Do the Forward Sales of Real Estate Stabilize Spot Prices?

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ABSTRACT

We examine forward sale (pre-sale) activities on the volatility of spot prices in the real estate market. The abundance of pre-sales data and major changes in regulatory control on the pre-sale market during the 90's in Hong Kong allow us to undertake empirical tests using Hong Kong's real estate data. Our results show that the volatility of spot prices increased significantly after forward sales were severely dampened by regulatory control measures introduced in 1994, but decreased again when the measures were partly relaxed in 1998. The results contribute to the long lasting debate on whether the introduction of a futures market reduces the volatility of spot prices. Previous studies were mainly conducted in markets with low transaction costs, notably financial markets. By utilizing the unique regulatory changes in the pre-sale market of Hong Kong, we are able to conduct an experiment on the conditional volatility of spot prices in a high information-cost environment. This sheds light on the mixed evidence found in the finance literature.

Keywords

Forward contract, GARCH model, pre-sale, price volatility.

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1. INTRODUCTION

In Hong Kong, the private residential property price has undergone great changes over the last decade (*Figure 1*). The price level grew nearly 350% between 1989 and 1997, with two small downturns in 1992 and 1994. Then, the Asian financial crisis occurred in 1997, leading to a substantial downward price adjustment. There are several explanations that were frequently used to account for this cyclical movement. One is that strong US economy helped inflate property prices before 1997 through the linked exchange system between Hong Kong dollars and US dollars. Another explanation is that the strong demand of property from growing population and foreign capital inflow has been accompanied by the relatively inelastic supply of land before 1997 as a result of the Sino-British Joint Declaration. The third explanation is the common belief that speculative activities caused an unreasonably high pre-1997 price level.[1] Since it is widely believed that speculative activities mainly arose from the pre-sale market, this paper aims to empirically evaluate whether the pre-sale market was responsible for the fluctuation in the price level of the spot market. This is not merely a local issue but constitutes part of the long lasting debate in finance on whether the introduction of a futures market reduces the volatility of spot prices. The active pre-sale market in Hong Kong together with the unqiue changes in regulatory control on pre-sales during in the 90's allow us to undertake the first study itest the stabilization effect in the real estate market.

Since the regulatory changes form the basis of our study, we will describe them in detail first in the next section. Then, Section 3 will review the major arguments and evidence both for and against the stabilization effect of futures on spot prices. Section 4 will describe the type of traders participated in the pre-sale market. The Hong Kong empirical data used in this study will be introduced in Section 5. Section 6 will give the methodology and the results of testing the hypothesis that forward sales help stabilize the

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[1] However, Ho and Kwong (2002) found that property prices Granger-caused speculative activities in the residential spot market of Hong Kong during 1995-2001.

spot market. We measure the price volatility through a repeat-sales price index and a GARCH model. Finally, Section 7 is a conclusion.
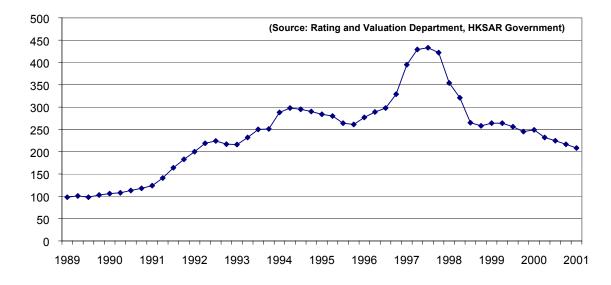
Figure 1: Hong Kong Private Residential Property Price Index (1989-2001)

2. HONG KONG PRE-SALE SYSTEM

Pre-sales or forward sales have been very active in the housing market of Hong Kong. Developers pre-sell their new developments to the market well before occupation so as to transfer their financial risk and discover the market value of the properties. In fact, pre-sales can be understood as forward contracts: the contracting parties have agreed on the price at the date of sale but the subject property, which is still under construction, is transferred to the assignee only at a certain period later, typically at the date of completion (Chau *et al*. 2003).[2]

Although Hong Kong is known as a lassie faire economy, the housing market, especially the pre-sale market, is subjected to heavy government intervention. In 1994, a task force was established by the Hong Kong government to curb sharp the rise in

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[2] Recently, we were aware of another view that pre-sales are real options (Lai *et al*. 2004). Which view is correct is an empirical question and does not affect the analysis and results of this study.

property prices. The task force[3] suggested that, among other things, the pre-sale market[4] should be controlled because it was conducive to speculative activities.

A number of anti-speculation measures were implemented in June 1994 with an aim to stabilize property prices (Lands Department, 1999). First, the permitted period of forward sales by developers was shortened to no more than 9 months. Before the implementation of this measure, developers had been permitted to pre-sell incomplete developments up to two-year before the anticipated date of completion (Lui 1997). Renaud *et al.* (1997) criticized it for hindering the cash flow management of developers and thus increasing development risk.

Second, the government restricted developers' sale methods by reducing the quota for private sales from 50% to 10% of the number of uncompleted. The rationale was that "[private sales] fuelled speculation since the vast majority of such buyers are not end-users" (Planning, Environment and Lands Branch, 1994). However, this measure obstructed a channel that developers could use to collect market information for pricing their new products, and might reduce the information content of pre-sale prices. Besides, the flow of pre-sale price information to the spot market was further suffocated by the fact that the government prohibited any re-sale of the Agreement of Sale and Purchase (ASP) before the Certificate of Compliance[5] or the consent-to-assign was given.

Third, the government discouraged short-term trading through increasing trading costs. Stamp duty (a kind of tax) was imposed on the transactions of the ASP, rather than on the subsequent transactions of the Deed of Assignment[6]. The amount of stamp duty on ASP was also significantly raised to a rate between 0.75% and 3.75%. Apart from taxes, the government required an initial deposit of 10% of the purchase price upon

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[3] See Planning, Environment and Lands Branch (1994).
[4] The Consent Scheme was introduced in 1961 to protect the interests of flat buyers and to prevent speculative activities in the pre-sale market. Consent for forward sales of uncompleted flats will generally be given to a developer if the Government is satisfied with, among others, the financial arrangements and the stage of development reached. The Consent Scheme, however, is only applicable to buildings on new land governed by a building covenant but not on redeveloped land.
[5] The Certificate of Compliance is issued when the development is complete and in compliance with all the positive obligations stipulated in the lease.
[6] The Deed of Assignment signifies the transfer of the legal title of a property to the buyer after the completion of a building

signing the preliminary sale and purchase agreement, and half of the deposit would be forfeited if a purchaser failed to sign the ASP. Before this requirement was imposed, the amount of initial deposit had simply been determined by the market, and was normally not more than 5%. All these restrictions were a significant disincentive to deter purchasers from adopting aggressive short-term investment strategies in the primary housing market (Renaud *et al*. 1997).

Not until the downturn of the property market in 1997 did the Government consider relaxing the anti-speculation measures. In May and September of 1998, Lands Department (1999) announced, among others, the following relaxation measures:

- Relaxing the permitted period of forward sales to no more than 15 months;
- Increasing the proportion of flats allocated for private sales by developers from 10% to 20%.
- Suspending the sub-sale restriction on uncompleted flat;
- Reducing the amount of initial deposit to 5%;

These measures have only partly relaxed the constraints imposed during the intervention period between 1994 and 1998. One of the most important constraints, namely the imposition of stamp duty on the ASP, has not been relaxed. Hence, the trading cost of pre-sales in the pre-intervention period is still higher than that in the post-intervention period.

The changes in the regulation of the real estate pre-sale market in Hong Kong provide an excellent arena to empirically examine the 'on' and 'off' effect of the pre-sale market on the volatility of the spot market. In the financial literature, many studies have been conducted to test whether futures trading can stabilize stock prices in the spot market. However, due to the infrequent trading of real estate or the absence of a real estate futures market, there have been few similar studies on the real estate market. Chau *et al*. (2003) established that the forward sales of housing provide a price discovery function for the spot market. Yiu *et al*. (2004) further shown that government intervention altered the price discovery relationship between spot and pre-sale prices. Yet, both studies focused only on the first moment of returns. The theme of this paper is to test whether trading in

the pre-sale market affects the second moment of the spot market. We employed a GARCH model to study the conditional volatility of the spot market. The results are of far reaching implications on policy-making and the development of forward contracts market of real estate. They also contribute to the long lasting debate on whether the introduction of a futures market reduces the volatility of spot prices.

3. LITERATURE REVIEW

The market for real estate forward contracts has rarely been studied, except for those which advocated the establishment of index-based real estate futures and options (Gemmill, 1990; Baum, 1991; Case *et al.*, 1993, Shiller, 1993, 1998; Thomas, 1996). However, such instruments are still not common in most places. Previous research in this area, therefore, resorted to the trading of direct real estate, notably the pre-sale of housing in Taiwan and Hong Kong (Chang and Ward, 1993; Chau *et al.* 2003; Lai *et al.* 2004; Yiu *et al.* 2004). Yet, the stabilization role of pre-sales has yet to be explored and a brief review of literature on the futures of other markets would help to set the problem in context.

In commodity and stock markets, there has been a long lasting debate on whether futures trading stabilizes or destabilizes spot prices. A key theoretical question was about the role of speculators. Kaldor (1939) recognized that while speculators could act as a moderator to stabilize prices, they could also destabilize prices by speculating on other players' behaviour rather than the market fundamental. However, Friedman (1953) argued that speculation should be price-stabilizing: otherwise welfare reduction would eliminate speculators from the market. Working (1953, 1962) also pointed out that hedging and speculation in the futures market provided more information on expected prices and thus reduced the volatility of the cash market. Peck (1976) and Stein (1992) further demonstrated that the presence of the futures market changed the formation of expected prices from adaptive expectations and cobweb cycles to that based on forward prices. This essentially established the information role of the futures market to guide production planning. There was empirical evidence showing that futures trading

increased traders' information and stabilized spot prices in the commodity market (e.g. Powers, 1970; Cox, 1976) and in the stock market (e.g. Bessembinder and Seguin, 1992).

On the other hand, Figlewski (1981) found that futures trading in the GNMA market had increased the volatility of spot prices and attributed this to the contention that futures speculators were less informed than spot traders. He argued that these less experienced futures speculators transmitted noise to the spot market. This was supported by Stein (1987), who established theoretically that the entry of new speculators to the futures market could change the information contents of spot prices and destabilize them even if the speculators were rational profit-maximizers. Yet, further studies on the GNMA market either did not find any significant destabilization effect (Simpson and Ireland, 1982) or found a long-term stabilizing effect (Corgel and Gay, 1984). In principle, destabilizing effects, if any, should not persist. If the futures market persistently provides wrong signals to traders in the spot market, they would not make their decisions based on the information from the futures market. A more comprehensive review of empirical literature for and against the stabilization theory can be found in Bologna and Cavallo (2002).

The evidence of stabilization effects from studies using financial data is thus mixed. This is probably because their results were obtained from markets with low transaction (especially information) costs. Stabilization is about information flow from the forward market to the spot market, which becomes extremely important when the spot market contains little information. It is likely that markets with higher information costs (e.g. real estate markets) have a stronger need for discovering spot prices from derivatives trading (e.g. land sales and pre-sales). Turning 'off' the pre-sale market of real estate should have a bigger effect on the spot market than turning 'off' the futures market of stocks. This means that a more prominent stabilization effect should be observed in real estate markets than in financial markets. Therefore, it would be fruitful to test the stabilization theory using a high transaction-cost market such as real estate. This should offer insight into the debate in the financial literature where transaction costs are largely ignored.

4. TYPE OF PRE-SALE TRADERS

Based on the review above, speculation plays a key role in price stabilizing. It appears that the type of traders in the futures market, in particular whether they are informed or not, would determine the stabilization effect on spot prices. In fact, by segregating traders into two types, Daigler and Wiley (1999) found that informed traders decreased price volatility while uninformed traders increased it. This can be explained by the model on the dispersion of beliefs, which asserts that informed traders have more homogeneous beliefs concerning new information than uninformed traders (Harris and Raviv, 1993).

In the pre-sale market of Hong Kong, there are three types of traders: developers, speculators, and the general public. First, developers are the first seller in the presale market. In Hong Kong, developers are dominated by several giant blue-chip listed companies, which are widely believed to have better access to market information (e.g. future property supply) than the general public. Second, speculators are those who actively purchase and re-sell uncompleted flats for profits arising from property price appreciation. Since pres-ales involve lower transaction costs than spot trading, speculators are more inclined to arbitrage in the presale market than the spot market. They are usually experienced property investors and property agents who have better access to market information (e.g. consumers' demand) than the general public. Finally, the general public refers to those home buyers who purchase uncompleted flats for future consumption. They are normally not as informed as the first two types of pre-sale traders and their trading activities should only represent a small portion of the total volume of pre-sales. The general public is much more involved in the spot market, especially in the secondary market. Therefore, the pre-sale market of Hong Kong can be described as a market largely for informed traders.

It follows from the above that the pre-sale market consists mainly of informed traders (developers and speculators) while the spot market consists mainly of uninformed traders (the general public). Knowing that pre-sale traders are more informed, spot traders would form their price expectations based on information from the pre-sale market. This implies a price discovery function of pre-sales for the spot market (Chau *et al*. 2003). If

trading activities in the pre-sale market are restricted, then spot traders would lose the channel to get price information from informed traders in the pre-sale market. As a result, a lower volume of pre-sales would raise the spot price volatility.

5. HONG KONG DATA

Although there does not exist a centralized market for the trading of futures or derivatives of real estate, this does not necessarily mean that such trading cannot exist. Pre-sale arrangement of uncompleted units is a common practice in real estate market. Developers and investors in pre-sale transactions are in fact selling shorts and longs of forward contracts, respectively. This study attempts to extend the empirical evidence from the financial literature to the real estate market.

The private residential market in Hong Kong provides a rich set of data to study the stabilization effects of forward sales on the spot market. Based on the time at which the anti-speculation measures on the pre-sale market were implemented, we divide the time horizon into three periods: Aug 1991 – May 1994 (*period 1*), Jun 1994 – May 1998 (*period 2*), and Jun 1998 – Mar 2001 (*period 3*). *Period 1* represents the period with no restriction in the pre-sale market (i.e. an 'on' period). *Period 2* was the time when activities in the pre-sale market were greatly restricted (i.e. an 'off' period). Repeat sales of pre-sales in this period were mostly properties of redevelopment with old lease (i.e. under non-consent scheme). *Period 3* represents the period with relaxation on most of the restrictions imposed in 1994, except that on stamp duty (i.e. a partly 'on' period). Following the theory that forward sales provide price information on the spot market, we hypothesize that the spot market in *period 2* will be more volatile than that in *period 1*. *Period 3* is used for testing whether the relaxation of some of the restrictions would have any effect on the volatility of the spot price. Furthermore, in order to isolate the effect of pre-sales from other events captured by time dummies, we will further test whether the transaction volume of the pre-sale market will have a negative effect on the conditional volatility of the spot market (i.e. stabilization effect). This would provide a more rigorous and direct way to relate pre-sales with spot price-stabilizing.

The unconditional volatility of the spot market can be estimated by the variance of the return of a property price index. One source is the official price index published by the Government as shown previously in *Figure 1*. The data, however, are only available quarterly, limiting the number of observations for analysis. Monthly data are provided recently, but the series is not long enough to study the market volatility before the implementation of the anti-speculation measures in 1994. Alternatively, we make use of about 270,000 pairs of transactions from July 1991 through March 2001 in Hong Kong to construct a monthly repeat-sales price index. The repeat-sales method was pioneered by Bailey *et al.* (1963) and has become a popular price index construction methodology for heterogeneous goods which are infrequently traded. The repeat-sales model can be described by the following equation:

$$\ln\left(\frac{P_{it_2}}{P_{it_1}}\right) = \sum_{t=1}^{T} \alpha_t D_{it} + \varepsilon_{it_1 t_2} \tag{1}$$

where P_{it} denotes the sales price of property i in period t ($i=1,\ldots,n$; $t=1,\ldots,T$); α_t denotes the estimated coefficient for time dummy D_{it}; and $\varepsilon_{it_1 t_2}$ is the error term. The time dummies are set to take the value -1 at the first sale ($t = t_1$), $+1$ at the second sale ($t = t_2$), and zero otherwise. The resulting monthly returns have an average of 0.20% and a standard deviation of 3.55%.

The volatility of price index is an ex-post portfolio risk which may not be equivalent to the total ex-ante risk of individual agent in trading undiversified assets. However, in view of the heterogeneity and limited number of transactions of real estate, the price index estimation method provides the best market information for analysis.

6. METHODOLOGY AND RESULTS

6.1 Preliminary Analysis

Before applying the GARCH modeling technique, we look at the spot market's volatility through the variance of returns derived from the repeat-sales price index. A simple test is performed to compare the sample variances of the returns of the spot

market in the three periods, which are shown in *Table 1*. Assuming the returns are normally and independently distributed, and under the null hypothesis that their variances are equal, the test statistic is s_a^2/s_b^2 where s_a^2 and s_b^2 denote the variance of returns in *period a* and *b* respectively (the period with a larger variance is deemed as the numerator). The test statistic has an F-distribution with numerator degrees of freedom n_a-1 and denominator degrees of freedom n_b-1, where n is the number of observations in the period concerned. The results of F-tests on the variances of the spot market returns are tabulated in *Table 2*.

Table 1: Sample variance of the spot market returns

	s^2 of the returns
Period 1	0.066%
Period 2	0.136%
Period 3	0.129%

From the results, we can show that the spot market in *period 2* is significantly more volatile than that in *period 1*, but the volatilities are not significantly different in other cases. Although it provides a general picture of the market volatility under different periods, in view of the changing market situations, more rigorous tests to identify the stabilization effects of the introduction of the forward contracts market are required.

Table 2: F-statistic testing the equality of sample variances

Null hypothesis	F-statistic (returns)
$s_1^2 = s_2^2$	2.063*
$s_2^2 = s_3^2$	1.056
$s_1^2 = s_3^2$	1.952

* Null hypothesis is rejected at 5% level

6.2 GARCH Analysis

In line with the recent development in financial research, the second test is based on the generalized autoregressive conditional heteroskedasticity (GARCH) model advanced by Engle (1982) and extended by Bollerslev (1986). The advantage of using a GARCH model is that it specifically allows the modeling and forecasting of conditional variances. In other words, the prediction of this period's variance can be explicitly modeled by a weighted average of a long term average, the forecasted variance from last period and information about volatility observed in the previous period. This model is particularly useful in case of the time-varying volatility we hypothesized.

To develop a GARCH model, two distinct specifications – a conditional mean equation and a conditional variance equation – have to be provided. We first specify the mean equation (*equation 2*) by regressing the spot market return (r_t) against its 1-period lag (r_{t-1}), the contemporary real interest rate (ri_t), and inflation rate (inf_t). The inflation rate is calculated from the Hong Kong Consumer Price Index while the real interest rate is derived from the Hong Kong Interbank Offered Rate (1-month). They are included because they are the important factors that affect the property returns apart from their past values. Their coefficients are expected to be negative. For estimation purpose, the residual in *equation 2* is assumed to be conditionally normally distributed with zero mean and variance σ_t^2 (see *equation 3*).

We then specify the conditional variance equation (*equation 4*) as a function of five terms: 1) the mean (α_0); 2) news about volatility from the previous period, measured as the lag of the squared residual from the mean equation (ε_t^2, the ARCH term); 3) previous period's forecast variance (σ_{t-1}^2, the GARCH term); 4) a dummy variable (D_2) which equals 1 for *period 2* and 0 otherwise; and 5) another dummy variable (D_3) which equals 1 for *period 3* and 0 otherwise. If the stabilization effect is stronger with fewer price information flow restrictions in the pre-sale market, we expect that α_3 and α_4 are positive, with the former being larger than the latter. *Equations 2* to *4* can be estimated by the method of maximum likelihood.

$$r_t = \beta_0 + \beta_1 r_{t-1} + \beta_2 ri_t + \beta_3 \inf_t + \varepsilon_t \qquad (2)$$

$$\varepsilon_t \sim N\left(0, \sigma_t^2\right) \tag{3}$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 + \alpha_3 D_2 + \alpha_4 D_3 \tag{4}$$

The above is in fact a GARCH(1,1) model which assumes the presence of a first-order ARCH term and a first-order GARCH term. It is regarded as the most convenient specification in the financial literature. Since there has been no application to the real estate market before, it would be useful to compare the GARCH(1,1) model against various higher-order alternatives (GARCH(p,q) with p=1,2,3 and q=1,2,3) . Based on the Schwarz Information Criterion (SIC), *Table 3* shows that **Error! Reference source not found.**the parsimonious GARCH(1,1) model is in fact best model. Therefore, we will proceed our analysis using the GARCH (1,1) model.

Table 3: SIC of GARCH(p,q) models

GARCH	SIC
(1,1)	-4.318597
(1,2)	-4.260785
(1,3)	-4.232618
(2,1)	-4.290745
(2,2)	-4.22246
(2,3)	-4.202642
(3,1)	-4.22804
(3,2)	-4.271491
(3,3)	-4.151277

The estimated results of *equations 2* to *4* are given in Panel A and Panel B of *Table 4*. For the conditional mean equation (Panel A), all the coefficients are significant at the 1% level. Their signs are also within our expectations. For the conditional variance equation (Panel B), both the coefficients of the GARCH term and the ARCH term are significant

at the 5% level and the 1% level, respectively. Their sum ($\alpha_1+\alpha_2=0.97$) approaches unity, indicating that the persistence in volatility is high. The most striking result is that the coefficient of the *period 2* dummy variable is positive and significant at the 1% level. This implies that the volatility in *period 2* is higher than that in *period 1*, confirming our hypothesis that the intervention measures introduced in *period 2* on forward sales have led to an increased volatility of the spot market. Although α_4 is not significantly differently from α_2, it is significantly smaller than α_3 at the 5% level. This suggests that after the intervention measures have been partly relaxed in *period 3*, the spot market volatility dropped. The results are in full support of our theory that the stabilization effect on spot prices is stronger with fewer price information flow restrictions in the pre-sale market.

Table 4: Results of the GARCH (1,1) model with period dummies

Panel A: Conditional mean equation

Constant (β_0)	Lag return (β_1)	Real interest rate (β_2)	Inflation rate (β_3)
0.0294**	0.5142**	-0.5487**	-0.5666**

Panel B: Conditional variance equation

Constant (α_0)	ARCH (α_1)	GARCH (α_2)	Period 2 (α_3)	Period 3 (α_4)
-2.71×10^{-7}	-0.0620*	1.0353**	3.90×10^{-5} **	1.06×10^{-5}

* Significant at the 5% level

** Significant at the 1% level

One may reasonably argue that the use of time dummy variables to disaggregate the entire study period into three is problematic because other major events might coincide with the imposition and relaxation of the anti-speculation measures. For instance, during the transition from *period 2* to *period 3*, not only the sovereignty of Hong Kong was returned to China but the Asian financial crisis also made a hard blow to Hong Kong's economy. If this is the case, the time dummies may have captured other unintended effects.

In order to isolate the effect of pre-sales from other simultaneous events, we further test whether the conditional volatility of the spot market is dependent of transaction volume in the pre-sale market by replacing equation (4) with equation (5). In equation (5), V^f_t denotes the log transaction volume of the pre-sale market.[7] It serves as a proxy of the amount of market price expectation information flowed from the pre-sale market to the spot market. Time dummies remain in the equation to hold other time-related effects unchanged. This approach provides a more rigorous test on whether changes in spot price volatility are directly attributed to presale activities.

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 + \alpha_3 D_2 + \alpha_4 D_3 + \alpha_5 V_t^f + \alpha_6 V_t^f D_2 + \alpha_7 V_t^f D_3 \qquad (5)$$

In general, the higher the volume of pre-sales, the more price expectation information can agents in the spot market extract from the pre-sale market, and thus the volatility of spot prices should be reduced. As a result, α_5 should be negative. However, the information content per sale may not be the same across the three periods. This is because the block of market information during the intervention period might have induced non-price market behaviour (e.g. queuing) so that the information conveyed by each pre-sale would be reduced. Therefore the period dummies are interacted with transaction volume to allow the information content of each pre-sale differed across periods. We expect that α_6 is positive. There is no a priori sign for α_7.

Table 5 shows the results of the test on the stabilization effect using transaction volume. Panel A reveals a similar result for the estimates of the conditional mean equation. In Panel B, α_5 is negative and significant at the 1% level, confirming our prediction that a larger number of pre-sale transactions in *period 1* stabilized the spot market. Furthermore, we find that α_6 is positive and significant at the 1% level. This suggests that the information content of each pre-sale was lower in *period 2*. Interestingly, a larger volume of pre-sales in fact destabilized the spot market during the

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[7] Augmenting the variance equation with trading volume is similar to the empirical method used by Lamoureux and Lastrapes (1990) to test the mixture of distributions hypothesis. But unlike their study, we used the trading volume of a different market (i.e. the pre-sale market) so that their problem of simultaneity between returns and volume can be largely avoided. This justifies our use of volume and returns contemporaneously.

period of intervention as the sum of α_5 and α_6 is positive. This means government restrictions have caused pre-sale transactions to generate noisy information to the spot market. In *period 3*, we find that the volume effect on spot price volatility is not significantly different from that in *period 1*.

Table 5: Results of the GARCH (1,1) model with transaction volume

Panel A: Conditional mean equation

Constant (β_0)	Lag return (β_1)	Real interest rate (β_2)	Inflation rate (β_3)
0.0323**	0.5158**	-0.6480**	-0.6701**

Panel B: Conditional variance equation

Constant (α_0)	ARCH (α_1)	GARCH (α_2)	Period 2 (α_3)	Period 3 (α_4)	Volume (α_5)	Period 2 *Volume (α_6)	Period 3 *Volume (α_7)
0.0002**	-0.1647**	1.0257**	-0.0011**	0.0002	-1.61×10^{-5}**	0.0002**	-3.26×10^{-5}

** Significant at 1% level

6.3 Lead-lag Relationship

To reinforce the price discovery process between the spot and pre-sale market, we also present some evidence of the lead-lag relationships of prices and transaction volume between the spot and forward contracts markets.

We apply the Granger causality test to the transaction volume of the two markets. *Table 6* shows that the series of the volume of spot transactions, V^s_t, is not stationary at the level, but both series are stationary at their first differences, ΔV^f_t and ΔV^s_t. *Table 7* presents the results of the Granger causality test using stationary variables. We find that the volume of pre-sales Granger-caused spot sales when there was no government intervention. During the intervention period, the relationship between the two markets in terms of transaction volume was weak. This suggests that information flows from the

forward contracts market to the spot market when the government did not intervene. The results are consistent with the findings in finance markets (e.g. Han and Misra, 1994) where futures-trading involves lower transaction costs. On the other hand, Yiu *et al*. (2004) studied the lead-lag relationship between the prices of the spot and pre-sale markets in Hong Kong. When there was no government intervention, they identified a feedback relationship between the two markets; but when the anti-speculation measures were implemented, the spot price led the price of forward contracts. This is somewhat different from the volume lead-lag results because developers (representing the pre-sale market) and individual sellers (representing the spot market) have different sale strategies. Developers usually need to sell a large bulk of flats, so they have a stronger liquidity need and tend to adjust their sale price to maintain their planned sale programme. Moreover, as long as developers stay in their business, they generally look for long-term normal profit through trading land and building stocks rather than speculate on any short-term price fluctuations. Therefore, the relationship between the prices of the two markets is more vivid than that between their volumes.

Table 6: Augmented Dickey-Fuller (ADF) unit root tests

	Level		First differences	
Time Series Variables	Trend	No trend	Trend	No trend
Volume of Forward Sales, V^f_t	-6.55*	-6.39*	-11.44*	-11.48*
Volume of Spot Sales, V^s_t	-2.48	-2.55	-15.73*	-15.77*

* indicates that the null hypothesis can be rejected at the 1% level. The critical values of the ADF statistics are -4.04 with trend; and -3.49 without trend, at the 1% level of significance.

Note: The lag length is selected based on the SIC with max. lag = 12.

Table 7: Results of the Granger Causality Tests on Transaction Volume

Panel A	
Intervention Period 1994:06 - 1998:09	*F Statistics*

Null Hypotheses	At 1 lags	At 2 lags	At 4 lags
ΔV^f_t does not Granger Cause ΔV^s_t	0.05	0.15	1.37
ΔV^s_t does not Granger Cause ΔV^f_t	2.74**	1.48	0.70

Panel B			
Pre- and Post-intervention Periods 1991:08 – 1994:05, 1998:10 - 2001:03	F Statistics		
Null Hypotheses	At 1 lags	At 2 lags	At 4 lags
ΔV^f_t does not Granger Cause ΔV^s_t	5.17**	2.64***	3.05**
ΔV^s_t does not Granger Cause ΔV^f_t	6.27**	1.75	0.93

(*, **, & *** indicate that the null hypothesis can be rejected at the 10%, 5%, and 1% levels, respectively)

7. CONCLUSIONS

The development of financial futures sheds light on the role of pre-sales in the real estate market. This paper focuses on the stabilization effect of pre-sales on spot prices. With the prevalence of pre-sales of uncompleted flats of apartments in Hong Kong and the anti-speculation measures implemented in 1994, an empirical test was carried out. The results agree with the proposition that pre-sales have a dampening effect on the fluctuations of net returns in the spot market. This has a sweeping implication that the anti-speculation (anti-futures) measures will increase the information cost of the market price change. It reinforces what Kaldor said in 1939:

'*In a world of imperfect foresight, the existence of speculators enables the system to behave with more foresight than the average individual in the system possesses.*'

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