 21% (i.e. 49% - 28%). Hypothetically, it accounts for a loss of approximately HK$3.2 million (about US$410,000) for the buyer who chooses to purchase Unit B, as opposed to a buyer who chooses to purchase Unit A, due to the lack of area shrinkage information available to them.

3.5   Methodology

3.5.1   The Presence of Lemon Market

To demonstrate whether or not the Hong Kong real estate market is a lemon market in terms of flat size shrinkage; it is important that this study paves the way to continuing research propositions in this respect.

Research Hypothesis 1 (H$_1$):

"Durable Lemons exist in the Hong Kong Real Estate Market due to the asymmetric information of flat size"

By understanding and applying the aforementioned terminology definitions, the flat shrinkage ratios in units of the subject mass residential developments can be calculated; the results will identify durable lemons in the market. The flat shrinkage ratios will indicate the existence of the lemon market owing to asymmetric information of flat size. The carpet area is undisclosed information until an inspection of any given flat is possible in the second hand market. In ascertaining the median of the flat shrinkage ratios, a general acceptance level of those ratios can be deduced. This will be referred to as the norm. Accordingly, flat shrinkage ratios higher than the norm will be identified as lemons.

Hence, if there is a range of flat size shrinkage ratios being detected due to the asymmetric information of flat size, then durable lemons exist in the Hong Kong Real Estate Market.

3.5.2 Presence of Adverse Selection

Research Hypothesis 2 (H_2):

"Adverse selection exists in the Hong Kong Real Estate Market due to the asymmetric information of flat size."

To test the hypothesis that adverse selection exists in the market, the turnover rates of the subject housing units between 1991 and 2013 were calculated by splitting them into tenth percentiles; for example: 10th, 20th, 30th and so on up to the 100th percentile of calculated shrinkage ratios.

If adverse selection is present, then the turnover rate for the lemon flats will be higher than that of the non-lemons. The Lemon Principle (Akerlof, 1970) suggests that since buyers can not easily identify whether a used car is good or bad, they tend to be attracted to lower priced used cars, thus driving out sellers of high quality used cars. This kind of behavior leads to a phenomenon called adverse selection process, which means most sellers tend to present asymmetric information to sell lemons, and this could eventually lead to market collapse.

After the shrinkage ratios of the lemons in this market were identified; it was hypothesized that the turnover rate of such flats would be higher than that of the non-lemon units, if there is a presence of adverse selection. When we classify the units as lemons, this is with reference to the ones with shrinkage ratios of 50 percentiles or above. Non-lemons, on the other hand, refer to the units anywhere below 50 percentiles. A trending effect by the more informed sellers is the preference to sell lemons, which leads to market collapse over time. The higher turnover rate of lemons indicates dominance over non-lemons in the market. Therefore, it can be observed that adverse selection is ongoing in this market.

In order to show that the average turnover rates are statistically different between groups, an ANOVA Test was carried out. The null hypothesis carries the following form:

$$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8 = \mu_9 = \mu_{10}$$

Whereas, μ_1 is the mean of the 10th percentile, μ_2 is the mean of the 20th percentile, so on and so forth.

3.6   Data Sources

One of the main focuses of this study is to examine whether adverse selection exists in the Hong Kong residential housing market. A total of 13 mass housing developments[2] located on Hong Kong Island were selected for this study. The selection criteria of the housing estates are described below.

Firstly, it is pertinent that the developments are large housing estates that contain a large number of similar flats; this maximizes efficiencies in collecting a greater volume of data for testing to process a more detailed empirical and analytical result. Single block residential buildings would not yield enough transaction data to draw a representative conclusion. Secondly, the housing estates must fall into the Rating and Valuation Department's Private Domestic Price Indices for Popular Development since housing transactions in such developments are well documented for statistical analyses. Thirdly, only housing estates with their first assignment of deed titles completed after 1991 were selected. This is because housing transaction records became digitalized only after 1991. This allows for comparative study of the overpricing premiums in the first and second hand markets. Fourthly, the buildings must have been constructed for 15 years or more, a fairly lengthy time span, so that a sufficient number of second-hand market transactions data is available. Fifthly, the geographical proximity of the mass developments on Hong

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[2] The 13 mass housing developments include The Orchards, Grand Promenade, The Leighton Hill, Robinson Place, Illumination Terrance, Island Place, Island Resort, The Belcher's, Dynasty Court, Redhill Peninsula, South Horizons, Les Saisons and Bel-air on the Peak

Kong Island was selected to minimize extremes in demographics. Hong Kong Island is one of the three key geographic segments of the property market in Hong Kong. Since the property industry developers of residential housing projects are the same for the three main segments, this study opens a gateway for further research on the shrinkage ratio problem in the Hong Kong real estate market and a platform relating to the evolution of current economic doctrines.

While the analytical framework of this study can be replicated on the other two geographical segments in Hong Kong, there is no compelling reason to support the notion that they would possess anything fundamentally different than the subject properties selected on Hong Kong Island. As of April 2017 (Land Registry, 2017), about 25% of residential transactions in Hong Kong took place on the Hong Kong Island, which amounted to about one-third of the total transaction value of the entire market. Therefore, it is reasonable to say that the empirical results of the selected housing projects on Hong Kong Island should portray a quite accurate representation as such.

Transaction records for this study were obtained from a comprehensive and well-organized database known as the Economic Property Research Center (EPRC), which are extracted from the Land Registry Records. Many academic institutions have purchased and adopted this system for property research in Hong Kong. The transaction records also include plenty of information, for example the purchase dates, dates of issuance of occupation permits, the addresses of properties, the floor level, and so on. Owing to the

comprehensive nature and legitimacy of the information in the EPRC, it has become a database of high reliability. To enhance the accuracy of this study, only transaction data from the Agreement of Sales and Purchases was used.

In determining the efficiency ratios in this study, GFA and SA figures were obtained from the EPRC while the carpet areas were measured by trained personnel under professional supervision. Floor plans used were the actual record plans, purchased from the Buildings Department. Carpet areas of 16,946 flats were measured in this study.

The periods selected for this research are the years between 1991 and 2013. This is because the SRPO was enacted in April 2013 and it is a measure to ease information asymmetry. After the elimination of outliners, the total number of transactions collected for residential flats over the period is 55,227.

3.7   The Empirical Test

3.7.1   Identifying and Presence of Lemons

Following the terminology and the methodology, the various efficiency and flat shrinkage

ratios calculated for the 16,946 flats in the selected developments are tabularized in Table

1 below:

Table 1 – Various forms of floor area efficiency ratios

	Sales Efficiency*	Carpet Efficiency	Net Carpet Efficiency	GFA Flat Shrinkage
	SA/GFA	Carpet/GFA	Carpet/SA	GFA- Carpet/GFA
Median (%)	79%	67%	85%	33%
Range (%)	72% - 84%	51% - 77%	69% - 98%	23% - 49%

*Only presented in sales brochures before April 2013

Before the enactment of the SRPO, the sales efficiency ratio, as measured by SA/GFA,

was the dominating factor influencing public perception about the usability of floor area

within a unit. The ratios ranged from 72% to 84%, whereas the median was 79%. We

then calculated the carpet efficiency ratio by using the carpet areas that were measured.

Table 1 illustrates that the actual usability of the units is substantially lower than

originally perceived by buyers; this is evidenced by the reduction of the median ratio to

67% and a range skewed towards the lower end from 51% to 77%.

In Table 1, the column Net Carpet Efficiency attempts to accurately illustrate how much actual usable floor area is in the SA. The figures range from 69% to 98%. Therefore it is obvious to see that varying levels of actual usable floor area "vanishes" for, inter alia, the thickness of walls, utility platforms and other usage; this ranges from 2% to 31% (i.e. 1 – Net Carpet Efficiency).

The last column in Table 1 shows the GFA Flat Shrinkage Ratios, the figures range from 23% to 49% respectively. These ratios will be utilized as this study proceeds with the analysis of overpricing premiums in subsequent chapters; prior to 2013, the GFA was the preeminent term by which people interpreted flat sizes. However, this study has adopted GFA Flat Shrinkage as the indicator to interpreting flat sizes rather than SA Flat Shrinkage. This study postulates that the higher the shrinkage ratio of a flat, the more likely it can be deemed a lemon.

3.7.2   Presence of Adverse Selection

After having determined the units that could be termed as lemons, the study proceeded with the adverse selection test. The 16,946 units were divided into ten 10th percentiles according to their flat shrinkage ratios. It was hypothesized that if an adverse selection process occurs in the market, then the turnover rate for the units with lower flat shrinkage

ratios (i.e. larger carpet area with respect to GFA) would be lower, and vice versa. Hence, the null hypothesis is that no statistically significant differences exist in terms of turnover rates between each group of units. For the purpose of this study, turnover rate is defined as the total number of sales transactions within the study period, which is from 1991 to 2013, divided by the total number of flats in the corresponding 10th percentile.

Table 2 presents the turnover rates of units that fall between the 10th and 50th percentiles. These are the flats with relatively smaller flat shrinkage ratios. The average turnover rate shows that on average, each flat has changed hands 2.85 times between 1991 and 2013.

Table 2 – Turnover Rates of Flats from 10th to 50th Percentile

Percentile	Flat Shrinkage % for the Percentile	Ranges for the Flat Shrinkage Ratio	No. of flats involved	No. of Transactions	Turnover Rate
10th	27.82%	<27.82%	1751	5003	2.86
20th	29.03%	≥27.82% and <29.03%	1647	5315	3.23
30th	30.48%	≥29.03% and <30.48%	1727	4178	2.42
40th	31.43%	≥30.48% and <31.43%	1684	4993	2.96
50th	32.75%	≥31.43% and <32.75%	1667	4708	2.82

*Flat Shrinkage Ratio refers to [(GFA-Carpet Area)/GFA]x100%

Comparatively, Table 3 presents the average turnover rates of units with relatively higher flat shrinkage ratios; these units are more likely to be durable lemons in the market. The

80

average turnover rate suggests that on average, each flat was resold 3.67 times from 1991 to 2013, which is considerably higher than that of the average figures in Table 2.

Table 3 – Turnover Rates of Flats from 60th to 100th Percentile

Percentile	Flat Shrinkage %* for the Percentile	Ranges for the Flat Shrinkage Ratio	No. of flats involved	No. of Transactions	Turnover Rate
60th	34.60%	≥32.75% and <34.60%	1678	5273	3.14
70th	36.51%	≥34.60% and <36.51%	1683	6190	3.68
80th	38.05%	≥36.51% and <38.05%	1719	6204	3.61
90th	40.30%	≥38.05% and <40.30%	1653	6172	3.73
100th	48.64%	≥40.30% and <48.64%	1737	7191	4.14

*Flat Shrinkage Ratio refers to [(GFA-Carpet Area)/GFA]x100%

The median shrinkage ratio is 33%, which serves as an implicit benchmark differentiating lemons and non-lemons in Hong Kong's housing market.

In order to show that the average turnover rates are statistically different between groups, an ANOVA Test was carried out. The null hypothesis carries the following form:

$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7 = \mu_8 = \mu_9 = \mu_{10}$

Whereas, μ_1 is the mean of the 10th percentile, μ_2 is the mean of the 20th percentile, so on and so forth.

Table 4 – Result of ANOVA Test

SUMMARY

Groups	Count	Sum	Average	Variance
10 Percentile	5003	134450	26.87387	0.47718
20 Percentile	5315	150658.8	28.34596	0.149812
30 Percentile	4178	124219	29.73168	0.189977
40 Percentile	4993	154161	30.87542	0.072251
50 Percentile	4708	151207	32.11703	0.148268
60 Percentile	5273	177800.5	33.71904	0.356896
70 Percentile	6190	220080.1	35.55414	0.340692
80 Percentile	6204	232068.7	37.40631	0.235719
90 Percentile	6172	242455.3	39.2831	0.533035
100 Percentile	7191	298258.7	41.47667	1.976409

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	122071	9	136230.1	268774.8	0	1.880055
Within Groups	27987.07	55217	0.506856			
Total	1254058	55226				

Table 4 indicates that there is a significant variation between groups. This study provides new evidence exhibiting that adverse selection process is indeed occurring in the Hong Kong housing market. The results appear to prove the existence of a progressive increase in the sales turnover rates that vary directly with the increase in flat size shrinkage ratios. Examining the 10th and 100th percentiles more closely, the empirical results suggest that in general, lemons tend to be resold more frequently than non-lemons. A flat with an approximate 49% shrinkage rate (lemons) was resold nearly 1.7 times more than a flat with less than 30% shrinkage rate (non-lemons) within the study period.

3.8   Summary

This chapter has empirically examined the presence of the lemon market and the adverse selection in the Hong Kong real estate market through the aspect of flat shrinkage. This empirical analysis contributes useful data to help fill the gap in the information asymmetry research field and unveils the logic behind the call for a need to establish institutional protocol in dealing with the alleviation of lemon problems.

Further to the supportive empirical results to the Lemon Principle in this chapter, whether sellers capture overpricing premium by taking advantage of information asymmetry is another question this thesis attempt to answer in the following chapter.

-    End of Chapter 3 -

CHAPTER 4 MEASURING OVERPRICING PREMIUM

4.1   Introduction

After evidencing the existence of Lemon Market and adverse selection, this chapter attempts to further investigate and measure the overpricing premium (Chau and Choy 2011) commanded by the housing developers in the primary market, where most of the units are sold under presale arrangement. A deeper look will also be taken into those emerging as a result of asymmetrical information and the flat size shrinkage phenomenon in the second hand market. In the Hong Kong presale market, transactions basically follow the rules of *caveat venditor*, which refers to "let the seller beware". It means the sellers are borne with legal liability for the information disclosed to buyers and for defects sold. However, the legal doctrine did not explicitly express the type of information required to be released until the enactment of the Residential Properties (First-hand Sales) Ordinance that came into effect on 29 April 2013. As a result, there was an array of information released for different developments, many of which were ambiguous. Flat size description was a prominent example of such ambiguity; there was no official or legitimate definition to refer to. Moreover, sellers had the option to stay silent in order to avoid divulging negative details, since the information might contribute disadvantages to the selling price. Sales brochures were the only source of information that potential buyers could refer to. That meant that although sellers were liable for the information released, they could at their discretion to choose the type and extent of

information to be released. These acts did not constitute legal misrepresentation or fraud, which are governed by other statutes and legal principles, but were maximizing usage of the regulation limitations by playing under the rules.

On the contrary, in the second hand market, the traditional common law doctrine governs the sales. It is called *caveat emptor*, meaning " let the buyer beware". Sellers have no liability in regards to products sold and are not obligated to disclose information. Therefore, under this principle, potential buyers have to investigate and scrutinize product information at their own accord and if they decide on a purchase, it is at their own risk as products are sold in an "as is" status.

Understanding some background information of Hong Kong property market is useful to this research.

Hong Kong is a small city with a total land area of about 1,100 square kilometers. However, due to the mountainous topology, only 25% of the land was developed for housing a huge population of eight million. The government owns all the land in Hong Kong. Historically, all property is under a leasehold system instead of freehold. Nevertheless, there is one exception, which is the St. John's Cathedral located in Central, Hong Kong. Therefore, the role of the government on the land supply decisions is crucial, and somewhat restrictive in nature. Together with the institutions that regulate the

market, these dominate the market efficiency, likewise the housing prices and the housing affordability to residents.

The Rating and Valuation Department in Hong Kong provided the private domestic index data from 1991 to 2016. The graph below illustrates that the price index increases during the skyrocketing market from 2003, and the price index in 2015 already exceeds the one from 1997. In the provisional figure for 2016, there appear to be signs of the beginning of a decrease, even though the index is still at a soaring high level.
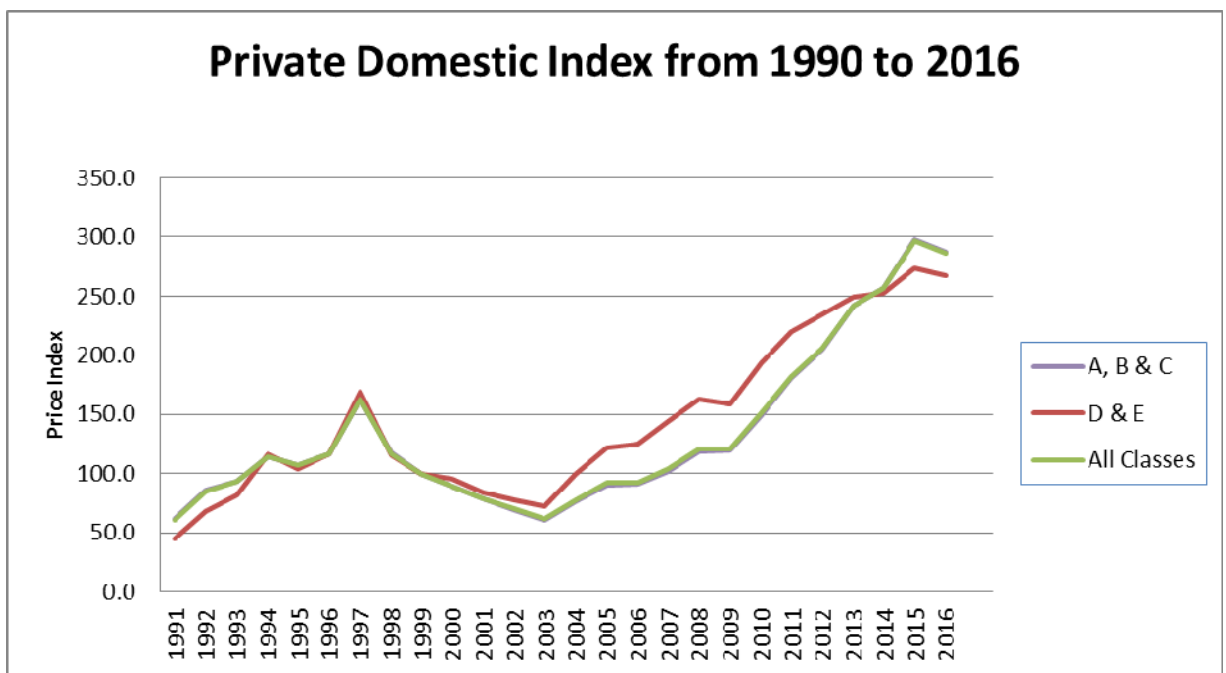
Figure 4 Price Index from 1991 to 2016

Sources: Hong Kong Rating and Valuation Department

On top of the skyrocketing property prices together with the high level of housing unaffordability, every single square foot of property matters in Hong Kong. Although information asymmetry on the flat shrinkage problem exists and raises a lot of public concerns, the property prices are still increasing rapidly.

As previously mentioned, this study is focused on the lawful flat size shrinkage in Hong Kong. Apart from the empirically proven presence of information asymmetry and adverse selection in Chapter 3; this chapter investigates whether housing developers have taken advantage of information asymmetry in the primary market. It measures the magnitude of the overpricing premiums that were acquired by developers in the presale market (if any) and hence their possible respective underlying pricing strategy. How will prices be reflected in the second hand market for properties with the same GFA but different carpet areas when information asymmetry no longer exists in this market? Table 5 below shows a simple case study to illustrate the situation,

Table 5 – Case Study on Price Variance with same GFA by different Carpet Area

Flat	Floor	GFA (a)	SA (b)	Sales Efficiency (b)/(a)	Presale Unit Rate (c)	Presale Price* (d) = (c) x (a)
A	40/F	684 s.f	519 s.f.	76%	$3200/s.f.	$2.19M
B	41/F	684 s.f.	525 s.f.	77%	$3500/s.f.	$2.39M
		Carpet Area (e)	Carpet Efficiency (e)/(a)	Second Hand Unit Rate (f)	Second Hand Price* (g) = (f)x(a)	Price Variance (h) = (g) – (d)
A		448 s.f.	66%	$2091/s.f	$1.43M	(-$0.76M) (-35%)
B		381 s.f.	56%	$2149/s.f.	$1.47M	(-$0.92M) (-39%)

*The price has been deflated in accordance to the Price Index from the Rating and Valuation Department

Sources : Hong Kong Land Registry

Table 5 shows that both Flat A and Flat B by different developers have the same GFA of 684 s.f., but with a different carpet area. Flat A, although it achieves a lower sales efficiency, as stated in the developer's sales brochure, it actually possesses higher carpet efficiency. Notably, the carpet area and the carpet efficiency information are not available

to buyers in the market, not even in the second hand market. Nevertheless, potential buyers are legitimately allowed to inspect a given flat in the second hand market, and are able to find out useful decision making information.

After taking into account the market fluctuation from the price index issued by the Rating and Valuation Department, the real prices for the presale and secondary market are reflected in Table 5. During the presale stage, another developer marketed a higher presale unit rate for Flat B. Therefore, the presale price for Flat B is higher than Flat A by $0.2M. In the second hand market, where potential buyers could physically inspect the flats, the carpet efficiency for each flat was found to be 66% and 56% respectively. Flat B has approximately 10% less actual carpet area in comparison to Flat A. Regardless of the second hand price for Flat B being higher than Flat A by $0.05M, the actual price variance for Flat A reduced by 35% while Flat B reduced by 39% in comparison to the presale price. This construes that Flat B, with a higher flat shrinkage ratio, displays a higher degree of price reduction in the second hand market, while the flat was actually marketed higher prices in the presale market. In other words, developer acquired an overpricing premium on the flat with the higher flat shrinkage ratio.

This principally ratifies the assumption: The developer acquires overpricing premiums by taking advantage of information asymmetry in particular regards to flat size shrinkage; and this overpricing reaction carries on into second hand market. Consequently, the slick

developers benefit much greater financially, while the property buyers end up paying more than they ought to for a flat with a high shrinkage ratio.

Hence, the Hypotheses for this chapter are formulated as below,

A)   *Research Hypothesis 3 (H₃) :*

"In presale market, it is hypothesized that the pricing strategy for the seller tends to underprice the lemons in order to seduce buyers to overlook the adverse attributes and purchase the lemons, but in fact the flats are being overpriced taking advantage of the information asymmetry in terms of flat size shrinkage."

If the price reduction for the flats during presale market is less than the reduction in the second hand market due to the flat size shrinkage, then the developers have overpriced the inferior flats through the ostensible under-pricing strategy. In this study, ostensible underpricing strategy means an inferior product is perceived to be underpriced but in fact overpriced. The ostensible underpricing premium given to the first hand buyers had induced them to flip the lemons into the secondary market, not the second hand market where flats could be inspected physically, but before the adverse information became public. In other words, the developer can pocket the private information taking advantage

of the information asymmetry in the first place and discharge themselves from the doctrine of *caveat venditor* regime.

To test the hypothesis, the independent variables of flat size shrinkage no matter in presale market or second hand market should carry a negative coefficient in the hedonic price model. It illustrates the negative relation between flat size shrinkage and the change in housing price. The negative coefficient of flat size shrinkage in presale market means the developers have offered price reductions for the inferior attribute of flat size shrinkage in the presale market already to seduce potential buyers to overlook and purchase the flats. If the negative coefficient of flat size shrinkage in presale market is smaller than that in the second hand market, it means the developers have overpriced the inferior products by taking advantage of the information asymmetry.

B)   *Research Hypothesis 4 (H$_4$) :*

"*It is hypothesised that there is an additional price reduction in the second hand market for the durable lemons, i.e. flats with high flat size shrinkage*"

When the information becomes public and information asymmetry no longer exists in the second hand market, the market value of the product will be revealed. If durable lemons exist, there will be an additional price reduction in second hand market when the

information becomes public. The Lemon Principle suggested that buyers tend to pay less for a used car, and the informed sellers will only sell off the lemons. Hence, it is hypothesised that the property price for the lemon flats are lower than the non-lemons.

To test the hypothesis, if the coefficient for the flat size shrinkage higher than the norm carries a negative sign in the hedonic price model, it means there will be additional property price reduction for the lemon flats.

C)   *Research Hypothesis 5 (H_5):*

"*The overpricing pricing strategies by the Developers are different for each class of properties in terms of difference in unit size. It is hypothesised that the overpricing is greater for the small size units.*"

Due to the severe imbalance supply and demand housing market and the soaring property price in Hong Kong, people are eager to purchase small size units of small lump sum in the private residential market in order to fulfil the accommodation purpose. This allows developers to exercise high monopoly power and to overprice in greater extent over the small size units. If the price reduction in the second hand market is the largest for the Class A properties when comparing it with the presale market, then the overpricing pricing strategies by the developers (if any) are greater for small size units and the

developers capture the highest overpricing premium for the small size units. Class A properties refer to the smallest unit size group in accordance to the Rating and Valuation Department.

To test the hypothesis, a hedonic price model to test the change in property price in terms of different class of properties is formulated. By comparing the coefficients of the flat size shrinkage for different class of properties between presale market and second hand market, the overpricing premium can be identified (if any).

There are two different models applied in the structure of housing prices. Firstly, the monocentric model which states housing prices are directly related to the proximity to an activity center, workplace or area of employment. However, residential property is a multi-dimensional commodity that consists of a group of utility-bearing attributes; it is for this reason the monocentric model is more often used in the land market rather than the housing market. The second method is called the hedonic price model formulated by Rosen (1974). The hedonic model for housing prices works by identifying price factors according to the concept that price is determined by a package of inherent characteristics of the property in question (Pollakowski 1982). Thus, similar size and quality flats may vary greatly in price due to differing internal and external factors. For example, the price of a flat is determined by internal factors such as size, appearance, high or low floor, condition, year of construction, plus external factors such as the neighborhood location,

proximity to schools, supermarkets, MTR stations, and value of other flats in the building as well as surrounding buildings.

The same set of data collected to analyze the lemon market and adverse selection in Chapter 3 can also be applied in a hedonic price analysis to calculate implicit housing prices and provide an account on the level of the lemons overpricing premiums imposed by developer. Just to recap, the actual carpet areas 16,946 were measured and data on 55,227 transactions of the subject premises between 1991 and 2013 were collected on the subject property developments.

4.2   Methodology

4.2.1   Hedonic Price Model

Hedonic price modelling is a widely used technique to explain the value of different types of individual property, research demonstrated that this method convey a meaningful way to gain insight into the value of property. (Beekmans, J., Beckers, P., Krabben, E. and Martens, K. 2014) Since properties are multidimensional commodities subject to durability, structural inflexibility and spatial fixity (Chau et al., 2001; So et al., 1996), the housing attributes can be classified into three categories: locational attributes (L), structural attributes (S) and neighborhood attributes (N). These attributes can be

evaluated as either quantitative or qualitative attributes (Goodman, 1989; Williams, 1991). The market prices (P) of the property can, therefore, be expressed as:

$$P = f (L, S, N)$$

The most important step in estimating housing prices is to specify the use of the hedonic price model. The multiple linear regressions are widely used in previous studies and the ordinary least square (OLS) estimator is applied for best fitting which estimates the sum of squared residuals on the premise that the residuals are normally distributed.

Numerous studies about housing price models have focused on the different directions; particular attention should be paid to locational, structural and neighborhood attributes of property in real estate studies. These three attributes are elaborated as follows,

4.2.1.1 Location attributes (L)

This attribute is essential in housing studies as it affects every transaction price. Relevant locational attributes are quantified through indirect measures such as socio-economic class, racial composition, aesthetic attributes, pollution levels and proximity to local amenities (Dubin & Sung, 1990). The accessibility, especially to the Central Business

District (CBD), influences housing prices to some degree (McMillan, Jarmin, & Thorsnes, 1992). Transport accessibility is frequently measured by time, cost of travel, convenience and the availability of different transport modes (Adair, McGreal, Smyth, Cooper, & Ryley, 2000). Nevertheless, the accessibility to the CBD is not the only noteworthy point. Good public transportation also has positive impact on housing prices. According to a 1996 study in Hong Kong on transport accessibility, surveys of distances from properties to nearby public transport stations were conducted; in general, Hong Kong property buyers are highly dependent on public transportation in their residential areas. Therefore, Hong Kong property buyers are normally willing to pay more for houses located near public transport stations.

Another point associated with the location of a dwelling site is the view from the house (Benson, Hansen, Schwartz, & Smersh, 1998). Various studies reveal that good views—whether sea views, mountain views or valley views—generally have a positive influence on housing prices (Cassel & Mendelsohn, 1985; Plattner & Campbell, 1978).

In this study, all subject property developments are located on Hong Kong Island. The direction the flats are facing and their proximity to the MTR and public transportation are also included in the analysis.

4.2.1.2 Structural Attributes (S)

Many studies have indicated that the flat itself, number of rooms, size, floor level and the view had positive influence on the housing price (Case and Quigley 1991, Harrison 1978).

Age of the housing is another important factor which is often negatively associated with housing prices (Clark & Herrin, 2000). Older houses incur high costs for maintenance and repair. Furthermore, older houses often contain some potential health and safety hazards that may have a negative impact on residents. These defects surely detract from the value of house.

Higher floor levels are often positively related with housing prices, since the view and air quality of the flats is often more favorable.

This study includes discourse on traditional structure attributes such as size, floor and age of properties.

4.2.1.3 Neighborhood Attributes (N)

Neighborhood attributes refers to the quality of the social environment surrounding any given property; previous studies have revealed that high-income households are willing to pay more for neighborhood homogeneity (Schnare and Struyk 1976; Goodman and Thibodeau 1998). On that account, housing prices are closely associated with income levels. Another crucial attribute is the regional crime rate in the community where the property is located. A study of Boston housing prices (Harrison and Rubinfeld 1978) found that the crime rate is insignificant. To the contrary, the study from (Swift 2005) revealed that crime rates have a negative effect on house prices.

Since all subject premises in this study are located on Hong Kong Island in Hong Kong, this aspect of neighborhood attributes were not included in the analysis.

4.2.1.4 Special Attributes

The aim of this study is to investigate the relationship between housing prices and flat size shrinkage due to information asymmetry. Residential properties could be divided into five major categories in accordance with the Rating and Valuation Department in

Hong Kong. Flat shrinkage ratios for different flat sizes may in fact affect housing prices in varying degrees. Flat shrinkage of different classes of properties are documented and analyzed in this study. Table 6 shows the five classes of property size as classified by the Rating and Valuation Department.

Table 6 Five classes of property size classified by Rating and Valuation Department

Classes	Saleable Floor Area (in sq.ft)
Class A	Below 430.5
Class B	430.5 to 753.4
Class C	753.4 to 1076.4
Class D	1076.4 to 1722.2
Class E	1722.2 Above

Sources : The Rating and Valuation Department in Hong Kong

It is expected that the higher the flat size shrinkage, then the higher the negative effect will be on housing prices. Assumingly, this negative effect on housing prices for Class A properties, with sizes below 430.5 s.f., would be evident to a greater extent than on the other property classes. This is most likely due to the fact that buyers of Class A properties are more sensitive to the area shrinkage of such small sized flats, in comparison to buyers or other classes of properties which are larger, and for the most part they are typically in a lower income bracket.

These special attributes can also be categorized under the Structural Attribute (S).

4.2.2   The Model

The hedonic pricing model does not correspond to a specific functional form (Nathalie, 2010). Various functional models have been used to represent a hedonic pricing approach, which includes linear function, log-log, semi-log, inverse semi-log, exponential, and Box-Cox Transformation (Freeman, 1993). Linear function has been chosen for the analyses conducted for as there are a very large number of housing transactions involved. It is common to use multiple regression models when analyzing types of hedonic models. The multiple regression method can explain the variation of the dependent variables (i.e. The Real Price in this case) by accommodating explanatory variables, which are also called independent variables. The more factors included in the model, the more variations in Y can be explained.

By incorporating the Hedonic Model, linear function and multiple regression analysis, the basic formula for this paper can be written as below,

$$\text{Ln (Y)} = \alpha + \beta_i X_i + \varepsilon, \text{ Where,}$$

Y = Dependent variable: transaction price of residential units

α = Constant term; the basic price of residential units

β_i = Coefficients of independent variables (i=1,2...n)

X_i = Independent variables; housing attributes affecting housing price (i=1,2...n)

ε = Error term

In order to test whether there is additional price reduction for the lemon flats, with the flat size shrinkage higher than the norm for each classes are identifies. For Class A, the norm for the flat size shrinkage is 39%. For Class B and Class C, it is 35% and 32% respectively. For Class E, it is 32%.

Hence, the empirical model designed for this study is depicted in Equation (1)

$$
\begin{aligned}
\text{LOG(RP)} = \alpha\ +\ & \beta_1\ \text{GFA} + \beta_2\ \text{FLOOR} + \beta_3\ \text{AGE} + \beta_4\ \text{SHRINKAGE*CA} + \\
& \beta_5\text{SHRINKAGE*CB} + \beta_6\ \text{SHRINKAGE*CC} + \beta_7\ \text{SHRINKAGE*CE} + \\
& \beta_8\text{AFTER*SHRINKAGE*CA} + \beta_9\ \text{AFTER*SHRINKAGE*CB} + \\
& \beta_{10}\text{AFTER*SHRINKAGE*CC} + \beta_{11}\text{AFTER*SHRINKAGE*CE} + \\
& \beta_{12}\text{AFTER*(SHRINKAGE>39)*CA} + \beta_{13}\text{AFTER*(SHRINKAGE>35)*CB} + \\
& \beta_{14}\text{AFTER*(SHRINKAGE>32)*CC} + \beta_{15}\text{AFTER*(SHRINKAGE>32)*CE} + \\
& \beta_{16}\text{E} + \beta_{17}\text{W} + \beta_{18}\text{N} + \beta_{19}\text{SW} + \beta_{20}\text{SE} + \beta_{21}\text{NE} + \beta_{22}\text{NW} + \beta_{23}\text{MTR} + \beta_{24}\text{SEA} \\
& + \varepsilon
\end{aligned}
\tag{1}
$$

In Equation (1), α is the constant and ε is the residual. Each variable is described as below,

4.2.2.1 Dependent Variable

a)   Percentage Change in Real Price (LOG(RP))

The property price is the housing transaction price. According to the data from EPRC, there are two types of transaction price: the total price and the price per gross floor area of a property. In this study the total price is used. The total prices have been adjusted using the corresponding housing price index at the 1999 real price level. Log refers to every increment of one percentage change in real price.

4.2.2.2 Independent Variables

Housing units are fairly standardized in Hong Kong. The housing prices are mainly affected by a few key attributes, such as floor area, floor level, flat direction, age and view. In Equation (1), the independent variables can be further elaborated as below,

a)   Gross Floor Area (GFA)

This refers to the GFA stated in sales brochures. Prior to the enactment of SRPO in April 2013, GFA was commonly used by the public to interpret flat sizes and by developers in preliminary sales consultations to calculate the cost per unit of floor area for reference to prospective buyers. The coefficient is anticipated to have a positive direct relation to the housing prices.

b)   Floor Level (FLOOR)

The floor level not only designates the flat location within a building, but also the view that can be seen when one is inside looking out. Normally the higher the flat is, the better the view will be. Moreover, general nuisances such as noise and pollution are reduced in higher floor units.

Due to these factors, buyers often prefer paying more for units located on the higher floors of buildings. The coefficient of the floor level is anticipated to be positive.

c)   Age of Building (AGE)

Building age is a significant consideration when purchasing a flat. The age of a building refers to the time period between the transaction date and the date of the occupation permit issuance. It is calculated by the following equation:

$$AGE = Year_1 - Year_2 + \frac{Month_1 - Month_2}{12}$$

Where $Year_1$ and $Month_1$ refer to the year and month of the purchase date, and $Year_2$ and $Month_2$ refer to the year and month of the date of issuance of the occupation permit.

Older flats incur higher costs for maintenance and repairs. Hence, the coefficient of this independent variable is expected to be negative.

d)   GFA Flat Shrinkage Ratio in terms of different classes of properties in Presale Market
(Shrinkage*CA; Shrinkage*CB; Shrinkage*CC; Shrinkage*CE)

In this analysis, flat shrinkage ratios are the major independent variables. Shrinkage refers to the percentage of *(GFA – Carpet Area) /GFA.* Since the GFA stated in developer sales brochures is the only information that public could access to, it was the common terminology by which people interpret flat sizes prior to 2013; the carpet area is the net covered area within a flat that can be exclusively enjoyed by the occupier, excluding balconies, utilities platforms, bay windows, air conditioning platforms and other similar features.

By adding the interaction terms, that is to multiply the flat shrinkage ratio with the dummy variables of Class A, Class B, Class C and Class E, which refers to different properties sizes in terms of saleable floor area by the Rating and Valuation Department, the magnitude of the housing price effect in relation to the flat size shrinkage in different classes can be differentiated. The dummy variable carried 1 if the saleable area of a flat falls within the flat size description in that class of properties and 0 if vice versa. In econometrics, a rule should always include one less dummy variable in the model, otherwise it will introduce multicolinearity into the model. Therefore, the interaction term for Class D is omitted in the equation.

Since in this equation, an "After" dummy is used to multiply the shrinkage in different property classes and added as independent variables, this captures the housing price reaction in relation to the flat size shrinkage in the different property classes in the second hand market. Hence, these independent variables of shrinkage multiply by difference classes are refer to the *presale market*. "After" is a dummy variable equal to 1 if the transaction occurred after the issuance of the occupation permit and 0 if vice versa. That means it is in the second hand market when people can inspect any given flat, then "After" dummy is equal to 1. On the other hand, if no "After" dummy is being multiplied, it refers to the presale market where no inspection can be carried out.

The coefficient for shrinkage, no matter which property classes, is expected to be negative. The suspected reason behind this is in the presale market, which is under the doctrine of *caveat venditor*; the developers tend to underprice the lemons to allow first hand buyers to flip them in the market before information released to public, which makes the flats fall to the second hand market after transaction carried out. The legal doctrine would change from *caveat venditor* in the presale market to *caveat emptor* in the second hand market. The developers have liability for the products they are selling under the doctrine of *caveat venditor*; however, they are no longer required to bear liability once the properties are flipped by the first hand buyers. This technique is applied to attract first hand buyers to purchase properties, regardless the standard of the flats.

The coefficient for flat shrinkage in Class A is expected to have a high negative effect in relation to housing prices. This is due to the flat size of this class being relatively small and therefore more sensitive to shrinkage; the housing prices for such units are expected to depreciate in the second hand market. Developers are generally inclined to extend relatively higher price cuts, below market prices, in order to entice first hand buyers to purchase this class of smaller units with high shrinkage ratios.

e)   GFA Flat Shrinkage Ratio in terms of different class of properties in Second Hand Market (After*Shrinkage*CA; After*Shrinkage*CB; After*Shrinkage*CC; After*Shrinkage*CE)

These interaction terms of independent variables measure the effect of housing prices in relation to the flat size shrinkage in the second hand market for difference classes of properties. In the second hand market, flat size shrinkage can only be realized accurately by carrying out physical inspections. The dummy variables for "After" and Classes of properties are explained in item (d) in previous paragraph. Due to the dummy variable interaction term for "After", the combination effect of the coefficients (d) and (e) will become a single coefficient to interpret results in the *second hand market*. The results will provide valuable knowledge on the difference between the presale market and second hand market.

The coefficient is expected to be negative, regardless of the class of properties; as flat size shrinkage information becomes known in the second hand market, the depreciation in flat prices will be commensurate with the level of shrinkage.

Similarly in the presale market, Class A flats are expected to display the largest negative coefficients among all the classes, due to the area sensitivity and the common financial limitations for the buyers of such properties.

Contrastingly, the results for Class E may not bear any significant effect due to the relatively large sizes of such flats and the adequate financial situation for this category of buyers. The buyers may not aware nor care so much about the flat size shrinkage. Again, Class D is omitted for the perfect collinearity.

f)   Flat size shrinkage exceeds the norm for each class of properties in the second hand market (After*(Shrinkage>39)*CA; After*(Shrinkage>35)*CB; After*(Shrinkage>32)*CC; After*(Shrinkage>32)*CE)

To further investigate whether or not there will be any additional effect in housing prices when the flat size shrinkage exceeds the norm for any class of properties, interactive independent variables are added to the equation. These flats refer to the lemons in this

market. The median flat size shrinkage for any class of properties is regarded as the norm; such norms are as generally considered to be acceptable by the buyers. The median of flat size shrinkage is calculated for each individual class of properties. The norms for flat shrinkage according to property class are: Class A 39%, Class B 35%, and 32% for both Class C and Class E. Similarly, Class D is missing for the perfect collinearity.

This captures the additional price effect for the lemons; it is expected that there will be further reductions in housing prices if the flats are lemons in the second hand market. The coefficients for these variables are expected to be negative. Similar to the identified results for Class E in the second hand market, the results may not have an overall significant effect.

g)   Direction of Flats (E, W, N, NE, NW, SE, SW)

The directions that the subject flats are facing will also be included in this model. Eight dummy variables are used to distinguish eight different directions: North, East, South, West, Northeast, Northwest, Southeast and Southwest. The dummy variables are equal to a value of "1" if the flat is facing that direction and "0" if vice versa. Likewise, one dummy variable is omitted in the equation, which is the South. South is omitted to avoid perfect collinearity. Traditionally, flats facing "West" carry a negative coefficient and the remaining directions should carry positive coefficients.

h)   MTR

The accessibility to the MTR influences housing prices to some degree. Generally, proximity to good public transportation is expected to have a positive impact on the housing prices. The distance of the subject mass developments to the nearest MTR stations were measured. However, most of these subject properties located on Hong Kong Island are not near MTR stations. Therefore, the MTR coefficient is not expected to be negligible or statistically insignificant.

i)   Seaview (SEA)

Sea view is another important aspect affecting housing prices. It is expected that housing prices are positively related to the flats with sea views. Generally, most buyers are welcome to pay additional premium for an impressive and enjoyable sea view. The dummy variable carried a value of 1 if the flat faces the direction of the sea and has a good sea view and 0 when the sea view is absent. Since on-site inspection to measure the actual extent of a sea view for every single residential flat included in the subject data is very difficult, a conservation approach is adopted to count the existence of sea view in a flat when the flat is not blocked or obstructed by other residential towers and is facing in orientation towards the sea. This examination approach is based on the latest version of

Centamap, which is a local online map developed by a major real estate agency in Hong Kong. The online map is employed as it also has detailed floor plans of major residential projects in Hong Kong, which is very useful in the determination of this dummy variable. Notwithstanding, a cautionary note is provided, stating that even though a flat may have a sea view, it does not necessarily imply that the sea view is appealing enough to contribute significantly to the price of the flat. This is because it also depends on the distance of the developments from the sea and the surrounding environment. Since flats with a sea view is not the focus of this study, the distance of the subject properties to the sea and the external environment will not be examined further.

4.2.3   Summary of Perceived Interpretation of the Dependent Variable

In the regression analysis, the dependent variables are influences that are not only quantitative variables, but also qualitative variables. Dummy variables are the qualitative variables taking a value of 0 or 1 to indicate the absence or presence of some categorical effect that may influence the outcome. In this study, both quantitative variables and dummy variables are employed (Draper & Smith 1998). The expected effect of the attributes are summarized as Table 7 below,

Table 7 Summary of Perceived Interpretation of the dependent variable

	Attributes	Perceived Sign of Coefficient
A.	Location Attributes (L)	
1	Direction of Flat	
	East	Positive
	West	Negative
	North	Negative
	Southern East	Positive
	Southern West	Positive
	Northern East	Negative
	Northern West	Negative
2	MTR	Insignificant
3	Seaview	Positive
B.	Structural Attributes (S)	
1	Gross Floor Area	Positive
2	Floor Level	Positive

3	Age of Building	Negative
4	Flat Shrinkage Ratio of Class A Units in Presale Market	Negative
5	Flat Shrinkage Ratio of Class B Units in Presale Market	Negative
6	Flat Shrinkage Ratio of Class C Units in Presale Market	Negative
7	Flat Shrinkage Ratio of Class E Units in Presale Market	Negative
8	Flat Shrinkage Ratio of Class A Units in Second Hand Market	Negative
9	Flat Shrinkage Ratio of Class B Units in Second Hand Market	Negative
10	Flat Shrinkage Ratio of Class C Units in Second Hand Market	Negative
11	Flat Shrinkage Ratio of Class E Units in Second Hand Market	Insignificant
12	Flat Shrinkage Ratio of Class A Units above the norm in Second Hand Market (Regard as Lemon of that Class)	Negative
13	Flat Shrinkage Ratio of Class B Units above the norm in Second Hand Market (Regard as Lemon of that Class)	Negative
14	Flat Shrinkage Ratio of Class C Units above the norm in Second Hand Market (Regard as Lemon of that Class)	Negative
15	Flat Shrinkage Ratio of Class E Units above the norm in Second Hand Market (Regard as Lemon of that Class)	Insignificant

Sources : The Author

4.3   Data Sources

The same set of data sources are used as in Chapter three, and were employed to carry out the analysis for the overpricing premium. To recap, a total of 55,227 entries of transaction data from 1991 through 2013, that encompass 13 mass housing developments on Hong Kong Island, were used in the research of this study. All transaction data was obtained from the EPRC, a comprehensive and reliable source of information extracted from the Land Registry.

4.4   The Empirical Test

Further to the empirical analysis of the Lemon Market and adverse selection, another key objective of this study is to investigate and measure whether or not overpricing premium is acquired by housing developers in the presale market and hence their respective pricing strategy; the results of analysis will also evidence if the overpricing premium is due to the presence of asymmetric information in regards to the flat size. Different doctrines of law govern the presale market, namely *caveat venditor*, and in the second hand market, namely *caveat empitor*. This study attempts to measure the extent of overpricing premium (if any) and \expose the strategy under these two different principles.

In analyzing the 55,227 transactions obtained for the subject developers, the computer package Eviews was adopted to conduct the statistical analysis. Since the Hedonic Price Model was selected to investigate the implicit price of product attributes, as explained in the prior methodology section, therefore the Ordinary Least Squares (OLS) was used. Ordinary Least Squares (OLS) is a method for estimating unknown parameters in a linear regression model. The advantage of the OLS technique is that it can accommodate massive batches of data; this makes it ideal for real estate market analyses. The confidence level is set at 99% for the analysis.

4.4.1   Summary of descriptive analysis

The descriptive analysis, by studying all the collected transaction data is summarized in table 8 below,

Table 8 Summary of Descriptive Analysis

	Real Price (HK\$/unit)	GFA[3] (Sq. feet)	SA[4] (Sq. feet)	CARPET[5] (Sq. feet)	SALEEFF[6] (%)	CARPETEFF[7] (%)	SHRINKAGE[8] (%)
Mean	6231204	998.4289	794.8132	660.1562	79.37567	65.86164	34.13836
Median	4636441	918	714	601	79.28465	65.99166	34.00834
Maximum	52514523	2691	2275	1859	84.79756	77.05193	48.64341
Minimum	463883.4	413	310	236	72.6914	51.35659	22.94807
Std. Dev.	4452346	354.6702	291.9717	244.4822	2.566593	4.765265	4.765265
Skewness	2.530234	1.54502	1.592097	1.413452	-0.446755	-0.127054	0.127054
Kurtosis	12.30906	5.647173	6.03718	5.463298	2.657386	1.997315	1.997315
Jarque-Bera	258340.3	38097.15	44557.95	32352.03	2107.247	2462.085	2462.085
Probability	0	0	0	0	0	0	0
Observations	55227	55227	55227	55227	55227	55227	55227

Sources : The Author

In this study, the flats are further divided in to a certain Class of Properties. Hence, the

flat size shrinkage for each class of properties is designated in Table 9 below,

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[3] GFA refers to Gross Floor Area stated in the sales brochure
[4] SA refers to Saleable Area
[5] CARPET refers to Carpet Area
[6] SALEEFF refers to Sales Efficiency, that is (Saleable Area/ Gross Floor Area) *100%
[7] CARPETEFF refers to the Carpet Efficiency, that is (Carpet Area/Gross Floor Area)*100%
[8] SHRINKAGE refers to GFA flat shrinkage, that is [(Gross Floor Area – Carpet Area)/Gross Floor Area]*100%

Table 9 Summary of Flat Size Shrinkage in terms of Different Class of Properties

	Flat Size Shrinkage				
	Class A[9]	Class B[10]	Class C[11]	Class D[12]	Class E[13]
Median/Norm	39%	35%	32%	34%	32%
Minimum	38%	23%	25%	27%	30%
Maximum	43%	47%	49%	43%	35%
Observations	589	30097	15184	8614	743

Sources : The Author

In this summary, it is found that the norm for the flat size shrinkage is largest for Class A, which is 39%, while the norm for Class C and Class E carry a relatively smaller flat size shrinkage, that is 32%. In other words, flat shrinkage occurs more acutely in comparatively small sized flats. Among this set of transaction data, 45,870 out of 55,227 transactions fall within Class A, Class B and Class C, which represents 83% of the total.

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[9] Class A refers to the flats with saleable area below 430.5 sq. feet
[10] Class C refers to the flats with saleable area between 430.5 sq. feet and 753.4 sq. feet
[11] Class C refers to the flats with saleable area between 753.4 sq. feet and 1076.4 sq. feet
[12] Class D refers to the flats with saleable area between 1076.4 sq. feet and 1722.2 sq. feet
[13] Class E refers to the flats with saleable area with 1722.2 sq. feet and above

4.4.2 The Hedonic Price Model

To recap the empirical test model mentioned in the methodology, the equation is shown as below,

$$
\begin{aligned}
\text{LOG(RP)} = \alpha\ +\ & \beta_1\ \text{GFA} + \beta_2\ \text{FLOOR} + \beta_3\ \text{AGE} + \beta_4\ \text{SHRINKAGE*CA} + \\
& \beta_5\text{SHRINKAGE*CB} + \beta_6\ \text{SHRINKAGE*CC} + \beta_7\ \text{SHRINKAGE*CE} + \\
& \beta_8\text{AFTER*SHRINKAGE*CA} + \beta_9\ \text{AFTER*SHRINKAGE*CB} + \\
& \beta_{10}\text{AFTER*SHRINKAGE*CC} + \beta_{11}\text{AFTER*SHRINKAGE*CE} + \\
& \beta_{12}\text{AFTER*(SHRINKAGE>39)*CA} + \beta_{13}\text{AFTER*(SHRINKAGE>35)*CB} + \\
& \beta_{14}\text{AFTER*(SHRINKAGE>32)*CC} + \beta_{15}\text{AFTER*(SHRINKAGE>32)*CE} + \beta_{16}\text{E} + \\
& \beta_{17}\text{W} + \beta_{18}\text{N} + \beta_{19}\text{SW} + \beta_{20}\text{SE} + \beta_{21}\text{NE} + \beta_{22}\text{NW} + \beta_{23}\text{MTR} + \beta_{24}\text{SEA} + \varepsilon
\end{aligned}
$$

(1)

The Equation takes a semi-log form in which the dependent variable, the list prices in the year of 1991 is used as the base year for calculating the real price levels, and has taken a logarithmic functional transformation. Quadratic functional forms of the independent variables have been removed from the model because their inclusion does not significantly improve performance accuracy.

A heteroskedasticity robust model depicting the implicit prices of the units and the Newey-West HAC standard errors and covariance method have been conducted.

4.4.3   The Result

Through the Eviews computer program, the hedonic price model results are summarized

in Table 10 as below,

Table 10 Result for the Hedonic Price Model

Dependent Variable: LOG(RP)				
Method: Least Squares				
Sample: 1 55227				
Included observations: 55226				
Newey-West HAC Standard Errors & Covariance (lag truncation=16)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.42124	0.044313	325.4389	0
GFA	0.001263	2.63E-05	48.0928	0
FLOOR	0.002322	0.000156	14.91662	0
AGE	-0.00649	0.000466	-13.93	0
SHRINKAGE*CA	-0.00536	0.000808	-6.63337	0
SHRINKAGE*CB	-0.00299	0.000642	-4.65529	0
SHRINKAGE*CC	-0.00347	0.000604	-5.75027	0
SHRINKAGE*CE	-0.01029	0.001125	-9.14648	0
AFTER*SHRINKAGE*CA	-0.00305	0.000351	-8.67248	0
AFTER*SHRINKAGE*CB	0.001526	0.000273	5.593763	0
AFTER*SHRINKAGE*CC	0.003041	0.000415	7.326113	0
AFTER*SHRINKAGE*CE	-0.0041	0.00281	-1.46018	0.1442

AFTER*(SHRINKAGE>39)*CA	-0.04767	0.015479	-3.07923	0.0021
AFTER*(SHRINKAGE>35)*CB	-0.14124	0.0118	-11.97	0
AFTER*(SHRINKAGE>32)*CC	-0.08105	0.013502	-6.00234	0
AFTER*(SHRINKAGE>32)*CE	0.138207	0.088632	1.559339	0.1189
E	-0.04176	0.013213	-3.16031	0.0016
N	0.005891	0.014207	0.414669	0.6784
W	-0.05921	0.01193	-4.96303	0
SE	-0.05147	0.010298	-4.99824	0
SW	0.011249	0.01097	1.025356	0.3052
NE	-0.05581	0.012924	-4.31813	0
NW	-0.05604	0.010596	-5.28913	0
SEA	0.057765	0.006267	9.217358	0
MTR	-0.04369	0.000978	-44.6671	0
R-squared	0.846305	Mean dependent var		15.46817
Adjusted R-squared	0.846239	S.D. dependent var		0.560289
S.E. of regression	0.219703			
Sum squared resid	2664.516			
Log likelihood	5344.062			
F-statistic	12664.97			
Prob(F-statistic)	0			

4.4.3.1 The R-Square

The R-square, also known as the coefficient of determination, is commonly used in statistics to evaluate the degree of model fitness. The R-square represents original

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variation as the variability of dependent variable Y can be divided in to the original variation and residual variation. The R-square can be obtained through 1 minus the ratio of residual variability. If the ratio of a residual variability value around the regression line relative to the overall variability is small, then the R-square value will be large and the predictive value of the coefficient from the regression equation will be good. A low R-square value indicates the coefficient from the regression equation has a weak predictive value. In extreme situations, where there is no relationship between the dependent variables and independent variables, the ratio of the residual variability of the Y variable to the original variance is equal to 1.0. Then the R-square value would be 0. If the independent variable X and dependent variables are perfectly related, then there will be no residual variance or ratio of residual variability. Therefore, the ratio of residual variability value should be 0 and the R-square value will then be 1. In most cases, the R-square values will fall between 1 and 0. The R-square value is an indicator of how much original variability can be explained by an estimated coefficient and model. Thus, the fitness of the specified model can be derived from the coefficient of determination.

The results show that an adjusted R-square is 0.85; this means that 85% of the variation of the change in unit price can be explained by the explanatory variables in the model, which is reasonable and acceptable.

4.4.3.2 The F-Test

The F- test is applied to assess whether independent variables are jointly significant to explain the dependent variable. The F-Test is the ratio of the mean square in the model to the mean square due to error, whereby the former is calculated by dividing the sum of error by its degree of freedom. The null hypothesis for F-test is that all independent variables are not significant with regards to the dependent variables they are associated with, as shown in the following equation:

$$H_o: \beta_0 = \beta_1 = \ldots = \beta_i = 0$$

If the p-value of each β_i (n=0, 1... n) is more than or not equal to zero, the null hypothesis will be rejected. In practice, 5% is commonly used as the standard to judge whether it passes the F-test or not. If the p-value of the F statistic is less than 5%, the null hypothesis can be regarded as false. This indicates that all the independent variables can jointly influence the dependent variable, which is the housing price in this case.

The F-test result is 12664.97 and the probability for the F-statistic of the null hypothesis is 0. Hence the null hypothesis is rejected. The variables are jointly significant in explaining the dependent variable.

4.4.3.3 The T-test

The T-test is adopted to determine whether each and every independent variable is individually significant enough or not to influence the dependent variable. To conduct a T-test, the null hypothesis has to be set first and the population must be sufficiently large. In this case, the null hypothesis is that the individual independent variable has no individually significant effect on the dependent variables. The null hypothesis H_o is shown below:

$$H_o: \beta_i = 0 \ (i=0, \ 1\dots n)$$

The T-value increases with increasing significance of the independent variable. In theory, if the particular coefficient β_i is less than 0, the null hypothesis should be rejected. However, in practice, the significance level of 5% is applied. This means that if the significance level is less than 5%, but still larger than 0, then the result can still be regarded as rejecting the null hypothesis. The significance level is calculated based on the T-value derived. Translating into the T-value, to reject a hypothesis, the T–value of a particular independent variable should be more than 1.96 or less than -1.96. This model is reliable when all β_i pass the T-test. The significance level and T-value allow the null hypothesis to be rejected as follows:

T- Value < -1.96 or > 1.96

Significance level < 0.05

The summary of the T-test results for each independent variable are summarized in Table 11 as below,

Table 11 Summary of T-test results

	T-Statistics *Significance in 5% level	Prob.
GFA	48.0928*	0
FLOOR	14.91662*	0
AGE	-13.93*	0
SHRINKAGE*CA	-6.63337*	0
SHRINKAGE*CB	-4.65529*	0
SHRINKAGE*CC	-5.75027*	0
SHRINKAGE*CE	-9.14648*	0
AFTER*SHRINKAGE*CA	-8.67248*	0
AFTER*SHRINKAGE*CB	5.593763*	0
AFTER*SHRINKAGE*CC	7.326113*	0
AFTER*SHRINKAGE*CE	-1.46018	0.1442

AFTER*(SHRINKAGE>39)*CA	-3.07923*	0.0021
AFTER*(SHRINKAGE>35)*CB	-11.97*	0
AFTER*(SHRINKAGE>32)*CC	-6.00234*	0
AFTER*(SHRINKAGE>32)*CE	1.559339	0.1189
E	-3.16031*	0.0016
N	0.414669	0.6784
W	-4.96303*	0
SE	-4.99824*	0
SW	1.025356	0.3052
NE	-4.31813*	0
NW	-5.28913*	0
SEA	9.217358*	0
MTR	-44.6671*	0

Sources : The Author

According to the table, most of the key attributes in this analysis carry very high t-values; hence, the corresponding coefficients are very reliable. Their significance level is less than 1%. Therefore, these independent variables in the statistical model have a significant

individual influence on the dependent variable.

However, it is observed that the flat size shrinkage in the second hand market for Class E properties has no significance in this model, just as predicted. They carry a significance level greater than 5%, and the T-value falls outside the range of < -1.96 or > 1.96. This coheres with the hypothesis that flat size shrinkage does not affect the buyers with comparatively high financial capabilities. The flats are not area sensitive, so the housing prices are not related to the flat size shrinkage for flats with usable floor area greater than 1722.2 square feet.

Flats facing North and Southwest, the results also exhibit a significantly level higher than 5%; this is explained by the fact that some of the environmental factors related to flats facing these directions were not taken into account when measuring the dummy variables. However, since these are not key points of focus, a further comprehensive study about the level of influence geographical directions of flats have on market prices of properties can be carried out in the future.

4.4.3.4 Interpretation for the Coefficient

The coefficient for the empirical test is summarized in Table 12 as below,

Table 12 Summary of the Coefficient

	Coefficient	Std. Error	Prob.
GFA	0.001263	2.63E-05	0
FLOOR	0.002322	0.000156	0
AGE	-0.00649	0.000466	0
SHRINKAGE*CA	-0.00536	0.000808	0
SHRINKAGE*CB	-0.00299	0.000642	0
SHRINKAGE*CC	-0.00347	0.000604	0
SHRINKAGE*CE	-0.01029	0.001125	0
AFTER*SHRINKAGE*CA	-0.00305	0.000351	0
AFTER*SHRINKAGE*CB	0.001526	0.000273	0
AFTER*SHRINKAGE*CC	0.003041	0.000415	0
AFTER*SHRINKAGE*CE	-0.0041	0.00281	0.1442
AFTER*(SHRINKAGE>39)*CA	-0.04767	0.015479	0.0021
AFTER*(SHRINKAGE>35)*CB	-0.14124	0.0118	0
AFTER*(SHRINKAGE>32)*CC	-0.08105	0.013502	0

AFTER*(SHRINKAGE>32)*CE	0.138207	0.088632	0.1189
E	-0.04176	0.013213	0.0016
N	0.005891	0.014207	0.6784
W	-0.05921	0.01193	0
SE	-0.05147	0.010298	0
SW	0.011249	0.01097	0.3052
NE	-0.05581	0.012924	0
NW	-0.05604	0.010596	0
SEA	0.057765	0.006267	0
MTR	-0.04369	0.000978	0

Sources : The Author

Note that the equation takes a semi-log form in which the dependent variable, the list prices follow 1991 as the base year for calculation of real price levels, and has taken form of a logarithmic functional transformation.

a)   Gross Floor Area (GFA)

The coefficient of "GFA" has a positive value of 0.001263. This means the dependent variable is positively correlated with the independent variable "GFA", given that other independent variables are kept constant. The result can be interpreted as, the larger the flats, the higher price they achieve in the housing market. Thus, with the change of each square foot of GFA, the coefficient 0.001263 contributes 0.13% of the unit price. This means that buyers pay 0.13% for every increase in square footage of space. It coheres with the expected sign of the coefficient in the methodology.

b)   Floor Level (FLOOR)

The coefficient of "FLOOR" has a positive value of 0.002322. The results suggest that the unit price of the flat increases 0.23% for every floor increment. It also coincides with the hypothesis that the higher the floor of the flats, the more occupiers can enjoy better views, cleaner air and less noise pollution, and that this is expected have a positive impact on the housing prices. For example, a unit on the 40th floor of a building costs about 10 % more than a unit on the 1st floor, ceteris paribus.

c)   Age of Building (AGE)

The results demonstrate that the building age has a negative correlation with the housing price. The coefficient of "AGE" has negative value of 0.00649. This means that the unit

price of the flat depreciates about 0.65% per year for the age of the building. On the contrary, this suggests that buyers would be willing to pay additional funds for new development in order avoid potential maintenance costs in the foreseeable future.

d)   GFA Flat Shrinkage Ratio in terms of different class of properties in Presale Market (Shrinkage*CA; Shrinkage*CB; Shrinkage*CC; Shrinkage*CE)

Flat size shrinkage is the key focus of this study. This focus is further divided into Classes of properties for a more detailed analysis of the market. For Class A properties, they carry a negative coefficient value of 0.00536. This result demonstrates that in the presale market, the unit price of a flat already has a price reduction level of 0.54% for every 1% of flat size shrinkage. Similarly, for Class B, Class C and Class E properties, the coefficient carries a negative value of 0.3%, 0.35% and 1% respectively for every 1% of flat size shrinkage. All these T-test statistics are significant at the 1% level. The results cohere with the methodology, which is that the flat size shrinkage holds a negative correlation with housing prices in presale market.

The results exemplify how developers discount the properties in accordance to flat size shrinkage at the presale stage. This technique allows sufficient time for potential buyers to flip the properties well in advance of any chance to allow for physical inspections in the second hand market where the actual flat size shrinkage would be discovered. This boosts motivation and incentive for first hand buyers to purchase flats regardless of the level of flat size shrinkage. The presale market is under the institution of *caveat venditor*,

where the sellers have liabilities, so this technique opens a door to circumvent legal ramifications.

e) GFA Flat Shrinkage Ratio in terms of different class of properties in the Second Hand Market (After*Shrinkage*CA; After*Shrinkage*CB; After*Shrinkage*CC; After*Shrinkage*CE)

In the second hand market, the flat size shrinkage is physically revealed to second hand buyers, the coefficients are expected to be negative. The dummy variable interaction term for "After" contributes the combination effect of coefficients (d) and (e) for the second hand market; the coefficient for each individual class is elaborated in Table 13 as below,

Table 13 Summary of Coefficient for Flat Shrinkage in Different Class in Second Hand Market

	Coefficient			Prob.
	Presale Market		Second Hand Market	
	Shrinkage*Class (a)	After*Shrinkage*Class (b)	Combination Effect (a)+(b)	
Shrinkage for Class A	-0.00536	-0.00305	-0.0084	0
Shrinkage for Class B	-0.00299	0.001526	-0.0015	0
Shrinkage for Class C	-0.00347	0.003041	-0.0004	0
Shrinkage for Class E	-0.01029	-0.0041	-0.0031	0.1442

Sources : The Author

The results show that the coefficient for flat shrinkage for Class A, B and C in the second hand market carry a negative correlation with the housing price and the significance level is within 5%, i.e. 0. To elaborate, in the second hand market, the unit price of a flat is reduced by 0.84% for Class A flats for every 1% of flat size shrinkage. Similarly, Class B and Class C also show reductions of 0.15% and 0.04% respectively for every 1% of flat size shrinkage. Class B and Class C have negligible price reduction in the second hand market as compare to Class A flats. This coheres with the hypothesis in the methodology.

For Class E flats, the results of flat shrinkage are insignificant to the housing price in the second hand market. The saleable area size for this class of properties is larger than 1,722

square feet; buyers of this class of property are less sensitive to the flat size shrinkage and their financial capabilities are relatively strong.

f)   Flat size shrinkage exceeds the norm for each class of properties in the second hand market (After*(Shrinkage>39)*CA; After*(Shrinkage>35)*CB; After*(Shrinkage>32)*CC; After*(Shrinkage>32)*CE)

Another key attribute of this study is to investigate whether or not there are any additional effects on housing prices if flat size shrinkage exceeds the norms of a particular class in the second hand market. Flats with flat size shrinkage greater than the norm, meaning the median of flat size shrinkage of a certain class, are termed as lemons. The norms for flat size shrinkage according to class are: Class A 39%, Class B 35%, and 32% for both Class C and Class E.

The results demonstrate that there are additional reductions of housing prices in second hand market for Class A, Class B and Class C, while for Class E they are still regarded as insignificant. The results can be recapped in Table 14 as below,

Table 14 Summary of coefficient for flat size shrinkage exceeds the norm for each class of units

	Coefficient	Std. Error	Prob.
AFTER*(SHRINKAGE>39)*CA	-0.04767	0.015479	0.0021
AFTER*(SHRINKAGE>35)*CB	-0.14124	0.0118	0
AFTER*(SHRINKAGE>32)*CC	-0.08105	0.013502	0
AFTER*(SHRINKAGE>32)*CE	0.138207	0.088632	0.1189

Sources : The Author

The probability shows that Class A, Class B and Class C carry a value of less than 5%, hence they are considered as significant, while Class E carries a value greater than 5%, hence it is considered as insignificant. The result shows that for Class A flats, when the flat size shrinkage is over 39%, there is a further reduction of 4.7% reflected in the housing price. While for Class B flats, they carry a further reduction of 14% if the flat size shrinkage is higher than 35%, and Class C flats carry a further reduction of 8% if the flat size shrinkage is over 32%.

To illustrate the results regarding the correlation between the housing price and the percentage change in flat size shrinkage in the second hand market for each class of properties, a simple summary for Class A, B and C flats are highlighted in Table 15. Since Class E is insignificant, it is not included in the summary.

Table 15 Summary of correlation of housing price in percentage to flat size shrinkage in second hand market

	Percentage change in price (%)		
Shrinkage (%)	Class A	Class B	Class C
1	-0.84	-0.15	-0.04
2	-1.68	-0.3	-0.08
3	-2.52	-0.45	-0.12
4	-3.36	-0.6	-0.16
5	-4.2	-0.75	-0.2
6	-5.04	-0.9	-0.24
7	-5.88	-1.05	-0.28
8	-6.72	-1.2	-0.32
9	-7.56	-1.35	-0.36
10	-8.4	-1.5	-0.4
11	-9.24	-1.65	-0.44
12	-10.08	-1.8	-0.48
13	-10.92	-1.95	-0.52

14	-11.76	-2.1	-0.56
15	-12.6	-2.25	-0.6
16	-13.44	-2.4	-0.64
17	-14.28	-2.55	-0.68
18	-15.12	-2.7	-0.72
19	-15.96	-2.85	-0.76
20	-16.8	-3	-0.8
21	-17.64	-3.15	-0.84
22	-18.48	-3.3	-0.88
23	-19.32	-3.45	-0.92
24	-20.16	-3.6	-0.96
25	-21	-3.75	-1
26	-21.84	-3.9	-1.04
27	-22.68	-4.05	-1.08
28	-23.52	-4.2	-1.12
29	-24.36	-4.35	-1.16

30	-25.2	-4.5	-1.2
31	-26.04	-4.65	-1.24
32	-26.88	-4.8	-1.28
33	-27.72	-4.95	-9.42
34	-28.56	-5.1	-9.46
35	-29.4	-5.25	-9.5
36	-30.24	-19.5	-9.54
37	-31.08	-19.65	-9.58
38	-31.92	-19.8	-9.62
39	-32.76	-19.95	-9.66
40	-38.37	-20.1	-9.7
41	-39.21	-20.25	-9.74
42	-40.05	-20.4	-9.78
43	-40.89	-20.55	-9.82
44	-41.73	-20.7	-9.86
45	-42.57	-20.85	-9.9

46	-43.41	-21	-9.94
47	-44.25	-21.15	-9.98
48	-45.09	-21.3	-10.02
49	-45.93	-21.45	-10.06
50	-46.77	-21.6	-10.1

Sources : The Author

The summary shows that the housing price reduction is much more serious for Class A flats; if the flats for Class A, Class B and Class C have the same flat size shrinkage of 40%, there will be a 38% reduction in the housing prices for Class A, 20% for Class B and 10% for Class C in the second hand market. The results demonstrate that the first hand buyers suffer more under the current regime and amongst all; the first hand buyers for Class A flats suffer the most for the flat size shrinkage problem. Although the developers have encountered a relatively larger price reduction for the Class A units regarding flat size shrinkage during presale stage, the price reduction is even larger in the second hand market when the flats can be inspected physically when flat size shrinkage is revealed. In other words, the developers in fact gain the overpricing premium by ostensible underpricing strategy. While the first hand buyers of small sized flats will suffer eventually in the second hand market.

For Class B and Class C flats, the developers also contribute incentives of underpricing and the price reduction is relatively negligible in the second hand market. So, the first hand buyers of these two classes can still flip the flats in advance. However, the developers can not gain the overpricing premium by ostensible underpricing strategy since the price reduction in the presale market and in the second market are similar.

As the average amount of housing prices is different for each individual class, an alternative summary will illustrate the housing price reduction in terms of actual prices is highlighted in Table 16 as below,

Table 16 Summary of correlation of housing price in terms of actual real price to flat size shrinkage in second hand market

	Percentage change in price (HK$)		
	Class A	Class B	Class C
Median Price ($)	2,400,000*	3,700,000*	6,200,000*[14]
Shrinkage (%)			
1	-20,160	-5,550	-2,480
2	-40,320	-11,100	-4,960
3	-60,480	-16,650	-7,440
4	-80,640	-22,200	-9,920
5	-100,800	-27,750	-12,400
6	-120,960	-33,300	-14,880
7	-141,120	-38,850	-17,360
8	-161,280	-44,400	-19,840
9	-181,440	-49,950	-22,320

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[14] *Refers to the median price for that class of properties, which has deflated to 1999 real price level

10	-201,600	-55,500	-24,800
11	-221,760	-61,050	-27,280
12	-241,920	-66,600	-29,760
13	-262,080	-72,150	-32,240
14	-282,240	-77,700	-34,720
15	-302,400	-83,250	-37,200
16	-322,560	-88,800	-39,680
17	-342,720	-94,350	-42,160
18	-362,880	-99,900	-44,640
19	-383,040	-105,450	-47,120
20	-403,200	-111,000	-49,600
21	-423,360	-116,550	-52,080
22	-443,520	-122,100	-54,560
23	-463,680	-127,650	-57,040
24	-483,840	-133,200	-59,520
25	-504,000	-138,750	-62,000

26	-524,160	-144,300	-64,480
27	-544,320	-149,850	-66,960
28	-564,480	-155,400	-69,440
29	-584,640	-160,950	-71,920
30	-604,800	-166,500	-74,400
31	-624,960	-172,050	-76,880
32	-645,120	-177,600	-79,360
33	-665,280	-183,150	-584,040
34	-685,440	-188,700	-586,520
35	-705,600	-194,250	-589,000
36	-725,760	-721,500	-591,480
37	-745,920	-727,050	-593,960
38	-766,080	-732,600	-596,440
39	-786,240	-738,150	-598,920
40	-920,880	-743,700	-601,400
41	-941,040	-749,250	-603,880

42	-961,200	-754,800	-606,360
43	-981,360	-760,350	-608,840
44	-1,001,520	-765,900	-611,320
45	-1,021,680	-771,450	-613,800
46	-1,041,840	-777,000	-616,280
47	-1,062,000	-782,550	-618,760
48	-1,082,160	-788,100	-621,240
49	-1,102,320	-793,650	-623,720
50	-1,122,480	-799,200	-626,200

Sources : The Author

By recapping the range for the flat size shrinkage for each class of properties, it is noticed that the range for the flat shrinkage in this study dataset is from 38% to 43% for Class A, 23% to 47% for Class B and 25% to 49% for Class C. The flat shrinkage refers to the difference between the Gross Floor Area in sales brochures and the actual carpet area.

Again, the results demonstrate that the actual price reduction for Class B and Class C properties has a negligible effect. In contrast, even though the lump sum for that Class of properties is comparatively low, the actual housing price reduction for Class A properties is relatively substantial in the second hand market despite the developers have already

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given an incentive of a large extent of price reduction in the presale market. In other words, the first hand buyers for flat sizes under 430 square feet will eventually suffer losses as they won't be able to flip the flats so easily once the flat size shrinkage information has been revealed to the public in the second hand market. Contrastingly, the developers are managed to overprice the small size units more.

In recent years, there has been a sharp increase of Nano flats in Hong Kong, with presale sizes starting from 125 square feet. This study may contribute a forward prediction to buyers of the Nano flats in presale markets that they may eventually suffer in the second hand market under the current legislation regime. The details will be discussed in the next chapter.

To summarize, the result of the relationship between housing prices and flat size shrinkage for Class A, Class B and Class C in the presale and second hand market is illustrated in Figure 5 graphically,

Figure 5 Graphical Presentation for 1% Change in Flat Size Shrinkage in relation to Percentage Change in Price
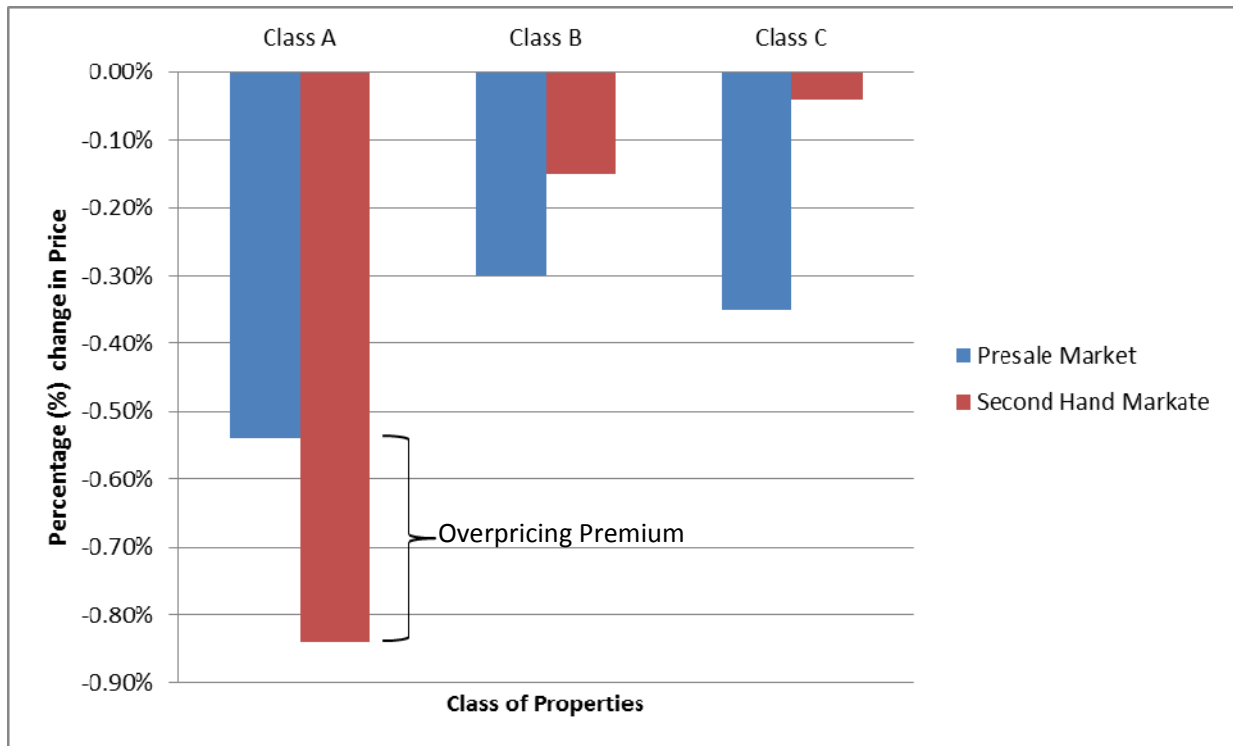
The figure graphically illustrates that the percentage of change in price for every 1% of flat size shrinkage in each Class of properties in the presale market and the second hand market. In the presale market, developers have already offered a price reduction for the flats with flat size shrinkage problems. This is to attract first hand buyers to overlook the flat size shrinkage problems and to allow the buyers to flip the lemons before the inferior attributes are being revealed.

To take a closer look on the price reduction in the presale market and the second hand market due to the flat size shrinkage, developers have gained the overpricing premium by adopting an ostensible underpricing strategy to the small size flats, i.e. Class A properties. The ostensible underpricing strategy refers to *"an inferior product is perceived to be underpriced but in fact overpriced"* (Choy 2007). For Class A properties, the first hand buyers are given a price reduction of 0.54% in presale market for every 1% of flat size shrinkage, however, a price reduction of 0.84% for every 1% of flat size shrinkage are reflected in the second hand market. In other words, the flats are perceived underpriced 0.54% but in fact overpriced 0.3% for every 1% of flat size shrinkage. The price reduction given to the first hand buyers had induced them to flip the lemons into the secondary market before adverse information of flat size shrinkage come to public.

However, for the Class B and Class C properties, the developers did not gain the overpricing premium arising from this asymmetric information of flat size. This is due to the price reduction given to the first hand buyers are more than the price reduction reflected in the second hand market. But of course, the price reduction in presale market can induce buyers to purchase the flats and overlook the adverse flat size shrinkage parameters. In other words, the first hand buyers are given a price reduction in presale market, while they can still gain (-0.15% +0.3%) = 0.15% premium for every 1% of flat size shrinkage for Class B properties and (-0.04% + 0.347%) = 0.31% premium for every 1% of flat shrinkage for Class C properties in the second hand market. The possible

reasons may due to the poor marketability for these flats with relatively large lump sum. The price reduction can serve as an incentive for the potential buyers to overlook the adverse attribute and purchase the flats.

Overall, developers have gained the overpricing premium by adopting ostensible underpricing strategy to Class A properties. The comparatively large price reduction in presale market serves as an incentive for the first hand buyers to purchase the flat regardless of the flat size shrinkage ratio and to flip the lemons into the secondary market before the adverse attribute come to public. The recently enacted legislation to prevent the flipping of flats in presale market changes the rules governing property transactions, the first hand buyers can only flip properties in the secondary market unless stamp duties are being paid. This greatly increases the transaction costs. In the second hand market, where flats can be inspected physically, the price reduction for Class A properties are the most serious. The first hand buyer can still flip the lemons in the second hand market when the economic situation is upwards with the relative price increase. Yet, they may bear a higher risk on their investment during economic downturn. On the other hand, developers have gained the de facto overpricing premium of (0.84% + 0.54% = 0.3%) simply from information asymmetry on Class A properties. It is worthy to note that developers were liable for the information and the properties during the presale market, and that they will be freed of any liability once the flats have been flipped in the secondary market. The legislation regime changes the situation from *caveat venditor* and *caveat empitor*.

On the other hand, for Class B and Class C properties, developers also offered price reduction to the flats in the presale market, while the price reduction in the second hand market is comparatively negligible. It means to first hand buyers, they were given 0.3% and 0.35% price reduction respectively for Class B and Class C properties in the presale market, while the price reduction reflected in the second hand market is negligible. In other words, they somehow can gain the developer's pricing premium and do not affect by the information asymmetry of flat size shrinkage after all. These buyers have less risk of losing their investment.

This chapter has tested the following research hypotheses

- Research Hypothesis 3 (H_3) : *"In presale market, it is hypothesized that the pricing strategy for the seller tends to underprice the lemons in order to seduce buyers to overlook the adverse attributes and purchase the lemons, but in fact the flats are being overpriced taking advantage of the information asymmetry in terms of flat size shrinkage."*

- Research Hypothesis 4 (H_4) : *"It is hypothesised that there is an additional price reduction in the second hand market for the durable lemons, i.e. flats with high flat size shrinkage"*, and

- Research Hypothesis 5 (H$_5$): *"The overpricing pricing strategies by the Developers are different for each class of properties in terms of difference in unit size. It is hypothesised that the overpricing is greater for the small size units."*

The empirical results reveal that developers offered price reductions for all flats with flat size shrinkage in the presale market to seduce buyers to overlook the adverse attributes. Additional price reductions for the lemons with higher flat size shrinkage were reflected in the second hand market. The developers gain the overpricing premiums for Class A properties particularly through ostensible underpricing strategy, but not for Class B and Class C properties.

g)   Direction of Flats (E, W, N, NE, NW, SE, SW)

Directions of flats have also being considered in this model. Eight dummy variables are used to distinguish eight different directions, namely North, East, South, West, Southeast, Southwest, Northeast and Northwest. South orientation is omitted and used as the baseline for this model. The results show that flats with "West", "Northeast" and "Northwest" orientations carry a negative correlation with housing prices and the result is significant. This coheres with the hypothesis. However, the remaining orientations are found to be insignificant in the model.

Orientation is not the key attribute of this study and a separate comprehensive study can be carried out in future research to investigate the relationship between orientations and the housing prices.

h)   Seaview (SEA)

The coefficient of the "SEA" variable carries a positive sign and is significant since in the probability is less than 5%. It coincides with the hypothesis that sea view in residential flats are usually positively correlated to the housing price.

i)   MTR

The variable of "MTR" in the model has shown a negative sign. Although this is counter intuitive to similar findings in Hong Kong where residential flats located near MTR stations usually command a premium, it can be explained by the fact that within the period of this study, most of the subject developments are not located near MTR stations on Hong Kong Island. Since the focus of this study is not about the impact of accessibility on residential flats and this variable serves as a control. Further research is needed to study such an effect subsequent to construction of MTR stations in proximity to properties.

4.5   Summary

This chapter investigates and measures the overpricing premium (Chau and Choy 2011) commanded by the housing developers in the presale market, as well as the housing price effect on first hand buyers in the second hand market arising from the asymmetrical information regarding the lawful flat size shrinkage phenomenon. For the developer, the results reveal that for every 1% of flat size shrinkage, developers pocket 0.3% de facto overpricing premium for Class A properties in particular by adopting the ostensible underpricing strategy. While on the other hand, it shows no evidence developers gain overprice premium for the Class B and Class C properties.

On the contrarily, when the flat size shrinkage problems can be visualized and measured in the second hand market, the first hand buyers of small sized flats would suffer the most. First hand buyers of Class A properties can still flip flats in the second hand market during booming economy in terms of relative price. However, they may suffer loss in their investment during economic downturns under the lawful flat shrinkage regime. Regarding Class B and Class C properties, first hand buyers may even gain the price premium given by the developers at the beginning since the price reduction is comparatively negligible in the second hand market.

This study has unveiled why more and more Nano flats are being built in recent years, and since the new legislation increases the transaction cost for the first hand buyer to flip the flats into the secondary market before the adverse attribute being revealed unless additional stamp duty being paid, the first hand buyers of Nano flats may suffer from inevitable financial losses in the second hand market. These empirical analyses fill in the gaps with regards to information asymmetry research area under different institutional doctrines as well as predicting the current distorted property market in Hong Kong.

Human behavior is highly related to the decision making process and it is inevitable when studying economics. The psychological context on how the people behave when flat size shrinkage becomes public information in the second hand market will be discussed in the next chapter.

-    End of Chapter 4   -

CHAPTER 5

MEASURING HUMAN BEHAVIOUR IN A LEMON MARKET

5.1   Introduction

Further to empirically analyzing the Lemon Market in terms of adverse selection,
overpricing premiums commanded by developers in the presale market, buyer reselling in
the second hand market, and the effect of asymmetrical information in regards to lawful
flat size shrinkage under current legislation; an interesting questions arises: How do
buyers react to the flat size shrinkage when it becomes a public information in the second
hand market? Is loss aversion behavior observable in the housing market?

As with the New Institution Economics perspectives, this study also probes into the
problem from the Behaviour Economics viewpoint. This is one of the first pioneer studies
analyzing the real estate market empirically from a behavioral economic perspective. The
human brain has limited capability when making decisions, especially when information
asymmetry exists. Kahneman and Tversky's Prospect Theory (1979) suggested that
people make decisions based on the potential value of losses and gains rather than the
final outcome, and the losses cause greater emotional impact on an individual than an
equivalent amount of gains. Will the Prospect Theory apply to the flat size shrinkage

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phenomenon in the Hong Kong Real Estate Market? This section of the study will focus on the second hand market, a point when flats can be inspected physically and investigate the psychological behavior of second hand buyers in terms of housing prices.

5.2   Methodology

5.2.1   Prospect Theory Model

The Prospect Theory, conceived by Kahneman and Tversky in 1979, suggested that people base the potential value of losses and gains to make decisions when it involves uncertainty and risks rather than the final outcome. In other words, it is a psychological relative behavior that treats the losses and gains.

The hypothetical value function graph developed by Kahneman and Tversky in 1979 is shown in Figure 6 below,

Figure 6 Hypothetical Value Function proposed by Kahneman and Tversky (1979)
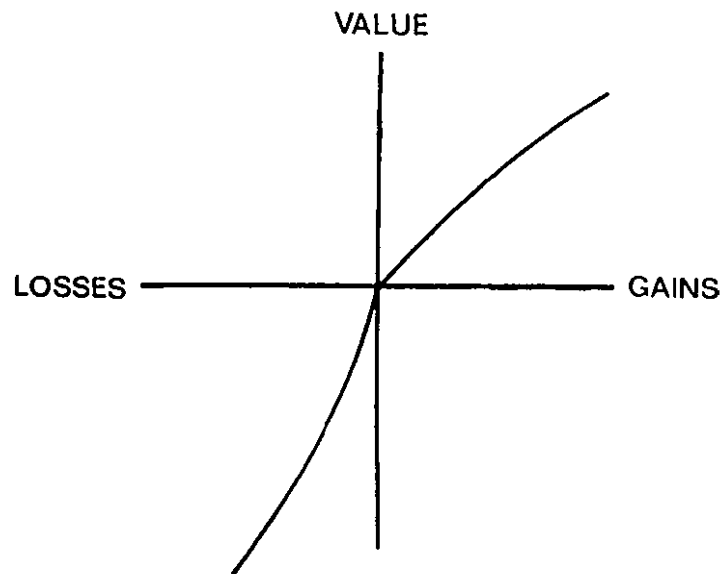
According to the Prospect Theory (Kahneman and Tversky 1979), there are four essential elements,

a)   Reference Dependence

b)   Loss Aversion

c)   Diminishing Sensitivity

d)   Probability Weighting

Reference Dependence means people make decisions and derive the utilities from gains and losses relative to a reference point, which refers to the people's expectations rather

than from the absolute level of wealth. However, where is the reference point? What are people's expectations? Kahnemand and Tversky offered little guidance that makes applying the prospect theory often a challenge. In this study, by measuring the norm of the flat size shrinkage for each Class of properties we investigate how this contributes to people's expectations of the flat size shrinkage. This can serve as the reference for the model; flat size shrinkage higher than the norm can be regarded as lemons and vice versa.

Notably, people are more sensitive to losses than to gains of the same magnitude, this is referred to as Loss Aversion. A typical example in the theory is that the pain of losing $100 far outweighs the pleasure of winning $100 in a gambling game. The losses cause greater emotional impact on an individual than does an equivalent amount of gains. It was proposed that the pain of losing is about twice as powerful psychologically compared to the pleasure of gain, and since people are more willing to take risks to avoid a loss, loss aversion explains the differences in risk-seeking and risk aversion. This explains why the value function of the gradients for the losses side is much steeper than the gains in the Prospect Theory Model. Loss Aversion was proposed as an explanation of the endowment effect. The Endowment effect refers to the fact that people will exert a higher value to the good they own themselves rather than an identical good that they do not own. However, these two concepts lead to an opposite view from the Coase Theorem, which opines that the extent should be identical for a person willing to accept a good and willing to pay for a good. But is it a violation or are there some implicit assumptions? In this study, the value function refers to the change in housing price reflected in the second hand market in response to the flat size shrinkage. The norm for flat size shrinkage of a

Class of Properties serves as the reference point, whenever the flat size shrinkage is higher than the norm, it would regarded as a loss and vice versa.

The prospect theory also suggested that the value function is concave for gains and convex for losses. This implies that the impact for substituting a $100 gain or loss by a $200 gain or loss is more significant than substituting a $1000 gain or loss by a $1200 gain or loss (Barberic 2013).

Barberic (2013) found that there are limited applications for prospect theory in economics. Most of the studies are based on "experimental" findings only and empirical tests are indeed slack. The x-axis in the Prospect Theory model usually refers to the monetary term with a dollars sign to determine losses and gains. The value function in y-axis refers to the value assigned to gains and losses rather than final assets. The directions given by Kahneman and Tversky are limited or unclear that what a gain or loss represents in a given situation and also where the reference point should be. This is typically one of the most common difficulties in the area of Behavioral Economics research. As human behaviour is usually in described in relative terms and very subjective, carrying out an empirical test to prove or investigate psychological human behavior is challenging, especially in the real estate market. This study contributes to the field by being one of the pioneers in providing empirical evidence in measuring human behaviours under an information asymmetry situation and referencing the Prospect Theory Model.

By referencing the spirit of the Prospect Theory Model, a few modifications have been made to it for this study in order to measure human behavior in terms of information asymmetry. Firstly, the asymmetric information on the flat size shrinkage ratios will be used on the x-axis, instead of the traditional dollar sign. The norms of the flat size shrinkage for each class of properties have been used as the reference point. By determining the reference point, the properties with flat size shrinkage higher than the norm refers to the Losses in the Prospect Theory Model. This is also refers to as Lemons under the information asymmetry theory. The relative flat size shrinkage would be negative. While on the other hand, flats with flat size shrinkage less than the norm would carry positive value and is referred to as the Gains in the Prospect Theory Model as well as Non-Lemons under the information asymmetry theory. The value function of the model in this study would be the change in housing prices in the second hand market, which serves as the y-axis. The value function of people's emotions has been quantified and transformed into monetary terms, which makes the model more convincing. The aim for this model is to measure whether or not people will have additional negative emotions as a result of financial losses or lemons and in terms of the flat size shrinkage their emotions have been quantified in housing prices. In other words, will there be any further reduction in housing prices for the losses or lemons? It is believed that this is one of the first pioneer studies to analyze information asymmetry in the real estate market, both empirically and from behavioral economic perspectives.

5.2.2 The New Model

Following the spirit of the Prospect Theory, a modified model was developed as shown in Figure 7 and demonstrates an empirical test to see whether losses are more painful than gains as a result of the asymmetric information on flat size shrinkage; the value function is quantified in terms of housing prices.

Figure 7 A New Modified Model Referencing Prospect Theory Model
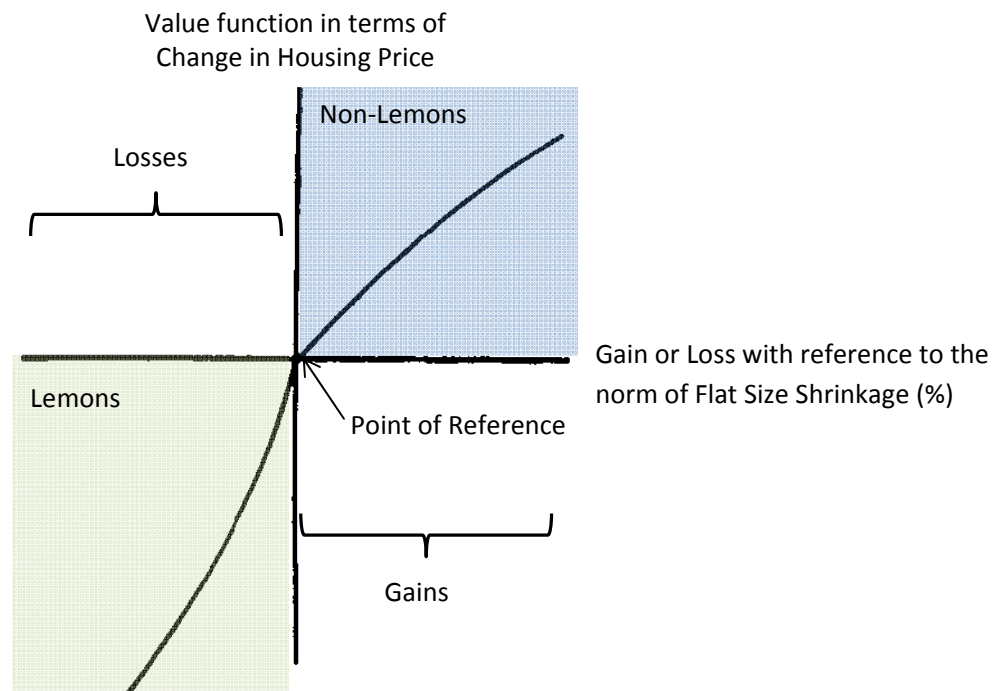
The reference point is the point that people use to compute gains and losses of their expectations. In this study, the reference point is the norm of flat size shrinkage, which is the median. This is the flat shrinkage ratio that people would generally expect. The flats with flat size shrinkage ratios higher than the reference point are regarded as Lemons and vice versa. Furthermore, the Non-Lemons portion refers to gains that carry positive values in comparison to the norm; the Lemons portion refers to losses carrying negative values compared to the norm.

In the Lemons portion, people are risk seekers. The slope for the value function in terms of housing prices is expected to be steeper. From the view of first hand buyers, if the flats are lemons, which correlates to losses, it is then expected that there will be an additional reduction in housing prices that subsequent buyers may be willing to pay once the flat is inspected in the second hand market. The possible reason behind this is that it is natural that people do not want to lose or are eager to reduce risks; obviously the potential subsequent buyers would tend to pay less for lemon flats in the second hand market, which would herald a price drop. While the sellers eager to flip the flats since they know their flats are lemons. In other words, housing price reductions imposed upon the first hand buyers are expected to be larger for lemons with high flat size shrinkage. Consequently, they stand to be the losers by being victims of information asymmetry.

On the contrary, in the Non-Lemons portion people are in a state of risk aversion. The slope for the value function is not expected to acute. If first hand buyers, who own flats,

know that the standard of their flats is above average, then they will value their units more than the others. This is known as the endowment effect. If a person owns a flat, forgoing it will make them feel like a loss, and humans are loss averse by nature. Hence, the owner will demand more money to compensate for the "loss feeling" so as to forgo their non-lemon flat. Otherwise, they would rather stick to their endowment. In view of this human behavior, people would rather stick to their endowment and demand a higher price to forgo the non-lemons; transactions for the non-lemons achieve relatively high price returns as they have low flat size shrinkage. Likewise, the amount of turnover for non-lemons should be lower, and this coheres with results from the empirical test on adverse selection whereby more lemons are in the market than non-lemons, and this may eventually trigger a market collapse.

Hence, the hypothesis for this chapter has been formulated as below,

A)   *Research Hypothesis 6 (H_6)*

"The relative housing price reduction in the second hand market for the lemons with higher flat size shrinkage will be greater than the relative housing price gains for the non-lemons of an equivalent amount. The slope for the losses will be steeper than that of the gains"

People make decision based on potential losses and gains. The concept of Prospect Theory (Kahnmen and Tversky 1979) in a psychological context is applied to measure human bahaviours. In this study, the potential losses and gains are interpreted in terms of flat size shrinkage. Losses refer to the flats with relative high flat size shrinkage as compared with the norm, while gains refer to the flats with relative low flat size shrinkage compared to the norm. The value function of human behaviour has been quantified as the change in housing price. People value losses more than gains. It is hypothesized that losses cause greater emotional impact to an individual than do an equivalent amount of gains. The possible reason behind this is that it is natural that people do not want to lose or are eager to reduce risks. While the potential subsequent buyers would tend to pay less for flats with higher shrinkage in the second hand market, sellers are more willing to sell the flats with a comparatively low price in order to complete the transaction. The rationale behind is due to the loss aversion. Hence, the slope for the losses will be steeper than that of the gains. On the contrary, the slope for the value function is not expected to be acute for the gains portion. If sellers know that their flats are above average, they will value their units more highly than others. Hence, they will demand more money to compensate for the "sense of loss" so as to forgo their flats with higher private value. Otherwise, they would rather stick to their endowment. Hence, transactions for the gains achieve a relatively higher price in the second hand market while the transaction volume is comparatively lower which coheres with the results demonstrate in the adverse selection section.

In order to test whether Prospect Theory applied when people are facing asymmetric information, a new modified model is developed to test whether losses are more painful than gain in terms of the asymmetric information on flat size shrinkage, while the emotional impact would be quantified as housing price as described in the previous section.

A hedonic price model will be carried out to investigate people's emotions in terms of housing prices with the comparative gains and losses in terms of the flat size shrinkage in the second hand market. The independent variable "NORM" represents the flat size shrinkage less than the norm, i.e. the Non-Lemons. It represents the percentage of gains relative to the norm of the flat size shrinkage. This variable captures the gains relative to the norm flat size shrinkage, which is 34%. The coefficient is expected to carry a positive value to reflect the relative housing price gain in percentage in the second hand market.

While another independent variable "NORM<0" represents the flat size shrinkage larger than the norm, i.e. the Lemons. It is the percentage of losses relative to the norm of the flat size shrinkage, i.e. 34%. Hence, the coefficient is expected to carry a negative value that reflects the losses in a percentage.

If the magnitude of the coefficient for NORM<0 is larger than NORM, then the price reduction in housing price for the Losses is larger than that of the Gains. The slope for the Losses will be steeper than the Gains.

5.3 Data Sources

Since this study on human behavior focuses specifically on the second hand market and investigates the magnitude of the housing price change with reference to the relative gains or losses from the norm of flat size shrinkage. The same set of data sources that were employed in Chapter 3 and 4 were utilized, but the presale market transactions were omitted. Second hand market transactions for the 13 mass housing developments on Hong Kong Island totaled 45,436 during the period from 1991 to 2013.

5.4 The Empirical Test

The overpricing premium commanded by developers in relation to housing prices was discussed in Chapter 4. Another relevant question that this study investigates is how people behave under a situation of information asymmetry, specifically in terms of flat size shrinkage in the second hand market. Will the financial losses cause a greater emotional impact on individuals than an equivalent amount of gains? By referencing the Prospect Theory developed by Kahnman and Tversky in 1979, a model has been

developed to quantify and measure the human behavior in towards housing prices while under an asymmetric information environment.

Another Hedonic Price Model has been put through the Eviews computer program to investigate people's emotions in terms of housing prices with the comparative gains and losses in terms of the flat size shrinkage.

The Equation (2) below is designed for this study,

$$LOG(RP) = \alpha + \beta_1 \text{ GFA} + \beta_2 \text{ FLOOR} + \beta_3 \text{ AGE} + \beta_4 \text{ NORM} + \beta_5 \text{NORM}{<}0 + \beta_6 E + \beta_7 W + \beta_8 N + \beta_9 \text{ SW} + \beta_{10} \text{ SE} + \beta_{11} \text{ NE} + \beta_{12} \text{ NW} + \beta_{13} \text{ MTR} + \beta_{14}\text{SEA} + \varepsilon$$

(2)

In Equation (2), α is the constant and ε is the residual.

Similar to Equation (1), the equation takes a semi-log form in which the dependent variable, list price in the year 1991 as the base year for calculating the real price levels, has taken a logarithmic functional transformation. Quadratic functional forms of the independent variables have been removed from the model because their appearances do not improve the performance significantly.

A heteroskedasticity robust model depicting the implicit prices of the units and the Newey-West HAC standard errors and covariance method has been conducted.

The key variables which are different from the Equation (1) are described as below,

5.4.1   Independent Variable

a)   Log(RP)

This independent variable is same as the one in Equation (1). It is the total housing transaction price adjusted using the corresponding housing price index, were at 1999 real price level. Log Real Price means every one percentage of change in real price.

5.4.2   Dependent Variables

The dependent variables of Gross Floor Area (GFA), Floor level (FLOOR), Age of Building (AGE), Direction of Flats (E, W, N, NE, NW, SE, SW), MTR and Seaview (SEA) are introduced in Chapter 4. Hence, they are not specifically explained in this Chapter. There are two new dependent variables introduced for this model.

a)   Flat size shrinkage less than Norm - Gains (NORM)

In order to calculate the gains and losses in terms of flat size shrinkage with the model, a new dependent variable "NORM" is added. It refers to the percentage of gains relative to the norm of the flat size shrinkage. The norm of the flat size shrinkage is 34%, which is also referred to as the median and the reference point. Therefore, it carries a positive value to reflect the second hand market gains in a percentage that first hand buyers achieved when flats could be inspected and purchased by second hand buyers. The coefficient of this independent variable is expected to be positive.

b)   Flat size shrinkage larger than Norm – Losses (NORM<0)

On the contrary, for flat size shrinkage larger than the norm, it is defined as the percentage of losses relative to the norm of the flat size shrinkage. Hence, it carries a negative value that reflects the losses in a percentage; first hand buyers suffer losses when flats are inspected in the second hand market. This variable captures the losses relative to the norm, meaning flat size shrinkage that is larger than 34%. The coefficient of this independent variable is expected to be negative. Additional price reductions are expected to incur losses. Moreover, the magnitude of the reduction in housing prices for the Losses is expected to be larger than that of the Gains. The slope for the Losses is expected to be steeper than the Gains.

5.5   The Result

The hedonic price model result for the second hand market is summarized in Table 17 below,

Table 17 Result for the Hedonic Price Model

Dependent Variable: LOG(RP)
Method: Least Squares
Sample: 1 45436
Included observations: 45435
Newey-West HAC Standard Errors & Covariance (lag truncation=15)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.29802	0.018861	758.0826	0
GFA	0.001321	1.56E-05	84.48448	0
FLOOR	0.002079	0.000178	11.65473	0
AGE	-0.00742	0.000501	14.8015	0
NORM	0.007559	0.001696	4.457286	0
NORM<0	-0.04045	0.015093	-2.68029	0.0074
E	-0.03238	0.013431	2.41098	0.0159
W	-0.07732	0.014175	-5.4549	0
N	-0.03197	0.015419	-2.07311	0.0382
NE	-0.05665	0.014348	-3.94835	0.0001
NW	-0.06715	0.011884	-5.64994	0
SE	-0.06359	0.011908	-5.34014	0
SW	0.007594	0.013351	0.568846	0.5695
MTR	-0.04011	0.001111	-36.0839	0
SEA	0.061901	0.006834	9.058009	0

R-squared	0.825982	Mean dependent var	15.46034
Adjusted R-squared	0.825928	S.D. dependent var	0.559311

S.E. of regression	0.233355
Sum squared resid	2473.334
Log likelihood	1654.715
F-statistic	15399.09
Prob(F-statistic)	0

5.5.1   The R-Square

As explained in Chapter 4, the R-square value is an indicator of how much original variability can be explained by an estimated coefficient and model. Thus, the fitness of the specified model can be derived from it.

The result shows an adjusted R-squared is 0.83, meaning 83% of the variation of the change in unit price can be justified by the explanatory variables in the model, which is reasonable and acceptable.

5.5.2   The F-Test

The F- test is applied to assess whether independent variables are jointly significant to explain the dependent variable. The F-test result is 15399.097 and the probability for the F-statistic of the null hypothesis is 0. Hence, the null hypothesis is rejected. The variables are jointly significant to explaining the dependent variable.

5.5.3　　The T-Test

T-test was adopted to determine whether each and every independent variable is individually significant enough or not to influence the dependent variable. The summary of the T- statistics is in Table 18 as below,

Table 18 - Summary of T-Statistics

	T-Statistics (*Significant in 5% level)	Prob.
GFA	84.48448*	0
FLOOR	11.65473*	0
AGE	-14.8015*	0
NORM	4.457286*	0
NORM<0	-2.68029*	0.0074
E	-2.41098*	0.0159
W	-5.4549*	0
N	-2.07311*	0.0382
NE	-3.94835*	0.0001
NW	-5.64994*	0
SE	-5.34014*	0
SW	0.568846	0.5695
MTR	-36.0839*	0
SEA	9.058009*	0

Sources : The Author

As discussed in Chapter 4, the significance level and T-value allow the null hypothesis to be rejected as shown as below,

T- Value < -1.96 or > 1.96

Significance level < 0.05

According to the table, all of the coefficients of the key attributes in this analysis are very reliable, except those for the flats facing southwest. Therefore, the independent variables in the statistical model have a significant individual influence on the dependent variable. Similar to the result in Chapter 4, the flat directions are not the key attributes for this study; a separate comprehensive study on the directions of flats can be carried out in the future.

5.5.4   Interpretation of Coefficients

The coefficient for this empirical test is recapped in Table 19 below,

Table 19 Summary of Coefficient

	Coefficient	Std. Error	Prob.
GFA	0.001321	1.56E-05	0
FLOOR	0.002079	0.000178	0
AGE	-0.00742	0.000501	0

NORM	0.007559	0.001696	0
NORM<0	-0.04045	0.015093	0.0074
E	-0.03238	0.013431	0.0159
W	-0.07732	0.014175	0
N	-0.03197	0.015419	0.0382
NE	-0.05665	0.014348	0.0001
NW	-0.06715	0.011884	0
SE	-0.06359	0.011908	0
SW	0.007594	0.013351	0.5695
MTR	-0.04011	0.001111	0
SEA	0.061901	0.006834	0

Sources : The Author

a)   Gross Floor Area (GFA)

The coefficient of "GFA" has positive value of 0.001321. Just as the result in Chapter 4, the buyers pay 0.13% for every increase in square foot of GFA. This means the larger the flat, the higher the housing price.

b)   Floor Level (FLOOR)

The coefficient of "FLOOR" has positive value of 0.002079. The result is similar to the result described in Chapter 4. It shows that the unit price of the flat increases 0.2% for every floor increment.

c)   Age of Building (AGE)

The coefficient of "AGE" has a negative value of 0.00742.   Similarly, the result demonstrates the building age has a negative correlation with the housing price. The unit price of the flat reduces 0.74% each year for the age of the building.

d)   Flat size shrinkage less than Norm - Gains (NORM)

This coefficient is devised to test the hypothesis of this chapter. The coefficient of "NORM" carries a positive value of 0.007559. The unit price of the flat increases 0.76% for every percentage gain relative to the norm of 34% flat size shrinkage. In other words, the first hand buyers who own the flats with flat size shrinkage less than the norm will gain 0.76% in housing price relative to each percentage gain. This coheres with the hypothesis that the Non-lemon flats have a positive relation with the housing prices.

e)   Flat size shrinkage larger than Norm – Losses (NORM<0)

Similarly, this coefficient is developed to test the hypothesis of this chapter. The coefficient of "NORM<0" has a negative value of 0.04045. It has a combination effect with the NORM, which makes a negative value of 0.0329. This means the unit price of a flat reduces 0.329% for every percentage of losses relative to the norm of 34% flat size

shrinkage. If the first hand buyers own the flats with a flat size shrinkage larger than the norm, then the effect will be a reduction of 0.329% in housing price, relative to each percentage of loss. Therefore, the result coheres with the hypothesis that the Lemon flats have a negative relation with the housing prices.

g)   Direction of Flats (E, W, N, NE, NW, SE, SW)

Directions of the flats are also included in this model. Similar to the result in Chapter 4, the current result demonstrates that flats oriented "West", "Northeast" and "Northwest" carry a negative correlation with housing prices and the result is significant. Flat orientations that are "East" and "Southeast" show results with a negative value and they are significant. Lastly, "Southwest" oriented flats demonstrated an insignificant result.

Similar to the results in Chapter 4, since orientations of properties is not the key focus of this study, and it would be necessary to include some environmental factors that cannot be applied in this model; future research should be carried out to investigate such an aspect of the real estate market.

h)   Seaview (SEA)

The coefficient of the "SEA" variable carries a positive value of 0.061901 and the result

is significant. This means that housing prices appreciate by 6.2% when properties have a sea view.

h)   MTR

Just as the results in Chapter 4, the results for "MTR" illustrate counter intuitive findings contrary to the common perception that flats near MTR stations should have a positive relation with housing prices. To restate, such a result cannot be supported, as most of the subject developments in the analysis are not located near MTR stations on Hong Kong Island within the study period. Similar to the point on the directions of flats, the recommendation is for future studies to be carried out to investigate the specific impact of flat prices that are in proximity to MTR stations especially when additional new stations on HK Island are opened.

5.6   The Modified Model

By referencing the Prospect Theory model, a modified version of the model, as presented in Figure 8, has been developed especially for this study to investigate human behavior in relation to the Lemon Theory. The aim is to study and understand whether or not loss aversion is present under the asymmetric information situation; this can be ascertained upon review of the slope of the gains and losses. Figure 8 below illustrates the result,

Figure 8 Graphical Presentation of Modified Prospect Theory Model

LEMONS & LOSSES   NON- LEMONS & GAINS
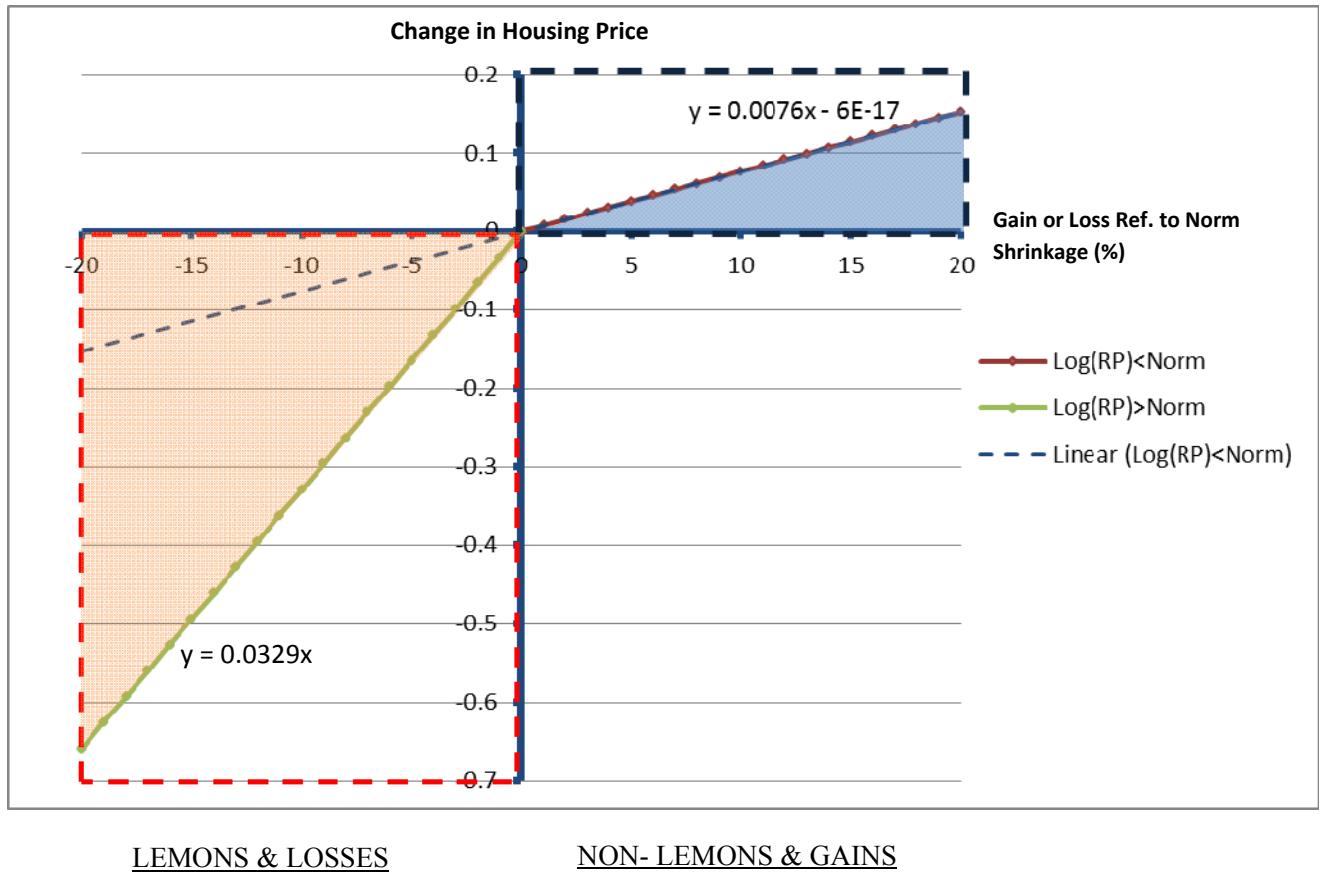
5.6.1   Interpretation of Model

a)   Reference Point

The Reference Point adopted for this model is the norm of the flat size shrinkage as per second hand market transactions, which is also interpreted as the median, quantified at 34%. The flat size shrinkage is further calculated with reference to the median. The flats with a flat size shrinkage exceeding the norm carry a negative value and are regarded as Losses in the Prospect Theory and Lemons in the Lemon Principle. On the other hand, flats with flat size shrinkage below the norm are considered as gains and carry a positive value. They are referred to as Gains in the Prospect Theory and Non-Lemons in the Lemon Principle.

b)   Loss Aversion under Prospect Theory

Loss Aversion describes an aspect of human behavior whereby people naturally tend to avoid losses to acquire equivalent gains. The results of the slope in this study depict the value function of losses to be steeper than gains under the Prospect Theory.

In this modified model, the results indicate that for every 1% of losses in terms of flat shrinkage, the flat unit price will decrease by 3.29% of the housing price. The gradient for the slope is 0.0329 as shown in the graph. This means when second hand buyers subsequently inspect the flats and discover that they are lemons, they will certainly tend to pay less as they do not want to suffer any financial losses. Therefore, housing prices are being affected by the influence of human behavior as such. The housing price drops for every additional percent of flat size shrinkage in comparison to the figure for the norm. Consequently, first hand buyers will face financial losses once their lemon flats enter the second hand market.

On the other hand, the results suggest that the unit price of a flat increases 0.76% for every percentage of gain from norm of flat size shrinkage. The gradient for the slope is 0.0076 as presented in the graph. This indicates that second hand buyers are generally willing to pay more for a property if they discover the flats are worth more than average value. Thereby, first hand buyers would normally demand more money for their Non-lemon flats to compensate for their "Loss Feeling" due to the endowment effect.

Contrarily, risk aversion defines the Non-Lemons results, which suggests that the unit price of a flat decreases by 0.89% for every 1% of unexpected flat shrinkage; generally this will be expressed in the housing prices of the secondary market. Notably, the developers successfully acquire the overpricing premiums through information asymmetry of flat size shrinkage, shown in the orange area. The gradient for the Non-

Lemons is 0.0089. The slope for the gains is not as sharp as that of the losses. If owners know their flats are Non-Lemons, the endowment effect may also be an influencing factor; flat owners will demand higher amounts for their Non-Lemons to compensate for their "loss feeling", otherwise they might just stick to their endowment and keep the property.

The results show that the slope in the Losses portion is steeper than that of the Gains portion. This newly developed model demonstrates that loss aversion behavior exists in the information asymmetry market.

5.7   Summary

This chapter documents that human behavior arises as an influential factor to housing prices as a result of information asymmetry. The newly developed model based on the Prospect Theory Model by Kahneman and Tversky's Prospect Theory (1979) was designed to investigate and quantify the influence of human behavior on housing prices. The asymmetric information of flat size shrinkage is comparatively presented and interpreted as Losses and Gains. The results graphically document that losses cause a greater emotional impact on individuals than an equivalent amount of gains. People are naturally afraid of losing, therefore we can see that buyers are usually prone to pay less for lemons in the second hand market, as the properties can be physically inspected. While the sellers also eager to sell the flats since they know the flats are lemons. This

human behavior subsequently influences and is reflected in terms of housing prices. The results indicate that housing price reductions are 3.29% for every percent of losses in comparison to the norms of flat shrinkage. Contrarily, buyers are willing to pay more for Non-lemon flats while the first hand buyers will demand more money to forgo the "loss feeling". These results illustrate that housing prices increase by 0.89% for every gain in percentage consistently with the norms of flat size shrinkage.

It is believed this pioneer study is unique and one of the first to analyze the real estate market empirically from behavioral economic perspective under an information asymmetric situation. Due to the human behavioral characteristics, corresponding institutions were implemented to investigate and relay new information on the Lemon Market. Future research should be developed and conducted to investigate whether or not the diminishing sensitivity phenomenon also applies.

The empirical findings in Chapter 3, 4 and 5 will be discuss from the new institutional perspective and the behavioural economic perspective in the next chapter.

- End of Chapter 5 -

CHAPTER 6

DISCUSSION AND CONCLUSION –

FROM INSTITUTIONAL AND BEHAVIOURAL APPROACH

6.1   Introduction

Area shrinkage of newly completed units has long been a hot debate issue in Hong Kong's housing market. This chapter will summarize the observations from the empirical analysis of this study. Firstly, durable lemons exist in the Hong Kong Real Estate market due to the information asymmetry problems in terms of flat size shrinkage and the durable lemons have been identified. This paved the way for the subsequent analysis from an information asymmetry perspective. Secondly, this study empirically demonstrates that adverse selection is active in the market. Lemons, is a term that refers to comparatively low quality products that are costly discern, are active in edging out non-lemons in the market due to the adverse selection process. The high turnover rates for lemons with high flat size shrinkage ratios indicate that the market is contending with lemons, and the market could eventually collapse in the long term. Thirdly, this study revealed that developers acquire an overpricing premium making use of information asymmetric situation in terms of flat size shrinkage especially for the small size flats by applying an ostensible underpricing strategy. It was found that the smaller the unit size is,

then the higher the overpricing pricing premium captured by the housing developers in the primary market will be. The empirical tests conducted found that developers offered price reduction for the Class A, Class B and Class C units in relation to the flat size shrinkage issues in the presale market to lure potential buyers to purchase the units without paying attention to this adverse attribute. By comparing the result in the second hand market, the results reveal that developers gain the overpricing premium by adopting ostensible underpricing strategy especially for the Class A units. On the contrary, the results show no evidence that developers acquire overpricing for Class B and Class C with respect to the flat size shrinkage. This may bring to light and give an explanation as to the reasons behind the prevailing trend of Nano flats being constructed by developers. It was noted that for the first hand buyers, price reductions are only realized in the second hand market when the flats could be physically inspected and the real usable flat size became known. Class A properties exhibit the largest price reductions, followed by Class B and Class C accordingly. It has been noted that two different doctrines are governing the presale and second hand markets. When flats are being resold in the secondary market, developers become discharged from bearing any liability as to the accuracy of the information they provided on the properties. The study has found that first hand presale buyers may suffer the most financial losses in terms of the flat size shrinkage issue during economic downturns. However, due to the price reductions given to the first hand buyers are higher than the price reduction in the second hand market for Class B and Class C units, the first hand buyers for these two classes of property may even gain the premium given by the developer in the first place without being affected by the flat shrinkage problem. The buyers of small sized Class A flats suffer the most. The first hand buyers of

Class A properties can still able to flip the flats and gain the relative price during economic upturns. Yet, they may bear a risk of loss during economic downturn even though developers have already extended a price reduction to them. Contrarily, the price reduction compared to the flat size shrinkage is comparatively negligible, the first hand buyers of Class B and Class C are not being affected. Finally, an investigation into information asymmetry from a behavioral economics perspective was conducted. A new model was designed, referencing the Prospect Theory model developed by Kahneman and Tversky in 1979, to investigate and quantify how human behavior influences housing prices. The asymmetric information of flat size shrinkage was interpreted as Losses and Gains. The results manifest graphically that losses cause greater emotional impact on individuals than an equivalent amount of gains. People in general are afraid to suffer losses, and tend to pay less for the lemons in the second hand market, especially when the flats could be physically measured. In this way, we can observe human behavior being reflected in terms of housing prices. To date, this is one of the first pioneer studies to empirically measure and analyze information asymmetry in the real estate market from a behavioral economics perspective.

Due to the nature of buyer behavior and difficulty in measuring it, corresponding institutions were implemented attempting to resolve the lemon problems in the real estate market. The four empirical analyses presented in Chapter 3, Chapter 4 and Chapter 5 have demonstrated and unveiled why new institutions are called for to handle the problems caused by asymmetric information.

This chapter will first discuss the evolvement of the new institutions in recent year that are attempting to increase market transparency and deal with the information asymmetry problems. It goes on to further discuss the counter measures, to institutional change in the real estate market, governing the information disclosures. The institutions that are tackling flat size shrinkage problems will be discussed and followed by a discourse on the evolving institutions for the small size flats. Finally, a review of human behavior under information asymmetry and the final conclusion will be presented.

6.2   Evolving Institutions to Tackle Lemons in the Housing Market

This study unveils that information asymmetry in terms of flat size shrinkage exist in the Hong Kong real estate market and overpricing premiums are captured by the developers by taking advantage of information asymmetry. First hand buyers of lemons suffer significant losses in property transactions, especially for the small size units, due to slack regulations governing information disclosure in the Hong Kong real estate market.

Information disclosure is believed to be one of the most effective methods that can be applied to ease the lemon problems. The newly enacted Residential Properties (First-hand Sales) Ordinance (SPRO) to regulate flat size descriptions in the first hand sales market in April 2013 attempted to ease the lemon problem by providing a fair and transparent platform for buyers to obtain more sales information before making buying decisions. It

imposes more stringent requirements for area descriptions in sales brochures to avoid confusion and potential misrepresentation by the developers. In a nutshell, the SPRO removes the measure of GFA entirely; SA is the only legitimate floor area description allowed in sales brochures. The definition of SA has been refined and made clearer. In particular, a number of items such as balconies, utility platforms and verandahs, and so on, must be listed in addition to the SA. In doing so, the first-hand buyers can better gauge the actual usable floor areas, as do the subsequent buyers. A new authority has been set up to scrutinize the descriptions of floor areas and other important sales information. The new law addresses the information asymmetry problem by changing from a voluntary information disclosure method to a mandatory information disclosure method (Chau and Choy 2011).

This new law mainly deals with first hand sales of residential property, which is under the *caveat venditor* regime. Prior to the enactment of the SPRO, regulations did not specify the information disclosure unless such requirement is stipulated in a government lease[15]. Therefore, in some cases no sales brochures were even required to be printed and developers did not to even mention the true flat size. In fact, the situation is still the same for the sales or lease of commercial or industrial buildings that are not included in the governing by the SPRO. There are no regulations to govern information disclosure, nor the calculation of the unit area, for the sales of non-residential properties. The description of the unit size is still confusing and blurred for these kinds of properties, no matter if they are for sell or for lease. Different developers have their own interpretation of unit

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[15] This is refers to the Consent Scheme that consent to sale is required to be obtained from the government for the presale of the uncompleted units. However, no requirement on information disclosure is specified for the sales of completed units under the Consent Scheme and completed or uncompleted units under the Non-consent scheme

size and this is why flat size shrinkage is rife, and yet, this is still permitted under current legislation. Even if the sales brochures are required, it is difficult to claim misrepresentations because of the disclaimers printed in them; such disclaimers are excluded from the Control of Exemption Clauses Ordinance Cap. 71(LRC 2002). After all, the original purpose for residential properties is to provide accommodation for people to live, and due to the skyrocketing housing prices in Hong Kong, one square foot matters a lot to common buyers. After the Law Reform Commission of Hong Kong proposed the enactment of law to increase the transparency of property information for almost ten years, the enactment of SPRO is a huge step forward for the government in controlling property developers and attempting to provide a fair and transparent platform for residential buyers to acquire more information for their decision making purposes. The strict enforcement of the SPRO should ultimately resolve the information disclosure problem.

Prior to the SPRO enactment, housing developers could opt to follow the sale guidelines issued by the Real Estate Developers Association of Hong Kong (REDA), a voluntary self-regulated association of housing developers. REDA took up the self-regulatory role of its members regarding sales and information disclosure of residential units in Hong Kong since 2001. It was voluntary information disclosure guidelines that were not legally binding. Several chaotic situations resulted under this voluntary information disclosure regime when the market in an upward situation. Misleading information on properties and sales performance were frequently reported. In the Ronald Coase Workshop held in Beijing in 2012, some economists questioned the misrepresentation happening and asked

why the Hong Kong government is still allowing this happen? As explained, there are tons of disclaimers printed in the sales brochures, thus allowing developers to circumvent their responsibilities. Choy (2009) suggested that while misleading information on sales brochure may constitute a breach of the presale regulations; it may not be construed as a breach of contract. Hence there was a missing link in the past so far as consumer protection is concerned.

Since the enactment of the SPRO for the presale market, the institution has been changed from voluntary information disclosure to mandatory information disclosure. Does this lead to greater market efficiency? Does it really lower the transaction costs and eliminate all the information asymmetry?

Stiglitz (2001) suggested that the efficiency of the market economy and the appropriate relationship between the market and the government are interrelated in this world with positive transaction cost and the existence of information asymmetry. Is this new institution attempting to solve the information asymmetry problems to lead to greater market efficiency? Posner (2003) argued that if one is restrained from making profits out of providing information, the incentive of possessing information will be hampered and eventually the society will suffer. According to the Coasian reasoning, no matter how negligible, there is always a cost to obtain information by any parties.

Kronman's (1978) differentiated two different kinds of information. He contended the product information itself should be disclosed by the seller since it will not affect the

level of information production. However, on the other hand, it should be allowed to withhold market information or decided by both the seller and buyer whether or not to disclose it. The reason behind is that the production level of information may be affected by this disclosure. He conceived that it is a cost-effective solution if the seller is asked to disclose the information at the outset. Yet, what is the meaning of "all" information? How detailed should the disclosed information be? Is the market more efficient due to the disclosure of "all" information? Is the transaction cost being lowered due to the disclosure? Even if the information is disclosed, is it too technical or professional for normal people to understand or process? The transaction cost for the sellers to disclose all the information increases; while the transaction cost for the buyers to process too detailed or technical information also increases. In the car market, the specification for each car are very details with all the technical terms and figures for every components in side. It is difficult and time consuming for the potential buyers to process all these information revealed by the sellers if the buyers are not engineer or acquire professional knowledge for this aspect. In the end, potential buyers will rely on leaflets with all the key figures and information produced by the agents with all the disclaimers stating that they are for reference only. Similarly, this situation applies to the housing market as well.

Apart from standardizing measures of floor area information, the SPRO imposes legal requirements on dissemination of price lists, show flats and sales arrangements, together with advertisements and TV commercials. Detailed dimensions, fittings, finishes, appliances, and the like, within a unit are required to be disclosed. It is now even mandatory to use certain font sizes of text characters and letters in information leaflets

(sales brochures). The information is already beyond the needs of the consumers. Grossman (1981) argues that the duty of disclosure may lead to an overinvestment in producer insurance and general prices may increase as a consequence if the sellers don't know what specific pieces of information to disclose. A number of studies, such as Mckean (1970), Buchanan (1970), Goldberg (1974) and Nanda and Ross (2009) also contend with the notion that general prices under product liability tend to be higher. The new institution that requires sales brochures to cover a wide array, if not excessive, amount of information will increase the information costs to both the sellers and buyers. To the sellers, in order to produce a comprehensive sales brochure, extra resources are allocated to gather the required information; an independent checker is usually employed to double check the validity of the information. It is common to see extraneous paper being wasted to print these sales brochures that are not read thoroughly by the property buyers.

Additionally, meaningless mandatory disclaimer statements are required to be displayed in the advertisements, during radio broadcasts and on TV commercials. Furthermore, to the buyers, although the search cost as well as the reliability of the information may appear to be minimized as compared to the voluntary information disclosure, they in fact need to spend extra time to process the superfluous property information. With the additional information costs incurred to both parties, the net benefit of the SPRO may be less significant than originally anticipated.

In order to counter this bulking-up of sales information, an informal practice has been

developed by the sales agents to diminish the increasing information costs arising from the SPRO. For sales of each housing development, the estate agents design a simplified leaflet of their own in which only the salient features of the premises are displayed. Nevertheless, since each of the sales agents distribute self-designed company leaflets for each housing development, an unintended consequence occurs; prospective buyers may receive multiple copies of property related information from property sales offices, filled with overlapping redundant information.

Although forcing the transacting parties to disclose "all" information may not necessarily attain perfect efficiency, it may be desirable if the total social costs can be saved by such disclosure. For specific information that is very costly to discern, a compulsory disclosure requirement may be efficient. To standardize the use of SA as the only legitimate unit to describe the flat size is definitely an improvement to match people's expectations on usable area, instead of using GFA. Actually, SA has long been construed as the exclusive useable floor area of a unit, until new building methods and layouts deployed in recent decades rendered some units significantly smaller than others, albeit with an identical SA. The "vanishing" areas include the exterior and internal walls, and also the extensive uses of utility platforms for air-conditioners, electrical and other utility installations. Although SRPO has refined the definition of SA by splitting up various components including balconies and utility platforms being displayed in sales brochures; in reality, the actual useable floor areas have not been truly reflected by the stated SA.

As far as the new regulations allow, housing developers can still lawfully build new units

with a smaller useable floor area than shown in the sales brochure. However, from a buyer perspective, it is costly information wise to discern the actual usable area of flats before entering into a sales agreement.

SPRO only governs the first hand sales market. So what about the second hand market? Only limited information is included in the standard sales and purchase property agreements. The specifications of floor areas are not even included in the agreements of many transactions. The Law Society explained that the practice is to minimize the risk of rescission. It is because it would be easier for either party to rescind the contract if more information were included in the agreement (Poon, Choy et.al. 1995). The enactment of Estate Agent Ordinance (EAO) Cap.511 in 1997 and the enforcement of Estate Agents Practice (General Duties and Hong Kong Residential Properties) Regulation imposed the code of practice on estate agents to provide prescribed information and seek information disclosure from the sellers. In 2012, due to the presence of the Estate Agents Authority (EAA) there were many complaints about unclear or misleading floor area information to clients in respect of second hand residential properties. The EAA has issued a circular to set out the guidelines for licensees on the provision of floor area information in accordance to the ordinance and regulations; they are required to obtain the saleable area of the property provided by the Rating and Valuation Department or as stipulated in the agreement for sale and purchase of the first assignment of the property registered in the Land Registry[16].

Licensees who fail to comply with the guidelines may be subject to disciplinary action by

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[16] See EAA circular 12/02 (CR) – Provision of floor area information for second-hand residential properties

the EAA. However, the EAO and its subsidiary legislation do not have any provisions requiring licensees to provide the price per square foot of the property Gross Floor Area (GFA) is also allowed to illustrate the price per square foot as soon as it has been stated to avoid misunderstanding. For old buildings in the second hand market, where saleable area cannot be obtained, licensees are allowed to provide gross floor area from a reasonable source. Comparatively, we can see that presale market has more delineation of floor area presented than the secondary market. Subsequent to the change in governing the floor area presentation, the EAA also issued new circulars to govern property information disclosure in 2013[17]. Nevertheless, the laws only regulated the estate agents. Sellers can choose not to disclose the full information on the property information form and the vendor's statement is not construed as any part of the agreement of sales and purchase.

6.3   The Countering Institutional Changes in Real Estate Market

On top of the mandatory information disclosure stipulated by the new Ordinance, there are some countering institutions that may evolve to resolve the Lemon Problems. Brand names and guarantees are two counteracting institutions illustrated by Akerlof (1970) to deal with the lemons before the enactment of SPRO. Chau et al (2001) found that the more reputable developers can command a higher premium in Hong Kong. Recently, some housing developers also devised buy-back guarantees within a certain period after the sales of first-hand properties. Usually properties with a guarantee arrangement have

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[17] See EAA Circular 13/02(CR) – Property information and completion of property information form/leasing information form

exquisite quality products and after-sales services. It is in fact, a signaling arrangement (Spence 1973), which attempts to differentiate high quality properties from lemons. In practice, exercising the buy-back option is never heard of. The reason behind this is that when the flats are being resold, the developers are supposed to be discharged from their legal liability. Hence, exercising buy-back guarantees extends the responsibility of developers and distinguishes themselves apart from lemons.

Voluntary information disclosure, as mentioned previously, is another method to tackle the problem of lemons. Developers can opt to follow the sales guidelines issued by REDA, to serve as an indicator that the properties are not lemons. These guidelines mainly act in enhancing market transparency by providing additional information as required by the relevant laws, such as the information on the footage of separate floor areas occupied by ancillary facilities. These guidelines have been superseded by the SPRO after 2013.

The emergence of third party information providers is another evolving institution to deal with the lemon problem. Social media is a popular tool that can be used to convey sales information online, critical reviews, analyses and other property information that can be shared by buyers and the public. This relatively new means of information dissemination is complementary to prevailing third party information providers, such as newspapers, radio broadcasts and TV programs about property news; this channel is considered very effective, especially to the younger generation of prospective property buyers. Following the technology evolution, some agencies have developed virtual tours of the developer

sales offices and model show flats. The use of Virtual Reality (VR) allows potential buyers to visualize the show flats even when they are unable to view in person.

The current discussion has documented the formal and informal rules and the emergence of counter-institutions to deal with the problem of lemons in the market. The following discussion focuses on new institutions that have evolved to specifically deal with flat size shrinkage.

6.4   New Institutions to Tackle Flat Size Shrinkage

Through empirical testing, it has been demonstrated that developers overprice flats by taking advantage of flat size shrinkage through asymmetric information. In other words, the higher the flat size shrinkage, the more they are overpriced. The empirical results also unveil that the smaller the size of the flat, the greater the overpricing effect is. This phenomenon affecting small size flats will be discussed in the next paragraph. In order to deal with the flat size shrinkage problem, another institution was imposed in 2010 to control the "inflated building" factor. An inflated building is an opposite interpretation to flat size shrinkage.

The public has accused that it is the GFA concession on the green features granted to the developers to promote sustainability in 2003 is the main reason contributing to the "inflated building" effect in Hong Kong; and since "free" additional floor area had been granted to developers, whereby it was allocated to the units in the project and then sold to

the buyers. In other words, the actual usable area of the flats had shrinkage due to the introduction of the green features to each unit. Each developer has their own formula and method in allocating the area that could be sold to the buyers. Some developers would allocate as many green features as possible to units, regardless to whether the area could be used by buyers, nor whether the furniture to fit the flat finally had to be tailor made. Developers merely see property development as a business and maximizing profits seems to be the sole purpose. The situation is even more severe under the unbalanced supply and demand housing market in Hong Kong; no matter how much of a lemon the flats are, they are still always sold out in no time.

Some developers, on the other hand, would try to consider from the user's perspectives. Attaining higher carpet efficiency serves as an advantageous arrangement to the market to distinguish high efficiency properties from the lemons. A higher premium can also be achieved if a developer has a prestigious reputation. These types of developers have the view to establishing long-term relationships with their clients.

In response to the public concern, guidelines and practice notes were issued by the Buildings Department under the authority of Buildings Ordinance (Cap. 123) to tighten the GFA concession policy to maximum 10% cap to green and amenity features for each development. It should be noted that the GFA here refers to the GFA stipulated in the Buildings Ordinance, it is not the GFA stated in sales brochures.

Prior to the issuance of the new guidelines and practice notes in 2010 to tighten up the GFA concession policy to a maximum of 10% to the green and amenity features for each developer; it is lawful to build and include as much GFA exempted green features into the flats. However, this depends on the developer self-regulating decisions and whether or not they want to establish long-term relationships or solely maximizing the profits.

The new institution governs the maximum 10% GFA concession per development for the green features, including balconies, utilities platforms, non-structure prefabricated wall, wider corridors, acoustic fins, as well as the amenity features, including club house, non-mandatory plant rooms, management facilities, and so on. In this thesis, the focus is to look at flat shrinkage from an individual flat owner and general public perspectives; hence, green features that could be allocated to the units is one of the key factors to look at in this study.

The concessions and rules for the green features are much more stringent in comparison to the past. A comparison is briefly summarized in Table 20 below,

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Table 20 Comparison of GFA Concession on Green Features

	Prior to 2010	After 2010
Balcony	min. 2 sq.m or 4% UFA max. 5 sq.m	Only **50% balcony area will be exempted** with max. concession of 2.5% UFA or 3 sq.m whichever is the greater
Utility platform	1.5 sq.m	**Only 50% UP area will be exempted** = 0.75 sq.m
Prefabricated wall	300 mm	150 mm **(50% cut)**
Bay Window	500 mm	100mm **(80% cut)**

Sources : Buildings Department

For a more concise understanding, an example of the impact of the new and the old policies for a mass development is consolidated in Table 21 below,

Table 21 Example of the impact of new and old policies

Item	**Under Old Policy**	**Under New Policy in 2010**
Balcony (50% cut)	3.3%	1.6%
Utility Platform (50% cut)	2.3%	1.2%
Pre-Fabricated wall (50% cut)	7.2%	3.6%
Bay Window (80% cut)	4.3%	0.9%
Common Area Allocated	15.3%	12.8%
Total Inflation	**32.4%**	**20.1%**

Sources : Buildings Department and the Author

In market practice, it was noticed that some players must allocate a balcony, a utility platform and bay window into a flat surrounded by prefabricated wall, even for a studio flat. By tightening the GFA concessions, the flat shrinkage problems definitely ease off.

After the enactment of SPRO, Saleable area (SA) is the only legitimate unit to present a flat's size; the common area is no longer valid since GFA had been vetoed. While the balconies and utilities platforms are allowed to be included in the saleable area, it still needs to be listed separately, and bay windows have also been excluded. Therefore, in current practice, using prefabricated wall is an increasing trend.

One important point to be clarified is that green features in fact not "free". Premiums have to be paid to the Lands Department in accordance to the size of the green features. One may argue that the premium must be transferred to the end buyers. However, it is not "free" as the public has wrongly accused in the past.

After the issuance of the practice notes and guidelines to cap the 10% GFA concessions for green features in 2010, counteractions appeared in the market by some developers to "balance" out their profit margins. Curtain wall, although it is not one of the green features, is allowed to form as an external face of a building. As long as it is allowed in the Building Regulations, a 300mm projection was allowed exemption from GFA calculations.

Not until 2015, the Buildings Department reviewed the practice notes on the projection of curtain walls and reduced the projection to 200 mm for residential buildings. As a result, most of the unscrupulous developers had adopted curtain wall in new projects instead of prefabricated wall due to the change of regulations during the period from 2010 to 2015. The cost for curtain wall increased substantially during this period. After 2015, since the adjustment reducing the allowable exempt area between prefabricated wall and curtain wall, in view of the cost and the maintenance issues of curtain wall, prefabricated wall has been increasingly adopted once again.

Apart from curtain wall, since the Saleable Area is measured from the exterior of the wall, some developers allocate all the structural elements to individual units; because of this, these elements can be capitalized upon by charging buyers.

Hence, there are still a lot of lemons in the market, and the extent of this also depends on how much unused areas in a building are allocated to individual flats. However, upon implementing the new institutions on governing the GFA concession on green features and the reduction of the exempt areas to individual green features, a distinct tapering off in the flat shrinkage issue has been observed. In addition, the use of saleable area eliminates the individual formula by developers in allocating the common areas of a building to individual units. These institutions provide a comparatively fair competition platform among developers by creating greater transparency on how those areas have been allocated.

Questionably, are these institutions governing flat shrinkage problems attaining efficiency and benefitting society? The purpose of providing incentives to the green features is to promote the construction of green and innovative buildings and reduce construction and demolition waste. Nowadays, the public sees green features as another method that developers use to maximum their profit only, the good intentions seems to have been overlooked. Are there any institutions that could seduce developers to adopt green features but not abuse the incentives? How about not using the GFA concession approach, and instead, using a premium charged approach? The government can charge for premium for each type of green features, instead of granting GFA concession. If balconies or utility platforms are really beneficial or welcomed by the public, the potential buyers are willing to pay a premium to have these features. On the other hand, developers are definitely willing to pay a premium for the features as the overall selling prices will increase and profit margins will be higher. If these features are not beneficial to society, why keep them in the market? Perhaps the best approach would be to let the market decide, the decision can be market driven instead of imposing regulations. After all, institutional change should happen only if market efficiency and social benefit can be achieved.

6.5   Overpricing Phenomenon and Pricing Strategy

The empirical test results have revealed that developers pocket 0.3% de facto overpricing premium for Class A properties for every 1% of flat size shrinkage through ostensible underpricing strategy. This has been taken into account of the price reduction given by

the developers in the presale market and the price reduction reflected in the second hand market. This coheres with the result demonstrated in Choy (2009) that lemons are in fact overpriced through an ostensible underpricing strategy.

In the presale market, developers have already offered a price reduction for the flats in relation to the flat size shrinkage. The motive is to seduce potential first hand buyers to overlook the flat size shrinkage problem. The results show that first hand buyers are given a price reduction of 0.54% for every 1% of flat size shrinkage to flip flats before the flat size shrinkage problem can be visualized for Class A properties, and likewise of 0.3% for Class B properties and 0.35% for Class C properties. Why do developers offer price reductions in the first place? The transactions are under the legislative doctrine of *caveat venditor,* which refers to the producer liability. It is easier for potential buyers or victims to claim from the sellers. Offering price reduction in presale market will increase the buyer's opportunity and cost of searching the adverse information, which is the flat size shrinkage in this case. First hand buyers can pocket the pricing premium in the first place while the developers can gain the de facto overpricing premium if the price reduction reflected in the second hand market is larger than the price reduction given in the presale market. This means in the rent-seeking exercise, that both the developers and buyers have a joint interest. Although the general phenomenon applies, the empirical test results suggest that the situation differs somewhat with respect to different classes of properties.

For the small size units in which the flat sizes are smaller than 430.5 square feet, it is observed that the result shows developers offered a perceived underprice to Class A properties in a comparatively larger extent to serve as an incentive for first hand buyers to purchase flats regardless of the flat size shrinkage problems. Once the flats have been sold to the first hand buyer, the liability of the developers becomes null and void.

In the second hand market, where flats can be inspected physically, the results show that the price reductions for Class A properties are the most substantial. There will be a total 0.8% price reduction in every 1% of flat size shrinkage in the second hand market. This indicates that the first hand buyers may bear a risk of suffering loss in the investment in the second hand market, especially during economic downturns. On the other hand, they can still gain the relative price gain during booming economy. But this no longer concerns the developers, the governing doctrine has changed from *caveat venditor* regime to *caveat empitor* regime. All liability is now under the first buyer in the common law system. Although they were given the largest extent of perceived underpricing premium, the housing price reduction is in fact larger than the given price reduction when the flats can be inspected, and the first hand buyer ultimately suffer the most and are the overall losers of the situation. In contrast, the developers have gained the de facto overpricing premium of (0.84% - 0.54% = 0.3%) from pocketing the funds by using information asymmetry on the Class A properties through the ostensible underpricing strategy. The developers pocket the most profits from information asymmetry in the sales of small sized flats. This is obviously one of the main factors contributing to the reason why there is an extremely increasing supply of Nano flats recent years.

The situation for first hand buyers of Class B and Class C properties may be better. They are also given a price reduction of 0.3% and 0.35% respectively. The housing price reduction is only 0.15% and 0.04% due to the flat size shrinkage in the second hand market. That means the buyers can capture the pricing premium in the presale market and flip the flats in the second hand market much more easily with the effect of the flat size shrinkage. Especially under the booming market, they will earn more in comparison to the Class A property buyers. However, there is no evidence show that developers gain any de facto overpricing premium for these classes of properties. To deal with the low marketability for these flats with comparatively large lump sum, the price reduction can seduce potential buyers to purchase the flats and increase the opportunity cost to search for the adverse attributes. The developers are free from the liability after the flats are sold.

A trend of gradual decrease in housing price with corresponding decrease in flat sizes is observed in the empirical test results in the second hand market when the flats can be inspected physically. It means to the first hand buyers, the smaller the size of the flats, the more they stand to suffer with respect to the asymmetric information of the flat size shrinkage. In contrast, the developers acquire the highest de facto overpricing premium particularly for the small size flats through ostensible underpricing strategy.

Another noticeable phenomenon from the empirical test is that the price reduction is higher for the lemon flats. The results show that there are additional 4.7%, 14% and 8% housing price reductions for every 1% of shrinkage that exceeds the norm of a particular Class of properties. In other words, developers pocket the most for the small size lemon flats, while the first hand buyers for this type of flats suffer the most, especially in economic downturns.

Why do developers can exercise higher monopoly to the small size flats? Why do people so eager to purchase the small size flats even though they may expose to higher risk of losses. This may due to the overall distorted housing policy in Hong Kong since late 1990s and early 2000s. The government at that time slowed down and put all the land planning and developments on hold in response to the Asian Financial Crisis and subsequent economic downturns. The current acute land and housing shortage to cope with the increasing demand for the growing population and economy lead to the distorted housing structure in Hong Kong and hence the housing property price keeps booming. Apart from the private housing, the supplies of public housing are also of severe shortage. There were total about 286,500 applicants as at end September 2016 waiting for the public housing. The average waiting time was 4.5 years. The ladder for supply and demand of housing was broken since the suspension of supply since 2000s. The demand for the housing are keep increasing. According to the Census and Statistics Department's latest population and household projections in 2017, Hong Kong's population and households are projected to continue to increase.

Since the need for accommodation is inevitable, small size private flats are alternative options in this soaring property price market. People are eager to purchase small size flats for accommodation purpose, and this is the reason why a new type of product, Nano flat, has been evolved. These products evolved to suit and fulfil people's need of living, while it is easier for them to manage the financial arrangement. The financial arrangements will be further discussed in the following session. The empirical results evidenced that the developers particularly overpriced the small size lemon flats the most. This is believed that it is the distorted housing market evolved since 2000s that allow the developers to exercise higher monopoly to the small size flats. To ease the situation, the biggest challenge for the prevailing government is catch up the land supply with the increasing demand. Apart from finding potential land to develop, the administrative procedures and the political agendas are other big challenges the prevailing government needs to face in order to speed up and increase the housing supply to ease the situation.

6.6   Evolving Institutions for the Small Size Flats

On top of the severe imbalance supply and demand distorted housing structure mentioned in previous section that allow developers to exercise higher monopoly to small size flats, and hence there is a trend of increasing supply of the small size flats, why do the potential buyers still purchase small size flats despite the housing price decrease due to the flat size shrinkage? This may be due to the booming property prices in Hong Kong; the housing

price index for properties has been increased from 61 to 298 from 2003 to 2015. In other words, buyers can still gain an appreciation of property value under the booming property price environment in Hong Kong. It is just that the amount of earnings may not be as much as that for other classes of properties. This is one of the reasons why people keep purchasing small size flats.

Another possible reason which also leads to a change of institution on the enactment of the Stamp duty (Amendment) Ordinance in 2011 is that, first hand buyers could resell flats before the flats could be inspected physically with a limited transaction cost. When the property market is booming, the resale of flats is common in that sellers can realize profits from the sharp increase in property value. In view that the flats cannot be inspected physically at such a point, the impact for the flat size shrinkage is not reflected at this stage in the housing price.

Due to the severe imbalance of supply and demand in Hong Kong housing market, the property market keeps booming without ceasing. To cope with the resale situation and release more supply into the market, a new institution of Stamp duty (Amendment) Ordinance was enacted in 2011 to implement a Special Stamp Duty (SSD) to the owners who resell their flats within 3 years. This new institution attempted to release more units into the market by adding cost to transfer the fluidity of the property, hence the speculations. In other words, the transaction costs for reselling a unit within 3 years were

greatly increased after 2011. The impact to the first hand buyer may increase comparatively.
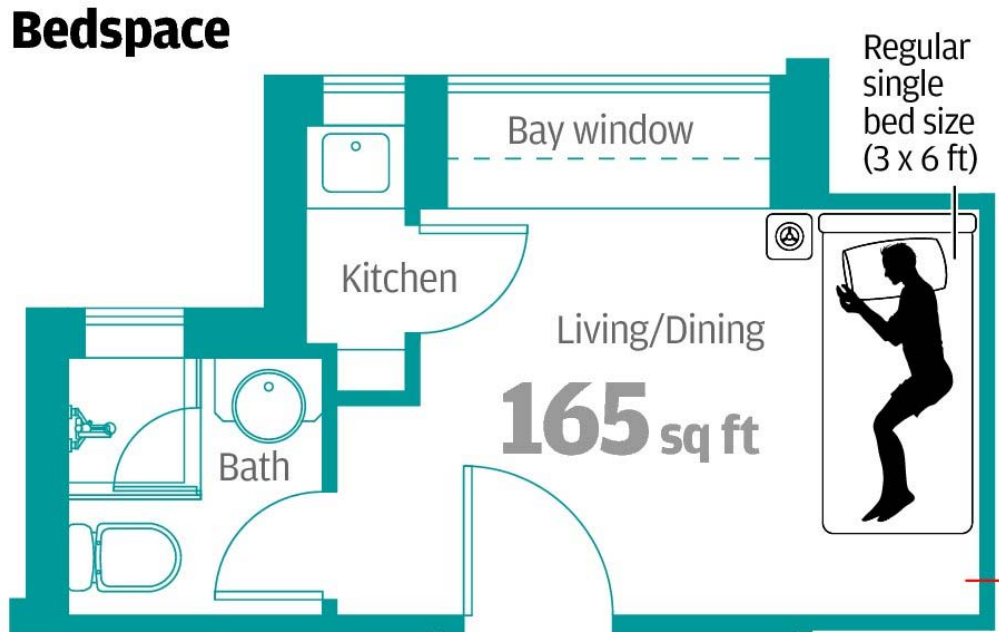
There is a noticeable trend for the construction of Nano flats recent years. Nano flats refer to the flats with saleable area less than 200 square feet. The government has also forecast that nearly half of the all flats completed in 2018 will be smaller than 400 square feet, meaning that they will all be Class A properties. In 2010, 5% of the completed units were Class A flats, which surged to 27% in 2016 and are expected to rise to 43% in 2018[18]. This trend shows the supply of small size flats increasing rapidly in these few years.

The earliest Nano flat appeared in the market in 2014 with saleable areas of 165 square feet, it set a record of the smallest residential units in the city. The South China Morning Post[19] has illustrated the layout for the units in Figure 9 below,

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[18] "As Hong Kong Flats Shrinks, Developer's Coffers Swell" in Bloomberg News dated 20 June 2017
"https://www.bloomberg.com/news/articles/2017-06-19/prison-cell-flats-in-hong-kong-show-limits-of-home-supply-policy"

[19] "A peek into 6 of the smallest apartments in Hong Kong" in South China Morning Post dated 22 July 2017
"http://www.scmp.com/property/hong-kong-china/article/2103640/peek-6-smallest-apartments-hong-kong"

Figure 9 Layout for the earliest Nano Flat of 165 square feet

It can be observed that structural walls and a large bay window are allocated within the unit. The actual carpet area is much less because of this.

Bloomberg also demonstrates that Tesla's Model X car can barely fit in this flat with a saleable area of 161 square feet. It is shown in Figure 10 below,

Figure 10 Illustration of Nano flat with Tesla Model S

Tightly Squeezed Tesla
Tesla's Model X barely fits in this micro-apartment, sold for slightly less than $500,000 in 2016

Cabinet Kitchen

Living, Dining

Seven Victory Avenue, 3J
Kowloon City

Saleable area: 161 sq.ft.

Source: Henderson Land Development Co., 28 House Information Co., Tesla
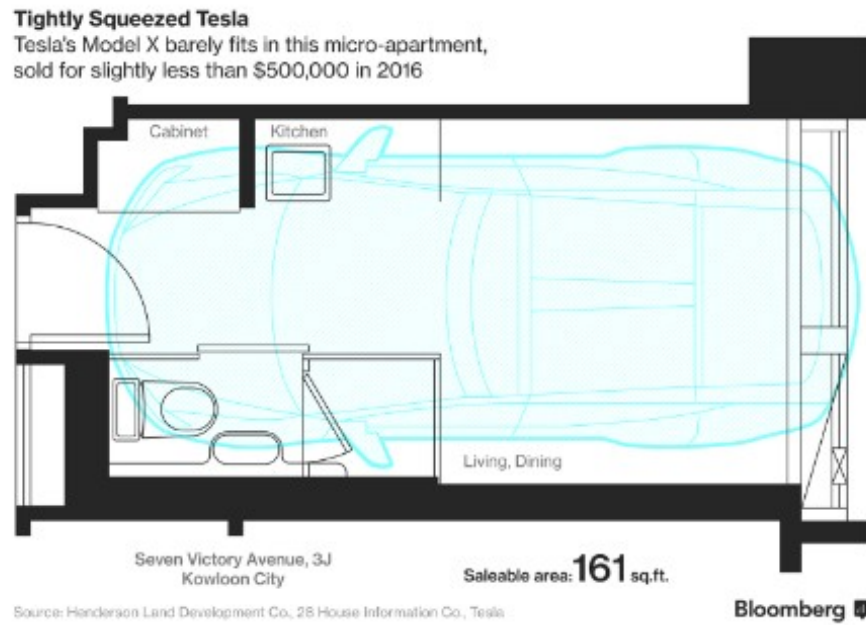
Bloomberg

Source: Bloomberg News

The plan explicitly demonstrates a typical Nano flat, and the supplies of these kinds of flats are sharply increasing in the Hong Kong market. Again, you may notice that the structural walls and bay windows surround the perimeter of the flat. These areas cannot be used, but are still sold to the buyers. This means a portion of housing price has been contributed to unusable area.

A recent market transaction exemplifies that flats with a size of 152 square feet have hit a market price of about HK$20,000 (US$ 2565) per square foot of saleable area. Later on in July 2017, another extreme example of Nano flat sales occurred, a project sold out in the presale market, and flat sizes are a mere128 square feet, which are even smaller than a standard car parking space (134 square feet). Another developer has announced plans to build the smallest homes in the city with a size of 61 square feet. This study demonstrates that the developers pocket the most profit for small sized lemon flats. This is likely an important factor as to why these kinds of properties are appearing in the market.

This trend of an ever increasing supply of Class A properties coheres with the results of the empirical test; developers extract the highest profits through the overpricing premium of small size flats. Most of the Nano flats have appeared in the presale market over the past two years, so none of the flats can be inspected physically. Upon the enactment of the Residential Properties (First-hand Sales) Ordinance (the Ordinance) (Cap.621) in 2013; the use of saleable area to calculate housing prices is the only legitimate unit for flat size descriptions and the explicit requirement prescribed for sale brochures, show flat provisions are also being regulated. The new institution states that if show flats are provided, there must be an "unmodified show flat" accompanying a "modified show flat". Taking measurements, photographs and videos of the "unmodified show flats" are allowed. In other words, the actual carpet area unmodified show flats can be measured by a potential buyer. However, the ordinance does not regulate the type of flats to be presented as the show flats and it is totally at the discretion of the developer. In current practice, developers will choose the most presentable and usable flats as the show flats,

and the smallest ones usually are not their choices. In other words, the extent of the flat size shrinkage for the small flats is still being shrouded from buyers until the physical inspection can finally be carried out in the second hand market. While developers maximize their profits, what about the first hand buyers for the lemon small size flats? They suffer losses, according to the empirical results herein. The effects are not reflected in the market yet, since most of the Nano flats are still under construction and the property market is still booming sharply.

Back in the 2010-2011 Budget Speech, the government had specified on land sale conditions, the minimum number of flats to be constructed and their size restriction. The aim was to increase the supply of small and medium-sized flats in the market. Ironically, the policy increases the supply of flats, but with smaller and smaller sizes, but the property prices are still skyrocketing. Although Nano flats are extremely small in size, the standard for people living in these "high quality" private housing are questionable, the demand for such small size flats is overwhelming.

Another reason for the emergence of Nano Flats is the housing price affordability as well as the financial arrangements. According to the Annual Demographia International Housing Affordability Survey 2017, Hong Kong has been ranked as the most unaffordable housing market in the world in 2016, with average flat prices at 19 times gross annual median income, the highest ever measured in the US in the past 11 years. Purchasing in smaller lump sum payment amounts, the units are the only choice for the

potential buyers with a limited budget in a sky-high property market like Hong Kong. Nano flats often have smaller lump sums payment amounts, so the total amount of mortgage loans can be comparatively higher, making them more attractive to buyers without strong financial resources. The Hong Kong Monetary Authority (HKMA) had tightened the guidelines on banks for the loan-to-value limit ratio in February 2015. For a first time purchase property buyer, the loan-to-value limit ratio (LTV) is capped at 60% for property valued under HK$10 Million. Yet, The Hong Kong Mortgage Corporation Limited (HKMC), which is wholly owned by the Hong Kong SAR Government provides the Mortgage Insurance Programme (MIP) to properties with a value at or below HK$6 Million. The maximum MIP coverage is 80% of loan-to-value ratio (LTV). For properties with a value at or below HK$4 Million, the maximum MIP can reach up to 90% of the loan-to-value ratio. This is another possible reasonable why Nano flats have been emerging so rapidly. In practice, developers will determine the flat size based on the target lump sum selling price. The units in properties valued at less than HK$4 Million are currently the most attractive in the market because of the available financial arrangements.

To curb property speculation, the HKMA has further tightened the loan to value ratio to lower the cap with additional 10% on the property mortgage loans to the buyers with one or more existing mortgages as of May 2017[20]. The aim was to strengthen bank's risk management and resilience. It is worth noting that these guidelines and measures only

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[20] Refer to the "Prudential Measures for Property Mortgage Loans" press release by Hong Kong Monetary Authority on 19 May 2017

apply to the Authorized Institutions (AIs), which refer in most part to the banking sector. In view of the keen competition in the mortgage business of the banking sector, the objective of tightening mortgage loan regulations was to protect the AIs ability to cope with a possible market downturn in the future.

In view of the implementation of this new institution, a counter institution was derived by the market to deal with the financial arrangement. There is an increasing trend that buyers of new flats turn to finance companies, instead of standard bank loans. The finance companies are beyond the reach of the HKMA. They are regulated by the Money Lender Ordinance, which is enforced by the Commissioner of Police. Some cash-rich developers usually offer first-time mortgages up to 90% of a flat's value through their financing arm to the buyers. One of the recent and most aggressive examples is for the developer offer a three-year financing loan of up to 120% of the flat's value, without the need to submit income proof. Although the offer only applies to buyers who already own an apartment with a value of no less than 70% of the would-be purchase price of the new flat, buyers are only required to pay interest in the first year and begin repaying interest and principal from the second year. This concept is to seduce buyer into switching from their original flats to the new flats. Moreover, this method allows the buyers to clear off their mortgage on an existing flat so that they can thereby have a longer period to sell the flat before trading up to a new one. For instance, if a flat costs HK$5 Million, the buyers would only need to pay 5% down payment, which is HK$250,000, but they can receive a loan in the amount of HK$6 Million. The 120% loan meaning 95% of the flat value, which is HK$4.75 Million and the remaining 25%, which is HK$1.25 Million, is for them to repay

the outstanding balance of the bank mortgage on the existing flat. Despite this aggressive arrangement, the norm for developers offering first mortgages is usually from 80% to 85% of the flat's market value. Such an offer is much higher than standard bank mortgages that have a ceiling up to 60% for flats valued below HK$10 Million and 50% for those valued at more than HK$10 Million.

In any case, it is the buyer's decision to choose their own mortgage plan that suits themselves best. The interest rates offered by financial companies may be higher than the banks, but buyers have a better chance of successfully being approved for bigger loans.

What will happen when there is an economic downturn? What will happen to the property value in Hong Kong? How can people repay loans? Is there an over lending situation happening in the Hong Kong Real Estate Market? These are other interesting research questions worth investigating in the future. A spokesperson for the HKMA said " *The HKMA observes that many property developers are offering high loan-to-value mortgages to attract buyers to purchase their properties. The accumulation of these high LTV mortages may change the risk profiles of these property developers to which banks may have exposures. The HKMA will continue to monitor the situation loosely and consider whether there is a need for banks to strengthen their risk management in respect of their lending to property developers.* "[21]

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[21] "Hong Kong homebuyers turn to finance companies as banks tighten mortgage lending" by South China Morning Post dated 9 May 2017, " http://www.scmp.com/property/hong-kong-china/article/2093466/hong-kong-

According to the empirical test results, the housing prices dropped most substantially for the lemons in Class A properties in the second hand market due to their flat size shrinkage ratios. The first hand buyers for these lemon small size flats suffer the most. During a booming property market period, they still profit handsomely, regardless of the flat size shrinkage. The trend of the burgeoning supply of Class A properties places an increased risk upon first hand buyers chances of losing money or even having to file bankruptcy if they borrow 90% of a flat's value under current market price. Most of the Nano flats are still under construction where physical inspection is not yet possible. What will happen when the real usable sizes of the Nano flats are realized and unveiled to the public? What will happen when there is an economic downturn?

Since small size flats are more area sensitive, when the occupiers move in, they must measure the carpet area in order to purchase furniture; flat size shrinkage affects them the most. For Nano flats, every fraction of an inch counts. The effect of the flat size shrinkage will inevitably be known. It is a hilarious and unbelievable thing for those living overseas; that people of Hong Kong people work so hard to purchase a flat with such a high price and with a puny area less than the size of a car parking space. Those overseas often ask: What is the difference of living in this kind of flat and living in a prison? From the indication of this research, the situation of Nano flats must be rectified before the situation comes to a point of no return.

homebuyers-turn-finance-companies-banks-tighten"

For the sake of the real estate problems at hand, in March 2017, the Secretary of Development, Eric Ma Siu-cheung, had suggested that measures could be inserted into the land sale conditions at any time, requiring developers to build flats above a certain floor area size if it was deemed necessary. Is the intervention of government in imposing such an institution beneficial and efficient to the market? Hong Kong is an open market, regardless where the capital comes from. Will restricting the minimum size of the flats without suppressing the property prices make the situation better? Most people doubt it. These types of flats evolve from the booming market and the unaffordability of housing prices in Hong Kong. Implementing effective institutions will lead to market efficiency, but if the institutions implemented are wrongly targeted, then this will not only increase the transaction costs, but also lead to market failure.

Why is this situation happening in Hong Kong? Why is there such a severe imbalance in property supply and demand leading to the skyrocket housing prices? How to tackle this difficult situation? From the past record, the land supply ceased for almost ten year from 1997, notwithstanding the public housing market or the private housing market. The bulking up of housing demand for ten years may be the possible reason that leads to the current situation in Hong Kong. The housing supply and bulking up demand are somehow being delinked. Under stable economy, the housing price can hardly go down under the severe imbalance of supply and demand.

It is believed that by increasing the land supply, together with streamlined administrative procedures to reduce the transaction costs for development can guarantee the sufficient

supply will have an impact on market speculation and alleviate the unrelenting booming property prices. This is the long-term strategy well noted by the current Chief Executive, Carrie Lam Cheng Yuet-Ngor. She formed a working group composed by non-official professionals to lead a "society-side debate" over the city's land resources, aiming to increase the land supply.

To ease the instant social conflict of housing, a temporary strategy was suggested by the current Secretary of Transport and Housing, Frank Chan Fan. He rolled out a pilot scheme enlist Non-governmental organizations (NGO) to operate government-approved subdivided rental flats in July 2017. He attempted to seek support from landlords and property investors who were willing to lease the subdivided flats at a fraction of market price. Although details of execution are not formally formulated and the effectiveness to ease the problem is questionable, it serves as a gesture that government is paying attention to this problem. Again, this evolvement of new institutions should be effective and beneficial to the society. While attempting to carry out the temporary strategy, the focus on the long term strategy should still be focus on to resolve the problem accumulated for a decade, splitting up the resources may not be the best for the society.

Another solution is to suppress the demand. In addition to the ongoing depreciation of the Chinese Yuan and the shrinkage of profits in mainland china have fuelled the influx of hot money to purchase Hong Kong properties as alternative investments, the current immigration policy from mainland China is one of the reasons contribute to the substantial housing demand. According to the population projection issued by the Census

and Statistics Department lately, there will be a continuous net inflow of persons into Hong Kong population. The major component is the holder of the One-Way Permits. One-way permits are the documents which have allowed up to 150 eligible mainland people to move to Hong Kong each day since 1 July 1997. By calculation, Hong Kong has become the permanent home to 620,500 new people from mainland China 20 years The government acknowledged in their 2015 population report that the inflow of WOP holder has been responsible for more than 60% of the city's population growth every year in the past decade. So Hong Kong's population will rise to a peak of 8.22 million in 2043 (South China Morning Post, 15 September 2017). It is so ironic that the land supply almost ceased since late 1990s while the government opened a policy to increase the demand. The current infrastructures were not designed for this continuous increase of population, not to mention the already lack of housing supply. While it is important to increase the housing supply, it is also crucial for the government to review the population structure and its relative immigration policy.

In addition to purchasing flats, mainland developers also purchase land resources in Hong Kong. The small-to-mid sized local Hong Kong developers, traditionally seven developers in the public land sales market, have lost their market share steadily from 45% in 2012, to 28% in 2014 and 22% in 2016. More recently, these developers have also missed bidding on land supply tenders via MTRC and URA sources to newcomers. Will the market adjust itself? Will Adam Smith's invisible hand work? Will some extent of government intervention lead to an efficient market? These are the areas that future research can be focus on to find out more answers.

By knowing that the first hand buyers for the Class A properties would suffer the most during an economic downturn, as researched in this study's empirical tests, and if there is an increasing supply of these type of flats, is there anything the government can do to protect these first hand buyers? It is thought that the government should not restrict the minimum size of flats, but instead let the potential first hand buyers know what product they are buying and the true usable area of flats could be a good solution. The government may consider amending the newly enacted SPRO to request developers to build the unmodified show flat for the smallest flat of a given development, whenever such show flats are provided viewing. This will allow people to measure, inspect, and visualize everything in advance during the presale stage. If buyers are being provided with enough information and fully understand what they are purchasing, it can be the choice and consequence that should be borne by the potential buyers themselves. This is a simple way to increase the market transparency and lower the level of information asymmetry.

The empirical test results suggest that the housing prices are reduced when the flat size shrinkage is actually visualized in the second hand market. The situation is more serious in small size flats where every inch is critical. The reason behind this is due to the information asymmetry and different interpretations of the flat sizes. In the newly enacted SPRO, saleable area has already been legitimate as the only unit for description of flat size. How about presenting the carpet area also? It is understood that the property for the areas allocated to a unit should belong to the buyers, including the structural walls, bay

windows, balconies and utilities platforms. It can be surmised that Saleable Area should still be adopted as the only legitimate unit to describe the flat size. However, by presenting the carpet area, potential purchasers may compare the effective usable area clearly and the information asymmetry for all of the unused areas allocated to flats can be clearly identified.   There may be social and political conflict if the carpet area was transparently presented, as the shrinkage may be up to 50% in area compared to the Gross Floor Area (GFA) prior to the enactment of SPRO. The possible impact could be further investigated.

Finally, the increasing trend of potential first hand buyers borrowing money from the financial companies of the developers instead of the Authorized Institute is another concern. Empirical results suggest that the housing price reduction is most severe for Class A properties in the second hand market due to the flat size shrinkage. It is difficult for buyers with limited financial strength to survive in economic downturns, especially for the Class A properties with high flat size shrinkage. Optimally, the government should keep monitoring and reviewing the financial arrangements between banks and the developers as suggested by HKMA.

6.7   Human Behaviour regarding Information Asymmetry

Due to the limited information revealed and the fact there are limited capabilities of the human mind; humans must seek efficiency when solving problems and overcoming difficulties. (Newell and Simon 1972) Kahneman and Tversky (1979) coined the Prospect

Theory, from the psychological context, when people are making decisions involving uncertainty and risks, they will base them on the potential value of losses and gains rather than the final outcome.

The newly developed model in this study, based on the Prospect Theory Model by Kahneman and Tversky's Prospect Theory (1979), was designed to investigate and quantify the human behavior in terms of housing prices. The asymmetric information of flat size shrinkage is interpreted as the Losses and Gains comparatively. The results manifest graphically that losses cause grater emotional impact on individuals than do an equivalent amount of gains. People are afraid of loss, so they tend to pay less for lemons that are proven to be of lower usable area after having been physically inspected in the second hand market. This human behavior is being reflected in terms of housing prices.

The empirical test results cohere with the theory and illustrates that the losses cause greater emotional impact on individuals than do an equivalent amount of gains (Kahneman and Tversky 1979). People prefer avoiding losses to acquiring equivalent gains. Hence, the slope for the value function of losses is steeper than gains. The result indicates that the housing price reduces by 3.29% for every percent of losses comparatively to the norm in terms of flat shrinkage. To the contrary, people are willing to pay more for the Non-lemon flats while the sellers, who are the first hand buyers, also demand more money to forgo the "loss feeling". This result shows that the housing price increases by 0.89% for every gain in percentage comparatively to the norm of flat size shrinkage.

Loss aversion behavior happens in the information asymmetry market. People tend to pay less to prevent loss in the lemon flats; this is reflected in the value function in terms of housing price. This phenomenon happens to all potential buyers in second hand market. This explains that non-conformity of human actions occur when people are making decisions with limited information and capacity. It is especially true in the housing market where heterogeneous products and asymmetric information make the market inefficient. On the contrary, the sellers of the non-lemon flats will demand more money to compensate for the "loss feeling" due to the endowment effect. They would rather stick to their own endowment in many cases.

This study reveals that human behavior in loss aversion also applies when people are making decisions under the information asymmetry market. It is believed that this is one of the first pioneering studies analyzing the real estate market empirically from behavioral economic perspective under an information asymmetric situation. Due to human behavior, corresponding institutions were implemented to deal with the lemons. Examples of the formal institutions include the Residential Properties (First-hand Sales) Ordinance in 2013 to increase market transparency and the issuance of guidelines and practice notes under the authority of Building Ordinance in 2010 to control flat size shrinkage. These have been explained in greater detail in the previous section.

6.8   Final Conclusion

This thesis contributes to the current limited empirical research of analyzing information asymmetry in the light of Lemon Principle (Aklerlof 1970) by measuring the adverse selection as well as the pricing strategy that developers use to capture the de facto overpricing premium through the applying of an ostensible underpricing strategy, particularly for the small size flats. The research follows a new approach of analyzing information asymmetry from the behavioral economics perspective.

The flat size shrinkage problem in the Hong Kong Real Estate Market is the key subject of analysis in this study, Hong Kong has been ranked the most unaffordable housing market in the world in 2016 by Annual Demographia International Housing Affordability Survey 2017. The empirical tests unveil that developers acquire the most lucrative profits for small size properties with high shrinkage ratios; simultaneously, first hand buyers of these properties would suffer the most losses as housing price become reduced to the largest extent in the second hand market, especially during economic downturns. The situation will worsen when an economic downturn befalls and property prices are no longer booming. This thesis demonstrates the reasons why a kind of unbelievable flat - Nano flats have appeared rapidly in the Hong Kong market and possible institutions or methods that may be applied to protect or prevent Class A first hand buyers from potential suffering. An example would be to consider amending the current SPRO requesting developers to let the potential first hand buyers visualize the actual usable space of the Nano flat in presale stage through the unmodified show flats which allows

them to measure and inspect the carpet area. Another suggestion is to display the carpet area for buyers as a reference. Moreover, the government should review the financial arrangement between banks and developers due to the increasing trend of the high mortgage loan to value ratio. To tackle the conflicts of severe imbalance of supply and demand, both the possible land supply as well as the population structure should be reviewed seriously by the government. This thesis conveys a forward message to the market and the significance of the government in seriously overseeing the improvement of the situation for small size properties in the market.

Another significance of this study is that it has unveiled why institutions were called for to tackle the lemon problems in terms of flat shrinkage in Hong Kong. Implementation of the Residential Properties (First-hand Sales) Ordinance (SPRO) changes the institution from voluntary information disclosure to mandatory information disclosure. Does this institution change attain better market efficiency and lower the transaction cost? Property right delineation may be a better alternative method to attain an efficient outcome by voluntary exchange of information. In practice, there is no doubt that SPRO provides a transparent platform for information disclosure in attempting to ease the lemon problems. It is especially beneficial for market competitors to attain information in order to analyze the pros and cons of individual developments by their building professionals. The real estate market in Hong Kong would become a fairer competitive platform for developers. It would be like a knowledge sharing platform so that anybody who is interested could study complete information. There are no more secrets or hidden magic as compared to the past, however, what about the public?

The SPRO mandatorily governs a wide array of information that should be disclosed in sales brochures, even some that may not be useful; but this would increase the transaction costs for both parties in order to comply with this regulation. To the developers, it increases the transaction costs to compile comprehensive sales brochures. To the buyers, it also increases the cost to process the overly-provided property information which may be meaningless to them. Requirements on information disclosure should be applied specifically to certain attributes rather than as a broad rule covering every single attribute. With the additional information cost incurred to both parties, the net benefit of the SPRO may be less significant than originally anticipated. The study believes that SPRO should be reviewed in order to attain an efficient outcome that can lower social costs, instead of increasing them.

This thesis also reviews the evolvements of the voluntarily measures to resolve the market inefficiency and the lemon problems. For example, some housing developers also devised buy-back guarantees to be within a certain period after the sales of first-hand properties, which attempts to differentiate high quality properties from lemons. The emergence of third party information providers such as social media, newspapers, radio and TV programs, are currently popular tools to convey sales information, read reviews and share analysis of properties with prospective buyers. The virtual reality (VR) system and taking video footage of show flats are the most recent tools used by the agents to provide information without having the prospective buyers come in person.

In order to deal with flat size shrinkage, another new institution to govern the GFA concessions was ratified in 2010. This evidenced that the flat shrinkage problem is a hot debate topic causing ongoing public arousal, and as such is an issue that needs to be resolved. But alas, is this institution attaining an efficient outcome and benefitting society? Do the mandatory rules shape of property development in Hong Kong and trigger developers into creating counteractive measures under this new institution? This study has evidenced some evolving measures being formulated by developers to circumvent the law in order to maximize profit margins. Are there any other institutions that can reduce the transaction cost while the green features could actually benefit society? How about letting the market decide whether these features are worthwhile in retaining? If the individual green features benefit the buyers and they are willing to pay a premium for these features, then the developers would definitely be willing to build these features into projects for a profit in return. Instead of offering a GFA concession, it may be best to let the market decide and let the buyers "pay for what it's worth".

Apart from the institutional perspective, this thesis also analyzes the information asymmetry problems from behavior economics approach. It empirically demonstrates that humans are non-rational. They tend to seek efficiency when solving problems and overcoming difficulties. By adopting the principle of the Prospect Theory, a new model has been developed and it empirically proves that losses cause greater emotional impact on individuals than does an equivalent amount of gains (Kahneman and Tversky 1979). People prefer avoiding losses to acquiring equivalent gains. Accordingly, the slope for the value function of losses is steeper than that for gains. Loss aversion behavior happens

in the information asymmetry market. People tend to pay less to prevent loss in owning lemon flats, and this is reflected in the value function in terms of housing price. On the contrary, the sellers of the non-lemon flats will demand more money to compensate the "loss feeling" due to the endowment effect. They would rather stick to their own endowment in many cases.

This phenomenon happens to all potential buyers in second hand market. This explains that non-conformity of human actions occur when people are making decisions with limited information and capacity. It is especially true in the housing market where heterogeneous products and asymmetric information make the market inefficient. This study empirically contributes to the significance on measuring human behavior under information asymmetry.

Through the lens of New Institutional Economics, this study has unveiled why new institutions were called for in past decades to tackle the asymmetric information. Empirical proof has been uncovered as well as forward ideas on the problem of Nano flats in the market. The possible institutions that could be implemented in alleviating such problems had been detailed. It is believed that this is one of the first pioneer research studies in the field of analyzing the information asymmetry problem by quantifying human behavior with a value function.

6.9 Limitations and Possible Future Studies

The empirical study is limited to the fact that the regulations and flat selling doctrines apply to the jurisdiction of Hong Kong. However, the real estate sector has a key role in economic systems worldwide. This study measures the information cost by empirical tests and serves as an illustration on the impact of information asymmetry that sheds light to similar real estate market worldwide.

In addition, the study focus on the flat size shrinkage problems and the data collected for this study ranged from 1991 to 2013, whereas there are series of new institutions enacted afterwards. The study has unveiled the reasons why institutions evolved to tackle the problems. For the impact and effectiveness of these new institutions trying to ease the problems as mentioned in the thesis should be reviewed in future researches.

There are several possible research ideas arising from this thesis,

a) The new ordinance attempts to ease the market transparency was enacted in 2013, housing transactions from 2013 could be collected and further studies on whether this institutional change attain an efficient outcome and benefit the society could be carried out.

b) Series institutional changes were enacted by the government try to stabilize the souring property price recent years, no matter on the demand side or the supply side, future researches could be carried out to study their effectiveness.

c) The fact that Hong Kong is being affected by the Mainland China is inevitable; no matter it is the political or the economy. Future researches should be focus on the evolution of government policies to facilitate Hong Kong to retain and optimize its advantages while to seek for a balance position to cope with the changing economy.

d) An in-depth study on the human behavior whether diminishing sensitivity exists when people facing gains and losses relating to flat size shrinkage could be carried out, referencing the Prospect Theory. The study of psychological context to institutional economics could be further developed.

- End of Thesis -

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