Flippers' sales and market mis-pricing: evidences from the Singapore private housing market

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Abstract

This paper defines housing flippers as home buyers and sellers whose trading is motivated by the capital gains accumulated within a short time period. Non-flippers are rental housing investors and owner occupiers. We attempt to offer an alternative explanation to housing market mis-pricing by scrutinizing their differential trading abilities and analyzing the positive feedbacks of non-flippers triggered by flippers' sale volume and selling premiums. We empirically prove that housing flippers have the highest trading ability in terms of buying low and selling high and are able to induce the positive feedbacks of rental housing investors and owner occupiers who represent the majority of housing market participants, which eventually lead to housing market mis-pricing. Our findings question the validity of the literature interpretation on the roles of informed flippers in smoothing housing market through additional supply during uptrend or booming periods. The findings imply that transaction taxes, such as the stamp duties targeted at flippers, should be a long run policy in order to stabilize long run housing market dynamics; and owner occupiers, who dominate a housing market, should also be properly restricted to curb an over-heated housing market while at the same time avoid malfunctioning housing market.

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1 Introduction

The existing housing literature adopts the approaches from the behavioral finance to explain housing market mispricing. Three streams of empirical work provide empirical evidences, i.e., the positive feedbacks of uninformed housing flippers (Fu, Qian & Yeung, 2013[21]; Fu & Qian, 2014[20]; Bayer, Geissler & Roberts, 2013[5]), the contagion of housing investors' trading activities to novice investors (Bayer, Mangum and Roberts, 2016[6]), and the pro-cyclical trading pattern adopted by owner occupiers (Anenberg & Bayer, 2013[1]). Unlike in a financial market, housing flippers, often referring to home buyers and sellers whose trading is motivated by the capital gains accumulated within a short time period, represent a very small portion of housing market participants, giving rise to the question of how they could induce whole market mispricing.

From policy perspective, in order to curb the housing price escalations from 2009 onwards, the Singapore government persistently implemented 9 rounds of anti-speculation policies between 2009 and 2013 before eventually stabilizing the markets, as shown in Figure 1. The policies, mainly targeting at flippers and rental housing investors, significantly changed the trajectory of the Singapore private housing market dynamics. However, real estate practitioners have worried that the strong policies may have also malfunctioned the housing markets due to the sharp decreases in transaction volumes. Thus, we need to understand whose trading activities can spur full market mispricing and how we can physically identify them, as this will guide policy makers to implement anti-speculation policies by directly targeting at them to reduce the risks of damaging housing markets. The literature provides little evidences in this aspect.

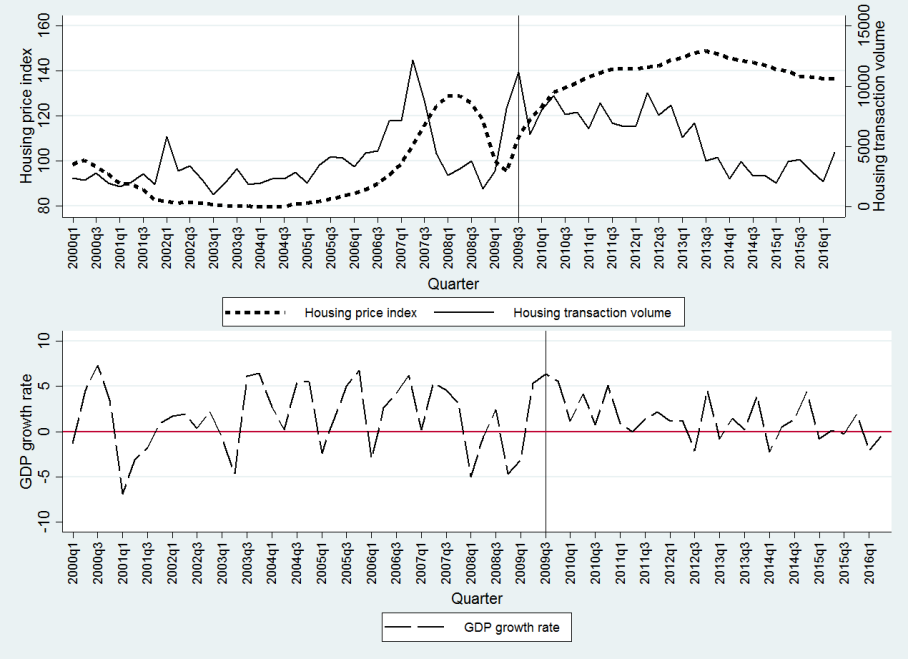

Figure 1: Price index, transaction volume and GDP

Note: *PriceIndex* represents the quarterly hedonic price index for non-landed properties (including condominiums and apartments) in Singapore private housing market, Q1 2000=100, and the data is from URA; *Volume* is the Quarterly transaction volume of the non-landed properties, the data is calculated from REALIS database; *GDP* represents the quarterly nominal GDP growth rate (in %), data is from Statistics Singapore.

A housing market is essentially different from a financial market. In a financial market, all participants are investors whose trading decisions are driven by investment motive, although they may adopt different trading strategies and have different levels of information. In theory, they are distinguished by informed flippers and uninformed flippers but they are empirically unobservable. In a housing market, flippers and non-flippers (rental housing investors and owner occupiers) are physically identifiable, whose trading decisions are either driven by investment, or consumption and investment. They may have different trading abilities, which however receives little attention. Thus, cautions must be taken when the theories from financial markets are extrapolated to interpret the sources of housing market mispricing (Glaeser, Edward and Nathanson (2014)[24]).

The finance literature has established several theories, such as the efficient market hypothesis (EMH) and the positive feedback hypothesis, to explain market mispricing by examining the impacts of informed investors' trading patterns on asset markets (Fama, 1965[18]; Gromb & Vayanos, 2010[26]; Rubinstein & Wolinsky, 1987[42]; Yavaş, 1994[54]; De Long, Shleifer, Summers & Waldmann, 1990[15]; Hong & Stein, 1999[29]; Grinblatt, Titman et al. 1995[25]; et al.). Most housing literature directly applies the finance theories to housing market. For example, the studies of housing flippers differentiate them into informed and uninformed flippers (Fu, Qian & Yeung, 2013[21]; Fu & Qian, 2014[20]; Bayer, Geissler & Roberts, 2013[5], et al.). They conclude that informed flippers can stabilize a market while uninformed flippers destabilize a market by adopting positive feedback trading strategy, leading to market mispricing. Housing flippers impact on the market by adding additional sources of housing demand and supply to a housing market, which may mitigate or add to housing market fluctuations.

Housing flippers, including informed and uninformed, form a small portion of housing market participants (our sample consists of 12.5% flippers as buyers[1]). We are curious how they may interact with non-flippers who are rental housing investors and owner occupiers. How may they induce whole market mispricing? We suspect that there are positive feedbacks from housing flippers to renal investors and owner occupiers, which may alternatively explain market mispricing. More specifically, in a housing market, informed housing flippers may trigger the positive feedbacks of uninformed flippers (Fu & Qian, 2014[20]; Fu, Qian & Yeung 2013[21]; Bayer, Geissler & Roberts, 2013[7], et al.). Subsequently, the sale activities of all housing flippers may induce the positive feedbacks of owner occupiers and rental housing investors, eventually leading to market mispricing. This is because housing flippers are in general more experienced and therefore better informed than non-flippers. Bayer, Geissler & Roberts (2013)[7] point out that the more experienced (or informed) housing participants tend to be less likely to take positive feedback trading patterns. When a flipper's selling premium is observed by non-flippers, it may trigger positive feedbacks. Besides, owner occupiers are driven by both investment and consumption motivations, they may worry that they would not be able to afford a house for consumption if they didn't buy it now after

[1]The studied sample in our paper is from Q1 2006 to Q4 2010.

observing a flipper's selling premium, which may also explain why a positive feedback of owner occupiers may happen.

This paper attempts to answer three questions. Firstly, do housing flippers have the highest trading ability, defined as the ability of buying low and selling high? Housing flippers are more able to time the market and undertake the transactions more spontaneously as they are the least constrained, while owner occupiers and rental housing investors are not only less experienced but also constrained by their housing consumption or tenancy contract. Thus, we expect housing flippers should have the highest trading ability, followed by rental housing investors and owner occupiers. Secondly, if housing flippers are the smartest, how will they trigger the positive feedbacks of non-flippers (owner occupiers and rental housing investors)? Non-flippers represent the majority of housing market participants, their positive feedbacks can eventually lead to full market mispricing. Intuitively, observing flippers' frequent sales and selling premiums may have two effects on other home buyers. It releases a signal that this development is attractive and has investment potential. It also indicates that price may appreciate faster and it may soon become unaffordable. Thirdly, will the above conclusions change over a cycle? As during different periods of a cycle, the market liquidity and therefore the information efficiency are different, which influences participants' trading abilities.

This paper contributes to the literature in three ways. Firstly, we empirically identify owner-occupiers, rental housing investors and flippers. We demonstrate their different trading abilities which vary across a cycle (Refer to Section 2 for the detailed discussion), which adds to the literature of bargaining power in housing market (Harding, Knight & Sirmans, 2003[27]). Both imply that the interactions among the three types of participants can be important in directing housing market movements. Our work provides an alternate channel to understand housing market dynamics.

Secondly, through studying the interactions among the three types of housing market participants, we provide a direct test of the positive feedback hypothesis, proposed by De Long, Shleifer, Summers & Waldmann (1990)[15], without engaging any proxy as in the literature (Fu, Qian & Yeung, 2013[21]; Deng, Liu & Wei, 2014[16]; et al.). The findings offer new evidences on how flippers may lead a housing market to mispricing as well as an explanation on how the anti-speculation policies take effect.

Thirdly, our argument is consistent with the understanding of Glaeser, Edward and Nathanson (2014)[24] that housing market's stylized characters make it different from other financial markets and particularly housing market is dominated by amateur investors (owner occupiers). By empirically proving that housing flippers' sales and selling premiums may trigger positive feedbacks for owner occupiers and rental housing investors, we provide an implementable policy vehicle to prevent housing market from bubbling, which makes our paper different from the literature and

provide a supplement to the understandings of flippers' role in a housing or financial market (Stiglitz (1989)[47]; Fu, Qian & Yeung, 2013[21]; Fu & Qian, 2014[20]; Bayer, Geissler & Roberts (2013)[5], et al.).

The remaining of the article is as follows. Section 2 justifies why housing flippers have higher trading ability and how they may lead market to mispricing. Section 3 presents the econometric implementation to test the predictions in section 2 as well as introduces the data and variable selection. Section 4 presents the empirical results and Section 5 discusses the robustness and sample selection bias issues. Section 6 concludes the paper.

2 Housing flippers, trading ability and market mispricing

Housing market consists of housing flippers and non-flippers. The latter includes rental housing investors and owner occupiers. Their trading abilities differ, so they hold different degrees of market power. Recognizing the differences leads us to believe that they may adopt different trading strategies and flippers may have a power to trigger positive feedbacks for rental housing investors and owner occupiers, which eventually leads to housing market mispricing. Section 2.1 justifies the differential trading abilities and Section 2.2 establishes the channels through which housing flippers trigger positive feedbacks. Predictions are drawn from the discussions.

2.1 The three types of participants in a housing market

Owner-occupiers invest in housing for consuming housing services and obtaining capital gain when it is sold (Arrondel and Lefebvre (2001)[3]; Megbolugbe & Linneman (1993)[37]). They are often constrained by high transaction costs and financial budgets (Muth, 1974[38]; Ioannides & Rosenthal, 1994[32]). An owner occupied property is more illiquid than others (Arrondel & Lefebvre, 2001[2]; Yang, 2005[52]; Flavin & Yamashita,2008[19]; Flavin & Nakagawa (2008)[19]; Lustig & Van, 2005[36];) because the demand for consuming housing services makes an owner occupier a long-term property holder. They may accept a higher price when buying and a lower price when selling because of the demand for housing consumption (Hung and So, 2012 [30]). These traits make us believe that an owner occupier is likely to be less experienced, and thus less informed.

Rental housing investors invest in housing as they expect to have capital gain as well as rental incomes. Capital gains, rental incomes as well as tax benefits make investment in rental housing a long-term investment and rental housing investors are less likely to respond quickly to market condition changes as they may be constrained by tenancy contract (Australian Bureau of Statistics,

1994[40]; Yates, 1996[53]; Beer, 1999[8]; Brown, Schwann & Scott, 2008[10]; et al.). Intuitively, they should be more experienced than owner occupiers.

Owner-occupiers and rental housing investors represent the fundamental of a housing market. They provide housing services to meet the demand for housing consumption at buying and provide housing supplies to a market at selling. Their demand for properties is to certain degree, determined by economic fundamentals such as income, the GDP and interest rate which drive the demand for housing services (Clayton, 1996[12]; Kenny, 1999[33], Sinai, 2012[45]; et al.).

When flippers enter a housing market, they don't provide additional housing services at buying but add to market volatility by creating additional source of housing demand. When they sell, they provide additional supply. Flippers are defined as short-term traders in a housing market, and their trading aims at tapping returns from the gap between buying and selling prices within a short time period (Fu & Qian, 2014[20]; Fu, Qian & Yeung, 2013[21]). Bayer, Geissler & Roberts (2013)[7] specify flippers into the informed and the non-informed flippers. The informed flippers are motivated by being able to fetch buying discount and selling premium while the non-informed are motivated by market price appreciation. As a summary, flippers are the least constrained and are able to response to market dynamics quickly. They are likely to be more experienced than non-flippers due to more frequent transactions, and they are keen to buy low and sell high compared to the market prices.

Inspired by their papers and the discussion as above, we believe that housing flippers as a whole are better informed than non-flippers within which rental housing investors are better informed than owner occupiers. Thus we predict housing flippers may have the highest trading ability, followed by rental housing investors and owner occupiers.

Flippers not only have higher trading ability than rental housing investors and owner occupiers, but also, the gap between the trading abilities of flippers and the rest are expected to be bigger during a bust than that during a boom. In a downturn, an existing owner occupier's subsequent purchasing decision (also for owner occupying) may often be delayed due to the down payment constraint (Stein, 1995[46]) or the loss aversion (Genesove, Mayor, 2001[23]). However, a flipper is typically free of these constraints and thus able to buy a property at better discount. Besides, the time-on-market of a property is typically long during a downturn. A better informed seller would have a better chance to find a deal. Since flippers are generally better informed than owner occupiers, they may exhibit a higher ability in fetching a premium. While in a boom, the transactions are more frequent, faster and the prices are rising. With more information available, the gap between flippers and the rest may be smaller during a boom than that during a bust, although flippers as better informed market players may still outperform the others.

2.2 Housing flippers and housing market mispricing

The finance theories regarding market mispricing predict that informed flippers (acting as arbitrageurs or middlemen) stabilize a market while uninformed flippers (acting as positive feedback traders) destabilize a market. The efficient market hypothesis (EMH) implicitly models arbitrage as a large number of arbitrageurs who take infinitesimal positions against the mispricing and drive asset prices towards fundamentals (Fama, 1965[18]; Gromb & Vayanos, 2010[26]; Shleifer & Vishny, 1997[44]). In addition, middlemen (or intermediary) can be market matchmakers, they raise the overall welfare through correcting the imperfection of search by matching buyers to sellers (Yavaş, 1994[54]; Rubinstein & Wolinsky, 1987[42]). Both trading strategies stabilize market fluctuations. De Long, Shleifer, Summers & Waldmann (1990)[15] develops a model of rational speculators and feedback traders. Speculators transact based on information obtained, while noise traders do not rely on information but adopt positive feedback trading patterns that they buy when seeing price rising and sell when seeing price falling. The authors argue that with the presence of positive feedback traders, rational speculators could also destabilize the price as those rational speculators know that the initial price increase (or down) will stimulate buying (selling) by positive feedback buyers and therefore they do not necessarily transact towards the price fundamental. Cutler, Poterba & Summers (1990)[14] hold similar opinion that feedback trading leads prices back towards fundamental while also triggers later feedback demand and leads to price overreaction, raising price volatility around fundamentals.

Real estate economists adopt the finance theories and approaches to study housing market mispricing. They define housing flippers as frequent traders in a housing market who tap capital gains through price appreciations within a short time period. They consider housing flippers as an additional source of housing demand or supply (Hau, 2006[28]; Fu & Qian, 2014[20]; Fu, Qian & Yeung 2013[21]; Bayer, Geissler & Roberts, 2013[7]; Chinco & Mayer, 2014[11]) and find that informed flippers are able to adopt right trading strategies, such as arbitrage and intermediary which stabilize a housing market, while uninformed flippers adopt positive-feedback trading strategy which raises market volatility.

The above literature addresses little about the differences between a housing market and a financial market. In a financial market, like a stock market, all participants are investors who can also become flippers due to low transaction costs. While in a housing market, majority participants are rental housing investors and owner occupiers who provide housing services to consume and face high transaction costs thus they are long-term property holders, less informed and unlikely to become flippers (they are non-flippers). Housing flippers form a small portion of housing market participants. Thus, the conclusion that informed housing flippers cause the positive feedbacks of non-informed housing flippers, leading housing markets mispricing, seems unable to explain a market scale mispricing.

Inspired by the arguments in De Long, Shleifer, Summers & Waldmann (1990)[15], we suspect that housing flippers interact with non-flippers, eventually leading to market mispricing. Positive feedback trading (also called momentum trading) acts as one way of interaction among market participants (Grinblatt, Titman et al., 1995[25]; Bikhchandani & Sharna, 2000[9]; De Long, Shleifer, Summers & Waldmann, 1990[15]; Cutler, Poterba & Summers, 1990[14]; Hong & Stein, 1999[29]). Bayer, Mangum and Roberts (2016)[6] provides the causal evidence on how housing investors influence each other, i.e. many investors enter the market because they observe others' investment activities. In a housing market, housing flippers have the highest trading ability as they can respond to housing market dynamics quickly. Thus, it is possible that housing flippers' trading activities may cause positive feedbacks on owner occupiers and rental housing investors as flippers transact more frequently. Levin & Wright (1997)[35] and Anenberg & Bayer (2013)[1] point out that owner occupiers (can be home up-graders) add to housing market mispricing and market over fluctuations through their pro-cyclical trading behaviors which is considered as the positive feedback trading pattern. When housing prices go up, homeowners will buy before selling and therefore add to the market demand, which eventually add to the rising market prices, and when the market goes down, they will sell before buying and beat the market further down.

In summary, flippers not only add additional housing demand and supply to a housing market, with informed flippers triggering positive feedbacks of non-informed flippers (see the references as above), but also may trigger the positive feedback trading of non-flippers, which eventually leads to market mispricing.

Housing flippers' trading decision is motivated by returns (composed of buying price discount, market price appreciation and selling premiums) accumulated within a short time period (Bayer, Geissler & Roberts, 2013[7]). However, only flippers' sales and selling premiums can be observed by non-flippers in a housing market. When rental housing investors and owner occupiers observe housing flippers' realized returns and frequent turnovers, it may trigger them to make their buying decision, forming positive feedbacks.

Housing flippers are likely to trigger positive feedbacks of non-flippers through market sentiment effect. Market sentiment effect happens after non-flippers observe the higher listing prices set by housing flippers or the realized capital gains obtained by flippers. Housing flippers are likely to set a higher listing price as their sales are driven by the capital gains accumulated within a short time period. They are also more confident to sell at a higher price as they are better informed and more able to time the market. Housing flippers' realized capital gains are fast accumulated housing wealth through housing price appreciations. Both realized returns and higher listing prices may boost general market sentiments (Baker & Wurgler, 2007[4]; Tetlock, 2007[48]; Clayton, Ling & Naranjo, 2009[13]; et al.). When owner occupiers observe higher listing prices or realized capital gains from flippers' sales, they may worry if they don't buy it now, they may not be able to afford it. When rental housing investors observe them, they may think that if they enter market

now, they may also get a share of fast housing price appreciations as both higher listing prices and capital gains may indicate that prices may continue to grow. As a result, non-flippers may take positive feedback decisions to make their buying decisions, probably by paying a higher price (Lambson, McQueen and Slade, 2004[34]; Furnham & Boo, 2011[22], et al.).

Opposite to the impacts of flippers' realized returns, flippers' selling turnover dampens non-flippers' sentiment. Firstly, the higher the flippers' selling turnover in the previous quarter, the more potential demands have been satisfied. Secondly, the selling of flippers sends a signal to the market that market prices are too high. Thus, we predict that in facing with higher flippers' selling turnover, the non-flippers may be more cautious and pay lower buying prices.

In addition, compared with rental housing investors, owner occupiers are more likely to take positive feedback trading strategy under the influences of flippers' selling behaviors. Owner-occupiers' trading decision is motivated by both housing consumption and investment. Pressurized by their demand for housing consumption, they may have to make a trading decision even if the market prices are high. Owner-occupiers are short of trading experiences too. Thus they are more likely to take positive feedback trading patterns (Bayer, Geissler & Roberts, 2013[5]) and pay higher prices in face with flippers' sales.

In summary, we predict that flippers have the highest trading ability. They interact with non-flippers to cause positive feedbacks of non-flippers through market sentiment effect. Owner occupiers are more likely to take positive feedbacks than rental investors. In the rest of the paper, we will present empirical work to test the predictions.

3 Data Collection, Variable Selection and the Design for Empirical Analysis

In this section, we first discuss the data collection and variable selection, followed by the empirical design and a discussion on robustness tests and sample selection bias tests.

3.1 Data collection and variable selections

A working dataset is constructed based on the six data sources: StreetSine, PowerSearch, REALIS and Datastream, Bloomberg and URA[2] and HDB[3] News Release. The Datastream and the Bloomberg provide the time series data of Singapore, including the GDP growth rate and the CPI.

[2]The Urban Development Board of Authority of Singapore, which provides mainly the private housing information: http://www.ura.gov.sg/

[3]Housing & Development Board, which is Singapore's public housing authority, mainly provides information on public housing: http://www.hdb.gov.sg/

The URA and the HDB News Releases provide the information of the Singapore housing-related policies. The working dataset covers more than 95% housing transactions in the Singapore private housing market between Jan 1995 and April 2014, consisting of 251,362 of transactions, it also covers more than 80% of total rental housing transactions in the market between Jan 2006 and April 2014, consisting of 177,206 of transactions[4]. Each transaction is associated with variables including hedonic variables, postal address and transaction contract date. All variables are defined in Table A2 of Appendix. B. It is important to note that our empirical studies focus on the sales transactions while these rental transaction records are only adopted for identifying the rental housing investors (as buyers and as sellers).

The working dataset includes a comprehensive history of rental and sale transactions for each property within the investigation period, based on which six key variables are constructed for hypothesis tests. They indicate if a home buyer buys a property for flipping (a flipper), or for renting it out (a rental housing investor) or for owner occupying (an owner occupier). And when a property is sold, we identify if it is sold by an owner occupier, or a rental housing investor or a flipper.

For a home buyer, it is defined that a property is bought by a flipper if the property is subsequently sold within a short holding period (in this study, 12 months or less are used as a threshold) or sold as a sub-sale[5]. We assume that for a less than 12 months' holding period, a property owner is unlikely to move into the property due to renovation and relocation costs. He is unlikely to rent it out as a standard residential rental contract is one year or two years involving both agent fee and stamp duty. A property is bought by a rental housing investor if the property is subsequently rented out within 12 months; and the rest are defined as by owner occupiers. They are defined in Table 1, named as $Flip^b$, $Rent\_Invest^b$ and Own_Occup^b .

For a home seller, the consecutive sales' records are established for each property. If a property is bought by a flipper (or a rental housing investor, or an owner occupier), the subsequent sale is defined as a flipper's sale (or a rental housing investor's sale, or an owner occupier's sale). They are defined as $Flip^s$, $Rent\_Invest^s$ and Own_Occup^s in Table 1. Appendix C presents the examples of the identification as well as the details of the identification process.

Because the dataset is truncated by the beginning and ending dates and the rental dataset covers a shorter time period with a less coverage too, applying the above identification procedure to the data may lead some observations unidentifiable. For example, at the beginning of the investigation period, we can capture sellers, but we don't know when they bought the property. At the end of the period, we can capture the buyers, but we don't know when they will sell their properties. This may cause sample selection bias. We take two measures to manage the concern. First, we

[4]We only consider the Condominiums and Apartments, while excluding the landed properties and the executive condominiums.
[5]A subsale is a sale transaction before TOP, when home buyers cannot move into or rent out the property.

adopt the samples between Q1 2006 and Q4 2010 which is the middle part of the full time period in the transaction dataset. This can significantly reduce the number of unmatched observations. Second, we will conduct sample selection tests to estimate if the problem may seriously bias the results, which will be further discussed in Section 3.3.

To study trading ability, we adopt hedonic models to capture how different participants fetch buying price discounts and selling price premiums in their trading. The dependent variable is transaction price. The six variables defined as above are trading ability test variables with a set of hedonic variables as control variables.

To investigate how housing flippers interact with non-flippers, we adopt hedonic models with the dependent variable as transaction prices of non-flippers. We adopt the past flippers' average realized capital gains at property development project level ($Flip^s\_Return_{j,t-1}$) to capture market sentiment effect. In addition, we also capture the past flippers' average turnovers as sellers, at property development project level ($Flip^s\_Turnover_{j,t-1}$), considering the fact that the more selling in the previous period, the more potential demand has been satisfied and will dampen the price in the current period. The liquidity effect is captured by the interaction term between $Flip^s\_Return_{j,t-1}$ and $Flip^s\_Turnover_{j,t-1}$, which is denoted as $Flip^s\_Return_{j,t-1} \times Flip^s\_Turnover_{j,t-1}$.

Specifically, the past flippers' average realized capital gains at property development project j at quarter $t-1$ ($Flip^s\_Return_{j,t-1}$) is calculated by Equation 1. In Equation 1, $Y^s_{j,t-1}$ represents the selling price of a flipper selling a property within project j in quarter $t-1$ and $Y^b_{j,t-l}$ is the buying price of the same property bought by that flipper in quarter $t-l$ (l is different for different transactions). The $n_{j,t-1}$ is the observed selling transactions by flippers within project j in quarter $t-1$.

$$Flip^s\_Return_{j,t-1} = \left[\sum_{n_{j,t-1}} \frac{Y^s_{i,j,t-1} - Y^b_{i,j,t-l}}{Y^b_{i,j,t-l}} / n_{j,t-1} \right] \tag{1}$$

Housing flippers' turnovers in property development project j at time $t-1$ ($Flip^s\_Turnover_{j,t-1}$) is calculated in Equation 2. It is the ratio of the observed flippers' sales ($n_{j,t-1}$) to total number of properties in the project (N_j), as shown in Equation 2.

$$Flip^s\_Turnover_{j,t-1} = {}^{n_{jt-1}}/_{N_j} \tag{2}$$

The control variables are a set of hedonic variables. In addition, as it has been discussed in Section 2, a transaction could also be triggered by housing market fundamentals, such as income shocks or economic cycles (Clayton, 1996[12]; Kenny, 1999[33], Shiller (2007)[43]; Sinai, 2012[45]; Glaeser & Nathanson, 2014[24]; et al.). We employ the past housing price index change of the sub

market, which is the district where the transacted property locates ($Submarket\_R_{t-1}$)[6], to control the impacts of market fundamentals.

At last, Bayer, Geissler & Roberts (2013)[5] raise a concern that flippers may tend to buy properties with poor maintenance and sell the property after renovation. As a result, the estimated flippers' buying discounts, selling premiums and capital gains may be biased, as they may capture the renovation costs. These concerns will be addressed in the robustness tests, in which we divide the sample into resales and new-housing sales (include new sales and sub sales). In new-housing sales, every property is newly renovated. We can test if their concern matters by comparing the results from new-housing sales and resales (see Section, 3.3). Two dummies are created with $New\_Housing$ indicates the transacted property is a new property; $Resale$ indicates the transaction is a resale transaction and the transacted property is not new (Refer to Table A1 in Appendix A for definitions.).

All variables are defined in Table 1 with descriptive statistics in Table 2. As shown in Panel A of Table 2, during the sample period, the average buying prices ($Y_{i,j,t}$) by flippers ($Flip^b$) was the lowest, at SGD[7] 1,251,094, while the average selling prices by flippers ($Flip^s$) was the highest at SGD 1,508,766. Although hedonic factors are not accounted when doing the comparison, these two figures can partially reflect the flippers' motivation to gain from buying low and selling high. Besides, Owner-occupied properties (either buy or sell) tend to be largest in $size$, oldest in Age, while flippers prefer newer and smaller properties. In addition, we do not see substantial difference in three types of participants' preferences in terms of property tenure ($TenureD$) or property type ($PropertytypeD$).

Panel B of Table 2 summarizes the observed average return ($Flip^s\_Return_{j,t-1}$) and selling turnover rate ($Flip^s\_Turnover_{j,t-1}$) by flippers in each project in each quarter. We can see that the realized return when selling by flippers in average was 18.76%, but it ranged from below -30% and above 96.45%. The average selling turnover rate by flippers in each project in each Quarter was 2.84%, which ranged from below 0.13% to above 16.67%. It is important to note that we only take into account these projects and quarters where flippers' sales happened.

Figure 2 depicts the relationship between flippers' average turnovers as sellers ($Flip^s\_Turnover_{j,t-1}$) and housing price indexes as well as the relationship between flippers' average realized returns ($Flip^s\_Return_{j,t-1}$) and housing price indexes at market level. It shows that at the peaks and troughs, both flippers' turnovers and flippers' realized returns are generally ahead of the variations of the housing market price dynamics, implying that flippers' sales or returns (cashing out the capital gains) can beat the market trend. Along with the up-and down- trends of a property cycle, both turnovers and returns move together with the property cycles, implying that flippers'

[6]It is calculated based on the price indexes at district level estimated with hedonic method.
[7]The SGD denotes the Singapore dollar.

Table 1: The definitions for all variables

Variables	**Definition**
$Flip^b$	Dummy variable, 1 if the buyer of the transaction record is a flipper, 0 otherwise.
$Rent\_Invest^b$	Dummy variable, 1 if the buyer of the transaction record is a rental housing investor, 0 otherwise.
Own_Occup^b	Dummy variable, 1 if the buyer of the transaction record is an owner occupier, 0 otherwise.
$Flip^s$	Dummy variable, 1 if the seller of the transaction record is a flipper, 0 otherwise.
$Rent\_Invest^s$	Dummy variable, 1 if the seller of the transaction record is a rental housing investor, 0 otherwise.
Own_Occup^s	Dummy variable, 1 if the seller of the transaction record is an owner occupier, 0 otherwise.
$Flip^s\_Return_{j,t-1}$	Flippers' average realized capital gains at development project level in the previous quarter.
$Flip^s\_Turnover_{j,t-1}$	Flippers' average sales turnover rate, at property development project level.
$Submarket\_R_{t-1}$	Housing price index change of the sub market, which is the district where the transacted property locates.
$Y_{i,j,t}$	The price at which a property is transacted. It is the contract price when a contract is signed.
$size$	The size of a housing unit, measured in Square foot.
$Floor$	The floor level that a housing unit is located.
$TenureD$	A dummy variable representing property tenure, with 1 indicating that it is leasehold property with maximum tenure of 99 years and 0 if it is a freehold or a tenure of 999 years.
$PropertytypeD$	A dummy variable with 1 indicating a Condo and 0 indicating an apartment.
Age	The age of a housing unit when it is transacted, measured by year (contract date minus TOP date).
$resale$	A dummy variable with 1 indicating the transacted property is a new property, 0 otherwise.
$QuarterDummy$	Dummy variables indicating the quarter when the transaction happens.
$ProjectDummy$	Dummy variables indicating the property project development where the transacted property locates.
$DistrictDummy$	Dummy variables indicating the district where the transacted property locates.
$Upward$	Dummy, 1 indicating the transaction happens during upward trend period Q1 2006-Q4 2007, 0 otherwise.
$Downward$	Dummy, 1 indicating the transaction happens during downward trend period Q1 2008-Q1 2009, 0 otherwise.
$Booming$	Dummy, 1 indicating the transaction happens during booming period Q2 2009-Q4 2010, 0 otherwise.

Table 2: Descriptive statistics of three types of market participants: Q1 2006-Q4 2010

Panel A: Mean and Std. Dev. (in Parentheses)					
	Obs	**price, S$**	**size, sqft**	**Floor, level**	**Age, year**
Own_Occup^b	63,690	1,275,282.00	1,383.49	8.34	6.19
		(1,257,087.00)	(585.24)	(7.30)	(7.69)
$Rent\_Invest^b$	15,449	1,351,041.00	1,223.93	8.57	3.65
		(1,115,359.00)	(532.40)	(7.59)	(7.85)
$Flip^b$	11,637	1,251,094.00	1,290.26	8.67	0.89
		(1,140,255.00)	(609.69)	(7.64)	(6.71)
Own_Occup^s	23,904	1,121,691.00	1,386.95	7.18	10.26
		(966,080.80)	(560.86)	(6.19)	(6.82)
$Rent\_Invest^s$	5,215	1,169,818.00	1,243.84	7.58	9.34
		(796,204.10)	(480.29)	(6.53)	(6.80)
$Flip^s$	17,238	1,508,766.00	1,288.70	10.71	1.31
		(1,285,891.00)	(605.13)	(9.30)	(5.40)

Panel B: Observation of Participants in the New-housing and Resale market				
	Resales	**Resales, percentage**	**New-housing sales**	**New-housing sales, percentage**
Own_Occup^b	43,355	81.39	20,335	54.22
$Rent\_Invest^b$	7,123	13.37	8,326	22.20
$Flip^b$	2,791	5.24	8,846	23.58
$Total$	53,269	100.00	37,507	100.00
Own_Occup^s	23,904	72.60	0	0.00
$Rent\_Invest^s$	5,215	15.84	0	0.00
$Flip^s$	3,808	11.56	13,430	100.00
$Total$	32,927	100.00	13,430	100.00

activities and market cycles may mutually reinforce each other. These observations are in general consistent with the literature that firstly, flippers can act as arbitrageurs or intermediaries that beat the market cycle, secondly flippers can also act as positive feedback traders that push market forward in the same direction (Fu, Qian & Yeung, 2013[21]; Fu & Qian, 2014[20]; Bayer, Geissler & Roberts, 2013[5]). In addition, although the movements of both $Flip^s\_Turnover_{j,t-1}$ and $Flip^s\_Return_{j,t-1}$ at market level are ahead of the variations of the housing price cycles, the two variables are uncorrelated at project level. Their correlation coefficient is around 0.0629[8].

3.2 Empirical design

3.2.1 Research design for studying the differential trading abilities

Hedonic models for home buyers and home sellers are empirically estimated separately, in which flippers, rental housing investors and owner occupiers are measured by dummy variables and enter the models as explanatory variables, as shown by Equation 3. Hedonic models do not include property traders' characters as it is assumed that housing market information is perfect and housing price is determined by a bundle of shadow prices of housing attributes (Rosen, 1974 [41];

[8]The correlation between the two variables is 0.2869 if these project and quarters where flippers' sales do not happen are included (both $Flip^s\_Turnover_{j,t-1}$ and $Flip^s\_Return_{j,t-1}$ for these projects and quarters are 0).

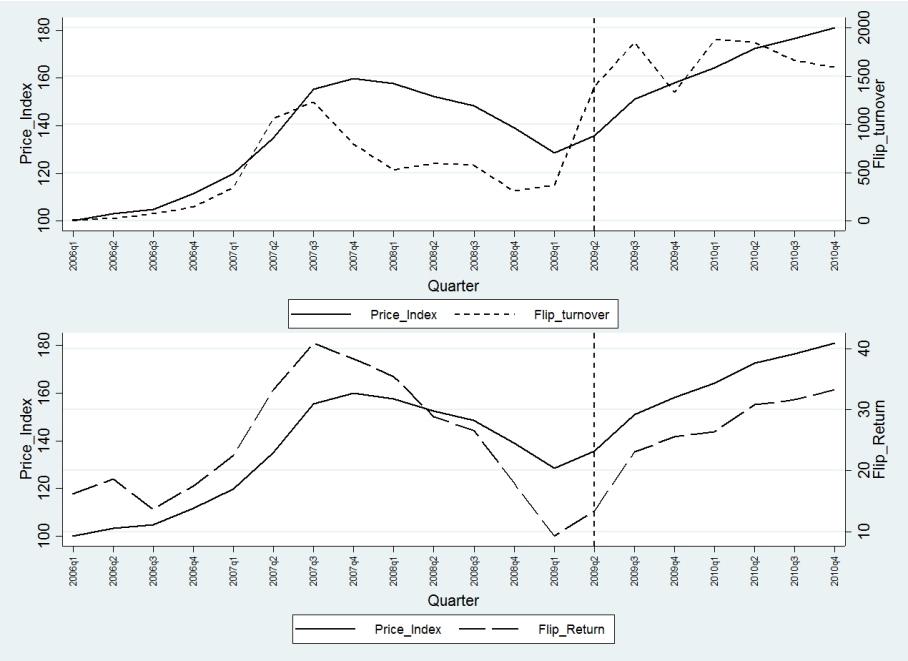

Figure 2: Price index, flippers' return and selling turnover

Note: *PriceIndex* represents the quarterly hedonic price index for non-landed properties (including condominiums and apartments) in Singapore private housing market, Q1 2006=100, and the data is from URA; *Flip_turnover* represents $Flip^s\_Turnover_{j,t-1}$ and *Flip_Return* represents $Flip^s\_Return_{j,t-1}$. The vertical dash line is the threshold after when Singapore government carries out a series of anti-speculation policies.

Epple, 1987[17]). However, housing traders' characters are brought into hedonic models to explore how traders' characters may impact on final housing transaction prices because traders may have different levels of market information (Turnbull & Sirmans, 1993[50]), bargaining power (Harding, Knight & Sirmans, 2003[27]) or social capital (Tu, Li & Qiu, 2016[49]). This is despite that Lambson, McQueen& Slade (2004) [34] and Ihlanfeldt & Mayock (2012)[31] raise the concern that directly adding property traders' characters into hedonic models may generate biased results because the factors influencing information, bargaining powers or social capitals might also influence their valuation for different housing attributes. This concern will be addressed in the robustness tests in Section 3.3.

To further investigate the variations of the differences in trading abilities between flippers and non-flippers during a cycle, we divide the sample into three sub periods. The upward trend period is between Q1 2006 and Q4 2007, when the price indexes of the Singapore private housing market rose steadily at beginning then boomed, characterized by the recovery from the 10 years' recession resulted from the 1997 Asia financial crisis. The downward trend period is between Q1 2008 and Q1 2009, led by the American subprime crisis. However, the Singapore private housing market quickly rebounded. Underpinned by the strong economic performance, the market witnessed a strong housing market rebound and boom period between Q2 2009 and Q4 2010, which subsequently induced a series of anti-speculation policies. Table 1 gives the definition of the variables (*Upward*, *Downward* and *Booming*) to indicate three periods. The econometric model is set up as in Equation 3.

$$Log(Y^k_{i,j,t}) = \alpha \mathbf{D^k_j} + \mathbf{f X_{i,j,t}} + \varepsilon^k_{i,j,t} \tag{3}$$

Y is the property transaction price.

k indicates home buyers if $k = b$; indicates home sellers if $k = s$.

i indicates the i^{th} property.

j indicates the 3 types of market participants, including housing flippers, rental housing investors, and owner occupiers, separately.

t indicates the different quarters when a transaction happens.

α and $\mathbf{f}$ are coefficients.

ε are residuals.

$\mathbf{D^k_j}$ is a vector of dummy variables, including $Flip^k$, $Rent\_Invest^k$ and Own_Occup^k.

$\mathbf{X_{i,j,t}}$ is a vector of hedonic variables of property i, transacted by j type of market participant at time period t.

In summary, the following models are empirically estimated using equation 1. For home buyers, four sets of models are estimated using full samples (Q1 2006-Q4 2010), the first upward trend period (Q1 2006-Q1 2007), the downward trend period (Q1 2008-Q1 2009) and the booming period (Q2 2009-Q4 2010). For home sellers, four sets of corresponding models are estimated. The above eight models take owner occupiers as the base, and we further run another eight models correspondingly where rental housing investors are taken as the base.

3.2.2 Research design for studying positive feedback hypothesis

Section 2.2 predicts that housing flippers' sales may trigger the positive feedbacks of non-flippers (rental investors and owner occupiers) through market sentiment effect. To empirically test the predictions, we adopt the following designs.

$$log(Y^b_{i,j,t}) = \alpha \mathbf{F^s_{j,t-1}} + \beta Rent\_Invest^b + \gamma \mathbf{F^s_{j,t-1}} * Rent\_Invest^b + \tau Submarket\_R_{i,t-1} + \mathbf{f X_{i,j,t}} + \varepsilon^b_{i,j,t} \tag{4}$$

Y is the property transaction price of owner occupiers and rental investors. b indicates home buyers.

i indicates the i^{th} property.

j indicates property development (project) j where property i locates.

t is the time periods.

α, β, γ and $\mathbf{f}$ are coefficients.

$Rent\_Invest^b$ is a dummy variable, with 1 indicating the transacted property is bought by a rental investor (for renting), 0 indicating it is bought by an owner occupier (for occupying).

$\mathbf{F^s_{j,t-1}}$ is a vector of variables including: $Flip^s\_Return_{j,t-1}$, $Flip^s\_Turnover_{j,t-1}$ and $Flip^s\_Return \times Turnover_{j,t-1}$ (see Table 1 for definition).

$Submarket\_R_{i,t-1}$ is the average price growth rate of the sub market in the previous quarter where property i is located.

$\mathbf{X_{i,j,t}}$ is a vector of hedonic variables associated with property i in development j at time t

The dependent variable $log(Y^b_{i,j,t})$ is the logarithm of transaction prices of both rental housing investors as home buyers and owner occupiers as home buyers. $\mathbf{F^s_{j,t-1}}$ is a vector of variables including: $Flip^s\_Return_{j,t-1}$, $Flip^s\_Turnover_{j,t-1}$ and and the cross term of the two $Flip^s\_Return \times Turnover_{j,t-1}$. They are used to test market sentiment effect. $\mathbf{F^s_{j,t-1}}$ is crossed with the dummy variable $Rent\_Invest^b$. This is because it is predicted in section 2, rental housing investors are less likely to take positive feedbacks than owner occupiers do. This cross term is used to prove it.

Five sets of empirical models are estimated. Firstly, Equation 4 is estimated using full sample without cross terms between $\mathbf{F^s_{j,t-1}}$ and $Rent\_Invest^b$. Then, Equation 4 is estimated with cross terms between $\mathbf{F^s_{j,t-1}}$ and $Rent\_Invest^b$ using full sample, upward trend period, downward trend period and booming periods separately (as defined in Section 3.2.1), based on which the positive feedback trading patterns across a cycle for rental housing investors and owner occupiers can be derived.

It is noted that, a DurbinWuHausman test (Nakamura & Nakamura, 1998[39]) is performed to test the potential endogeneity between $Flip^s\_Return_{j,t-1}$ and Y. We anticipate that the endogeneity should be weak. Besides, market sentiment effect can also be caused by flippers' high listing price. In this study we are not able to test it due to data limitation (we show some preliminary results in terms of this issue in Appendix. E).

3.3 Robustness tests and sample selection bias tests

There are three reasons that robustness and sample selection bias tests are needed. Firstly, directly adding property traders' characters into hedonic models may generate biased results (Lambson, McQueen& Slade, 2004[34] and Ihlanfeldt & Mayock, 2012[31]). In this study, flippers, owner occupiers and rental housing investors have different trading motivations and trading experiences, which may result in different hedonic prices for different attributes. In robustness tests, we split full sample into three subsamples of flippers, rental investors and owner occupiers to re-estimate the models proposed in section 3.2. The results are compared to study if adding traders' information into a hedonic model will produce biased results.

Secondly, flippers tend to buy properties with poor maintenance and sell the property after renovation, thus their buying and selling prices may capture the influence of maintenance and the cost of renovations, leading to biased results (Bayer, Geissler & Roberts, 2013[5]). In this study, we divide the sample into resales and new-housing sales. In new-housing sales, every property is

newly renovated. We can test if their concern matters by comparing the results from new-housing sales and resales.

Thirdly, sample selection biases arise because at the beginning of the investigation period, we can capture sellers, but we don't know when they bought the property. At the end of the period, we can capture the buyers, but we don't know when they will sell their properties. Although we adopt the samples between 2006 and 2010 which is the middle part of the full time period in the transaction dataset to minimize the influence, we further conduct sample selection bias tests by taking the following steps. For the sample between Q1 2006 and Q4 2010, we systematically eliminate a portion of the sample at the beginning or at the end of the period, we re-estimate the models. The results are compared to see if findings are biased due to the changes of the sample.

4 Empirical Results

This section presents the empirical results. For testing Research Question 1, in Section 4.1, we have run eight models for demonstrating the different trading abilities of different participants in terms of their buying price discounts (In Section 4.1.1) and another eight models in terms of their selling price premiums (In Section 4.1.2). For testing positive feedbacks of owner occupiers and rental housing investors triggered by the flippers (Research Question 2), we run five models as shown in Section 4.2.

4.1 How do flippers, rental housing investors and owner occupiers have different trading abilities?

4.1.1 Price discounts when purchasing

Against Equation 3, we estimate the following four models where the owner occupiers (Own_Occup^b) are taken as the base. The results are presented in Table 3a. Model 1 is estimated using full samples (Q1 2006-Q4 2010), Model 2-3 are estimated with the upward trend period (Q1 2006-Q1 2007), the downward trend period (Q1 2008-Q1 2009) and the booming period (Q2 2009-Q4 2010), separately.

As shown in Table 3a, the key variables of special interest, including $Rent\_Invest^b$, $Flip^b$ have expected coefficients and are generally significant at 1% level. The important controlled variables $size$ and $Floor$ are significant at 1% level, all the four models have satisfying R-Squares which range between 0.947-0.959. The results in Table 3a reveal that, compared to owner occupiers, both the flippers and rental housing investors are able to fetch a buying price discount while flippers outperform rental housing investors. Besides, the buying price gap is bigger during a downward trend period than that during an upward trend or booming period.

Across the four models, we can see that the coefficients *size* and *Floor*, as the key controlled variables determining housing attributes, are consistent and significant at 1% level. The coefficients for *size* is around 0.0005, which means 1 more square foot (sqft) of property size will raises the property price by 0.05 percentage. The coefficients for *Floor* is around 0.005, which means 1 level of increase in property floor will raises the property price by 0.5 percentage. As to the rest the of controlled variables, including *PropertytypeD*, *Resale* and *Age*, these are not the key variables determining housing prices and their coefficients are mixed probably because the different samples against which each model is estimated.

In Model 1, during the whole period, the coefficient of $Flip^b$ is -0.0309 and significant at 1% level, which indicates that the flippers enjoy an approximately 3.04[9] percentage points of price discount compared to the buying price of owner occupiers. The number for $Rent\_Invest^b$ is -0.0105 and at 1% significance level, which indicates that the rental housing investors enjoy 1.04 percentage points of price discount compared to the buying price of owner occupiers. The Model 2-4 show consistent results, i.e., flippers fetch the highest buying price discount, second by rental housing investors. The higher buying price discount fetched by flippers compared to that of rental investors reveals that the flippers have the highest trading ability, second by rental housing investors and then the owner occupiers. The result is consistent with what is predicted in Section 2.

In addition, Model 2-4 reveal the variation of trading abilities across the Upward trend, Downward trend and Booming periods. We can see that, the buying price gaps among different participants are larger during the upward trend period and downward trend period, while smaller during the booming period. Specifically, we calculate the buying price gaps between different players across different periods of a cycle based on the results from Model 2-4, and summarize them in Table 3b. During the Upward trend period, the buying prices paid by $Flip^b$ are 3.33 percentage points lower than Own_Occup^b, and is 2.47 percentage points lower than $Rent\_Invest^b$, while the corresponding price gaps during the Booming period is 3.19 percentage points and 1.68 percentage points which are smaller in magnitude. The above indicates that a flipper's relative trading ability compared to owner occupiers and rental investors is higher during the Upward trend period than that during the Booming period.

During the Downward trend period, the buying prices paid by $Rent\_Invest^b$ are 2.6 percentage points lower than that paid by Own_Occup^b, and that paid by $Flip^b$ are 4.2 percentage points lower than that by Own_Occup^b, while the corresponding price gaps during the Booming period are 1.54 percentage points and 3.19 percentage points. The above indicates that the relative trading abilities of a flipper and a rental housing investor compared to an owner occupier during the Downward period are higher than that during the booming period.

[9]It is calculated as (exp(-0.0309)-1)*100. The same calculation method applies to the remaining coefficients.

Table 3a: The different trading abilities of participants in terms of their buying prices, owner occupier as base

Dependent Variable: LnPrice				
	Model 1 All Period	Model 2 Upward trend	Model 3 Downward trend	Model 4 Booming
$Rent\_Invest^b$	-0.0105***	-0.00894***	-0.0263***	-0.0155***
	(0.00134)	(0.00250)	(0.00373)	(0.00149)
$Flip^b$	-0.0309***	-0.0339***	-0.0429***	-0.0324***
	(0.00161)	(0.00229)	(0.00465)	(0.00232)
size	0.000483***	0.000459***	0.000527***	0.000507***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Floor	0.00467***	0.00506***	0.00524***	0.00441***
	(0.00011)	(0.00018)	(0.00034)	(0.00014)
PropertytypeD	0.014	0.0661	-0.00472	0.00604
	(0.02610)	(0.06310)	(0.08060)	(0.01460)
resale	-0.0133***	-0.0273***	-0.0129	0.0153***
	(0.00242)	(0.00607)	(0.00994)	(0.00404)
Age	-0.00353***	-0.00121	0.000598	-0.00212*
	(0.00110)	(0.00119)	(0.00293)	(0.00113)
Quarter Dummy	Yes	Yes	Yes	Yes
Project Dummy	Yes	Yes	Yes	Yes
District Dummy	Yes	Yes	Yes	Yes
Tenure Dummy	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
Observations	90,581	11,100	39,304	40,177
R-squared	0.947	0.954	0.951	0.959

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 3b: The different buying prices of different partiicpants calculated based on results from Table 3a, in Percentage points

	Upward	Downward	Booming
$Rent\_Invest^b$ - Own_Occup^b	-0.89	-2.60	-1.54
$Flip^b$ - Own_Occup^b	-3.33	-4.20	-3.19
$Flip^b$ - $Rent\_Invest^b$	-2.47	-1.65	-1.68

Note: The calculation is based on the coefficients as in Table 3a. For example, the buying price difference between $Flip^b$ and $Rent\_Invest^b$ during the Upward trend period is "-2.15", which is calculated as (exp(-0.0339+0.00894)-1)*100, which means flippers pay prices of 2.15 percentage points lower than the rental housing investors when buying properties.

To see if flippers can pay significantly lower prices than that of rental housing investors, we run another four models where rental housing investor is taken as base. We obtain consistent results which are presented in Table A4 in Appendix. D.

As a short summary, the above models prove that, from the viewpoint of buying price, flippers have the highest trading ability, second by rental housing investors and finally the owner occupiers. In addition, the difference in their relative trading abilities is larger during the Upward trend period and Downward trend period than that during the Booming period.

4.1.2 Price premium when selling

In order to reveal the different trading abilities of participants in terms of their selling prices, against Equation 3, we estimate the following 4 models where the selling of owner occupiers (Own_Occup^s) is taken as the base. The results are presented in Table 4a. Model 1 is estimated using full samples (Q1 2006-Q4 2010), Model 2-3 are estimated with the upward trend period (Q1 2006-Q1 2007), the downward trend period (Q1 2008-Q1 2009) and the booming period (Q2 2009-Q4 2010), separately.

As shown in Table 4a, the key variables of special interest, including $Rent\_Invest^s$, $Flip^s$ have expected coefficients and are generally significant at 1% level. The important controlled variables $size$ and $Floor$ are significant at 1% level, all the four models have satisfying R-Squares which range between 0.948-0.96.

The results in Table 4a reveal that, compared to owner occupiers, the flippers are able to fetch a selling price premium. Although rental housing investors do not realize higher selling price compared to owner occupiers, we believe that they still have higher trading abilities. Their low selling prices are caused by the poor "reputation" of rental housing investors, i.e., the rented out properties are usually poorly maintained by the renters (Wang, Grissom, et al., 1991[51]). Besides, the selling price gaps are bigger during a downward trend period and an upward trend period than that during the booming period.

Across the 4 models, we can see that the coefficients for $size$ and $Floor$, as the key hedonic variables determining housing attributes, are consistent and significant at 1% level. The coefficients for $size$ is around 0.0005, which means 1 more square foot (sqft) of property size will raises the property price by approximately 0.05 percentage point. The coefficients for $Floor$ is around 0.004, which means 1 level of increase in property floor will raises the property price by 0.4 percentage point. As to the rest of the controlled variables, including $TenureD$, $PropertytypeD$, $Resale$ and

Age, these are not the key variables determining housing prices and their coefficients are mixed probably because the different samples against which each model is estimated.

In Model 1, during the whole period, the coefficient of $Flip^s$ is 0.0315 and significant at 1% level, which indicates that the flippers enjoy a 3.2 percentage points of price premium compared to the selling price of owner occupiers. The figure for $Rent\_Invest^s$ is -0.00784 and at 1% significance level, which indicates that the rental housing investors actually sell lower than owner occupiers. This is probably because the rented out properties are usually poorly maintained by the renters (Wang, Grissom, et al., 1991[51]) and the indoor maintenance is unobservable and not controlled in our model. The Model 3-5 show consistent results, i.e., flippers fetch the highest selling price premium, and rental housing investors sell at prices lower than owner occupiers. The high selling price premium of flippers suggest their highest trading ability. For rental housing investors, although they do not sell higher than owner occupiers, we still believe they have higher trading ability because their lower selling price is probably caused by the poor maintenance of their properties. Thus, the result is consistent with the results from the buying side and with what is predicted in Section 2.

In addition, Model 2-4 reveal the variation in trading abilities across a cycle. We can see that, the selling price gaps among different participants are larger during the upward trend period and downward trend period, while smaller during the booming period. Specifically, we calculate the selling price gaps between different players across different periods of a cycle based on the results from Model 2-4, and summarize them in Table 4b. During the Upward trend period, the selling prices realized by $Flip^b$ are 4.5 percentage points higher than $Rent\_Invest^b$ and Own_Occup^b, while the corresponding price gaps during the Booming period is 2.75 percentage points and 1.43 percentage points which are smaller in magnitude. The above indicates that a flipper's relative trading ability compared to owner occupiers and rental investors is higher during the Upward trend period than that during the Booming period.

During the Downward trend period, selling prices realized by $Flip^b$ are 4.84 percentage points higher than that realized by $Rent\_Invest^b$ and are 3.11 percentage points higher than that realized by Own_Occup^b, higher than the corresponding price gaps during the Booming period. The above also indicates that the relative trading ability of a flipper compared to an owner occupier during the Downward period is higher than that during the booming period.

To see if flippers can realize significantly higher selling prices than that of rental housing investors, we run another four models where rental housing investor is taken as base. We obtain consistent results which are presented in Table A5 in Appendix. D.

In summary, results of Model 1-8 prove that from the viewpoint of selling premium, the highest selling premium of flippers indicates their highest trading ability, and we still believe that rental

Table 4a: The different trading abilities of participants in terms of their selling prices, owner occupier as base

Dependent Variable: LnPrice				
	Model 1 All Period	Model 2 Upward trend	Model 3 Downward trend	Model 4 Booming
$Rent\_Invest^s$	-0.00784***	0.00503	-0.0167***	-0.0129***
	(0.00189)	(0.00751)	(0.00617)	(0.00187)
$Flip^s$	0.0315***	0.0440***	0.0306***	0.0142***
	(0.00262)	(0.00451)	(0.00706)	(0.00315)
size	0.000506***	0.000485***	0.000555***	0.000515***
	(0.00001)	(0.00001)	(0.00002)	(0.00001)
Floor	0.00421***	0.00454***	0.00395***	0.00385***
	(0.00015)	(0.00027)	(0.00041)	(0.00017)
	(0.00907)	(0.01450)	(0.21500)	(536.80000)
PropertytypeD	0.0534	0.117	-0.0533*	0.0096
	(0.05090)	(0.13400)	(0.03030)	(0.02050)
resale	0.0153***	-0.0255**	-0.0221	0.0167***
	(0.00339)	(0.00995)	(0.01570)	(0.00498)
Age	-0.00393**	-0.00129	0.00128	-0.00106
	(0.00166)	(0.00194)	(0.00743)	(0.00151)
Quarter Dummy	Yes	Yes	Yes	Yes
Project Dummy	Yes	Yes	Yes	Yes
District Dummy	Yes	Yes	Yes	Yes
TenureD	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
Observations	46,260	17,308	6,130	22,822
R-squared	0.948	0.951	0.958	0.96

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 4b: The different selling prices of different participants calculated based on results from Table 4a, in Percentage points

	Upward	Downward	Booming
$Rent\_Invest^s$ - Own_Occup^s	0.00	-1.66	-1.28
$Flip^s$ - Own_Occup^s	4.50	3.11	1.43
$Flip^s$ - $Rent\_Invest^s$	4.50	4.84	2.75

Note: The calculation is based on the coefficients as in Table 3a. For example, the selling price difference between $Flip^s$ and $Rent\_Invest^s$ during the Downward trend period is "4.84", which is calculated as (exp(0.0306+0.0167)-1)*100, which means flippers fetch prices of 4.84 percentage points higher than the rental housing investors when selling properties.

housing investors out-perform owner occupiers. In addition, the difference in their relative trading abilities is larger during the Upward trend period and Downward trend period than that during the Booming period. The results are consistent with that from the perspectives of buying price discount.

4.1.3 Summary

As a summary, we can see that flippers are able to fetch a higher price discount when buying and higher premium when selling compared to rental investors who also outperform the owner occupiers. The results suggest that flippers have the highest trading ability second by rental investors. In addition, we can see that the difference in their relative trading abilities is larger during the Upward trend period and Downward trend period than that during the Booming period. The above results are consistent with the predictions from the literature as summarized in Section 2.

4.2 Flippers' sales trigger the positive feedbacks of rental housing investors and owner occupiers

As predicted in Section 2.2, housing flippers' sales may trigger the positive feedbacks of non-flippers (rental investors and owner occupiers) through market sentiment effect. To empirically test the predictions, against Equation 4, we estimate the following 5 models. The empirical results are shown in Table 5.

Model 1 estimates equation 4 using full sample (both the buying transactions of owner occupiers and rental housing investors) over "Full period", excluding the cross term between $Rent\_Invest^b$ and with $\mathbf{F^s_{j,t-1}}$ to show robustness of the coefficients for Model 2, which estimates equation 4 using full sample (both the buying transactions of owner occupiers and rental housing investors) over "Full period", including the cross term between $Rent\_Invest^b$ and with $\mathbf{F^s_{j,t-1}}$. Model 3-5 further estimate the equation 4 using full sample (both the buying transactions of owner occupiers and rental housing investors) with "Downward trend period", "Downward trend period" and "Booming period" including the cross term between $Rent\_Invest^b$ and with $\mathbf{F^s_{j,t-1}}$. Model 6 reestimate Model 2 but removes the insignificant variables including $Rent\_Invest \times Flip^s\_Return_{j,t-1}$ and $Rent\_Invest \times Flip^s\_Return \times Flip^s\_Turnover$ from Model 2.

As shown in Table 5, the coefficients of key variables of special interest, $\mathbf{F^s_{j,t-1}}$ (including $Flip^s\_Return_{j,t-1}$, $Flip^s\_Turnover_{j,t-1}$, $Flip^s\_Return \times Turnover_{j,t-1}$), $Rent\_Invest^b$ as well as the interaction between $\mathbf{F^s_{j,t-1}}$ and $Rent\_Invest^b$ are consistent with what is predicted in Section 2. The important controlled variables $size$, $Floor$ and $Submarket\_R_{i,t-1}$ are significant at 1% level, all the 5 models have very satisfying R-Squares. Model 1 excludes the interaction terms between $Rent\_Invest^b$ and with $\mathbf{F^s_{j,t-1}}$. The coefficients between Model 2 to Model 1 are only

slightly different and the R-Squires of the two models are same, which indicates that the inclusion of the interaction terms does not distort the results.

The empirical results show that flippers' realized return when selling ($Flip^s\_Return_{j,t-1}$), which triggers the sentiment effect and leads to higher buying prices of owner occupiers and rental investors; the flippers selling turnover rate ($Flip^s\_Turnover_{j,t-1}$) adds to supply to the market and decreases the buying price of non-flippers, and this effect is stronger for rental housing investors. The joint effect of the realized return and selling turnover lead to higher buying prices of owner occupiers and rental investors. The results suggest that, the flippers, who have the highest trading ability, interact with non-flippers to cause positive feedbacks of non-flippers through market sentiment effect. Owner occupiers are more likely to take positive feedbacks than rental housing investors.

In Model 2 of Table 5, the negative and significant coefficient for $Rent\_Invest$ (-0.00756) indicates that the rental housing investors enjoy a price discount of about 0.756 percentage point compared to owner occupiers during the whole studied period, which is consistent with results in Section 4.1.1 indicating that rental housing investors have higher trading abilities than owner occupiers. Flippers' realized returns raise the market sentiment of owner occupiers. The coefficient of $Flip^s\_Return_{j,t-1}$ is 0.000342 and significant at 1% level.

The impacts of $Flip^s\_Turnover_{j,t-1}$ acts as the opposite of $Flip^s\_Return_{j,t-1}$. Firstly, the higher the flippers' selling turnover in the previous quarter, the more potential demands have been satisfied. Secondly, the selling of flippers sends a signal to the market that market prices are too high. As a whole, $Flip^s\_Turnover_{j,t-1}$ dampens the market sentiment. Consistent with the above prediction, we see that the coefficient for $Flip^s\_Turnover_{j,t-1}$ is -0.00131 and significant at 5% level. In addition, the significantly positive joint effect of $Flip^s\_Return_{j,t-1} \times Flip^s\_Turnover_{j,t-1}$, which is 7.09e-05, indicates that flippers sales as a whole lead the owner occupiers to pay higher prices.

Compared to the sentiment effect of flippers' sales on owner occupiers, the sentiment effect on rental housing investors is slightly weaker. The coefficient for $Rent\_Invest \times Flip^s\_Return_{j,t-1}$ is negative but insignificant, which means the sentiment effect of $Flip^s\_Return_{j,t-1}$ on rental housing investors is as strong as that on owner occupiers. However, the coefficient for $Rent\_Invest \times Flip^s\_Turnover_{j,t-1}$ is -0.00418 and significant at 1% level. It indicates that the rental housing investors are more sensitive to flippers' past selling turnover which dampens rental housing investors' sentiment more. Thus, as a whole, the flippers selling as a whole will trigger the positive feedbacks of owner occupiers more than that of the rental housing investors, which is consistent with what is predicted in Section 2.

Model 3-5 reveals the positive feedbacks of non-flippers across different market periods. The coefficients for $Flip^s\_Return_{j,t-1}$, $Flip^s\_Turnover_{j,t-1}$ and their interaction terms demonstrate that the positive feedbacks of non-flippers happens only in the Upward trend while does not happen in downward trend or booming period. During the downward trend period, the sentiment of non-flippers is not easily to be triggered up by flippers' sales; while during the booming period, every participant is rushing to buy with a high sentiment and the flippers' sales do not add to non-flippers' sentiment. In addition, during the upward trend period, the sentiment effect of flippers' sales on rental housing investors is as strong as that on owner occupiers, while the rental investors are more sensitive to the negative signal sent by flippers during the downward trend and booming period (as demonstrated by the coefficients of the $Rent\_Invest \times Flip^s\_Return_{j,t-1}$ and $Rent\_Invest \times Flip^s\_Turnover_{j,t-1}$).

Despite the coefficients of $Flip^s\_Return_{j,t-1}$ and $Flip^s\_Turnover_{j,t-1}$ are small in absolute value, their effects are actually large in housing market. Model 6 is used to demonstrate how large the actually effects are. The coefficient for $Flip^s\_Return_{j,t-1}$ is 0.000328, which suggests that one percentage point of return in average realized by the flippers' sales in the previous quarter in this particular project will trigger owner occupiers in the current quarter to pay buying prices of 0.0328% higher. This coefficient is actually not small in magnitude. The average return rate of flippers realized when selling is 18.7% (As shown in Table 2), and the average price of properties transacted by owner occupiers is around SGD 1.28 Million. That means, in average, flippers' realized return can trigger an owner occupier to pay SGD 7.85 thousand more for buying a property.

The coefficient for $Flip^s\_Turnover_{j,t-1}$ is -0.00163, which suggests that 1 percentage point of selling turnover by flippers in the past in a particular development project will trigger an owner occupiers to pay a buying price of 0.163% lower. The effect of $Flip^s\_Turnover_{j,t-1}$ is actually smaller than that of $Flip^s\_Return_{j,t-1}$. The average selling turnover rate of flippers is 2.84% (As shown in Table 2), and the average price transacted by an owner occupier is around SGD 1.28 Million, that means in average, flippers' selling turnover can trigger an owner occupier to pay SGD 5.92 thousand less. In total, the selling of flippers (considering the effects of both $Flip^s\_Return_{j,t-1}$ and $Flip^s\_Turnover_{j,t-1}$) in average triggers the owner occupiers to pay SGD 1.93 thousand more. Besides, the coefficient for the joint effect of flippers' realized return and selling turnover ($Flip^s\_Return \times Turnover_{j,t-1}$) is 7.09e-05 and is significant at 1% confidence level. It indicates that the selling turnover and the positive realized return jointly raise make the owner occupiers to pay higher prices.

As a summary, we see difference between owner occupiers and rental housing investors in terms of their degrees of positive feedback trading facing with flippers' selling behaviors. Consistently, owner occupiers are more likely to be influenced by flippers' selling behaviors and take positive feedback trading pattern. In addition, the sentiment of the non-flippers are more easily to be triggered up during the upward trend period.

Table 5: Flippers sales trigger the positive-feedback of non-flippers

Dependent Variable: LnPrice						
	Model 1 All Period	Model 2 All Period	Model 3 Upward Period	Model 4 Downward Period	Model 5 Booming Period	Model 6 All Period
$Rent\_Invest$	-0.0107***	-0.00756***	-0.00607**	-0.0276***	-0.0148***	-0.00805***
	(0.00138)	(0.00155)	(0.00295)	(0.00468)	(0.00163)	(0.00144)
$Flip^s\_Return_{j,t-1}$	0.000334***	0.000342***	0.000833***	-0.000132	2.56E-05	0.000328***
	(0.00006)	(0.00007)	(0.00013)	(0.00022)	(0.00006)	(0.00006)
$Flip^s\_Turnover_{j,t-1}$	-0.00201***	-0.00131**	-0.00295***	-0.000712	-0.000592	-0.00163***
	(0.00051)	(0.00054)	(0.00090)	(0.00263)	(0.00058)	(0.00050)
$Flip^s\_Return_{j,t-1} \times Flip^s\_Turnover_{j,t-1}$	7.97e-05***	7.09e-05***	6.92e-05***	9.69E-05	8.08e-05***	8.67e-05***
	(0.00002)	(0.00002)	(0.00002)	(0.00010)	(0.00003)	(0.00002)
$Rent\_Invest \times Flip^s\_Return_{j,t-1}$		-5.66E-05	-0.000183	0.000319	-4.78E-05	
		(0.00011)	(0.00023)	(0.00028)	(0.00011)	
$Rent\_Invest \times Flip^s\_Turnover_{j,t-1}$		-0.00418***	-0.00213	-0.0130**	-0.00168*	-0.00267***
		(0.00111)	(0.00182)	(0.00530)	(0.00101)	(0.00061)
$Rent\_Invest \times Flip^s\_Return \times Flip^s\_Turnover$		6.03E-05	2.74E-05	0.000217	8.14E-06	
		(0.00005)	(0.00004)	(0.00016)	(0.00005)	
$Submarket\_R_{i,t-1}$	0.000144***	0.000146***	0.000459***	0.000429***	0.000146***	0.000146***
	(0.00004)	(0.00004)	(0.00007)	(0.00010)	(0.00004)	(0.00004)
size	0.000477***	0.000477***	0.000455***	0.000520***	0.000499***	0.000477***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Floor	0.00462***	0.00462***	0.00494***	0.00517***	0.00438***	0.00462***
	(0.00012)	(0.00012)	(0.00020)	(0.00036)	(0.00014)	(0.00012)
TenureD	0.00264	0.00231	-0.0154	-0.133	-0.115	0.0024
	(0.00779)	(0.00780)	(0.01290)	(0.19100)	(260.60000)	(0.00780)
PropertytypeD	0.0188	0.0187	0.0803	-0.00622	0.0141	0.0188
	(0.02920)	(0.02930)	(0.07520)	(0.08420)	(0.01600)	(0.02930)
Age	-0.00410***	-0.00413***	-0.00152	-0.00591	-0.00238*	-0.00412***
	(0.00118)	(0.00118)	(0.00137)	(0.00613)	(0.00125)	(0.00118)
Quarter Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Project Dummy	Yes	Yes	Yes	Yes	Yes	Yes
District Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Observations	78,948	78,948	32,805	9,931	36,212	78,948
R-squared	0.948	0.948	0.952	0.955	0.961	0.948

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

5 Robustness tests and sample selection bias tests

As discussed in Section 3.3, the robustness tests and sample selection bias tests are developed to address the following three concerns. Firstly, directly adding property traders' characters into hedonic models may generate biased results (Lambson, McQueen& Slade, 2004[34] and Ihlanfeldt & Mayock, 2012[31]). Empirical results for this concern are provided in Section 5.1. Secondly, flippers tend to buy properties with poor maintenance and sell the property after renovation, thus their buying and selling prices may capture the influence of maintenance and the cost of renovations, leading to biased results (Bayer, Geissler & Roberts, 2013[5]). Results for the second concern are provided in Section 5.2. Thirdly, sample selection biases arise because at the beginning of the investigation period, we can capture sellers, but we don't know when they bought the property. At the end of the period, we can capture the buyers, but we don't know when they will sell their properties. The third concern is discussed in Section 5.3.

Empirical results after considering the three concerns are still consistent with those discussed in Section 4.

5.1 For the concern that traders' information may distort results

For testing participants' trading abilities

We design a simulation for the trading prices of the three types of participants, and simulate the buying and selling prices separately. Firstly, we estimate Equation 3 with only hedonic variables against the buying transaction records of the three participants, i.e., owner occupiers, rental housing investors and flippers, separately. Full period sample is adopted. Secondly, we randomly draw 100 properties and predict their prices with coefficients estimated for the three participants, respectively. Thirdly, based on the simulated buying prices of owner occupiers, rental housing investors and flippers in terms of the 100 properties, we calculate the average predicted buying price of the three types of participants separately. Fourthly, we repeat the draw and prediction for 30 times, and produce a figure for the average buying prices of the three types of participants in Panel "Full Period" of Figure A1 in Appendix F1.

We repeat the above 4 steps of simulation but with subsample of upward trend period, downward trend period and booming period separately, and produce the figures Panel "Upward", Panel "Downward" and Panel "Booming" in Figure A1, respectively.

As shown in Figure A1, robustness tests show consistent results. For a particular group of 100 randomly selected properties, the flippers pay the lowest prices, second by rental investors and owner occupiers pay the highest prices when buying. In addition, the buying price gaps of the three types of participants are larger during the Downward trend period while smaller during the Upward trend and Booming period. It is important to note that, here we only use the new-housing

sale sample, this is because the buying transaction of flippers in resale market during the downward trend and booming periods are too few (As shown in Table A6). It will not be accurate to use these few observations to predict the prices in resale market.

For selling prices of the three types of participants, we adopt the same method as that for the buying prices, and produce the 4 corresponding panels of figures in Figure A2 in Appendix F1. We obtain consistent results, i.e., for a particular group of 100 randomly selected properties, the flippers sell at the highest prices, second by owner occupiers while rental housing investors sell at the lowest prices; their selling price gaps are largest during the Downward trend period while smaller during the Upward trend and Booming period.

For testing positive feedback of non-flippers

We estimate Equation 4 against the buying transactions of owner occupiers and rental investors, separately. For the buying transactions by owner occupiers, we estimate four models against the full period, upward trend period, downward trend period and booming period, respectively. The results are presented in Panel A of Table A9 in Appendix F2. Following the same procedure, we estimate 4 models for buying transactions by rental housing investors, the results are presented in Panel B of Table A9 in Appendix F2.

The results are consistent with that in Section 4.2, i.e., flippers sales trigger the positive feedback buying of non-flippers, and owner occupiers are more easily to be influenced. Specifically, the market sentiment of owner occupiers is more easily to be triggered up, as the coefficient of $Flip^s\_Return_{j,t-1}$ for owner occupiers is larger in magnitude and more significant compared to that of rental housing investors; the rental housing investors are more sensitive to the negative signal sent by flippers by their selling turnover, as the coefficient of $Flip^s\_Turnover_{j,t-1}$ (which is negative) for owner occupiers is smaller in absolute value. Besides, the sentiment effect is stronger during the upward trend period.

5.2 For the concern of unobserved indoor maintenance

It is possible that our results in terms of different participants' trading abilities are biased due to the unobserved indoor maintenance. For testing the trading ability in terms of buying prices, we repeat the first 5 models in Section 4.1.1, while against new-housing sale market and resale market separately. The results are shown in Table A10 (where owner occupiers are taken as the base) and Table A11 (where rental housing investors are taken as the base) in Appendix. G. We obtain consistent results in both new-housing sale and resale market with the results in Section 4.1, i.e., the flippers can fetch the lowest buying prices, second by rental housing investors and the owner occupiers pay the highest prices. It is worth noting that we are not able to split the new-housing sale market and resale market for reestimating the participants' selling prices, because

by definition the sales by owner occupiers and rental housing investors can only happen in resale market.

5.3 For the concern of sample selection bias

For testing the robustness of results in terms of trading abilities, we reestimate Equation 3 against Model 1 in Section 4.1.1, using full period (Q1 2006-Q4 2010) and 4 different sub periods which are systematically truncated at the beginning and ending of the full period sample. The results are shown in Table A12 in Appendix. H. Similarly, for testing the robustness of results in terms of positive feedback of non-flippers, we reestimate Equation 4 against Model 2 in Section 4.2, using full period (Q1 2006-Q4 2010) and 4 different sub periods which are systematically truncated at the beginning and ending of the full sample. The results are shown in Table A13 in Appendix. H. We also obtain robust and consistent results.

6 Conclusions and Implications

We empirically identify housing market participants as owner occupiers, rental housing investors and flippers. The three types of participants are recognized by the literature, governments and the public. Through a comprehensive literature review, we establish the different motivations, decision making processes as well as the implied different trading abilities for the three types of participants. Using a carefully constructed dataset, we empirically demonstrate that flippers show the strongest trading ability while rental investors outperform owner occupiers in terms of fetching buying discounts and selling premiums. Besides, across a housing cycle, the relative trading abilities are stronger during an upward trend period and during a downward trend. Weaker during a booming period. The results are summarized in Table 6.

We demonstrate that the positive feedback buying by non-flippers (owner occupiers and rental investors) triggered by flippers' sales act as a new source of market over fluctuation, which adds to the understanding on housing bubbles from behavioral perspectives.

According to the behavioral housing literature, the over-fluctuation in a housing market can be driven by: 1) the positive feedback trading of non-informed flippers (Fu & Qian, 2014[20]; Fu, Qian & Yeung 2013[21]; Bayer, Geissler & Roberts, 2013[5], et al.); 2) the contagion of housing investors' trading activities to novice investors (Bayer, Mangum and Roberts, 2016[6]); 3) pro-cyclical (also positive feedback) trading pattern of owner occupiers (Anenberg & Bayer, 2013[1]). The role of flippers in a housing market is understood only as an additional source of housing demand or supply and whether they stabilize or destabilize the market depends on in which period

of the cycle they enter or leave the market. Our findings are distinct from the above understanding and suggest that flippers have the highest trading ability and their sales also trigger the positive feedback buying of non-flippers which add to market mispricing. In addition, owner occupiers with lower trading ability than rental housing investors are more likely to positive feedback. Our findings help explain the puzzle that how flippers as a small group of market participants can drive the housing bubble up.

The above findings question the validity of the literature interpretation on the roles of informed flippers in smoothing housing market through additional supply during uptrend or booming periods, the findings also implies that during a downtrend, flipper's buying alone doesn't help boom up the market.

Table 6: A summary of findings in terms of trading abilities and positive feedbacks

	(1)	(2)	(3)	(4)
Panel A: Trading abilities of different participants				
	Trading ability	Vary across a cycle		
		Upward	Downward	Booming
	F>R>O	**F>>R>O**	**F>R>>O**	**F>R>O**
Panel B: Positive feedbacks triggered by flippers' sales				
	Whole period	Vary across a cycle		
		Upward	Downward	Booming
Owner occupiers	+ +	+ + +	.	+
Rental housing investors	+	+ + +	-	.

Note: In Panel A, "F", "R" and "O" indicate flippers, rental housing investors, and owner occupiers. In Panel B, the number of "+" reflects the degree of the positive feedback effect, the larger the number is, the larger the effect it represents. "." indicates the base or no effect; and "−" indicates the negative feedback.

Taking advantage of the several housing markets' stylized characters which are different from financial markets, we avoid the problems of ambiguous identification of market participants in finance literature as well as the existing housing literature. In addition, our findings have clear implications on the financial market. For example, we empirically justify how the interaction of different participants influences the whole market while it is difficult to be empirically demonstrated in financial markets.

Our findings have strong policy implications. Flippers should always be removed from the market, transaction taxes on cap gains are necessary and effective, but policy makers should be careful on designing the anti-speculation policy package to minimize the impacts on owner occupiers and investors. Besides, owner occupiers, who dominate a housing market, have the lowest trading ability and thus may more likely to take irrational behaviors (as indicated by Bayer, Geissler & Roberts, 2013[5]). Owner occupiers' market sentiment are more likely to be influenced by other players. In this regard, Owner-occupiers should be controlled during a booming market, for example, through higher LTV or through imposing transaction taxes to prevent owner occupiers turned investors from happening.

At the current version, we have not empirically set up the feedback loop, i.e., owner occupiers' demand triggers flippers' trading, which reinforce owner occupiers. We focus on the second part. For further work, we will empirically establish the feedback loop by looking at what would happen if one particular type of participants sold a property to another type of housing market participants during a cycle (we can identify both the buyer and seller of a transaction record).

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Appendices

Appendix .A An Overview of Singapore Housing Market

In Singapore, the private residential properties are homes to around 13.9%[10] of Singaporeans and most of relatively high-income foreigners. Condominium and apartment are the two dominant property types. Being different from the public housing (which is called as the HDB housing), the private housing market is characterized by high quality and high price, targeting at upper middle-to-high-income groups and foreign expatriates as well as less regulated.

Newly constructed properties are often launched for presales that are developer sales before a Temporary Occupation Permit (TOP) is issued. TOP is the date that a property development project is completed and home buyers can move in. New housing sales in Singapore includes presales, sub-sales which are repeated sales before a TOP and sales by a developer after a TOP (Post-TOP new housing Sale). Resales are defined as the properties sold by individuals after TOP. It is important to differentiate new housing sales from resales as the former does not incur any maintenance costs, insurance costs or have building depreciations. It is noted that a property development project is typically launched two to four years before its TOP. Both presale homebuyers' and developers' defaults in Singapore are uncommon.

In addition, before a TOP, a home buyer only needs to pay part of the total contract price. Shortly after a sale's contract is signed, the buyer needs to pay a total of 20% of the contract price as deposit, stamp duty of (3% to 15%), and they will pay the rest of 80% based on the process of the completion of the project. After TOP, 100% of the contract price as well as the stamp duty should be paid.

Two dummies are created with $New\_Housing$ indicates the transacted property is a new property, which includes presales, Post-TOP New housing Sales and subsales as in Table A1; *Resale* indicates the transaction is a resale transaction.

Table A1: The 4 types of sales and their distribution in our working dataset

Type of Sale	Sellers	Pre or Post TOP	Payment Scheme	Observations	Percentage
Presale	Developer	Before	20%+c*Price+Stamp duty	93,639	37.51
Post-TOP new housing sale	Developer	After	100%+Stamp duty		
Subsale	Individual Owners	Before	20%+c*Price+Stamp duty	29,623	11.87
Resale	Individual Owners	After	100%+Stamp duty	126,370	50.62

[10]This figure is from Singapore Department of Statistics under "Households & Housing" for 2015. Weblink: *http* : *//www.singstat.gov.sg/statistics/*.

Appendix .B A summary of the variables in the working dataset

Table A2: Variables in the working dataset

Variables:	
Transaction ID: Full Address:	A numerical number used to distinguish a transaction record. The address of a housing unit, including street name, block number, floor level and unit number.
Postal Code:	Each building has one postal code.
Transaction Price:	The price at which a property is transacted. It is the contract price when a contract is signed.
Contract Date:	The date when a sales contract is signed.
Size:	The size of a housing unit, measured in Square foot.
Floor level	The floor level that a housing unit is located.
TOP	The date when the construction is finished (buyers can move in).
Property Age	The age of a housing unit when it is transacted, measured by year (contract date minus TOP date).
Purchaser Address Indicator	0 for the HDB (The buyer previously lived in a public house unit); 1 for the Private (the buyer previously lived in the private housing market).
District	In Singapore, there are 28 districts.
Property Type	A dummy variable with 1 indicating a Condo and 0 indicating an apartment.
Property Tenure	A dummy variable with 1 indicating that it is leasehold property with maximum tenure of 99 years and 0 indicating if it is a freehold or a tenure of 999 years.
Type of Sale	A variable with 1 indicating it is a new sale (sold by developer before TOP or after TOP), with 2 indicating that it is a sub -sale (resold by an individual owner before a TOP is granted), with 3 indicating that it is a resale (resold by an individual owner after a TOP is granted).
Project Name	The name of a property development project.
Project Units	Total number of units of a property development project.
Singapore time series	Three variables including the quarterly GDP growth rate; the quarterly CPI, and the monthly interest rate (10 years government bond rate).
Housing Policies	The date when each anti-speculation policy takes effect.

Note: In this paper, the working dataset only includes sales transactions which our empirical studies will focus on. The rental transaction records share the same variables as the sales transactions but we only use them for identification of rental investors as buyers and as sellers.

Appendix .C Identification of different market participants

There are three types of housing market participants. They are housing flippers, rental housing investors and owner occupiers. We adopt the following strategy to identify if a housing unit is bought or sold by a flipper, a rental investor or an owner occupier.

.C.1 Identifying a home buyer as a housing flipper, rental housing investor or an owner occupier

Identifying a home buyer as a housing flipper. Assuming that a home buyer buys a property, and sells it later. He is a housing flipper if he satisfies one of the following criteria.

- If the sale is a sub-sale, the home buyer is defined as a housing flipper.
- The first transaction is a presale (before TOP) or sub-sale and the second transaction is a resale. There is no rental transaction between the two transactions. If the interval between the second transaction and the TOP is no more than one year, he is a flipper.
- Both transactions are resales. The time interval between the two transactions is no more than one year and there is no rental transaction between the two transactions. He is a flipper.

Identifying a home buyer as a rental housing investor. Assuming that a home buyer buys a property, and rent it out later. He is a rental housing investor if he satisfies one of the following criteria.

- The first transaction is a presale (before TOP) or a sub-sale, the second transaction is a rental housing transaction. If the interval between the rental housing transaction and the TOP is no more than one year, the home buyer is a rental housing investor.
- For two consecutive transactions, the interval between the first transaction and the subsequent rental transaction is no more than one year, then the home buyer is a rental housing investor.

Identifying a home buyer as an owner occupier. Assuming that a home buyer buys a property, and sells it later if there are two sales' observations. He is an owner occupier if he satisfies one of the following criteria.

- For two consecutive sales' transactions, the first transaction is a presale (before TOP), a sub-sale, the second transaction is a resale. There is no rental transaction between the two trades. If the interval between the second transaction and the TOP is larger than one year, the home buyer is an owner occupier.
- For two consecutive transactions, the first transaction is a presale (before TOP) or a sub sale, the second transaction is rental housing transaction. If the interval between the rental transaction and TOP is larger than one year, then the home buyer is an owner occupier.

- For a housing unit, only one sale transaction is observed. The transaction is a presale (before TOP) a sub-sale. If the interval between 2014 and the TOP is larger than 1 year, the home buyer is an owner occupier.
- For a housing unit, two consecutive sales' transactions are observed. The first transaction is a resale, there is no rental housing transaction between the two trades, and the interval between the two trades is longer than one year. The home buyer in the first transaction is an Owner-occupier.
- For a housing unit, two consecutive transactions are observed, the interval between the first sale's transaction and the subsequent rental housing transaction is longer than one year, the home buyer is the first sale's transaction an owner occupier.
- For the last transaction of a housing unit, if it is a post-TOP new housing sale or a resale, and the interval between 31st April 2014 and the transaction date is longer than one year. The home buyer is an Owner-occupier.

It is important to note that, there are some transaction records unidentifiable:

- For a housing unit, this is the last transaction observed and it is a sale's transaction. The transaction is a presale (before TOP) or a sub-sale. If the interval between 2014 and TOP is shorter than or equal to 1 year, the home buyer is unidentifiable.
- For the last trade of a housing unit, if it is a post-TOP new housing sale or a resale, and the interval between 31 April 2014 and the trade is shorter than or equal to one year. The home buyer is unidentifiable. (This is because our dataset only covers the period before 31 April 2014)

In the studied sample between 2006Q1 and 2010Q4, the unidentified transaction records only account for 4.26%. To examine the influence of the unidentified transaction records, we carry out a sample selection test, and find that they do not distort the results.

.C.2 Identifying a home seller as a housing flipper, a rental investor or an owner occupier

With two consecutive sales' transactions (excluding the rental housing transactions), if the home buyer in the first transaction is identified as a flipper, then the seller in the latter transaction is flipper. Identification of Owner-occupiers and rental housing investors follows the same strategy, and the rest are those either sold by developers or cannot be identified. Besides, some owner occupiers as buyers will turn to be rental housing investors. If a property is bought by an owner occupier, then later it is rented out by the owner occupier, and finally sold. We identify this selling record is sold by a rental housing investor.

Based on the constructed dataset, we identify owner occupiers, rental investors and flippers from both the selling and buying sides. The constructed dataset includes a comprehensive history of rental and sale transactions for each property unit within the investigation period[11]. The identification strategy is developed based on the comprehensiveness of the transaction history of each particular unit, and it includes two parts: identification of participants as buyers and as sellers.

On the buying side, we identify a transaction record as bought by a flipper if the property was then sold within a short period of time (we use 1 year as a threshold) or sold as a sub-sale. We assume that within 1 year of holding period, the property owner is not likely to move into the property due to the cost of relocation. We identify a transaction record as bought by a rental investor if the property was then rented out within one year; and the rest were bought by owner occupiers.

On the selling side, we look at any two consecutive sale's transaction records (ignoring the rental transactions), if a buyer in the first record is a flipper, then in the second record, the property was sold by the flipper. The identification of rental investor and owner occupiers follows the same strategy. The strategy details are provided in the Appendix. C. It is noted that for both buying and selling identifications, there are sale's transactions which buyers or sellers are not able to be identified. This is because the original databases only covers a limited time period.

Table A3 presents the transaction history of a private housing unit. Taking transaction record No. 1 as an example, the property was transacted in August 2003 while it was transacted again in September 2006 as a sub-sale. It means that the buyer in record No.1 sold the property before moving into it, and therefore he or she was identified as a flipper. At the same time, in record No.2, the seller was previously a flipper. Let's take record No.5 as another example. The property was transacted in September 2009 and then sub-let within 1 year in Jan 2010, which means the buyer in record No.5 is a rental investor. As the buyer in the previous sale transaction (record No.2) is identified as a rental investor, then in record No.5, the property was sold by the rental investor. In addition, in record No.9, as the previous sale transaction is beyond our investigation period, we are not able to identify it.[12]

[11] It is noted that although the sale's transaction records are comprehensive, the dataset only covers more than 80% of the rental transactions in the private housing market. Thus, rental investors are possibly under-represented as compared to owner occupiers, but the identification of flippers is not influenced.

[12] In addition, if the selling of a property was sold by developer (or "New Sale"), we treat the seller as unidentified as this article does not consider the behavior of housing developers.

Table A3: Comprehensive transaction history of a property as an example for identification

No.	Full Address	Rent/Sale	Type of Sale	TOP	Contract date	Identi Buyer	Identi Seller
1	1 ESSEX * #**-02	Sale	NEW SALE	2006	8/29/2003	Flipper	N.A.
2	1 ESSEX * #**-02	Sale	SUB SALE	2006	9/25/2006	Rental Investor	Flipper
3	1 ESSEX * #**-02	Rent		2006	12/26/2007		
4	1 ESSEX * #**-02	Rent		2006	12/16/2008		
5	1 ESSEX * #**-02	Sale	RESALE	2006	9/28/2009	Rental Investor	Rental Investor
6	1 ESSEX * #**-02	Rent		2006	1/4/2010		
7	1 ESSEX * #**-02	Rent		2006	6/18/2010		
8	50 LOR*** #**-33	Rent		1998	4/29/2011		
9	50 LOR*** #**-33	Sale	RESALE	1998	9/25/2013	Rental Investor	N.A.
10	50 LOR*** #**-33	Rent		1998	11/22/2013		

Note: For the Full Address of the records, we have the address inform while cover it for confidentiality consideration.

Appendix .D Price discounts when purchasing and price premiums when selling, rental housing investors as the base

Table A4: The different trading abilities of participants in terms of their buying prices, rental investor as base

Dependent Variable: LnPrice				
	Model 5 All Period	Model 6 Upward Period	Model 7 Downward Period	Model 8 Booming Period
Own_Occup^b	0.0105***	0.00894***	0.0263***	0.0155***
	(0.00134)	(0.00250)	(0.00373)	(0.00149)
$Flip^b$	-0.0204***	-0.0250***	-0.0166***	-0.0169***
	(0.00185)	(0.00299)	(0.00525)	(0.00243)
size	0.000483***	0.000459***	0.000527***	0.000507***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Floor	0.00467***	0.00506***	0.00524***	0.00441***
	(0.00011)	(0.00018)	(0.00034)	(0.00014)
PropertytypeD	0.014	0.0661	-0.00472	0.00604
	(0.02610)	(0.06310)	(0.08060)	(0.01460)
resale	-0.0133***	-0.0273***	-0.0129	0.0153***
	(0.00242)	(0.00607)	(0.00994)	(0.00404)
Age	-0.00353***	-0.00121	0.000598	-0.00212*
	(0.00110)	(0.00119)	(0.00293)	(0.00113)
Quarter Dummy	Yes	Yes	Yes	Yes
Project Dummy	Yes	Yes	Yes	Yes
District Dummy	Yes	Yes	Yes	Yes
TenureD	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
Observations	90,581	39,304	11,100	40,177
R-squared	0.947	0.951	0.954	0.959

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table A5: The different trading abilities of participants in terms of their selling prices, rental investor as base

Dependent Variable: LnPrice				
	Model 5 All Period	Model 6 Upward Period	Model 7 Downward Period	Model 8 Booming Period
Own_Occup^s	0.00784***	-0.00503	0.0167***	0.0129***
	(0.00189)	(0.00751)	(0.00617)	(0.00187)
$Flip^s$	0.0393***	0.0390***	0.0474***	0.0271***
	(0.00290)	(0.00822)	(0.00863)	(0.00327)
size	0.000506***	0.000485***	0.000555***	0.000515***
	(0.00001)	(0.00001)	(0.00002)	(0.00001)
Floor	0.00421***	0.00454***	0.00395***	0.00385***
	(0.00015)	(0.00027)	(0.00041)	(0.00017)
PropertytypeD	0.0534	0.117	-0.0533*	0.0096
	(0.05090)	(0.13400)	(0.03030)	(0.02050)
resale	0.0153***	-0.0255**	-0.0221	0.0167***
	(0.00339)	(0.00995)	(0.01570)	(0.00498)
Age	-0.00393**	-0.00129	0.00128	-0.00106
	(0.00166)	(0.00194)	(0.00743)	(0.00151)
Quarter Dummy	Yes	Yes	Yes	Yes
Project Dummy	Yes	Yes	Yes	Yes
District Dummy	Yes	Yes	Yes	Yes
TenureD	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
Observations	46,260	17,308	6,130	22,822
R-squared	0.948	0.951	0.958	0.96

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Appendix .E Some evidences for the anchoring effect

We run hedonic regression with dummies indicating different listers (by rental investors, flippers, developers compared to that listed by owner occupiers) with listing data. As shown in Table A6, we find that the listing price of flippers is higher than rental investors and owner occupiers during the booming periods and lower during the bust period. The coefficients are not significant for booming periods, which is probably caused by the sparseness of flippers' listing records, as shown in Table A7.

Table A6: A comparison of the listing prices of different participants

Dependent Variable: Ln(price), the list prices by different participants.				
	All: 06Q1-13Q4	Upward: 06Q1-07Q4	Downward: 08Q1-08Q4	Booming: 09Q1-10Q1
RIvest_List	-0.0128	-0.126	0.00273	-0.115
	(0.0891)	(0.2310)	(0.0296)	(0.1350)
Flip_List	0.0273	0.136	-0.0964***	0.12
	(0.0382)	(0.1080)	(0.0353)	(0.1330)
Deve_List	0.0146	-0.0592	-0.0169	-0.0106
	(0.0900)	(0.1720)	(0.0591)	(0.1370)
size	0.000902***	0.000796***	0.00126***	0.00115***
	(0.0001)	(0.0002)	(0.0001)	(0.0001)
sizesq	-9.92e-08***	-7.55e-08**	-1.98e-07***	-1.89e-07***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Floor	0.00828**	0.00949	0.0109*	0.00625**
	(0.0033)	(0.0068)	(0.0059)	(0.0026)
Floorsq	-3.16E-05	-7.66E-05	-4.30E-05	4.98E-05
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
TenureD	-1.291**	-0.785	0.668	-0.458***
	(0.5830)	(0.6430)	(0.4420)	(0.0415)
PropertytypeD	0.344***	-1.711	0.152**	0.556**
	(0.0888)	(1.5050)	(0.0728)	(0.2460)
Age	2.54E-02	7.51E-02	1.85E-02	2.37E-03
	(0.0199)	(0.0802)	(0.0162)	(0.0031)
Observations	2,505	884	827	794
R-squared	0.649	0.704	0.803	0.894

Note: Other controlled variables including quarter dummies, district dummies and project dummies;
Robust standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1

Table A7: A Summary of observations of listings

List by	Obs	Asking Price	size	Floor	Age	PropertytypeD	TenureD
Owner-Occupier	1,855	990,981.80	1,283.27	7.51	8.23	0.75	0.59
Rental Investor	143	1,343,767.00	1,181.08	9.69	3.90	0.68	0.47
Flipper	500	1,401,030.00	1,167.26	10.07	1.22	0.62	0.39
Developer	12	942,500.00	894.50	8.08	-0.33	0.75	0.58

Appendix .F Robustness consideration for Concern 1: For the concern of including traders' information

.F.1 For Equation 1: the trading ability

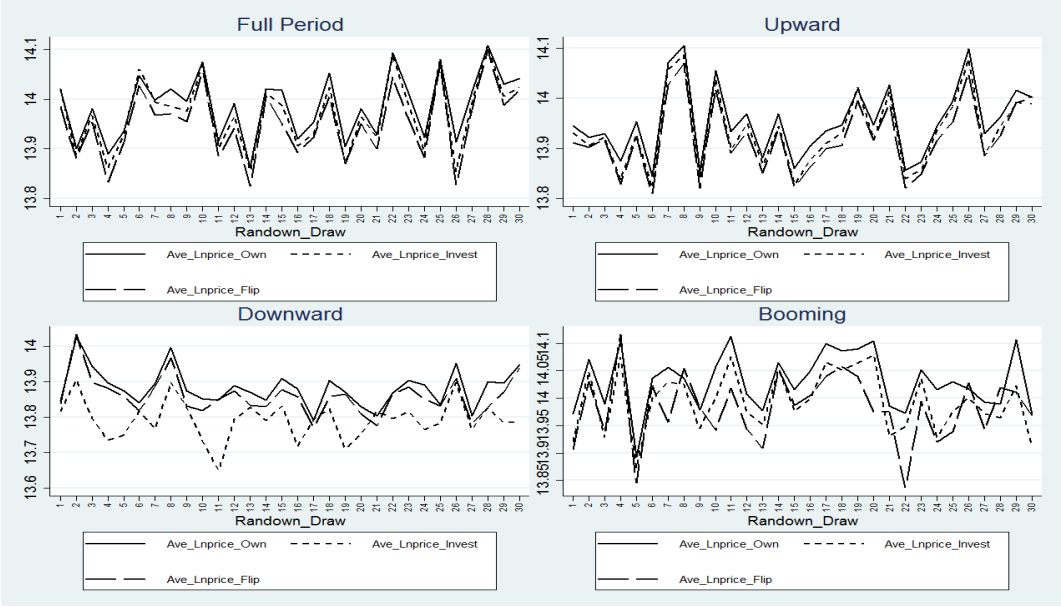

Figure A1: A simulation of the purchasing prices by the three types of participants: New-property Sample by randomly drawing 100 properties for 30 times

Table A8: Too few Flippers in the resale market during the "Downward" and "Booming" period makes the simulation results for the transactions in resale market inaccurate

Buyer	RESALE	New-housing Sale
Full Period		
Own_Occup^b	43,558	20,436
$Rent\_Invest^b$	7,144	8,364
$Flip^b$	2,794	8,869
Total	53,496	37,669
Upward trend		
Own_Occup^b	18,586	9,232
$Rent\_Invest^b$	2,058	3,183
$Flip^b$	1,817	4,699
Total	22,461	17,114
Downward trend		
Own_Occup^b	5,246	2,973
$Rent\_Invest^b$	777	1,009
$Flip^b$	193	979
Total	6,216	4,961
Booming Period		
Own_Occup^b	19,726	8,231
$Rent\_Invest^b$	4,309	4,172
$Flip^b$	784	3,191
Total	24,819	15,594

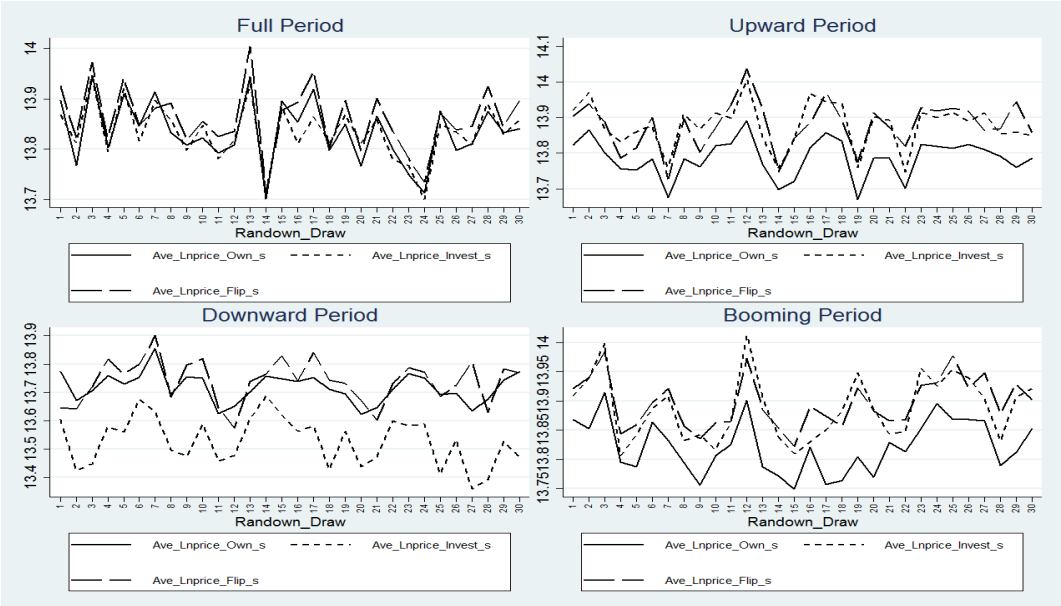

Figure A2: A simulation of the purchasing prices by the three types of participants: Full Sample by randomly drawing 100 properties for 30 times

.F.2 For Equation 2: the positive feedback

Table A9: Flippers' sales trigger the positive feedback of owner occupiers and rental investors

Dependent Variable: LnPrice				
	Model 1 All Period	Model 2 Upward trend	Model 3 Downward trend	Model 4 Booming
Panel A: The positive feedback of owner-ocupiers				
$Flip^s\_Return_{j,t-1}$	0.000358***	0.000858***	-0.000217	7.37E-06
	(0.00007)	(0.00015)	(0.00021)	(0.00007)
$Flip^s\_Turnover_{j,t-1}$	-0.00137**	-0.00316***	-0.000777	-0.000865
	(0.00056)	(0.00095)	(0.00274)	(0.00061)
$Flip^s\_Return_{j,t-1} \times Flip^s\_Turnover_{j,t-1}$	7.01e-05***	6.64e-05***	9.73E-05	9.41e-05***
	(0.00003)	(0.00002)	(0.00010)	(0.00003)
$Submarket\_R_{i,t-1}$	0.000164***	0.000496***	0.000531***	0.000115**
	(0.00005)	(0.00009)	(0.00012)	(0.00005)
Observations	63,525	27,595	8,151	27,779
R-squared	0.949	0.953	0.957	0.962
Panel B: The positive feedback of rental investors				
$Flip^s\_Return_{j,t-1}$	0.000170*	0.000377*	0.000857**	6.96E-05
	(0.00010)	(0.00022)	(0.00041)	(0.00012)
$Flip^s\_Turnover_{j,t-1}$	-0.00511***	-0.00400**	-0.00796	-0.00189
	(0.00101)	(0.00201)	(0.01030)	(0.00135)
$Flip^s\_Return_{j,t-1} \times Flip^s\_Turnover_{j,t-1}$	0.000164***	0.000127***	0.000237	4.36E-05
	(0.00003)	(0.00004)	(0.00026)	(0.00005)
$Submarket\_R_{i,t-1}$	0.000101*	0.000263	0.000202	0.000198***
	(0.00006)	(0.00016)	(0.00020)	(0.00007)
Observations	15,423	5,210	1,780	8,433
R-squared	0.952	0.955	0.969	0.966

Note: Hedonic variables of the properties are controlled, including *size*, *Floor*, *TenureD*, *PropertytypeD*, *Age*. Other controlled variables include Quarter Dummies, Project Dummies, District Dummies and *constant*. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Appendix .G Robustness consideration for Concern 2: different participants buy properties with different qualities that are unobservable

Table A10: The trading abilities of different participants when buying, owner occupiers as the base and specifying the new-housing sale market and resale market

Dependent Variable: LnPrice				
Panel a: New-housing sales market				
	Model 1	Model 2	Model 3	Model 4
	All Period	Upward trend	Downward trend	Booming
$Rent\_Invest^b$	-0.0155***	-0.00904***	-0.0240***	-0.0174***
	(0.00203)	(0.00327)	(0.00518)	(0.00273)
$Flip^b$	-0.0365***	-0.0296***	-0.0360***	-0.0321***
	(0.00188)	(0.00266)	(0.00531)	(0.00276)
Observations	37498	17,042	4,938	15,518
R-squared	0.953	0.956	0.954	0.96
Panel b: Resale housing market				
	Model 5	Model 6	Model 7	Model 8
	All Period	Upward trend	Downward trend	Booming trend
$Rent\_Invest^b$	-0.0145***	-0.00766**	-0.0279***	-0.0148***
	(0.00170)	(0.00365)	(0.00504)	(0.00169)
$Flip^b$	-0.0418***	-0.0441***	-0.0615***	-0.0351***
	(0.00308)	(0.00404)	(0.00983)	(0.00495)
Observations	53,083	22,262	6,162	24,659
R-squared	0.945	0.947	0.953	0.958

Note: Attributes of the properties are controlled, including *size*, *Floor*, *TenureD*, *PropertytypeD*, *Age*. Other controlled variables include Quarter Dummies, Project Dummies, District Dummies and *constant*. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table A11: The trading abilities of different participants when buying, rental investors as the base and specifying the new-housing sale market and resale market

Dependent Variable: LnPrice				
Panel a: New-housing sales market				
	Model 1	Model 2	Model 3	Model 4
	All Period	Upward Period	Downward Period	Booming Period
Own_Occup^b	0.0155***	0.00904***	0.0240***	0.0174***
	(0.00203)	(0.00327)	(0.00518)	(0.00273)
$Flip^b$	-0.0210***	-0.0205***	-0.0120*	-0.0147***
	(0.00221)	(0.00351)	(0.00617)	(0.00294)
Observations	37,498	17,042	4,938	15,518
R-squared	0.953	0.956	0.954	0.96
Panel b: Resale market				
	Model 5	Model 6	Model 7	Model 8
	All Period	Upward Period	Downward Period	Booming Period
Own_Occup^b	0.0145***	0.00766**	0.0279***	0.0148***
	(0.00170)	(0.00365)	(0.00504)	(0.00169)
$Flip^b$	-0.0273***	-0.0364***	-0.0336***	-0.0203***
	(0.00342)	(0.00530)	(0.01070)	(0.00510)
Observations	53,083	22,262	6,162	24,659
R-squared	0.945	0.947	0.953	0.958

Note: Attributes of the properties are controlled, including *size*, *Floor*, *TenureD*, *PropertytypeD*, *Age*. Other controlled variables include Quarter Dummies, Project Dummies, District Dummies and *constant*. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Appendix .H Robustness consideration for Concern 3: the concern of sample selection

Table A12: Trading abilities of different participants when buying and selling: different truncated periods

Panel A: buying price discount					
Dependent Variable: LnPrice					
	2006Q1-2010Q4	2006Q3-2010Q4	2006Q3-2010Q2	2006Q4-2010Q2	2007Q1-2010Q1
$Rent\_Invest^b$	-0.0105***	-0.0112***	-0.0112***	-0.0111***	-0.0119***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
$Flip^b$	-0.0309***	-0.0316***	-0.0321***	-0.0332***	-0.0361***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	90,581	84,363	74,647	71,134	59,822
R-squared	0.947	0.947	0.948	0.948	0.948
Panel B: selling price premium					
Dependent Variable: LnPrice					
VARIABLES	2006Q1-2010Q4	2006Q3-2010Q4	2006Q3-2010Q2	2006Q4-2010Q2	2007Q1-2010Q1
$Rent\_Invest^s$	-0.00784***	-0.00849***	-0.00676***	-0.00738***	-0.00621**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$Flip^s$	0.0315***	0.0300***	0.0301***	0.0300***	0.0288***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	37,461	32,241	38,538	44,500	46,260
R-squared	0.948	0.948	0.948	0.948	0.948

Note: Attributes of the properties are controlled, including *size*, $Floor$, $TenureD$, $PropertytypeD$, *Age*. Other controlled variables include Quarter Dummies, Project Dummies, District Dummies and *constant*. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table A13: How flippers' sales trigger the positive feedback of non-flippers: different truncated periods

Dependent Variable: LnPrice					
VARIABLES	2006Q1-2010Q4	2006Q3-2010Q4	2006Q3-2010Q2	2006Q4-2010Q2	2007Q1-2010Q1
$Rent\_Invest$	-0.00756***	-0.00868***	-0.00900***	-0.00864***	-0.00938***
	(0.00155)	(0.00159)	(0.00177)	(0.00178)	(0.00192)
$Flip^s\_Return_{j,t-1}$	0.000342***	0.000330***	0.000372***	0.000392***	0.000389***
	(0.00007)	(0.00007)	(0.00008)	(0.00008)	(0.00009)
$Flip^s\_Turnover_{j,t-1}$	-0.00131**	-0.00123**	-0.000822	-0.000499	0.000703
	(0.00054)	(0.00054)	(0.00056)	(0.00054)	(0.00052)
$Flip^s\_Return_{j,t-1} \times Flip^s\_Turnover_{j,t-1}$	7.09e-05***	7.05e-05***	6.57e-05**	5.91e-05**	4.20e-05*
	(0.00002)	(0.00003)	(0.00003)	(0.00003)	(0.00002)
$Rent\_Invest \times Flip^s\_Return_{j,t-1}$	-5.66E-05	-4.82E-05	-4.28E-05	-6.05E-05	-3.50E-05
	(0.00011)	(0.00011)	(0.00013)	(0.00013)	(0.00014)
$Rent\_Invest \times Flip^s\_Turnover_{j,t-1}$	-0.00418***	-0.00370***	-0.00332***	-0.00318***	-0.00281**
	(0.00111)	(0.00113)	(0.00119)	(0.00118)	(0.00117)
$Rent\_Invest \times Flip^s\_Return_{j,t-1} \times Flip^s\_Turnover_{j,t-1}$	6.03E-05	5.20E-05	5.09E-05	5.01E-05	4.48E-05
	(0.00005)	(0.00005)	(0.00005)	(0.00005)	(0.00005)
$Submarket\_R_{i,t-1}$	0.000146***	0.000150***	9.97e-05***	0.000116***	0.000603***
	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00006)
size	0.000477***	0.000481***	0.000481***	0.000486***	0.000493***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Floor	0.00462***	0.00464***	0.00476***	0.00472***	0.00480***
	(0.00012)	(0.00012)	(0.00013)	(0.00013)	(0.00015)
TenureD	0.00231	0.00161	0.00526	0.00514	0.0139
	(0.00780)	(0.00803)	(0.00860)	(0.00864)	(0.00962)
PropertytypeD	0.0187	0.024	0.0259	0.0263	0.0307
	(0.02930)	(0.03050)	(0.03450)	(0.03480)	(0.03930)
Age	-0.00413***	-0.00395***	-0.00354***	-0.00347***	-0.00312**
	(0.00118)	(0.00120)	(0.00119)	(0.00120)	(0.00128)
Quarter Dummy	Yes	Yes	Yes	Yes	Yes
Project Dummy	Yes	Yes	Yes	Yes	Yes
District Dummy	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Observations	78,948	73,644	64,489	61,597	51,809
R-squared	0.948	0.949	0.949	0.949	0.95

Note: The owner occupiers are taken as the base. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.