Bank Lending and Real Estate in Asia: Market Optimism and Asset Bubbles[*]

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Abstract

This paper investigates the Asian real estate price run-up and collapse in the 1990s. We identify financial intermediaries' underpricing of the put option imbedded in non-recourse mortgage loans as a potential cause for the observed price behavior. This underpricing is due to behavioral causes (lender optimism and disaster myopia) and/or rational response of lenders to market incentives (agency conflicts, deposit insurance, or limited liability of bank shareholders). The empirical evidence suggests that underpricing occurred in Thailand, Malaysia, and Indonesia. Consequently, these countries experienced a more severe market crash then Hong Kong and Singapore, where underpricing was kept under control by strong government intervention and/or more appropriate incentive mechanisms.

Keywords: real estate bubble, lender optimism, disaster myopia, Asian financial crisis

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1. Introduction

Excessive bank lending to the real estate sector has been noted as sn explanation of the Asian financial crisis. For instance, while Sachs and Woo (2000) point to macroeconomic problems as the basis for the crisis, they also note that "too much money was poured into speculative real estate projects, e.g., in downtown Bangkok." More directly, Krugman (1998), states that "(t)he problem began with financial intermediaries – institutions whose liabilities were perceived as having an implicit government guarantee, but were essentially unregulated and therefore subject to severe moral hazard problems. The excessive risky lending of these institutions created inflation – not of goods but of asset prices." Krugman goes on to identify the need for a more complex analysis of the Asian financial crisis based on an option value approach.

In a recent theoretical paper Pavlov and Wachter (2004), hereafter PW, formalize an options based model of financial intermediaries. As PW show, non-recourse asset-backed loans imbed a put option which gives the borrower the right to default. If the value of the underlying asset falls below the outstanding balance of the loan, the borrower may simply "put" the asset to the lender, and walk away from any future payments of the principal or interest on the loan. The lender is compensated for providing this option through a higher interest rate on the loan. PW demonstrate that if lenders underprice this put option, asset markets incorporate this mistake in higher asset prices. They further identify the conditions that induce lenders to rationally underprice the put option.

In this paper, we apply the PW model to the Asian financial crisis. In particular, we examine the underpricing hypothesis for its impact on asset prices, using data for five Asian countries. This underpricing is initiated by short-term bank managers who rationally underestimate the default risk of their loans in order to capture larger market share. Under certain conditions, competition then forces all remaining managers to underprice the put option as well. PW show such these effects can lead to an underpricing equilibrium in the

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lending market, as well as inflated prices in the asset market. Importantly, these results hold even when market participants are fully rational.

Of the five Asian countries we examine, we empirically find evidence consistent with the PW underpricing phenomena in Thailand, Malaysia, and Indonesia. Hong Kong and Singapore, on the other hand, do not seem to exhibit the symptoms of underpricing. Interestingly, the first three countries experienced real estate price declines of 95, 86, and 81 percentage points, respectively, while Singapore and Hong Kong saw relatively more tampered declines of ????33 and ??38 percentage points. These findings are consistent with the widely accepted notion that there was a shift in demand for real estate assets caused by macroeconomic negative demand shock but this shift was substantially magnified by the excessive bank lending in certain countries.

A large body of literature has examined the role of the banking sector in propagating business cycles; see, for example Bernanke (1983), Bernanke and Gertler (1995), King (1994), Kiyotaki and Moore (1997), and Allen and Gale (1997). These studies demonstrated that the workings of the financial sector can amplify the magnitude of the business cycle as bank credit exposure moves procyclically. In the aftermath of the Asian financial crisis, many researchers (including Krugman (1998), Wade (1998), Mera and Renaud (2000), Tan (2000) and Quigley (2001)) have examined the role played by the real estate sector in the crisis, and have argued for reforms in the regulation of the real estate markets and the treatment of real estate loans by financial institutions in order to prevent the recurrence of the kind of asset bubbles that contributed to the financial crisis.

Commentators have noted that real estate markets are vulnerable to waves of optimism and herd behavior that result in bubbles;[1] and that speculation in real-estate markets was rampant in many Southeast Asian economies in the early 1990s (Quigley, 2001). In Thailand, for instance, short-term capital inflows found its way into Thailand's real estate

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[1] See Mera and Renaud (2000) and Quigley (2001), which provide detailed accounts of the role played by Asia's real estate market in the financial crises of 1997-1998.

market, as banks competed to lend to real estate developers and investors, based on expectations of continued strong economic growth (Tan, 2000). Herring and Wachter (1999A) find that a common striking feature of many financial crises around the world is that the most seriously affected economies often first experienced a collapse in real estate prices and a consequent weakening of banking systems before going on to experience an exchange rate crisis, a banking sector crisis, and a business cycle bust. We add to this literature by identifying the conditions that would accompany a bank driven financial crisis and examine whether this analysis applies to the Asian financial crisis.

The paper is organized as follows. In Section 2, we briefly review key developments in Asian real estate markets in the early 1990s, focusing on the surge in foreign capital and the expansion of bank credit to the real estate sector. In Section 3, we discuss the relationship between lender optimism and underpricing of the put option in non-recourse loans, as described in PW. We also discuss the role that market optimism plays in the real estate markets across Asian economies. Section 4 applies the analysis of PW to investigate bank loan underpricing as a factor in real estate markets in Hong Kong, Indonesia, Malaysia, Singapore and Thailand and the Asian financial crisis. Concluding remarks are contained in Section 5.

2.   Asian Economic Growth and Real Estate Bubble

With the benefit of hindsight, it is clear that the activities in real estate markets in East Asian economies in the early to mid-1990s were an important contributing factor to the Asian financial crisis of 1997. As early as 1996, the risk that the real estate sector posed to the overall stability of the financial sector was noted by the *IMF.*[2] As we will see a large portion of the banking credit was extended to the real estate sector.[3] Nonetheless, the origins of the Asian real estate bubble can be traced to the

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[2] *World Economic Outlook,* December 1997 p.69 Box 1.
[3] See Edison, et al (2000) and Tan (2000) for further discussion on the subject.

surge in capital inflows into East Asia in the early 1990s, when emerging Asian economies were experiencing strong economic growth. [5]   Many Asian currencies were then managed against a basket of currencies, of which the U.S. dollar is the most significant component. Following the 1985 Plaza Accord, which effectively devalued the U.S. dollar by close to 50% against the yen, the export competitiveness of many Asian economies was boosted in the late 1980s.

As foreign capital surged into Asia, speculation in the real estate market, driven by cheap financing, was rampant.   In many countries, loan quantum and credit facilities of up to 90% of the collateral value were common for investments in real estate properties (Mera and Renaud, 2000).   This flood of liquidity led to a sharp price appreciation in the asset markets, inflated collateral value and prompted further credit expansion as asset prices climbed.

Banks competed by increasing loan amounts, reducing interest rates for certain customers, and even extending renovation loans. By 1996, the loan exposure of the real estate sector in Thailand was estimated at 30-40% of total loans with a value of US$160 billion. While the buildup in real estate exposure was dramatic in Thailand, other countries also saw a significant buildup. From 1992-96 more than 70% of bank lending in Malaysia was channeled into real estate and stock-market investments. In South Korea too, Korean conglomerates invested a substantial amount of real estate, mostly financed with short-term debt (Mera and Renaud, 2000). Barth et al. (1998) estimate that expansion in bank credit to the private sector, relative to GDP growth, was 48% in Hong Kong during the 1990–1996 period; the corresponding figures were 62% in Indonesia, 40% in Malaysia, 115% in the Philippines, and 70% in Thailand. By comparison, the growth was 19% in Germany, 3% in Japan, 16% in the United Kingdom, and 21.5% in the United States. The rapid expansion in bank credit to the real estate sector continued in 1995 and 1996 even as the ratio of

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[5]   In this paper, emerging Asian economies include China, Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand.

nonperforming real estate loans to total loans rose. As shown in Table 1,in 1995, nonperforming loans were 10.4% of all bank loans in Indonesia, 7.7% in Thailand, and almost 6% in Malaysia.

Table 1: Exposure of the Banking Sector to Real Estate, 1996

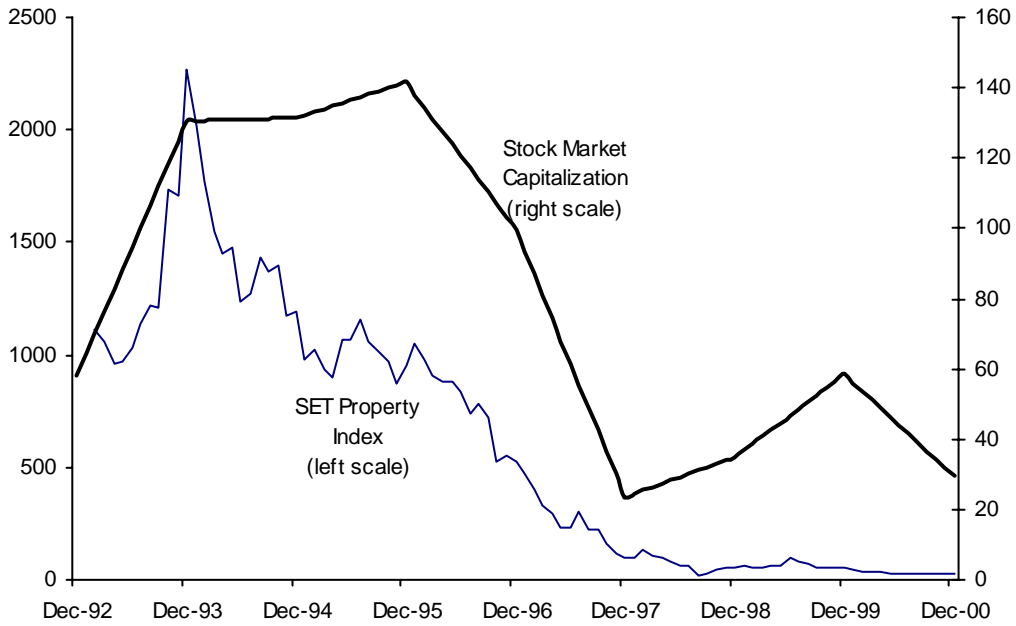|	Real estate, as % of bank loans	Private bank credit (US$ billion)	Average loan exposure to real estate as % of GNP	Non-performing real estate loans (% of total loans)[1]	Moody's rating of the banking sector	1996 GNP (US$ billion)
China	35-40	930	9	n.a.	D	812
Hong Kong	40-55	300	76	3.0	C	154
Indonesia	25-30	54	7	18.0	-	197
Malaysia	30-40	120	58	6.0	D+	94
Philippines	15-25	40	17	8.0	D+	87
Singapore	30-40	130	30	4.5	C+	94
South Korea	15-25	440	17	18.0	D	480
Taiwan	35-45	400	58	5.0	D	274
Thailand	30-40	160	44	16.0	E+	176

Note: 1.   Estimates, based on Asian Financial Markets, 2nd Quarter1998, J.P. Morgan Inc.

The real estate boom in Asia mirrored the fortunes of Asian stock market.[6] As shown in Figures 1A to 1E below for Thailand, Indonesia, Singapore, Hong Kong and Malaysia, respectively, the real estate markets and the stock markets tracked closely in both the ascent and the subsequent collapse.

Figure 1A:
Stock Market Capitalization and Real Estate Property Index - Thailand
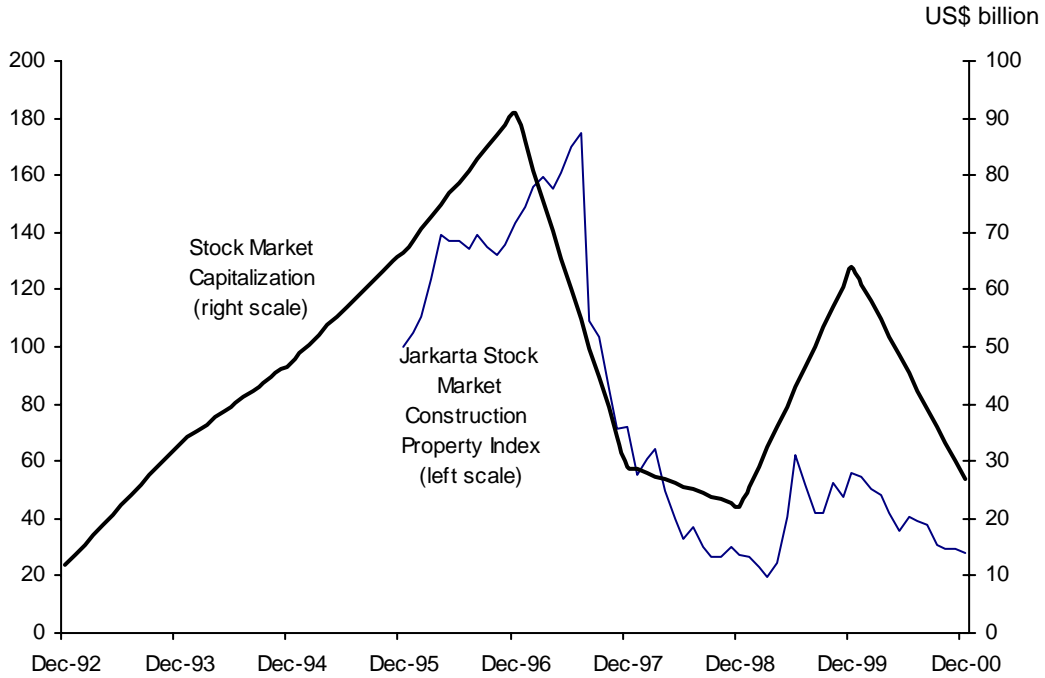
US$ billion

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[6] Our focus on bank lending does not rule out herding behavior on the part of individual investors. In fact, it is most likely that both herding and excessive bank lending occurred mutually reinforcing the asset bubble. However, the share of real estate funded by banks increased as the bubble emerged. (Herring and Wachter, 1999)

Note: The SET Property Index is a subindex of the Stock Exchange of Thailand (SET) Index. (Source: Bloomberg) Stock Market Capitalization data is taken from World Development Indicators (2002).

Figure 1B:

Stock Market Capitalization and Real Estate Property Index- Indonesia
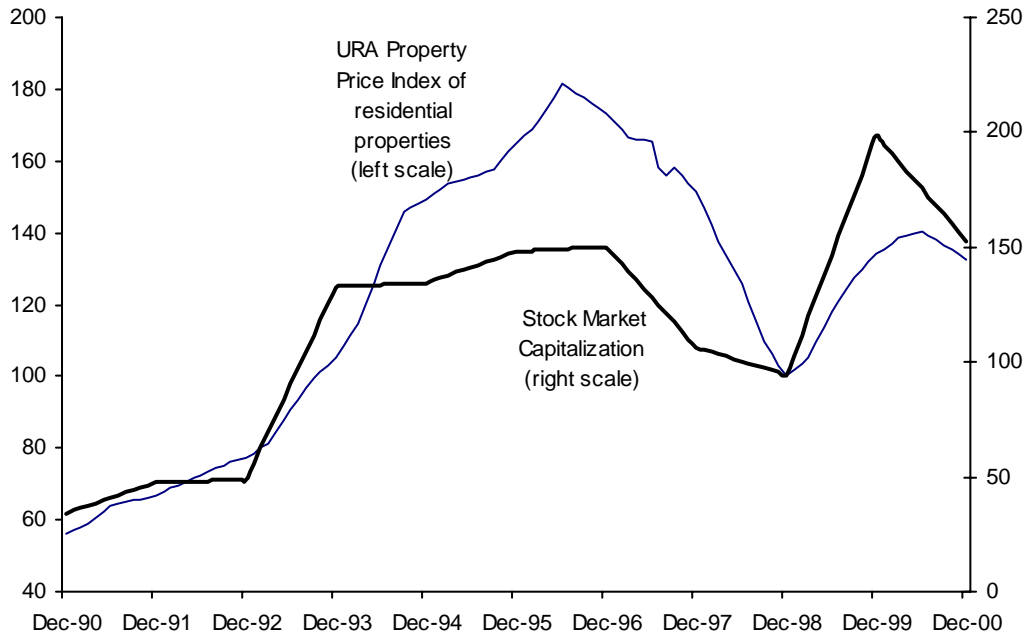
US$ billion

Note: The Jakarta Stock market Construction and Property Index is a subindex of the Jakarta Stock Market Index (JSI). (Source: Bloomberg) Stock Market Capitalization data is taken from World Development Indicators (2002).

Figure 1C:

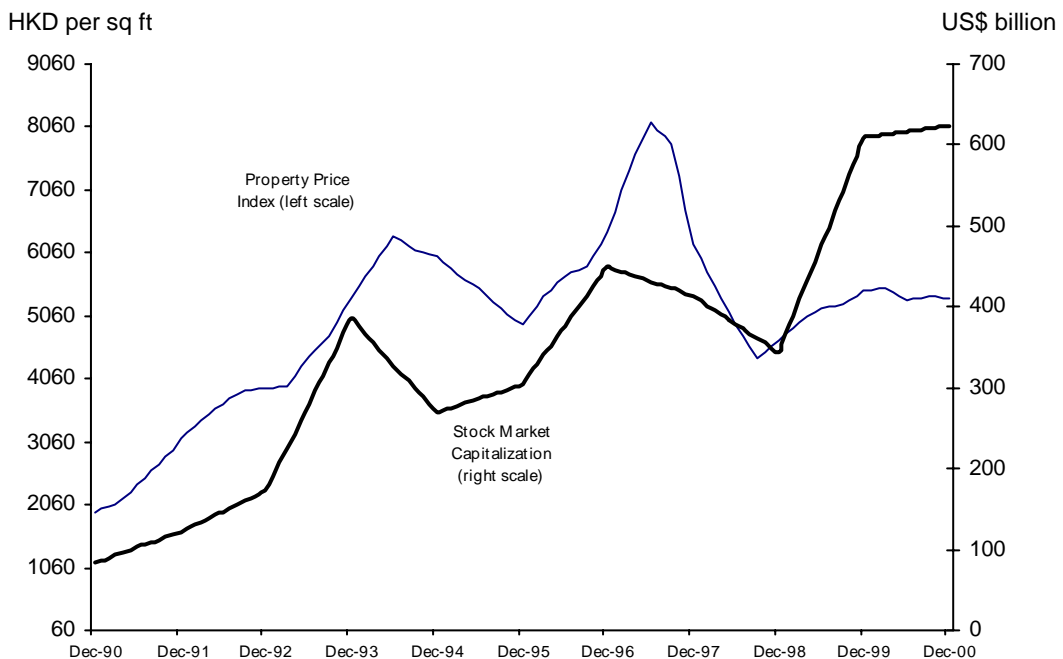**Stock Market Capitalization and Real Estate Property Index - Singapore**

US$ billion

Note: The URA property Index is reported on a quarterly basis (Source: Urban Redevelopment Authority, Singapore). Stock Market Capitalization data is taken from World Development Indicators (2002).

Figure 1D:

Stock Market Capitalization and Real Estate Property Price Index - Hong Kong
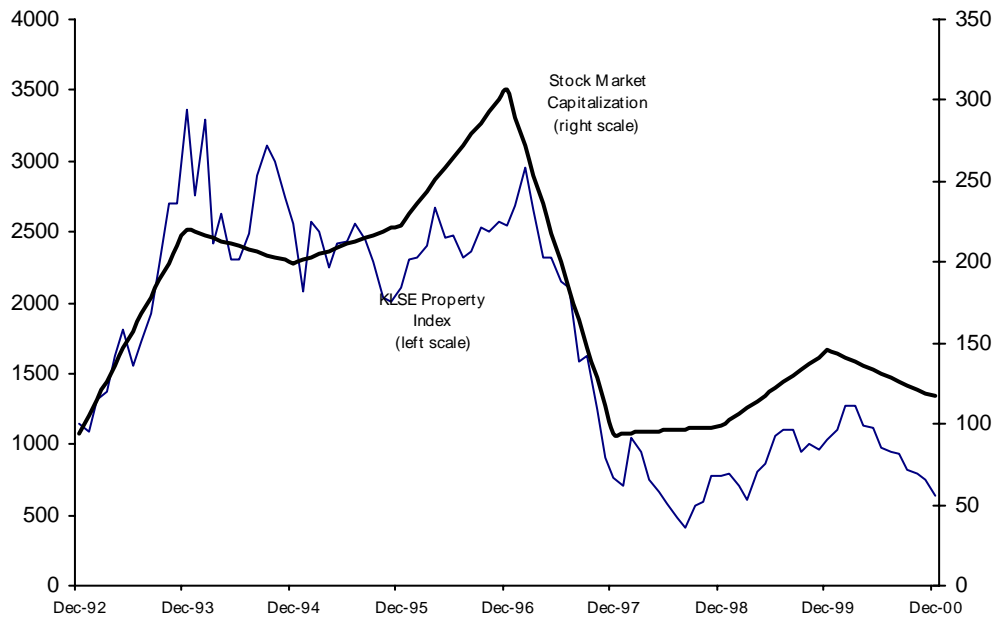

Note: The Property Price Index is the average of the residential property value per square foot. (Source: Vigers Hong Kong Limited). Stock Market Capitalization data is taken from World Development Indicators (2002).

Figure 1E:

Stock Market Capitalization and Real Estate Property Index - Malaysia

US$ billion

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Note: The KLSE Price Index is the subindex of the Kuala Lumpur Stock Exchange Index. (Source: Bloomberg). Stock Market Capitalization data is taken from World Development Indicators (2002).

Asia's real estate bubble started to deflate in early 1996, as U.S. interest rates started to rise. This prompted the appreciation of the U.S. dollar against the yen, and eroded the export competitiveness of Asian economies, as Asian currencies were tied to the U.S. dollar. As current account balances of Asian economies deteriorated, this led to a depletion of foreign exchange reserves, and raised investor concerns over the sustainability of the pegged currency regimes. As Krugman (1998) notes "in all the afflicted countries there was a boom-bust cycle in the asset markets that *preceded* (author's italics) the currency crisis: stock and land prices soared, then plunged (although after the crisis they plunged even more)." The commercial real estate markets fell sharply across Asian cities during 1997-1998. Property prices plunged by an average of 40%. Similar declines were recorded for the residential real estate property markets.[7]

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[7] Asian Financial markets: 4th Quarter 1998, published by J.P. Morgan.

3.   A Model of Investor Optimism and Bank Lending

Expectations play an important part in the formation and collapse of real estate bubbles. An asset bubble occurs when investors believe that future investments will continue to yield high returns, despite worsening fundamentals. A strong growing economy, as was the case in Asia during the early 1990s, raises expectations about future prospects and increases the willingness of banks to increase their credit exposure (see Mera and Renaud, 2000; Quigley, 2001; and Tan, 2000).

In a booming economy, borrowers and lenders thus have an incentive to provide as high an estimate as possible of the collateral value of assets. For the borrower, it is to maximize the quantum of loan facility; while for the lender, it is to compete for a bigger slice of the loanable funds market. Herring and Wachter (1999, 2002) point to a common reliance on external appraisals in the real estate markets, which enables this outcome. Such appraisals are usually based on recent transactions and, as such, are backward-looking.[8]

In Asia's real estate market in the early 1990s, the incentive problems inherent in asset appraisal and valuation have been noted. Previous studies, surveyed in Mera and Renaud (2000), identified a number of such problems in Asia's banking sector that contributed to the buildup of the real estate bubble. These features included unsophisticated credit risk management system, the implicit support of financial institutions by the government, and relatively lax regulation that enabled banks to lend at high loan-to-collateral values. Many Asian financial markets were also characterized by weak foreclosure and property rights laws, as well as a lack of transparency of lending relationships. Close linkages and reciprocal business relationships in Asian economies also made it easy to mortgage real estate assets at inflated assessed values in order to secure funding for new business ventures

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[8] Hendershott and Kane (1995) present econometric evidence of such appraisal bias of over 50% in the late 1980's U.S. commercial office market.

or to expand existing businesses (Bullard, et. al, 1998).   In the aftermath of the Asian

Financial Crisis, IMF's Stanley Fischer noted that among the key domestic factors leading to

the East Asian crisis was '… lax prudential rules and financial oversight which led to a sharp

deterioration in the quality of banks' loan portfolios." (Fischer; 1998, page 21).

PW offer a theoretical model that shows how the presence of short-term players in the

banking sector induces the underpricing of the put option of non-recourse loans. Here, we

briefly describe Pavlov and Wachter's underpricing model. In the model, banks are defined

as financial intermediaries that accept deposits and make loans to borrowers and investors

who purchase the risky real estate with zero equity. All agents are risk-neutral. The

fundamental price of the risky real estate asset is the expected discounted value of the asset

over all possible future states of the economy. A rational investor would pay this price in the

absence of lending or if lending is full recourse. For simplicity, a two-state model is analyzed

in which the asset has high payoff (R_H), or low payoff (R_L). Let the probability of the high-

payoff state be δ. The fundamental asset price, denoted P_f , is

$$P_f = \frac{R_H + (1-\delta)R_L}{1+d} \tag{1}$$

where d is the discount rate, which is also the deposit rate that the bank offers. In the case of

non-recourse lending, an investor who purchases the asset with zero equity either receives the

payoff R_H in the good state less the interest payments, or receives zero in the bad state. Let

the lending rate be denoted by i. If the put option imbedded in the non-recourse loan is fairly

priced, the expected payoff of the investor is zero in either state, so that

$$R_H - P(1+i) = 0 \tag{2}$$

where P denotes the current price of the asset. Let v denote the value of the put option, which

satisfies the non-arbitrage condition: $v + (1-\delta)\left[\dfrac{R_L}{P} - 1\right] = 0$. This yields

$$v = (1-\delta)\left[1 - \frac{R_L}{P}\right] \tag{3}$$

In other words, the value of the put option is equal to the magnitude of the expected loss if the low-payoff state occurs. Since interest payments are collected only in the high-payoff state, this means that the interest rate on the loan, i, must incorporate the value of the put option that is given to the borrower. Specifically, the appropriate loan rate must satisfy the following relationship: $\delta i = v + d$. Substitute the fair value of v derived earlier in (3) to obtain

$$i = \frac{1}{\delta}\left\{(1-\delta)\left[1 - \frac{R_L}{P}\right] + d\right\} \tag{4}$$

Substituting into (2), we obtain $P = \dfrac{R_H + (1-\delta)R_L}{1+d}$, i.e. the current price which is equal to the fundamental price. However, if the value of the put option is underpriced, so that instead of v, it is $v^* = v - \varepsilon$. In this case, it is straightforward to show that $P = \dfrac{R_H + (1-\delta)R_L}{1+d-\varepsilon} > P_f$. Thus, any underpricing of the put option imbedded in the loan results in an inflated asset price.

PW show that the presence of short-term players such as bank officers and their managers gives rise to private incentives for the default risks of real estate loans to be underpriced. In a booming market, loan officers may compete to meet their quota of loans – particularly, if their compensation is tied to their degree of success in generating new real estate loans. Such incentives are strengthened in the presence of informational asymmetries, when it is not possible to accurately monitor if the real estate loans are priced properly. In such situations, any underpricing is detected only when real estate loans actually default and become non-performing. If no default occurs, bank officers and those involved in making the loans receive their salaries and the managers receive their bonuses, which are an increasing function of the realized profits.

The market implication of the PW model is that when lending rates are lower than they should be and do not incorporate the value of the put option asset prices will exceed their fundamental level. A further implication of the PW model is that banks will compete for additional demand deposits to generate new loans. This competition drives up the bank deposit rates during a real estate bubble. Putting the two predictions of the Pavlov-Wachter model together, this implies that in an environment of lender optimism, we are likely to see a

narrowing of the differential between the bank lending rate and deposit rate. The predictions are summarized in Result 3 of Pavlov and Wachter's model :

Result 3 of Pavlov and Wachter, 2004: *The underpricing equilibrium results in inflated asset prices above their fundamental level. The two forces driving the divergence between market and fundamental prices are: (a) Lower lending rates that do not reflect the value of the put option; (b) Higher deposit rates due to the banks' increased demand for deposits.*

The divergence between market value and fundamental value of real estate assets in an underpricing equilibrium is not directly testable. However, if the Pavlov-Wachter model holds, the differential of the lending rate over the deposit rate can be used as a proxy for the extent of underpricing of the default risk

As periods of widespread underpricing are often associated with increased lending activity, this leads to a second testable implication that deposit rates are positively correlated with asset prices. This is because banks must attract additional funds, and competition drives up the deposit rates. Therefore, we test for the occurrence of an underpricing equilibrium in the real estate market with the following hypothesis:

Result 4 of Pavlov and Wachter, 2004: *The spread between lending rates and deposit rates is negatively correlated with asset prices. Deposit rates are positively correlated with asset prices.*

4.   Testing for Lender Optimism in Asian Real Estate Markets

To apply the model, we first construct real estate price indices – for Thailand, Singapore, Malaysia, Indonesia and Hong Kong – using data from various sources, including The World Bank's World Development Indicators (2002), Bloomberg and the central banks of the countries in this study. The data on interest rates are obtained from the websites of the various central banks. The relationship between the property price index and the interest rate differentials for Thailand other Asian economies are illustrated in Figures 2A to 2E.

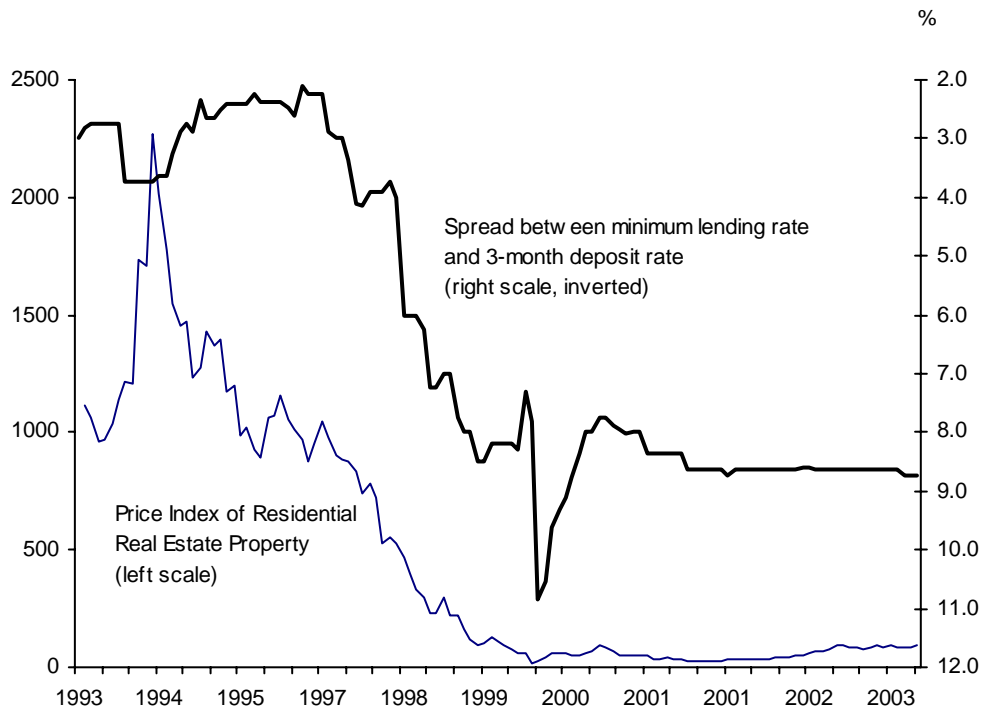**Figure 2A: Property Price Index and Interest Rate Spread – Thailand**

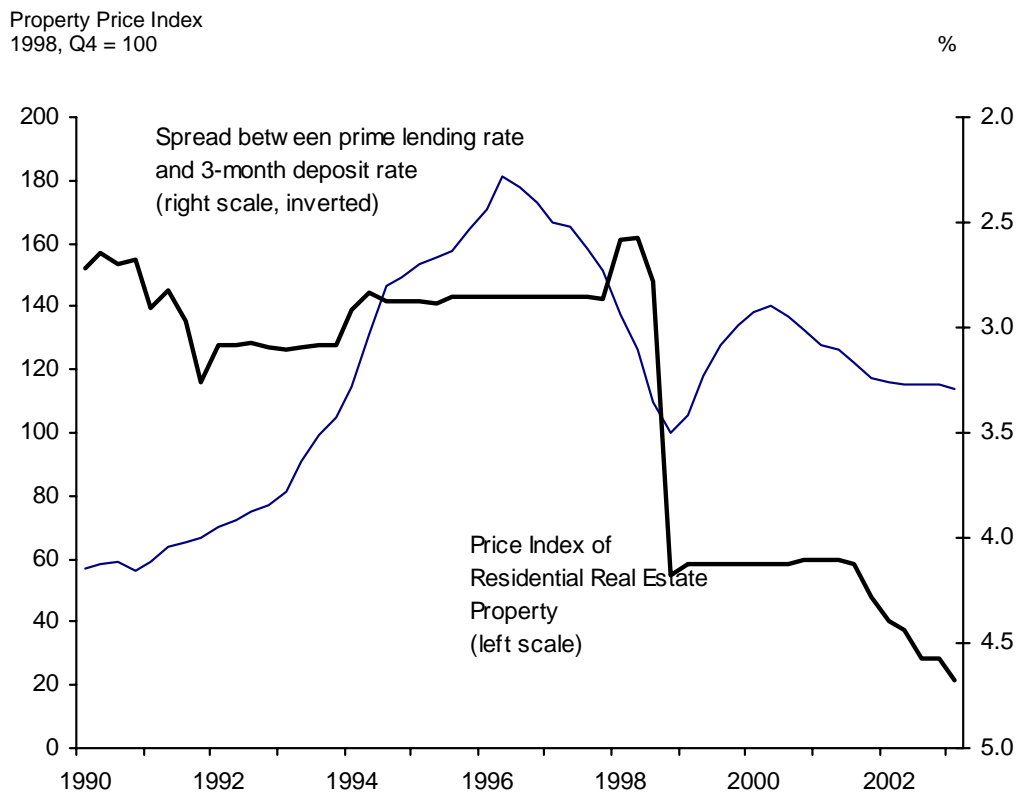**Figure 2B: Property Price Index and Interest Rate Spread - Singapore**

Property Price Index
1998, Q4 = 100   %

Spread between prime lending rate
and 3-month deposit rate
(right scale, inverted)

Price Index of
Residential Real Estate
Property
(left scale)

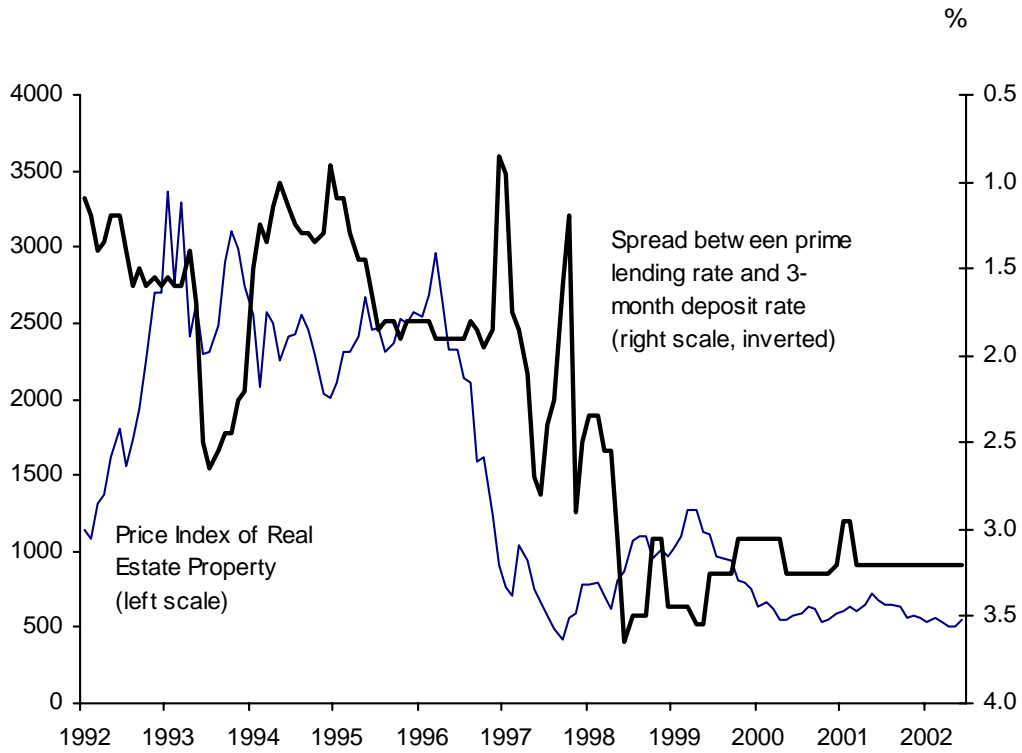**Figure 2C: Property Price Index and Interest Rate Spread - Malaysia**

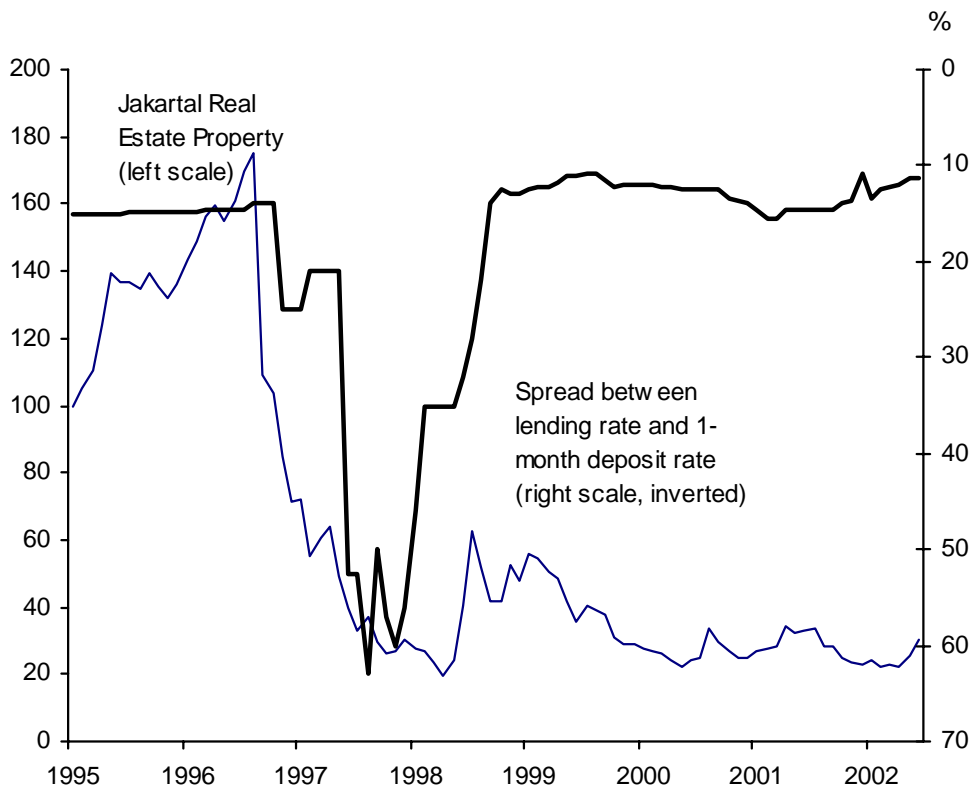**Figure 2D: Property Price Index and Interest Rate Spread - Indonesia**

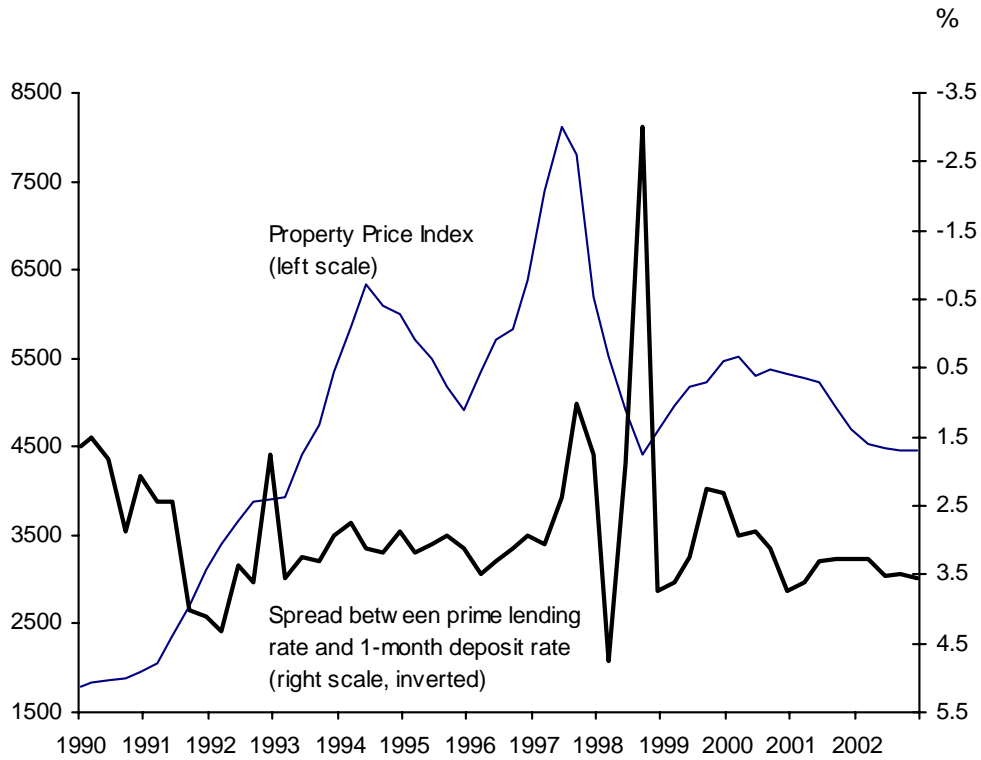**Figure 2E: Property Price Index and Interest Rate Spread – Hong Kong**

Table 3 reports the results of the correlation analysis to test if the Pavlov and Wachter (2004) model are supported in Asian real estate markets. The correlation analysis, for the period 1993 to 1997, is based on the levels in the property price index and interest rate differential. To determine the significance of these results, we construct confidence intervals for the correlation coefficients, as follows. Let r denote the correlation coefficient, n denote the number of observations, and $SD = \sqrt{\dfrac{1 - r^2}{n - 2}}$ denote the standard deviation. The confidence interval, at 5% significance level, is given by ($r - 1.96\ SD$, r $+ 1.96\ SD$).

In the case of Thailand, the correlation coefficients, reported in Table 3, are of the right signs, consistent with the predictions of the Pavlov-Wachter model. Changes in real estate price index were positively correlated with changes in 3-month deposit rates and negatively correlated with the changes in interest rate spreads. The results are also significant in light of the confidence interval, at 5% level of significance.

Table 3: Correlation Analysis of Real Estate Price Indices and Interest Rates

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	Correlation Coefficient and its Confidence Interval (%)[*]	
	Spread of Lending rates over deposit rates	Deposit rates (3-month rate at commercial banks)
Model prediction of Pavlov and Wachter (2004)	Negative	Positive
Thailand (level monthly, from Jan 1992 to May 2003)	−89.37 (−96.94, −81.80)	50.97 (43.40, 58.54)
Malaysia (level, monthly, from Dec 1992 to May 2003)	−64.75 (−78.16, −51.33)	34.66 (18.15, 51.17)
Indonesia (level, monthly from Dec 1995 to Dec 2000)	−40.33 (−80.64, −0.02)	−44.32 (−84.63, 4.01)
Singapore (level, quarterly, from 1990Q1 to 1997Q4)	−21.93 (−56.84, 12.98)	−26.79 (−61.26, 7.69)
Hong Kong (level, quarterly, from 1990 Q1 to 1997Q4)	3.99 (−30.62, 38.61)	−30.46 (−63.47, 2.537)

* The numbers in parenthesis denote the confidence interval for the correlation coefficient, at 5% level of significance.

Likewise, we ran the same correlation analysis for Malaysia and Indonesia. In the case of Malaysia, the correlation coefficients are also supportive of the predictions of the Pavlov-Wachter model. The confidence intervals for both sets of correlation coefficients also indicate that the results are significant.

For Indonesia, the correlation coefficient between the real estate price index and the interest rate differential is negative, in line with the prediction of the Pavlov-Wachter model. However, the correlation coefficient between the real estate price index and the deposit rates is also negative. While the negative correlation result is not consistent with the Pavlov-Wachter model prediction, it may not be significant, in light of the confidence interval of (−84.63, 4.01). One possible explanation for a negative correlation that we find between deposit rates and real estate prices may be the fact that Indonesia saw very strong inflows of foreign capital in the 1990s, so that deposit rates continue to fall in the wake of the inflow.

Finally, we carry out the correlation analysis for Singapore and Hong Kong as well.[9] In both cases, the signs of the correlation coefficients were opposite to those that were predicted by the Pavlov-Wachter model, as well as noticeably smaller in absolute values. The confidence intervals for the correlation coefficients indicate that these contrary results are significant, except for the correlation between Hong Kong real estate prices and deposit rate. In this case, the confidence interval of $(-63.99, 3.06)$ implies that the negative correlation between real estate price and deposit rate may not be as significant as the other correlation results. Nonetheless, taken together, these results suggest that the Pavlov-Wachter underpricing phenomenon was likely not present in Singapore and Hong Kong.

In Singapore's case, the government exercised tight control over land sales and such sales were accelerated in the 1990s to dampen the property market as real estate prices rose. At the same time, guidelines for real estate loans were tightened in 1996 to curb speculation in property. Among the measures introduced was to treat capital gains of real estate transactions as taxable income if the sale of the property took place within three years of purchase. The maximum loan quantum was also fixed at 80% of the appraised real estate value. Together with tighter guidelines on bank loans to the real estate sector, Singapore banks were less exposed to the real estate market than other countries, such as Indonesia and Thailand. The Monetary Authority of Singapore (the de-facto central bank) also has a tighter control over monetary policy and intervened actively to smooth the fluctuations in interest rates.

In the case of Hong Kong, the currency was pegged to the U.S. dollar at HK$7.8 to one U.S. dollar. This meant that the Hong Kong interest rates moved in line with the U.S. interest rates. This may have prevented banks from underpricing and led to a financially sound lending sector.

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[9] For the case of Singapore, only quarterly data for the residential property price index was available. As for Singapore interest rates, we use the 3-month deposit rates and bank prime lending rates (Source: Monetary Authority of Singapore).

5.   Discussion and Conclusion

The Pavlov and Wachter (2004) model shows that the incentives to underprice the put option of non-recourse loans results in inflated asset prices above their fundamental level. Our analysis shows that Thailand, Malaysia, and Indonesia appeared to have experienced the Pavlov-Wachter underpricing phenomena, which, in turn, resulted in massive price declines following the negative demand shock of 1997. Singapore and Hong Kong, on the other hand, seem to have successfully controlled underpricing in the early 1990s, due to strong and decisive government intervention. Consistent with this model, Singapore and Hong Kong experienced relatively smaller price declines. Relative to their peaks, the real estate markets in Thailand, Malaysia, and Indonesia declined by shocking 95, 86, and 81 percentage points, respectively, while Singapore and Hong Kong saw relatively more moderate declines of 33 and 38 percentage points.

The analysis of the underpricing equilibrium in the paper supports the view that the presence of incentives to underprice real estate loans was prevalent during the Asian real estate bubble, and is a factor in fuelling the asset bubble in the run-up to the Asian financial crisis. These results complement the findings of other research on the factors that fuelled the asset bubbles in the run-up to the Asian financial crisis.

Data limitations prevent us from conducting a more detailed analysis at present, and further research is needed to refine the results. With more comprehensive real estate data, we could also control for other variables to refine the analysis. For instance, we could control for the difference in the exchange rate regimes as well as the control over domestic interest rate by the central banks. As we noted earlier, since foreign capital inflow was a significant driver of the stock market boom and real estate market boom, deposit rates may not need to rise, even as banks continue to increase their lending to the real estate sector.

Finally, we note that the system of pegged exchange rates present in many Asian countries in the early 1990s also meant that besides loan default risk, exchange rate risk (specifically, devaluation risk) could be another significant factor in the underpricing of the

embedded put options in the loans market. By incorporating these aspects into an expanded theoretical model described in Pavlov-Wachter (2004) will enrich the analysis and could yield additional predictions that we can test empirically.

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