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Abstract: Several studies have focused on the relationship between stock and house prices, but they reached contradictory conclusions. This paper contributes to the literature by analyzing the effects of stock prices on house prices with panel data of 28 regions in China for the 2003:Q1 to 2012:Q4 period. Compared with the previous studies, we explain these contrasting effects by distinguishing between the long- and short-run effects of stock prices. Our main results show that stock prices have a negative effect on house prices in the long run but positive effects in the short run. Furthermore, we determine that high market openness and low composition risk account for the opposite short-run effects of stock prices.

Keywords: house prices, stock prices, dynamic relationship

JEL Classification: G32, E31, E44

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1. Introduction

Houses can be regarded as both investment goods and consumption goods, and this differentiates them from financial assets such as stocks (Algieri, 2013). The potential dynamic relationship between house and stock prices has been the subject of substantial debate in both the academic and practitioner literatures (Quan & Titman, 1999; Piazzesi, Schneider, & Tuzel, 2007). Pinpointing the relationship between stock and housing markets is essential to explain the housing price dynamics of an economy, since it is one of the leading indicators of real economic activity, inflation, or both, and hence serves as indicator to where the real economy is heading to (Stock & Watson, 2003; Ibrahim, Padli, & Baharom, 2009). Besides, similar to other real estate markets, such as Singapore[1], the housing market in China, consisting of construction, renovation, and trade services, is estimated to be over 6% of the country's GDP[2]. In view of the importance of housing in an economy, it is crucial for us to analyze the dynamic effects of stock prices on house prices.

However, the stock price effects on house prices are controversial. Owing to the special characteristic of housing, Algieri (2013) pointed out that the effect of stocks on house prices can be considered as substitution and wealth effect. Real estate and stocks are both speculative assets, and so houses and stocks can be considered as investment alternatives (Shiller, 2014). In this case, the relationship between the two assets (stocks and houses) can be interpreted as a substitution effect. This means that high returns in the stock market can cause investors to leave the housing market and thereby decrease housing demand and prices. Therefore, stock prices have a negative effect on house prices. Worzala and Vandell (1993) find a negative correlation of -0.0971 between housing and stock returns in the United Kingdom. The literature has examined the contemporaneous correlation between housing and stock returns. Considering the correlation endogenous, Eichholtz and Hartzell (1996) show that property and stock indexes have a negative correlated in the United Kingdom, Canada, and the United States. More recently, Ayuso, Blanco, and Restoy (2006) applied an Error Correction Model (ECM) with annual data of Spain from 1978 to 2002 to analyze the dynamics of house prices and found that the elasticity

[1] In Singapore, according to Liow (2006), real estate investment and development firms account for about 15% of the Republic's stock market capitalization.

[2] According to Hilbers, Hoffmaister, Banerji, and Shi (2008), for many countries, house activities consist of 5% to 10% of GDP.

of house prices with respect to stock market returns is -0.3 in the long run. Ibrahim et al. (2009) apply an autoregressive distributed lags (ARDL) approach with quarterly data from 1995:Q1 to 2006:Q2 to analyze the long-run relationship between house and stock prices. Although not statistically significant, the estimated results from ARDL show that stock prices have a negative effect on house prices (for semi-detached houses, -0.613; for town houses, -0.051).

When houses serve as consumption goods, the well-known wealth effect stresses on a transmission channel from stock to housing (Sim & Chang, 2006). All income and wealth, including financial, housing, and human wealth, as well as any expected disposable income, have a positive impact on total consumption spending. Since stocks provide households with unexpected gains, the wealth effect from these unexpected gains increases the spending on houses as consumption good. Put differently, the wealth effect leads to a positive relationship between stock and housing prices because high returns in the stock market tend to increase the total wealth of households and their capability to invest in other assets (Koivu, 2012). For example, Gyourko and Keim (1992), Hoesli and Hamelink (1997), and Fu and Ng (2001) show a contemporaneous positive relationship between stock and housing returns in the United States, Switzerland, and Hong Kong, respectively. Using the annual data of 17 countries over a period of 14 years, Quan and Titman (1999) find a significant positive relationship between real estate price changes and stock returns when they pooled the countries' data and considered longer measurement intervals. When Sutton (2002) applies a vector autoregression (VAR) model to explain changes in housing prices with quarterly data covering six industrialized countries[3], the results show that changes in stock prices have a positive effect on changes in housing prices, the magnitude ranging from 1.0 to 5.0. Further, Algieri (2013) finds a positive stock price elasticity for house prices for seven countries[4] in the long run, with the magnitude varying from 0.01(in Italy) to 0.23 (in the Netherlands). Ibrahim et al. (2009) analyze the long-run relationship between house and stock prices in Thailand by applying the dynamic ordinary least squares (DOLS) and maximum likelihood (ML) estimation methods. Their DOLS and ML results show that stock prices have a positive impact on house prices. Lean and Smyth (2014) apply cointegration and Granger causality tests to examine the dynamic relationship between

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[3] The six countries are the United States, the United Kingdom, Canada, Ireland, the Netherlands, and Austria (see Sutton, 2002).

[4] The seven countries studied by Algieri (2013) are Germany, France, Italy, Spain, the Netherlands, the United Kingdom, and the United States.

house price indices, stock prices, and interest rates in Malaysia. They too find that stock prices have a positive effect on house prices.

In China, Huang and Ge (2009) apply a linear standard regression model with monthly data from 2006:04 to 2008:07 to analyze stock market impacts on house market and find that the correlations between housing and stock prices are relatively weak. However, Yang and Ye (2010) find no correlation between real estate and stock market returns in China in a study using monthly data from 2005 to 2010.

Several studies have analyzed the long-run relationship between stock and house prices (Ayuso et al., 2006; Ibrahim et al., 2009; Oikarinen, 2010; Lean & Smyth, 2014), but as far as we know, very few illustrate the problem explicitly by distinguishing and analyzing both the long- and short-run coefficients. Whether positive or negative, the correlations between stock and house prices have been found sufficiently low, implying significant diversification opportunities (Oikarinen, 2010). Hence, it is crucial for us to explicitly distinguish between the long- and short-run effects of China's stock prices on its house prices and to check whether there exists any difference between them. This paper applies a pooled mean-group (PMG) estimator of dynamic heterogeneous panel data to distinguish between the long- and short-run effects of stock prices. Another improvement of this study is that we further analyze the possible economic reasons for cross-sectional heterogeneity in short-run effects, after first estimating the cross-sectional pattern of variations in short-run coefficients.

The rest of this paper is organized as follows. Section 2 describes the data and econometric methodology used in this study. Section 3 presents our estimation results. Section 4 analyzes the short-run heterogeneous effects. Section 5 provides our concluding remarks.

2. Data and Econometric Methodology

The primary focus of this study is on the effects of stock prices on house prices. However, employing bivariate analysis is not an appropriate method because the relationship between the variables might be specious and reflect common factors (Quan & Titman, 1999; Ibrahim, 2010), requiring us to add certain other control variables. A study by Jud and Winkler (2002) shows that the housing price appreciation observed in 130 metropolitan areas across the United States was strongly influenced by stock market appreciation as well as interest rates and income. In

China, land prices have the greatest impacts on house prices (Hua, Sun, & Borgia, 2012). Thus, the control variables used in this paper include individual lending rates for housing, land prices, and per capita disposable income.

In view of the heterogeneity between its different provinces and cities, we use panel data of 28 regions of China for the 2003:Q1 to 2012:Q4 period[5]. The quarterly data of house prices, stock prices, and individual lending rate are from the CEIC database[6]. Land price is the land transaction fee divided by land transaction area, and the related data are from the China Economic Information Network (CEINET) database. The data of house prices, stock prices, land price, and per capita disposable income are taken from natural logarithms. For the control variables, land price and per capita disposable income are expected to positively impact house prices (Hua et al., 2012; Algieri, 2013; Pan & Wang, 2013), while the individual lending rates are expected to negatively affect house prices (Madsen, 2012; Zhang, Hua, & Zhao, 2012).

Sluggish and autocorrelated adjustments of house prices to shocks in fundamentals are likely to create a lead–lag relationship between stock and housing price movements (Lean & Smyth, 2014). In addition, housing prices might react slowly to shocks in fundamentals, although economic fundamentals are important factors for the movement of housing prices (Himmelberg, Mayer, & Sinai, 2005). Therefore, a dynamic panel data model that includes lagged values of the dependent as well as contemporaneous and lagged independent variables is a proper method to analyze the dynamic relationships between house and stock prices.

As a dynamic panel data model, the autoregressive distributed lag ($ARDL(\mathrm{p},\mathrm{q},\mathrm{q},\cdots,\mathrm{q})$) model can be shown as an equation:

$$hp_{it} = \sum_{j=1}^{p} \lambda_{ij} hp_{i,t-j} + \sum_{j=0}^{q} \gamma'_{it} X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (1)$$

where hp_{it} represents the natural logarithm of house prices; X_{it} is the vector of explanatory variables, including the logarithms of stock prices and other control variables for group i; μ_i represents fixed effects; λ_{ij} and γ_{it} are coefficients; ε_{it} is a time-varying disturbance; and the subscripts i and t represent region and time, respectively.

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5 The following are the 28 regions: Anhui, Beijing, Chongqing, Fujian, Guangdong, Gansu, Guangxi, Guizhou, Hainan, Hebei, Henan, Heilongjiang, Hubei, Hunan, Inner Mongolia, Jiangsu, Jiangxi, Liaoning, Ningxia, Qinghai, Sichuan, Shandong, Shanghai, Shaanxi, Shanxi, Tianjin, Xinjiang, Zhejiang.

6 Because the data (house prices) provided are on monthly basis, we consider the data of March, June, September, and December as the quarterly data. For consistency of data, we use the same method for the data of stock prices and individual lending rate.

Individual lending rate is the average of lending rates up to 5 years and over 5 years.

To clearly illustrate the dynamic relationship, we examine both long- and short-run effects of stock prices on house prices. For this, we use an empirical model encompassing the long- and short-run coefficients on stock prices, because this would help us formulate and empirically explain the apparently contradictory effects of stock prices on house prices. Thus, we use an error-correction model where both long- and short-run effects can be estimated jointly by using the ARDL model. This can be shown as

$$\Delta hp_{it} = \phi_i (hp_{i,t-1} - \theta_i' X_{it}) + \sum_{j=1}^{p-1} \lambda_{it}^{*} \Delta hp_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{it}'^{*} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \tag{2}$$

where ϕ_i gives the coefficients on the error correction term, θ_i' is the long-run coefficient, and λ_{it}^{*} and $\gamma_{it}'^{*}$ are short-run coefficients.

Two estimators of Eq. (2) are widely used, the mean group (MG) and pooled mean-group (PMG) estimators, introduced by Pesaran and Smith (1995) and Pesaran, Shin, and Smith (1999), respectively. The MG estimator provides the averaged coefficients of individual time-series regressions for each group of the panel; this indicates that all the individual regressors are heterogeneous. However, the PMG estimator imposes a homogeneity restriction on the long-run relationship between variables. Thus, the PMG estimator relies on a combination of pooled coefficient for a long-run relationship and it averages the individual coefficients for short-run dynamics. Therefore, in Eq. (2), the PMG estimator restricts the long-run coefficients θ_i'; this is common across all regions. The error-correction speed of adjustment parameter ϕ_i and the short-run adjustment coefficients λ_{it}^{*} and $\gamma_{it}'^{*}$ vary across all regions. The speed of adjustment parameter ϕ_i should be negative; this would indicate the tendency of house prices to return to the long-run equilibrium level. Once the estimates of short-run coefficients for individual countries are obtained, we can consistently estimate the cross-region mean of these parameters as

$$\lambda_j^{*} = \sum_{i=1}^{N} \lambda_{ij}^{*} / N \qquad j = 1, 2, .p -, \tag{3}$$

$$\gamma_j^{*} = \sum_{i=1}^{N} \gamma_{ij}^{*} / N \qquad j = 0, 1, .q -, \tag{4}$$

where N represents the number of regions.

One important merit of these two estimators is that they can be used to estimate nonstationary dynamic panels in which the parameters are heterogeneous across groups. Compared to MG estimators, as pointed out by Pesaran et al. (1999), PMG estimators are consistent and asymptotically normal regardless of whether the regressors are $I(0)$ or $I(1)$. Another merit of PMG estimators over MG estimators is that they rely on economic theory that links changes in housing prices to stock prices and other control variables and generate more efficient estimates when the homogeneity restrictions imposed by theory are valid [7] (Koetter & Poghosyan, 2010).

Depending on the characteristics of PMG estimators, a comparison of the estimated region-specific short-run coefficients allows us to examine the region-specific patterns of variations in estimated short-run coefficients. Our second estimation strategy is to illustrate the reasons for regional variations in short-run coefficients. This is closely linked to the strategy of Loayza and Rancière (2006), who use a PMG estimator to examine the long- and short-run relationships between financial development and economic growth.

3. Estimation Results

Before our actual estimation, we confirm the lags of all variables according to the Akaike Information Criterion (AIC) and Schwarz Bayesian Information Criterion (SBIC). Table 1 shows the values of AIC and SBIC for models with different lags. The results indicate that the proper model is ARDL (3, 2, 2, 3, 3), with 2 lags of stock prices, 2 lags of lending rate, and 3 lags of the other variables. We estimate the proper ARDL model with PMG and MG estimators; the results are shown in Table 2. The Hausman test (1978) reveals that the null hypothesis of homogeneous long-run coefficients cannot be rejected for all parameters, just as for individual parameters. We therefore focus mainly on the results of PMG estimators.

The estimates of long-run coefficients on land price and disposable income are positive and statistically significant, indicating that higher changes in land prices and disposable income are associated with increasing changes in house prices in the long run. However, the long-run

[7] The latter assumption can be tested empirically with the Hausman test (1978).

coefficient of individual lending rates on house prices is negative and statistically significant; this indicates that individual lending rates are negatively associated with increasing changes in house prices. In the long run, a statistically significant coefficient of share prices has a negative effect on house prices. This result is consistent with the previous studies of Eichholtz and Hartzell (1996), Ayuso et al. (2006), and Ibrahim et al. (2009). The negative effects of stock prices on house prices show a long-run substitution effect dominating the relationship between stock and house prices. This also indicates that houses serve as an investment good in the long run, in agreement with Englund, Hwang, and Quigley (2002), suggesting that investors should hold 15%–50% of housing assets for longer-period low-risk portfolios. The reason is consistent with the viewpoints of Lean and Smyth (2014) that houses are expensive, income is high, and real estate is used more as an investment vehicle.

The positive estimates of short-run coefficients on stock prices indicate that stock prices are associated with house prices in the short run. However, the estimates of region-specific short-run coefficients on stock prices are heterogeneous, as shown in Figure 1. The mean of one-lag short-run coefficients on stock prices is positive and statistically significant. The different long- and short-run effects of stock prices on house prices and the heterogeneous cross-region short-run effects provide rationale for a deep analysis of PMG estimators.

The estimated coefficient of the error-correction term is negative and statistically highly significant, indicating the tendency of house prices to return to the long-run equilibrium level. However, the relatively low magnitude of the coefficient implies that it takes a long time for house prices to return to its long-run equilibrium level once it is shocked. The slow speed of adjustments underlines the importance of distinguishing between long- and short-run effects and thus provides another rationale for a deep analysis of PMG estimators.

As a robustness check, we use the Shanghai stock prices as alternative stock prices; the long-run coefficient is found negative, whereas the mean of short-run coefficients is found positive. The estimated results of the Shanghai stock prices are shown in Table 3. One lag of short-run coefficient on the Shanghai stock prices is also statistically significant.

In summary, the above estimation results indicate that stock prices can have different and even contradicting effects on house prices, depending on the time horizon. More specifically, we find that in China, even if stock prices reduce house prices in the long run, they tend to increase house prices in the short run. In other words, stock prices show a substitution effect on house prices in the long run and a wealth effect in the short run[8].

4. Analysis of short-run heterogeneous effects

In this section, we further discuss and develop the explanation of apparently contradictory short-run effects of stock prices on house prices. For this, we take the estimates of region-specific short-run coefficients on stock prices. The development of stock and housing markets are associated with contradictory effects of stock prices. Taguchi (2011) shows that capital inflows affect stock markets through a direct channel. Kim and Yang (2009) point out that capital inflow shocks contribute to increasing stock prices. Particularly in China, net inflow shocks of Foreign Direct Investment (FDI) affect both the housing and stock markets (Feng, Lin, & Wang, 2012). Thus, the proportion of FDI to Gross Domestic Product (GDP) plays an important role in the contradictory short-run effects of stock prices. This proportion serves as an indicator of market openness, a higher value indicating a higher level of market openness. The average of this proportion for each region by annual data from 1995 to 2012 can be used as a measure of market openness.

In addition, a mechanism of transmission effect from stock prices to house prices comprises a composition risk; this relates changes in asset prices to changes in expenditure share (Lean & Smyth, 2014). This also represents that the correlation between stock prices and house prices is affected by returns in both markets. Therefore, we utilize the relative returns between house and stock prices as the proxy of composition risk. A higher relative return indicates a higher composition risk; this indicates a higher investment risk in the housing market than in the stock market. With regard to data, we average the relative returns for each region by quarterly data for the 2002:Q4 to 2013:Q3 period. The averaged values give the proxy of composition risk for each region.

The correlation coefficients based on estimated short-run coefficients on market openness and composition risk are shown in Table 4 (the results of the Shanghai stock market represent a robustness test). The reported standard and rank correlations are positive for market openness and negative for composition risk. Although the rank correlation between short-run coefficients

[8] Strictly speaking, causality can run in the reverse direction; so, house prices might affect stock prices. Liow (2006) points out that house prices have a positive effect on stock prices in the long run. However, there is no plausible explanation for the effect of house prices reducing stock prices in the short run. Hence, we interpret our estimation results as indicating causality running from stock prices to house prices.

and market openness is not statistically significant at the 5% level, it is significant when measured by the standard correlation. The magnitudes of correlation values show that they are appropriately large.

The positive correlation between market openness and short-run coefficients indicates that higher market openness increases short-run coefficients. Taguchi (2011) and Feng et al. (2012) illustrate that capital inflow shocks have a positive effect on stock prices. Oikarinen (2010) show that because of large transaction costs, real estate investments should typically be a long-term investment. Englund et al. (2002) also suggest that for short periods, an efficient portfolio[9] for investors should not hold assets in housing. With this in mind, we assume that in the short run, housing tends to be a consumption good. In this case, the wealth effect dominates the relationship between stock prices and house prices. Therefore, we can conclude that higher market openness pushes up stock prices. Households gain more unanticipated benefits in stock prices, increasing the amount of housing demand and therefore house prices (Lean & Smyth, 2014). Thus, high market openness promotes the positive short-run effects of stock prices on house prices.

Nevertheless, there is a negative correlation between short-run effects and the composition risk in that a higher composition risk is associated with decreasing the positive short-run effects of stock prices. A higher composition risk reveals higher relative returns of housing compared to stock, indicating a higher speculative risk in the housing market compared to the stock market. Lean and Smyth (2014) point out that owing to the risk aversion motive, investors tend to invest in low-risk assets, and hence the inter-temporal substitution mechanism could lead to the relationship between stock prices and house prices. Therefore, a high composition risk dominants the substitution effect between stock and house prices. When stock prices increase, to avoid risk, consumers prefer to improve their share of other consumption and investment goods, rather than housing goods.

In summary, our results indicate that higher market openness and lower composition risk are associated with the contradictory short-run effects of stock prices on house prices.

We now examine whether an apparent difference exists in mean of short-run coefficients between regions with high market openness and low market openness, as well as between

[9] In Englund et al. (2002), the household investment portfolio consists of housing, common stocks, bonds, and *t*-bills.

regions with high composition risk and low composition risk. We split our sample into two subsamples based on median value of indicators of market openness and composition risk, respectively. We show the means of short-run coefficients for each subsample and the *t*-test results for the significance of their differences in Table 5. As a robustness test, we show the related values and tests in the Shanghai market in the right-hand side of Table 5. For regions with different levels of market openness, the mean of short-run coefficients is higher for regions with high market openness than for regions with low market openness. This indicates that market openness is positively related to short-run coefficients, which is consistent with our results shown in Table 3. The *t*-test results show that the differences in mean values of the different subsamples' short-run coefficients are statistically significant. This indicates that market openness is an important factor affecting opposite short-run coefficients. In the same way, from Table 4 we find that the mean value of short-run coefficients is higher in regions with low composition risk than in regions with high composition risk. The negative relation between composition risk and short-run coefficients is consistent with our results shown in Table 3. The statistically significant results of the related *t*-tests indicate that composition risk is another important factor explaining the opposite short-run coefficients.

Using the figures of frequency distribution, we further explain whether visible differences exist in short-run coefficients between the two subsamples. Figure 2(a) and (b) shows the frequency distributions for each subsample respectively divided by market openness and composition risk. From the figures, we can visually conclude the same results of Table 4, that is, regions with high market openness have a higher mean of short-run coefficients than regions with low market openness. The same goes for the criterion of composition risk.

In general, statistical evidence indicates that high market openness and low composition risk are associated with contradictory short-run effects of stock prices on house prices. Regional differences in market openness and composition risk are two main reasons for the different short-run coefficients.

5. Conclusions

The relationship between stock and house prices has been the subject of substantial debate in the academic literature. Existing studies have focused on the long-run relationship and contemporaneous correlation between stock and house prices. However, these studies have reached contradictory conclusions. By necessity, we use panel data of 28 regions of China for the 2003:Q1 to 2012:Q4 period and we explain these contrasting effects by distinguishing between the long- and short-run effects of stock prices on house prices. Furthermore, we explore the possible reasons for the contradictory short-run effects of stock prices.

Our results show that stock prices have different and even contradicting effects on house prices, depending on the time horizon. In the long run, stock prices have a negative effect on house prices, indicating that the substitution effect dominates the relationship between stock and house prices. However, in the short run, the positive effects of stock prices on house prices are statistically significant[10], revealing the remarkable wealth effect of stock prices. From previous studies, we assume that the contradictory short-run effects of stock prices are associated with the regional specifics of market openness and composition risk. The short-run correlation coefficients of market openness and composition risk prove our assumption. We then test the difference in mean values and show the frequency distributions of short-run coefficients, which are divided depending on market openness and composition risk, and we find that these two aspects are the main factors affecting the opposite short-run effects of stock prices on house prices.

Since stock prices lead house prices in the short run across regions with high market openness, the stock market is important for stability in the real estate market, especially in such regions. The actual annual growth rate of house prices in these regions is very high[11], indicating the necessity to stabilize the housing market. From our evidence that is consistent with the short-run stock price wealth effect on house prices, the implication for policymakers is to implement policies to promote stability in the stock market. As Zhou and Sornette (2004) have pointed out, the immaturity of China's stock markets makes it quite different from the Western markets and it has to be developed. Following the Asian financial crisis, similar to Malaysia's stock market, China's stock market also should put in place a series of standards designed to improve transparency, disclosure, accounting, and corporate governance, even though these standards might still fall short of international standards (Shimomoto, 1999).

[10] At least, the short-run coefficient of lagged stock prices is statistically significant at the 0.1% level.

[11] For example, as Ren, Xiong, and Yuan (2012) pointed out, from 2003 to 2007, house prices in Beijing reported an annual increase of 22%.

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Table 1 AIC and SBIC values of models with different lags

	House prices	Stock prices	Lending rate	Land price	Disposable income	AIC	SBIC
Model 1	3	2	2	3	3	-3831.43*	-3742.45*
Model 2	2	2	2	3	3	-3800.85	-3716.81
Model 3	2	2	2	3	2	-3755.74	-3676.65
Model 4	2	2	2	2	3	-3779.16	-3700.07
Model 5	3	2	2	2	3	-3812.70	-3728.66

Notes:

The values given in the first five columns are the lags of different variables. For example, Model 1 represents the ARDL (3, 2, 2, 3, 3). The last two columns give the AIC and SBIC values. * The proper model selected by AIC and SBIC.

Table 2 The long- and short-run effects of stock prices on house prices. The dependent variable is the log value of house prices.

	Pooled Mean Group		Mean Group		Hausman Tests	
Variables	Coef.	Std. Er.	Coef.	Std. Er.	*h*-test	*p*-val
Long-Run Coefficients						
Stock prices (log)	-0.0401	0.0189	0.0604	0.0720	2.09	0.14
Lending rate	-0.0377	0.0144	-0.0726	0.0333	1.36	0.24
Land price (log)	0.0955	0.0183	0.1138	0.1282	0.02	0.89
Disposable income (log)	1.0301	0.0397	0.8055	0.2929	0.60	0.44
			Joint Hausman Test		5.45	0.24
Error Correction Coefficients	-0.1758	0.0286	-0.5494	0.0750		
Short-Run Coefficients						
Δ House prices (log) (-1)	-0.1549	0.0571	-0.0666	0.0594		
Δ House prices (log) (-2)	-0.0509	0.0333	-0.0448	0.0429		
Δ Stock prices (log)	0.0004	0.0161	0.0113	0.0149		
Δ Stock prices (log) (-1)	0.0492	0.0184	0.0288	0.0204		
Δ Lending rate	0.0108	0.0066	0.0344	0.0104		
Δ Lending rate (-1)	0.0162	0.0098	0.0427	0.0097		
Δ Land price (log)	-0.0138	0.0086	0.0070	0.0190		
Δ Land price (log) (-1)	-0.0240	0.0068	-0.0124	0.0138		
Δ Land price (log) (-2)	-0.0095	0.0057	-0.0062	0.0101		
Δ Disposable income (log)	-0.0645	0.0728	-0.4214	0.1076		
Δ Disposable income (log) (-1)	-0.1073	0.0698	-0.3093	0.0942		
Δ Disposable income (log) (-2)	-0.1272	0.0663	-0.1601	0.0656		
Intercept	-0.2315	0.0466	-0.7174	0.3584		
Sum of Coefficients on Stock Price (∑ΔStock price coefs.)	0.0496	0.0244	0.0401	0.0253		

Table 3 The long- and short-run effects of Shanghai stock prices on house prices. The dependent variable is the log value of house prices.

	Pooled Mean Group		Mean Group		Hausman Tests	
Variables	Coef.	Std. Er.	Coef.	Std. Er.	h-test	p-val
Long-Run Coefficients						
Shanghai stock prices (log)	-0.0406	0.0180	0.0568	0.0644	2.48	0.12
Lending rate	-0.0276	0.0140	-0.0737	0.0333	2.33	0.13
Land price (log)	0.0985	0.0187	0.0999	0.1308	0.00	0.99
Disposable income (log)	1.0203	0.0411	0.8392	0.2923	0.39	0.53
			Joint Hausman Test		4.08	0.40
Error Correction Coefficients						
(Phi)	-0.1795	0.0303	-0.5389	0.0752		
Short-Run Coefficients						
Δ House prices (log) (-1)	-0.1372	0.0544	-0.0642	0.0592		
Δ House prices (log) (-2)	-0.0475	0.0319	-0.0534	0.0424		
Δ Shanghai stock prices (log)	0.0092	0.0104	0.0155	0.0163		
Δ Shanghai stock prices (log)(-1)	0.0350	0.0121	0.0156	0.0164		
Δ Lending rate	0.0140	0.0056	0.0377	0.0099		
Δ Lending rate (-1)	0.0153	0.0108	0.0446	0.0116		
Δ Land price (log)	-0.0142	0.0085	0.0090	0.0198		
Δ Land price (log) (-1)	-0.0271	0.0064	-0.0126	0.0144		
Δ Land price (log) (-2)	-0.0102	0.0057	-0.0061	0.0105		
Δ Disposable income (log)	-0.0679	0.0672	-0.4144	0.1129		
Δ Disposable income (log) (-1)	-0.0988	0.0702	-0.2999	0.1004		
Δ Disposable income (log) (-2)	-0.1323	0.0703	-0.1579	0.0708		
Intercept	-0.2154	0.0458	-0.7335	0.3576		
Sum of Coefficients on Stock Price (∑ΔStock price coefs.)	0.0442	0.0160	0.0311	0.0231		

Table 4 Correlation between short-run coefficients on market openness and composition risk

(a) National stock market

	Market openness	Composition risk
Standard correlation	0.3772 (0.0479)	-0.4826 (0.0093)
Rank correlation	0.3514 (0.0667)	-0.4182 (0.0268)

(b) Shanghai stock market

	Market openness	Composition risk
Standard correlation	0.3553 (0.0635)	-0.5759 (0.0013)
Rank correlation	0.3388 (0.0778)	-0.4182 (0.0056)

Note: *p*-values are reported in parenthesis.

Table 5 Test of difference in means of short-run coefficients between subsamples in both the national market and Shanghai market

	National Market			Shanghai Market		
(a) *Low market openness vs. high market openness*						
	Mean short-run coefficients	Std. error	No. obs.	Mean short-run coefficients	Std. error	No. obs.
Low market openness	0.0149	0.0724	14	0.0073	0.0607	14
High market openness	0.0864	0.0849	14	0.0811	0.0812	14
Test of difference in means: Ho: Diff = 0 vs. Ha: diff ≠ 0						
Method	differ	*t*-value	*p*-value	differ	*t*-value	*p*-value
t-test	-0.0285	2.3266	0.0280	-0.0737	2.7209	0.0115
Satterthwaite-Welch t-test	-0.0285	2.3266	0.0283	-0.0737	2.7209	0.0119
(b) *Low composition risk vs. high composition risk*						
	National Market			Shanghai Market		
	Mean short-run coefficients	Std. error	No. obs.	Mean short-run coefficients	Std. error	No. obs.
Low composition risk	0.0849	0.0910	13	0.0823	0.0798	13
High composition risk	0.0189	0.0684	15	0.0112	0.0655	15
Test of difference in means: Ho: Diff = 0 vs. Ha: diff ≠ 0						
Method	differ	*t*-value	*p*-value	differ	*t*-value	*p*-value
t-test	0.0660	-2.1868	0.0380	0.0711	-2.5886	0.0156
Satterthwaite-Welch t-test	0.0660	-2.1420	0.0435	0.0711	-2.5512	0.0178

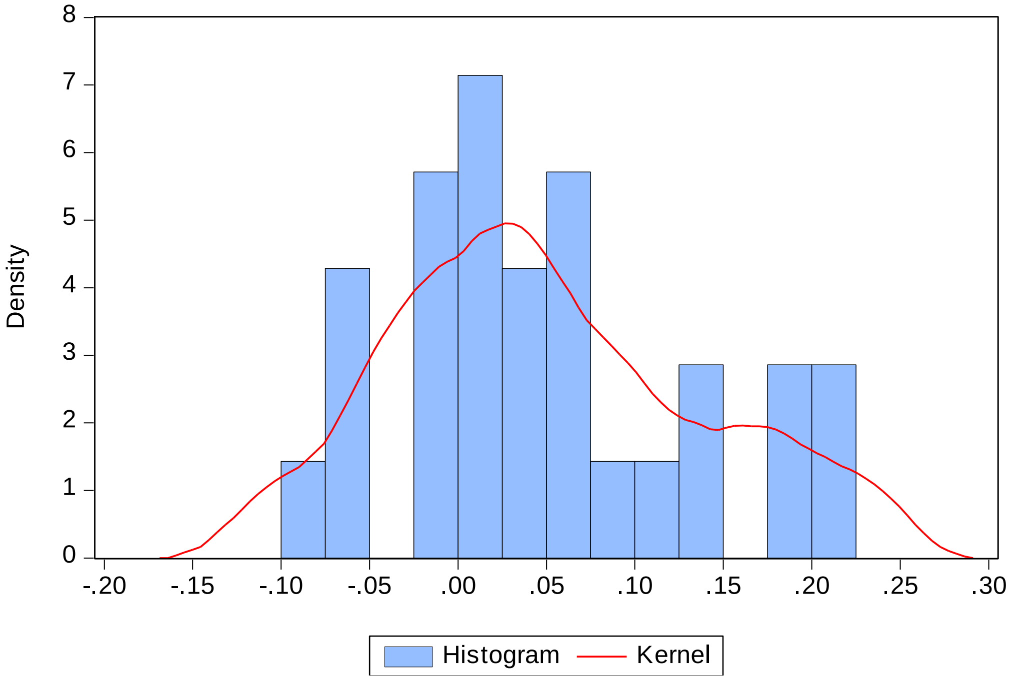
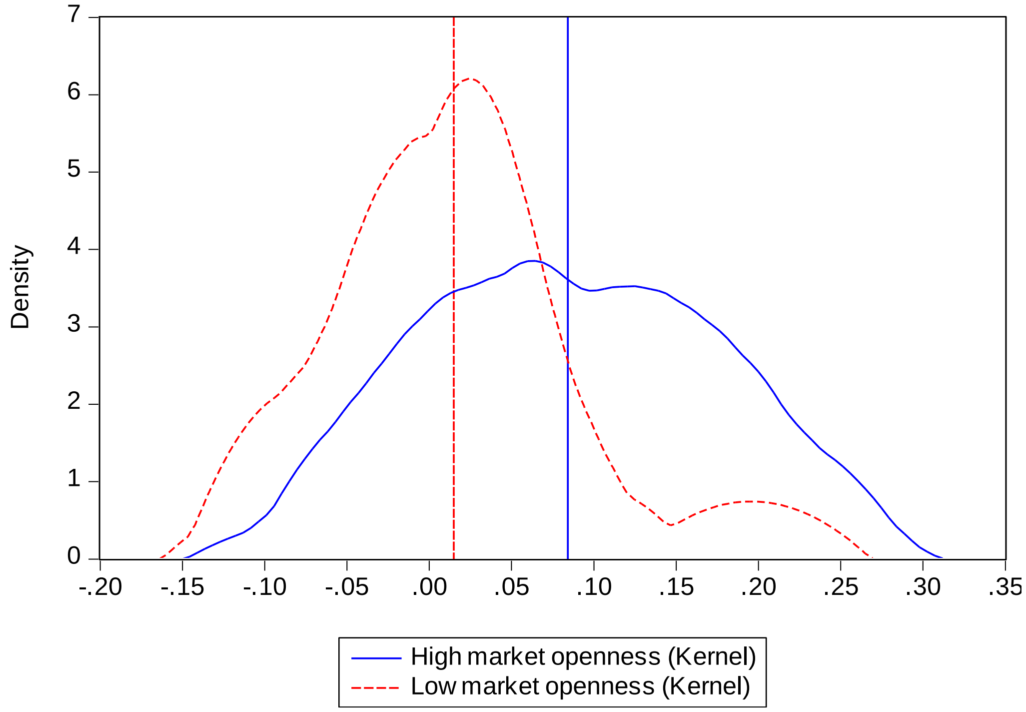
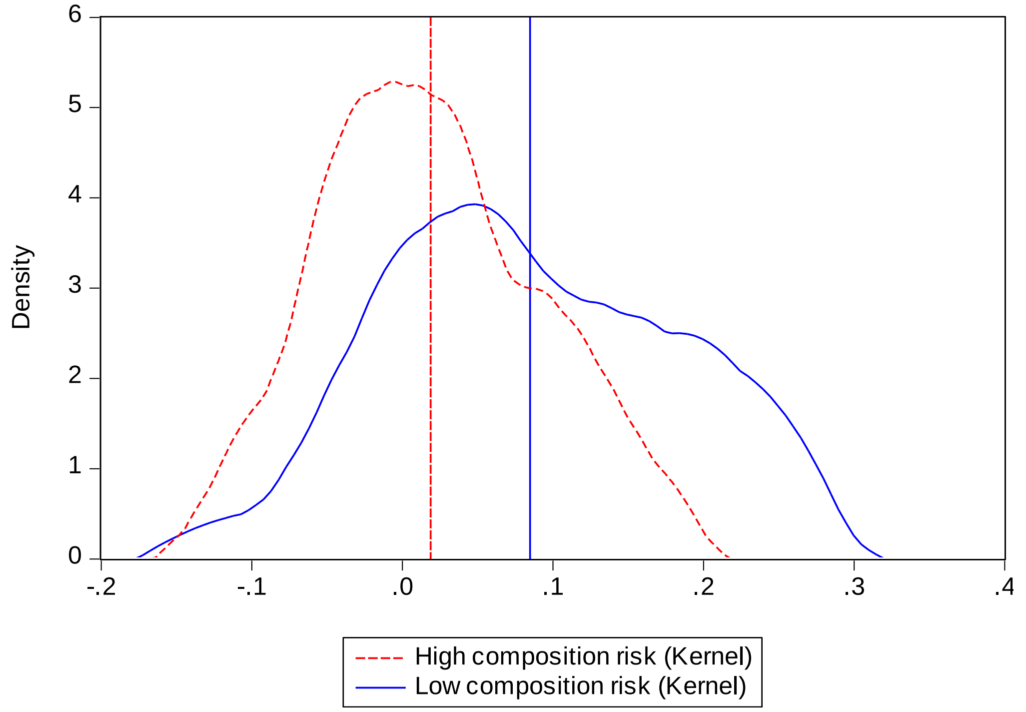


Figure 1 Frequency distribution of short-run coefficients



(a) Low market openness vs. high market openness



(b) Low composition risk vs. high composition risk

Figure 2 Frequency distributions for each subsample