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Interest Rate, Inflation, and Housing Price
With an Emphasis on *Chonsei* Price in Korea

Dongchul Cho

9.1 Introduction

Since the IT bubble burst in 2000, interest rates have fallen and housing prices have risen in the global economy. According to Case and Shiller (2003), for example, the ratio of house prices to per capita income soared from around 6.5 in 2000 to around 8.5 in 2003 in California. Along with the soaring house prices, investment on house construction also increased at a substantial pace. For example, the residential investment in the United States increased by 4.9 percent in 2002 and 7.5 percent in 2003, while gross domestic product (GDP) grew at the rate of 2.2 percent in 2002 and 3.1 percent in 2003.

Korea was no exception in this global trend. During the period from 2001 to 2003, the general house price index rose by more than 30 percent. However, the prices of apartments—the most preferred housing type in recent years—rose by more than 50 percent nationwide, and by almost 100 percent in the Kangnam area (south of Han River) of Seoul. Along with the rise in house prices, construction industries enjoyed a boom. The average annual growth rate of building construction investment during the period of 2001–2003 reached 13.3 percent, while the average GDP growth rate remained only at 4.6 percent. This boom increased the portion of

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building construction relative to GDP from 8.4 percent in 2000 to 11.3 percent in 2003.

In addition to all of these standard indicators, however, the Korean housing market has a unique *chonsei* system that provides a very meaningful indicator for the market value of housing service—*chonsei* price, or an up-front lump-sum deposit from the tenant to the owner for the use of the property with no additional requirement for periodic rent payments (see section 9.2 for details). While *chonsei* prices, as well as sales prices, should reflect demand and supply in the housing market, the two prices have shown sharply different trends since the second half of 2002 (see figure 9.1). Until the first half of 2002, both prices had rapidly recovered from the collapse after the 1997 crisis. Since then, however, only the sales prices have kept rising while the *chonsei* prices have stagnated, which has sharply raised the ratio of sales to *chonsei* price or lowered the real value of *chonsei* deposit (deflated by the sales price). This phenomenon can, in a sense, be interpreted as a transfer of wealth from *chonsei* tenants to house owners.

Motivated by this observation, this chapter examines the determinants of the relative housing prices—sales and *chonsei* prices—and shows that the relative housing prices depend on the ratio of nominal to real interest rate. It is probably easy to expect that the discrepancy between the two housing prices is widened as the (expected) inflation rate increases. At the same time, however, the discrepancy can also be widened when the real interest rate declines, even though the monetary authority adamantly sticks to a pre-announced inflation target. In fact, this argument applies not only to the housing prices, but also to the prices of general nominal assets that are not hedged against inflation.

If the monetary authority has concerns over the potential wealth transfers due to the decline in real interest rate, it could, at least in theory, maintain the relative housing prices (or relative prices of real to nominal assets) by proportionately adjusting the target level of inflation rate to the decline of the real interest rate.[1] This result may find its relevancy to an economy like Korea's, in which real interest rates are secularly declining and the credit market is not yet completely accessible to households (see sections 9.2 and 9.5).

This chapter is organized as follows. Section 9.2 explains the *chonsei* sys-

1. The recent volatility in asset prices under the stable and low inflation environment has triggered a challenge on the standard inflation-targeting framework. While a majority of economists (e.g., Bernanke and Gertler 2001; Gilchrist and Leahy 2002) still support the standard monetary-policy framework represented by Taylor rules, a group of economists (e.g., Cecchetti et al. 2000; Borio and Lowe 2002; Hahm and Hong 2002) argue that the monetary authority needs to react to asset-price bubbles in order to stabilize the economy. See Bean (2003) for this debate. Although from a quite different perspective, this chapter's result could be interpreted to provide a rationale for the monetary policy that considers asset-price fluctuations.

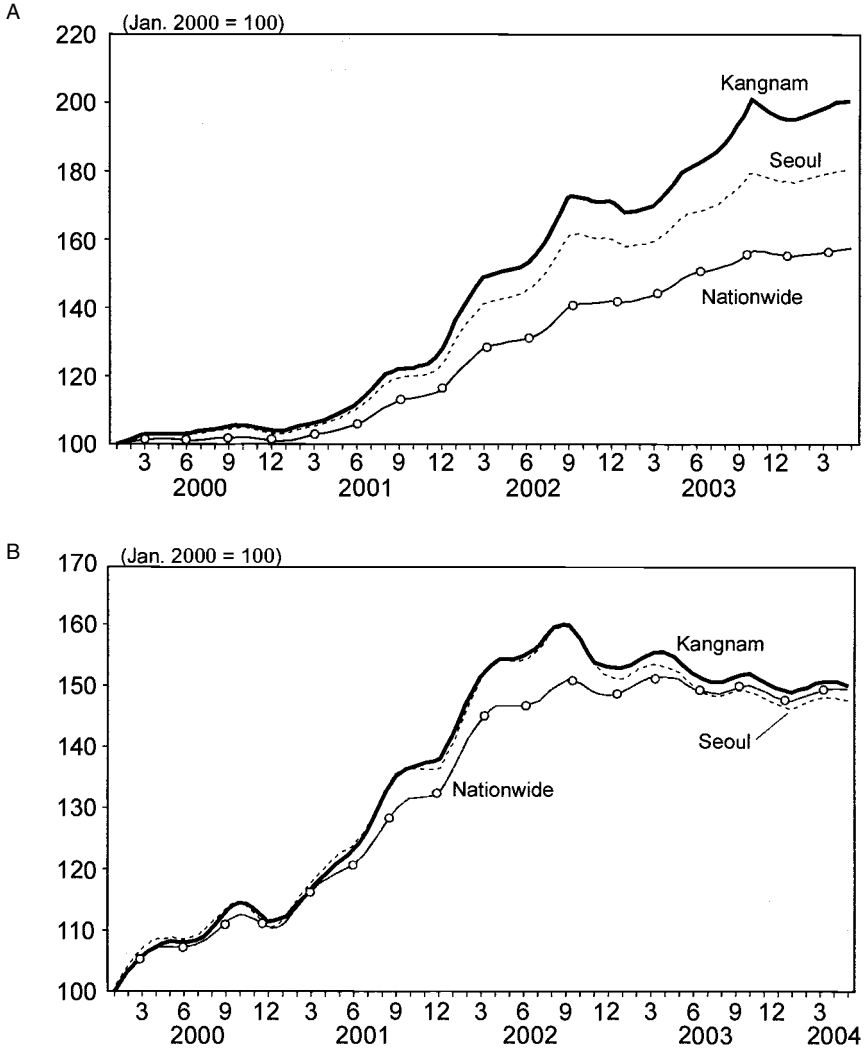


Fig. 9.1 ***A,*** **trends of house prices;** ***B,*** **trends of** ***chonsei*** **prices**

tem of Korea and section 9.3 contains a theoretical model that explains the determination of housing prices. The first part of section 9.3 discusses the arbitrage condition between the sales and *chonsei* prices, and the second part presents a simple general-equilibrium growth model that includes housing sector. Section 9.4 presents the results of a crude empirical analysis on the ratio of sales to *chonsei* prices in Korea, and section 9.5 concludes with brief remarks about monetary policy.

9.2 *Chonsei* System in Korea

The Korean housing market has a very unique system called *chonsei.* In this system, the tenant pays an up-front lump-sum amount of deposit (currently 30 to 70 percent of house sales prices) to the owner for the use of the property with no additional requirement for periodic rent payments. The interest earned on this lump-sum deposit, therefore, provides income to the owner during the contract period (typically two years), and the deposit is returned to the tenant when the contract expires. If the owner does not return the *chonsei* deposit at maturity, the Korean legal system grants the tenant priority to recoup the deposit from an auction for the house arranged by the court. That is, the tenant's deposit is legally protected as an asset that can be claimed against the collateral value of the property.

Although the historical origin of the *chonsei* system is not entirely clear, the literature reports that a convention similar to the *chonsei* system already existed in Korea during the Chosun Dynasty (or Yi Dynasty, 1392–1910).[2] In particular, this system was widely spread out in Seoul, where people rushed in as the feudal system collapsed after the Byung-Ja Treaty (1876) between Korea and Japan. While the court recognized the *chonsei* system as a convention during the Japanese colonial period (1910–1945), the first Korean government, in 1948, began to formally recognize the *chonsei* system under the legal framework. The legal rights and obligations of the homeowners and tenants have slightly changed over time, but the deposit has been protected if legally registered. Nevertheless, the *chonsei* contract differs from a collateral contract in that the tenant does not assume the ownership of the property even if the homeowner defaults on the deposit.

Underdeveloped financial services (mortgage services in particular) and rapid urbanization are thought to be the two most important factors that explain the popularity of the *chonsei* system in Korea.[3] During the period of "government-led development," in particular, the Korean government kept interest rates low for business firms. These interventions inevitably imposed higher-than-equilibrium interest rates on consumer credit and housing finance in the formal financial market. Under this environment, "for landlords, *chonsei* is an informal financial instrument that satisfies various household credit demands. . . . For tenants, the *chonsei* system allows households to afford homes that would not be possible for outright cash purchase" (Ambrose and Kim 2003, 62).

This *chonsei* system has been widely spread out with the rapid urbanization for the last few decades in Korea.[4] According to the *Population and Housing Census Report* (National Statistics Office 2000), the total number

2. For example, Kim (2000) and Park (2000) cite the survey reports on Korean conventions prepared by the Japanese Colonial Government (1910–1945).

3. See for example Renaud (1989) and Choi (2003).

4. See Ambrose and Kim (2003) for details.

of households in Korea is 14.31 million, out of which 7.75 million (54 percent) are homeowners and 4.04 million (28 percent) are under *chonsei* contracts (the remaining households are under monthly rents). In particular, the ratio of *chonsei* tenants increases in metropolitan areas, where housing prices are high. For example, the number of *chonsei* tenants is as large as the number of homeowners in Seoul (out of 3.09 million households, 1.26 million [40 percent] are homeowners and 1.27 million [40 percent] are under *chonsei* contracts).

Given the popularity of the *chonsei* system, it is obvious that a substantial amount of assets are held in the form of *chonsei* deposit in Korea. For example, a back-of-the-envelop calculation yields 200 to 250 trillion won, approximately 40 percent of GDP or 80 percent of the total stock value, as the outstanding amount of total *chonsei* deposit.[5] Given this size of the *chonsei* deposit, it seems natural that policymakers are concerned about the fluctuation of *chonsei* prices.[6] More important than the *chonsei* prices themselves, however, may be the ratio of sales to *chonsei* prices. This ratio is often interpreted as an indicator for the affordability of potential homebuyers because relatively young and/or poor households commonly live under *chonsei* contracts until they accumulate sufficient savings in addition to the *chonsei* deposit for the purchase of their own houses.[7] As an extreme example, if 100 percent of *chonsei* deposit is held for future purchase of houses, then a 1 percent increase of sales price over *chonsei* price simply implies a 1 percent decline in the purchasing power of *chonsei* deposit.

Apart from the policymakers' concerns, the information about *chonsei* prices is potentially very useful in identifying the factors that affect asset prices of real estate. Unlike the sales price, the *chonsei* price inherently excludes the possibility of capital gains and reflects the value of housing service assessed by the spot housing market itself. In this sense, the Korean housing market provides an important additional indicator for the real

5. According to the *1997 National Wealth Survey,* the total value of household housing (excluding land) is 485 trillion won, which is approximately 50 percent of the total building value of all sectors. Applying this ratio of 50 percent to the total land value estimate, 1,548 trillion won, yields 1,259 (= 774 + 485) trillion won as the total value of housing (including land). Using 28 percent as the ratio of *chonsei* dwellings and 60 percent as the ratio of *chonsei* to sales prices, one can obtain 212 trillion won in 1997, which is estimated to inflate to 284 trillion won as of the end of 2003, applying the *chonsei* price index. This amount is almost 40 percent of GDP (721 trillion won) or 80 percent of total equity value (355 trillion won) in 2003.

6. While many *chonsei* contracts are revolved upon maturity, the related parties write new contracts whose prices reflect market situations at that time. Therefore, new contracts involve cash transactions between owners and *chonsei* tenants, whenever *chonsei* prices change in the market. With general price inflation, it is common for tenants to deposit additional money that covers the increments in *chonsei* prices, but there were some exceptional cases. For example, housing prices including *chonsei* prices were collapsed by more than 20 percent nationwide in the swirl of economic crisis in 1998, which pushed many owners to the verge of liquidity crisis and invited the government to mobilize special rescue funds for them.

7. For the stylized facts of housing tenures and demography, see Renaud (1989) and Choi (2003).

estate prices, which are not available in other countries. The next section considers various factors that explain the discrepancy between the sales price and *chonsei* price, but the emphasis will be given to the expected capital gains that are greatly influenced by macrovariables, such as interest and inflation rates, rather than other micro or institutional factors.

9.3 Theoretical Discussion

9.3.1 Interest Rate, Inflation Rate, and Real Estate Prices

Chonsei *versus Purchase*

A household in Korea having two choices for housing service, either purchase or *chonsei,* would consider the following factors. First, there are inherent differences between homeowners and *chonsei* tenants. For example, the homeowners are free to move whenever they want, while the *chonsei* tenants do not enjoy such a freedom. This is a factor that boosts the sales price relative to *chonsei* price. In contrast, however, the homeowners should bear the cost to maintain the quality of houses that *chonsei* tenants do not have to care about. This is a factor that discounts the sales price relative to *chonsei* price. A priori, therefore, it is not clear whether the sales price should be inherently higher than the *chonsei* price.

Second, the homeowners should bear the risk of price fluctuations, while the *chonsei* tenants are relatively well-protected from such risks. As far as investors are risk averse, this is a factor that discounts the sales price relative to *chonsei* price. Third, the homeowners should pay taxes that *chonsei* tenants are free from.[8] This is another factor that discounts the sales price relative to *chonsei* price. In short, these factors cannot explain why sales prices are substantially higher than *chonsei* prices for the basically same housing services.

Therefore, the primary reason for the huge discrepancy of the sales price relative to *chonsei* price seems to lie in the expectation on capital gain. That is, the *chonsei* tenants are expected to recoup only the deposit in monetary unit upon maturity, but the owners will be able to enjoy capital gains if the house prices rise as they did in Korea. As with any other prices in monetary economy, the rise of house price is composed of two parts, the rise in the relative price of house over general prices and the rise of general prices (or inflation) itself. However, the rise of relative price can hardly be sustained in the long run, and thus this chapter focuses on the general price inflation as the underlying factor that persistently increases house price.[9] For

8. Section 9.4 provides explanation on Korea's real estate tax system.

9. Theoretically, it is possible that the relative prices of houses keep rising at a more rapid rate than general prices if the productivity growth rate of the housing sector is permanently lower than other sectors. However, this does not seem to be the case at least in Korea during

the same reason, the general price inflation can be seen as a primary factor for the sales price that remains substantially higher than *chonsei* price all the time.

An Arbitrage Condition

Focusing on the aforementioned factor of expected capital gain, the arbitrage condition between the sales and *chonsei* prices can be written as

$$P_t^H = \frac{[i_t P_t^C + E_t(P_{t+1}^H)]}{(1 + i_t)}, \tag{1}$$

where P_t^H is sales price at time t, P_t^C is *chonsei* price, i_t is nominal interest rate, $E_t(P_{t+1}^H)$ is the sales price at time $t + 1$ expected at time t. That is, the sales price at time t is the discounted sum of the return for housing services (or the opportunity cost of dwelling in the house rather than leasing the house on a *chonsei* contract), $i_t P_t^C$, and the expected sales price at time $t + 1$, $E_t(P_{t+1}^H)$.

This arbitrage condition can be recursively solved forward, and the solution will be a complicated function of the expectations about future *chonsei* prices and interest rates. Assuming a steady state with no speculative bubbles (in which the interest rate is fixed at i and the *chonsei* price increases at a constant inflation rate of π), however, equation (1) produces a simple and intuitive result:

$$\frac{P_t^H}{P_t^C} = \frac{i}{i - \pi}. \tag{2}$$

That is, the ratio of the sales to *chonsei* price is equal to the ratio of nominal to real interest rate. Of course, this result is based on many restrictive assumptions. Nevertheless, if the sustained real interest rate is around 4 percent and *chonsei* price inflation rate is around 3 percent (a medium-term target inflation rate of the monetary authority in Korea), this ratio becomes 1.75, which is similar to the ratio of sales to *chonsei* price at the end of 2003.[10]

Financial versus Real Asset Prices

It has long been recognized that the existence of inflation raises the value of real assets relative to financial assets that are not hedged against inflation risks. In Korea, the discrepancy between the sales and *chonsei* prices for the same housing can be referred to as a typical example for this. In fact,

the 1987–2003 period: the overall housing price increased at 4.1 percent per annum, slightly lower than the CPI inflation rate of 5.0 percent, although the average apartment price increased at 6.9 percent, slightly higher than the CPI inflation rate.

10. The ratio of sales to *chonsei* prices of apartments at the end of 2003 was 1.7 for the nation and 2.0 for Seoul (Kookmin Bank 2004).

the above result can be applied to rather general asset prices. In a steady state economy where the nominal interest rate is fixed at i, the price of a financial asset that yields a constant return R in monetary unit at every point in time is determined by $\int_0^\infty e^{-is}Rds = R/i$, while the price of a real asset that provides service flow whose price increases at a constant inflation rate π can be expressed as $\int_0^\infty e^{-is}Re^{\pi s}ds = R/(i-\pi)$. Therefore, the existence of inflation pushes up the price of a real asset relative to that of financial asset providing the same service, and their ratio becomes the same as the sales to *chonsei* prices $P_t^H/P_t^C = i/(i-\pi)$.[11]

From this result, it is easily confirmed that a rise in the inflation rate would raise the price of real asset relative to that of financial asset. What has not been much discussed in the literature, however, is that the same effect can be generated by the decline of real interest rate. Defining the real interest rate as $r \equiv i - \pi$, equation (2) can be re-expressed as $P_t^H/P_t^C = 1 + \pi/r$, implying that the relative price is determined by the ratio of inflation rate to real interest rate, rather than by the inflation rate alone. Therefore, even when the monetary authority strictly maintains a pre-announced target level of inflation rate, the ratio of sales to *chonsei* price rises if the real interest rate is lowered.

In order to relate this discussion to monetary policy, however, it seems necessary to explicitly understand the general price level. In other words, the meaning of "real estate price" or "*chonsei* price" rather than the relative price of those two needs to be clarified in the context of general price inflation. At the same time, if the discussion is extended from the housing market to the macroeconomy, the real interest rate and rent need to be taken as endogenous variables. In this sense, this subsection's discussion is viewed as a partial equilibrium approach in which inflation rate, real interest rate, and rent are exogenously determined. In order to sense a general equilibrium flavor, the next subsection will examine a very simple growth model.

9.3.2 A Simple Growth Model

Consider a representative household who earns (nominal) income $i_t A_t$ from asset A_t and spends $P_t C_t$ and $R_t H_t$ for consumption C_t and housing service H_t, respectively. If the instantaneous utility function is given by $\ln(C_t^\alpha H_t^{1-\alpha})$ and the time discount rate is ρ, then the household solves the following optimization problem:

$$(3) \qquad \text{Max} \int_0^\infty \ln(C_t^\alpha H_t^{1-\alpha})\, e^{-\rho t} d_t, \text{ s.t. } \dot{A}_t = i_t A_t - P_t C_t - R_t H_t,$$

11. The sales to *chonsei* price ratio can also be considered in this context. The prices of *chonsei* and sales are $P_0^C = \int_0^t e^{-is} R_s ds + P_0^C e^{-it}$ and $P_0^H = \int_0^t e^{-is} R_s ds + P_t^H e^{-it}$, respectively. The main difference between the two prices is that, at time t, *chonsei* renters are left with the *chonsei* deposit at time zero, while the owners are left with the house price at time t ($P_t^H = P_0^H e^{\pi}$). Comparing the two prices, one can derive $P_0^H/P_0^C = (1 - e^{-it})/(1 - e^{-[i-\pi]t}) \approx i/(i-\pi)$.

where $\dot{A}_t$ denotes the increase in the asset level. If the (nominal) value of the asset is the sum of (nominal) values of capital and houses,

$$A_t \equiv P_t^K K_t + P_t^H H_t, \tag{4}$$

it is easy to show that the growth rate of consumption as well as capital becomes proportional to the real interest rate, or $i_t - \dot{P}_t^K/P_t^K$:

$$\frac{\dot{C}_t}{C_t} = \frac{\dot{H}_t}{H_t} = i_t - \frac{\dot{P}_t^K}{P_t^K} - \rho. \tag{5}$$

Production and Capital Market Efficiencies

In this economy with no frictions, where real and nominal variables can be completely separated, the relative prices of real assets to consumption goods are entirely determined by the supply side, or the technology that stipulates how many units of real assets are accumulated at the expense of one unit sacrifice of consumption. In order to make this point clear, assume the following technology:

$$\dot{K}_t + \dot{H}_t = D(BK_t - C_t). \tag{6}$$

For simplicity, this equation takes a linear-production function BK_t and treats capital and house as perfect substitutes at the supply side. A peculiar feature in this equation is the coefficient $0 < D \leq 1$ that measures the units of increase in future capital when present consumption is reduced by one unit. While $D = 1$ is the standard case in growth models, the case of $D < 1$ can be interpreted in line with a Tobin's q model in the sense that $D < 1$ implies a real adjustment cost in investment.[12] Another, perhaps more pertinent, interpretation of D may be the degree of capital-market efficiency. In other words, if the capital-market efficiency is low, or $D < 1$, then the capital-accumulation process is marred although the production efficiency B is maintained.

Once the model is set up as above, it is easy to derive the equilibrium relative prices by equating the resource constraint (equation [6]) and the budget constraint (equations [3] and [4]). That is, using equations (3) and (4),

$$\dot{P}_t^K K_t + P_t^K \dot{K}_t + \dot{P}_t^H H_t + P_t^H \dot{H}_t = i_t(P_t^K K_t + P_t^H H_t) - P_t C_t - R_t H_t \tag{7}$$

is derived, and by equating this equation to equation (6), one can obtain the following four equilibrium conditions:

$$\frac{P_t}{P_t^K} = D \Rightarrow P_t^K = \frac{P_t}{D}; \tag{8-1}$$

12. Of course, while the adjustment cost vanishes when the economy approaches a steady state in Tobin's q models, equation (6) assumes that the cost exists permanently for simplicity. See Abel and Blanchard (1983) and Lim and Weil (2003) for growth models that explicitly incorporate formal Tobin's q specifications.

$$\frac{P_t^H}{P_t^K} = 1 \Rightarrow P_t^H = P_t^K; \tag{8-2}$$

$$\frac{i_t - \dot{P}_t^K}{\dot{P}_t^K} = DB; \tag{8-3}$$

$$\frac{(i_t P_t^H - R_t - \dot{P}_t^H)}{P_r^K} = 0 \Rightarrow \frac{\square i_t - \dot{P}_t^H}{P_t^H} = \frac{R_t}{P_t^H} \Rightarrow \square R_t = BP_t. \tag{8-4}$$

These results are easily predictable from the assumptions. That is, results (8-1) and (8-2) state that the relative price of capital (or house) to consumption good is determined by D, while result (8-3) indicates that the real interest rate is determined by B multiplied by D, or the efficiency of the capital transformation process from present to the future. Result (8-4) is an arbitrage condition that the benefit from the purchase of house, the sum of rent R_t and capital gain $\dot{P}_t^H$, should be equal to the opportunity cost, $i_t P_t^H$.

Inflation and Chonsei *Price*

The introduction of money in this model economy does not affect any relative prices, hence any resource allocation processes. Therefore, if the monetary authority inflates a certain target price, say, consumption price P_t, at a rate of π, the asset prices will increase at the same rate. In contrast, however, the rate of inflation can affect the relative price of *chonsei.* As far as an arbitrage condition holds between the *chonsei* and rent markets, the opportunity cost of *chonsei,* $i_t P_t^C$, should be equal to the rent:

$$P_t^C = \frac{R_t}{i_t} = \frac{BP_t}{(DB + \pi)}. \tag{9}$$

Price Responses to a Decline in Real Interest Rate

What would happen to this economy if the real interest rate permanently declines? First, the growth rate is unambiguously lowered (equation [5]). The relative prices of assets to consumption goods, however, depend on the sources of the decline in interest rate. If the real interest rate is lowered due to the decline in B, then the relative price of house (or capital) does not change (equation [8-1]), and only the relative price of *chonsei* declines (equation [9]). If, in contrast, the real interest rate is lowered due to the decline in D, then both the house (or capital) and *chonsei* prices rise, but the price of house rises more than that of *chonsei.* Figure 9.2 describes this situation.

The intuition that the decline in B does not change the relative price of house can be explained as follows. The price of house is ultimately determined by $P^H = \int_0^\infty e^{-(i-\pi)s} Rds = R/(i-\pi)$, and thus the fall in the real interest rate itself is a factor to raise the house price by lowering the discount

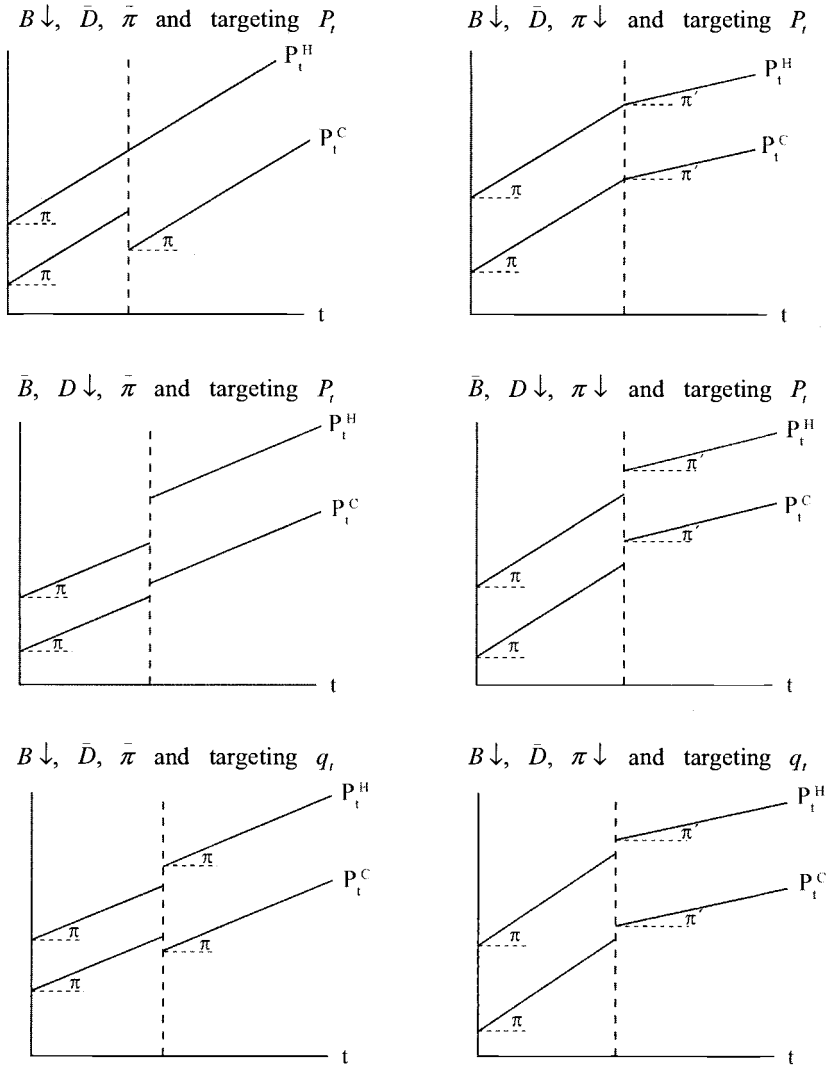


Fig. 9.2 Time paths of house price (P_t^H) and *chonsei* price (P_t^C)

rate for the future (or the return rate of alternative investment). In a general equilibrium set-up, however, the rent R is also lowered by the decline in B because consumption goods supplied by the same amount of capital are decreased while the supply of houses remains at the same level. In the particular model of this subsection, the instantaneous fall in R exactly cancels off the effect from the decline in the real interest rate, leaving the house

price unchanged.[13] In contrast, if the real interest rate is lowered due to the decline in D, the supply of consumption goods and R do not change, raising the house price.

Price Index and the Target Rate of Inflation

In the previous paragraphs, it was shown that the house price does not change if the real interest rate declines due to a fall in B. Yet it is worthwhile to note that the house price here was the relative price of house to consumption goods. In other words, this "price" becomes the price in monetary unit, only when the monetary authority uses the price of consumption goods as a target. In practice, however, it seems common to include rent as an important component of the target Consumer Price Index (CPI).[14] If, for example, the monetary authority gradually increases the price index,

$$q_t \equiv P_t^{\alpha} R_t^{1-\alpha} \tag{10}$$

(instead of P_t), then the price of housing (as well as P_t) in monetary unit will rise even when a fall in B lowers the real interest rate (see figure 9.2 for the time paths of the housing prices in this case).

Although the *chonsei* price in monetary unit is also affected by the choice of target price as well as the source of the decline in real interest rate, the ratio of sales to *chonsei* prices depends only on the inflation rate as confirmed in the previous subsection. Therefore, if the monetary authority lowers the target inflation rate proportionately in response to the decline in the real interest rate, the discrepancy of the *chonsei* price from the sales price would not be expanded. Figure 9.2 also shows the time paths of housing prices when the monetary authority follows such a rule.

Quantity Responses to a Decline in Real Interest Rate

Though not a central issue in this paper, the responses of the quantity variables with respect to a decline in the real interest rate can also be traced (see the appendix for algebra). One of the results worth noting is that a fall in the real interest rate lowers the ratio of consumption to housing at the steady state, but raises the ratio of consumption to capital.

It is natural to decrease the steady-state level of capital to housing ratio as the real interest rate (or the marginal rate of return for capital) declines due to a fall in B, because the shock that lowers the marginal rate of return

13. In this case, the relative price of capital to consumption good does not change, but the shadow price of capital (as well as consumption good) jumps up. That is, an unanticipated adverse shock to productivity decreases the level of consumption, and the ex post marginal utility of consumption good is higher than the marginal utility that was expected before the shock was realized.

14. In Korea, the weight of rent is approximately 15 percent in the headline CPI that does not include owner's equivalent rent (www.nso.go.kr). If the owner's equivalent rent was included in the CPI, the weight of rent would be increased to approximately 31 percent, which is similar to that in the United States at 31.5 percent (www.bls.gov).

for capital does not directly lower the marginal utility from the housing service.[15] Therefore, the household reduces the saving for capital accumulation (hence income), but not the saving for housing. This optimization behavior leads to a decrease in the steady-state level of consumption, but not as much as the decrease in the steady-state level of capital. Recalling that the measured income is a linear function of capital, this implies that the steady-state saving rate in the aggregate falls when the real interest rate declines. At the same time, however, the saving rate for housing investment rises with a fall in the real interest rate or growth rate, which seems to be consistent with the recent experiences of the global economy as mentioned in the introduction.

Remarks

In order to learn intuitions in a straightforward way, this subsection introduces a very simple growth model in which all of the prices are instantaneously adjusted from one steady state to another. This model may be extended in various dimensions to generate rich dynamics of asset prices. For example, a Cobb-Douglas production function can be used instead of the linear-production function of this subsection (results are available upon request). In this case, a fall in the efficiency growth rate gradually lowers the real interest rate, and thus the discrepancy between the sales and *chonsei* prices is also widened at a gradual pace. Another variant would be to explicitly introduce the Tobin's *q* model, which would produce short-run fluctuations of asset prices. Perhaps the most interesting variation of the model, however, might be the one in which housing rents adjust to fluctuations of interest rates in a gradual manner (probably due to a slow adjustment of housing market relative to consumption goods market). This feature that relaxes the tight link between the housing and other markets would be able to generate short-run deviations of rents from interest rates, hence the fluctuations of house prices.

9.4 A Brief Look at the Data

Interest Rate, Inflation Rate, and the Ratio of Sales to Chonsei Prices

Based on the theoretical discussion of the previous section, this section takes a brief look at the actual data of the sales and *chonsei* prices of apartments from Korea.[16] While it would also be of great interest to examine the house prices in relation to general prices and macroeconomic fluctuations,

15. When the real interest rate declines due to a fall in D, the results become complicated. See the appendix.

16. See appendix B for variable explanations and data sources. The data for house prices were collected from the Kookmin Bank. This data set is an official (or at least semi-official) one that the Korean government uses. Originally, this data set was compiled by the National Bank for Housing, which was merged into the Kookmin Bank (then another government

the model's predictions regarding these issues are not sufficiently clear. At the same time, it is very likely that various sector-specific shocks have generated uneven effects across the housing market and other markets in actual data. This section, therefore, limits the scope of analysis to the relative housing prices that are presumably immune to the noises generated by micro sector-specific shocks. In addition, considering that most theoretical discussion was based on steady-state analyses, the empirical examination is also focused on the relationships of long-run trends across variables.

Figure 9.3 shows the trends of relevant variables since 1986, the first year of the available data, along with their HP-filtered trends. First, the ratio of sales to *chonsei* prices (figure 9.3A) had declined from almost three in the late 1980s to around 1.5 in 2000, and rebounded back to two since then. Second, apart from the exceptional hike during the currency crisis period in 1998, the nominal interest rate (figure 9.3B) had also declined from over 15 percent in the early 1990s to around 6 percent in 2003. Third, however, the expected inflation rate (figure 9.3C) had also been lowered from over 5 percent in the late 1980s to below 3 percent in 1998 and 1999, operating as a factor to lower the ratio of sales to *chonsei* prices. Fourth, in contrast, the portion of expected inflation in the nominal interest (figure 9.3D) has been rising from below 20 percent in 1998 and 1999 to over 40 percent in 2003, mainly due to the decline in the real interest rate in spite of stable inflation expectations, which seems to operate as an important factor for the rebound of the housing price ratio.

Taxes on Real Estate

Although the inflation and interest rates seem to be capable of explaining the *direction* of long-term trend of the housing price ratio, they are not sufficient enough to explain the *magnitude* of the changes in this ratio, particularly the ratio around three in the late 1980s and early 1990s. During this period, the portion of the expected inflation rate in the nominal interest rate was nearly 50 percent, implying that the inflation and interest rate cannot generate the housing price ratio over two. This observation invites discussions on the other factors explained in section 9.3 that can potentially affect this ratio. In order to incorporate the other factors, slightly modify the arbitrage condition, equation (1):

$$(1') \qquad P_t^H = \frac{[(i_t + \alpha)P_t^C - \tau P_t^H + E_t(P_{t+1}^H)]}{(1 + i_t)},$$

bank) and privatized after the Korean crisis. This data set traces the prices of 16,000 sampled houses throughout the whole country every month. For apartments, the sample size is 13,020 covering Seoul, six metropolitan areas, fifty-six cities, four Goons (district unit in rural area), and ninety Gus (district unit in urban area). Currently, the quality of the houses is not considered in this data set.

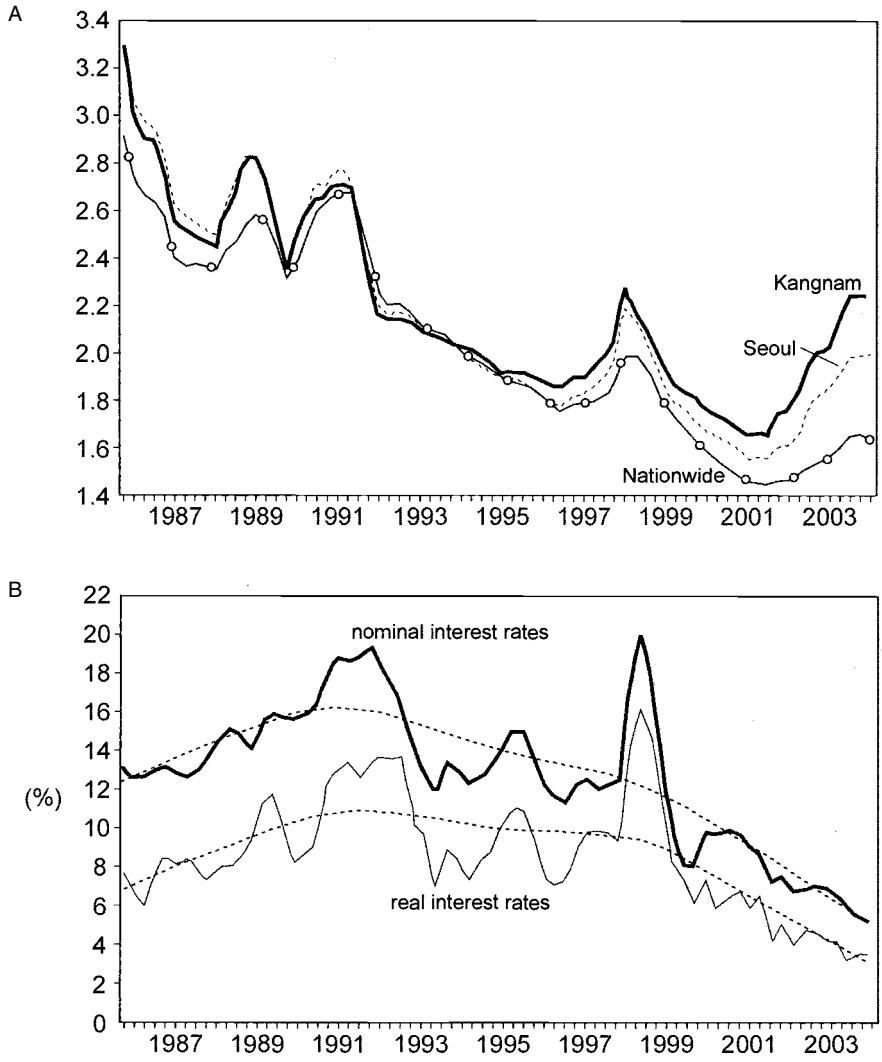
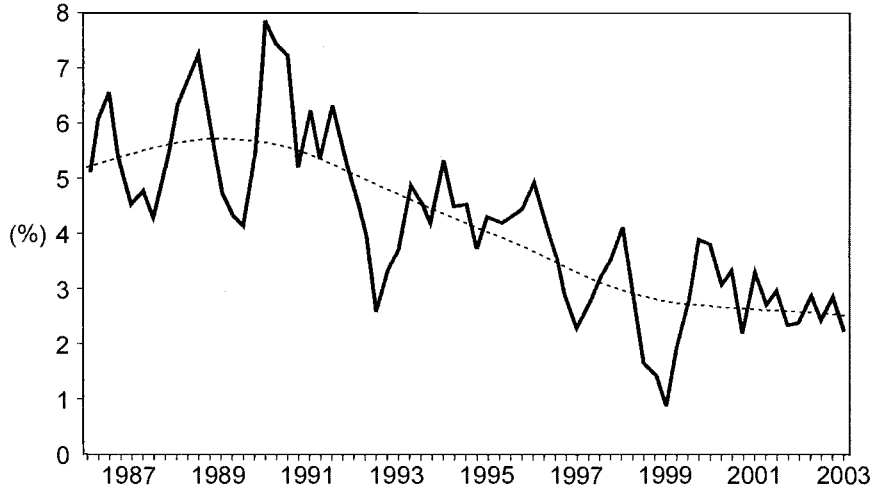


Fig. 9.3 ***A,*** **ratio of sales to** ***chonsei*** **prices;** ***B,*** **nominal versus real interest rates;** ***C,*** **expected inflation rate;** ***D,*** **expected inflation rate as a portion of nominal interest rate;** ***E,*** **effective tax rate on real estate;** ***F,*** **effective tax rate relative to nominal interest rate**

where τ is a tax rate for holding a house and α represents all the other factors, such as convenience for owning a house, maintenance cost, risk averseness and so forth. The reason for separating out the tax rate from other factors is that the changes in tax rate can be traced to an extent, while the changes of other factors over time are neither traceable nor believed to

C



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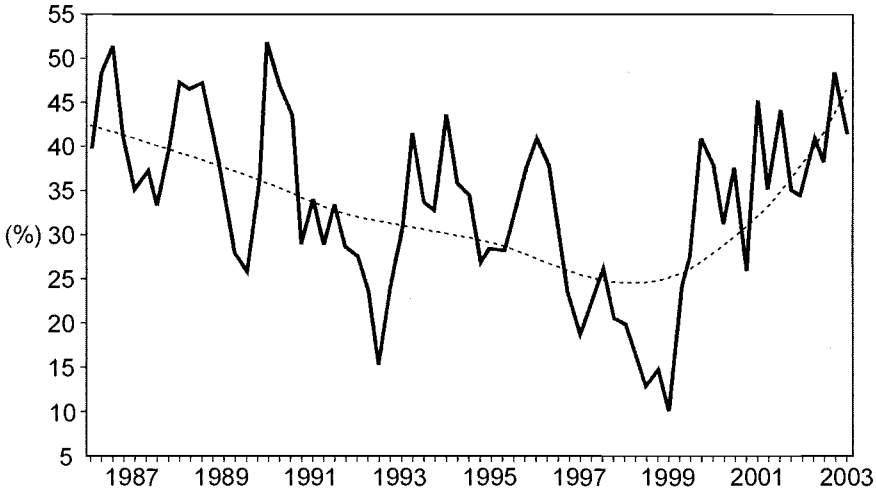


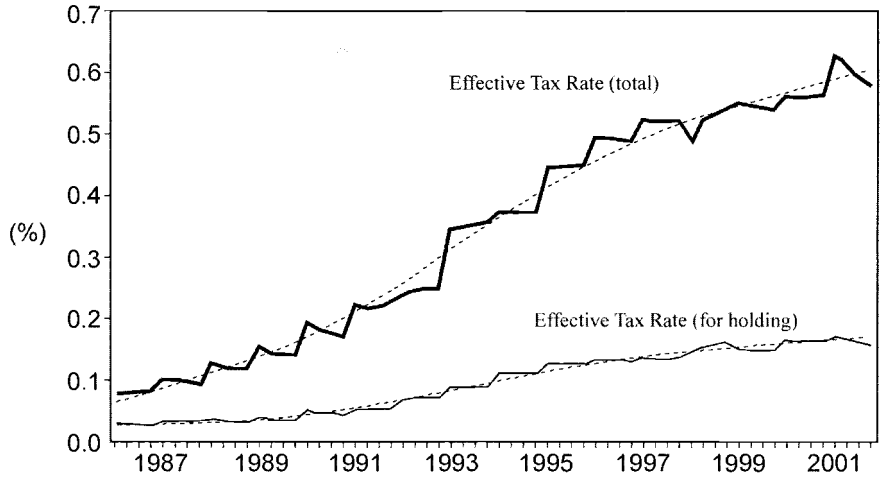
Fig. 9.3 (cont.)

be significant. Under the steady-state assumption again, equation (2) is modified to be:

$$(2') \qquad \frac{P_t^H}{P_t^C} = \frac{i + \alpha}{i + \tau - \pi}.$$

The real estate tax system is extremely complicated in Korea: one should pay acquisition and registration taxes when he or she purchases a house, property tax while he or she holds a house, and capital gains tax when he

E



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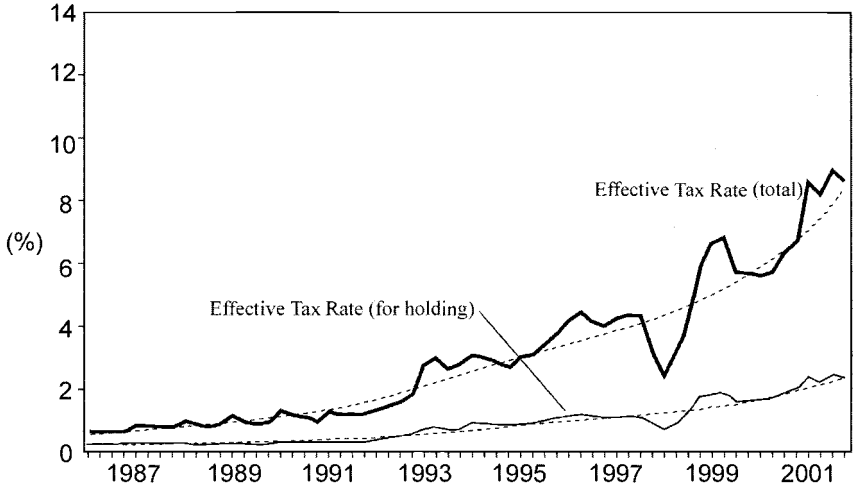

Fig. 9.3 (cont.)

or she sells a house. However, what makes the system complicated is how to calculate the actual taxes. For example, the legal tax rates for acquisition and registration are 2 percent and 3 percent, respectively, but the effective tax rates are far lower than the legal rates because the actual taxes are based on "publicly assessed values" that are far lower than market prices. Similarly, the property tax rate ranges from 0.2 percent to 7 percent progressively with property values, but the effective tax rate is estimated to be around 0.1 percent. The capital gains tax rate is 40–60 percent, but there exist many exceptional cases for reductions and exemptions.

Figures 9.3E and 9.3F show the estimated effective tax rates on real estate, or the total tax revenues divided by the estimates of total real estate value. In light of equations (1′) and (2′), these statistics have two potential shortcomings. First, since the relevant tax data for apartments are not available, these figures report the effective tax rates for the entire real estate (including land and nonapartment houses). Second, since the portion of property tax (or holding tax) in total real estate tax revenue is very low in Korea relative to those in other countries, the figures report not only the property tax rate but also the total tax rate, including taxes related to transactions. However, it should be noted that the transaction-related taxes must have theoretically different effects on real estate prices from those of holding taxes.

In spite of the shortcomings, the figures provide some basic insights. First, the effective tax rate on real estate has been rising from a very low level (figure 9.3E).[17] In conjunction with the rapid decline of nominal interest rate, the relative size of the effective tax rate to the nominal interest rate has been sharply increasing (figure 9.3F), implying that the tax factor appears to have contributed to the decline in the ratio of sales to *chonsei* prices. Second, however, the magnitude of the impact by tax seems to be small relative to the impacts by interest rates and inflation rates: during the sample period in figure 9.3, the effective holding tax rate fluctuates from 0.02 percent to 0.12 percent only (from 0.1 percent to 0.6 percent for the entire tax rate), while the fluctuations of interest rates and inflation rates are in the order of several percentage points. This observation seems to emphasize the importance of macrovariables in determining the real estate prices, although the macrovariables as well as taxes do not appear to sufficiently explain the high sales price relative to *chonsei* price in the late 1980s.[18]

9.6 Conclusion with Some Remarks on Monetary Policy

This chapter discusses the relationship between interest rates and inflation rates on one part and the house prices (typical real asset prices) relative to *chonsei* prices (typical nominal asset prices) on the other. The key point of the chapter is that the relative price of sales to *chonsei* depends on the ratio of inflation to real interest rates. Therefore, even when the monetary authority maintains a pre-announced target level of inflation rate, the relative price of sales to *chonsei* rises if the real interest rate declines.

It is not clear whether the monetary authority *should* be concerned about

17. The effective holding tax rate was merely 0.02 percent and even the entire tax revenue was less than 0.1 percent of total real estate value in the late 1980s.

18. A strong conjecture among Koreans is that there were significant bubbles in real estate prices in the late 1980s, which has not been considered in this chapter.

the changes in this ratio. At least, the growth model presented in this chapter is completely silent on this issue: there exists neither short-run fluctuation nor social cost from inflation. Probably the answer should be sought in the context of the debate about whether the monetary authority should be concerned with the fluctuations of asset prices in the first place.[19] In addition to its implication on short-run economic fluctuations, however, the changes in the relative housing price between sales and *chonsei* generate significant implications about wealth distribution in Korea. As mentioned in section 9.2, most of the *chonsei* deposit is the savings that relatively young and/or poor people have reserved for the purchase of houses in the future. Unless the capital market is perfect, therefore, a rise in the sales price relative to *chonsei* price is very likely to worsen the wealth distribution.

If the fluctuations in interest rates and the induced fluctuations in the relative house prices are cyclical, the implication about wealth distribution is temporary. If the real interest rate (and growth rate) secularly declines, however, it may permanently deteriorate the wealth distribution. In fact, the secular decline in capital productivity and real interest rates is a likely scenario in developing economies like Korea, although it may not be common in developed economies.[20] Figure 9.4, copied from Cho and Koh (1999), clearly shows the long-term declining trends of capital productivity and real interest rates in Korea for the past thirty years. In this case, the monetary authority can at least in theory prevent such an "undesirable" deterioration of wealth distribution by lowering the target inflation rate in proportion to the decline in real interest rate.

In practice, of course, it is extremely difficult to identify the components of short-term fluctuation, as opposed to secular components, from the variations of real interest rates. Given the widespread apprehension about the zero (nominal) interest rate bound, in addition, a more serious question may be how much to lower the target inflation rate in an economy with very low interest rates. That is, as the real interest rate declines toward zero, the monetary authority may have to accept either a higher discrepancy between real and financial-asset values or a higher risk of hitting the zero interest rate bound. Regarding many issues, including this thought-provoking one,

19. The recent volatility in asset prices under the stable and low inflation environment has triggered a challenge on the standard inflation-targeting framework. While a majority of economists (e.g., Bernanke and Gertler 2001; Gilchrist and Leahy 2002) still support the standard monetary-policy framework represented by Taylor rules, a group of economists (e.g., Cecchetti et al. 2000; Borio and Lowe 2002; Hahm and Hong 2003) argue that the monetary authority needs to react to asset-price bubbles in order to stabilize the economy. See Bean (2003) for this debate. Although from a quite different perspective, this chapter's result could be interpreted to provide a rationale for the monetary policy that considers asset-price fluctuations.

20. The convergence theory based on either the Neoclassical growth model (Barro 1991; Mankiw, Romer, and Weil 1992) or technology diffusion (Lucas 2000; Parente and Prescott 1994) predicts a secular decline of (capital) productivity growth rate and real interest rate.

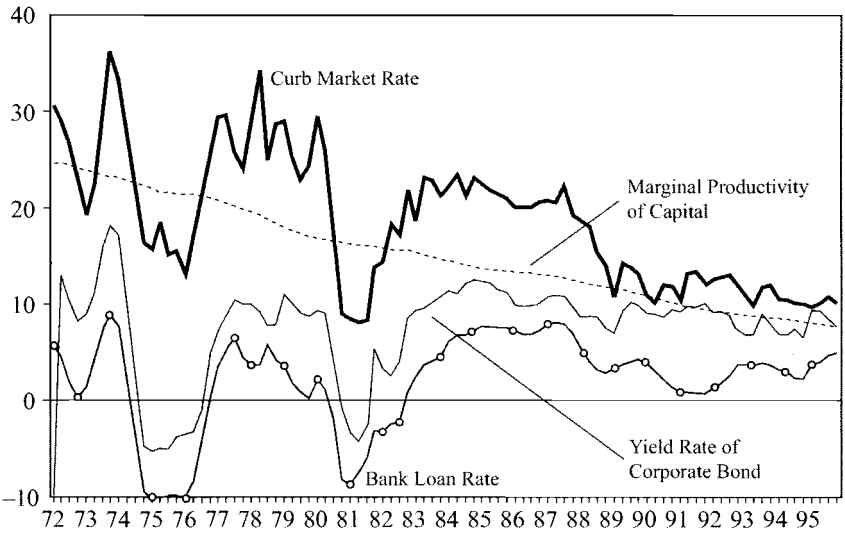

Fig. 9.4 Trends of real interest rates of Korea
Source: Cho and Koh (1999).

the chapter does not provide rigorous discussions yet, and many arguments remain at conjecture levels. No doubt that far more research is needed before drawing conclusions in this area.

Appendix A

Dynamics of the Model in the Text

The dynamics of the model in the text can be traced by solving the following three equations for C_t, H_t, and K_t:

$$\frac{\dot{C}_t}{C_t} = \frac{\dot{H}_t}{H_t} = i_t - \frac{\dot{P}_t^K}{P_t^K} - \rho = r_t - \rho = DB - \rho; \tag{5}$$

$$\dot{K}_t + \dot{H}_t = D(BK_t - C_t); \tag{6}$$

$$C_t = \frac{\alpha}{1-\alpha} \cdot \frac{R_t}{P_t} H_t = \frac{\alpha}{1-\alpha} r_t H_t = \frac{\alpha}{1-\alpha} DBH_t,$$

from the optimization of instantaneous allocation between consumption and housing expenditure. While C_t and H_t always move along the steady-

state paths (although the steady-state level of C_t can jump at the moment when a shock arrives), K_t has a transitional dynamics governed by:

$$\frac{\dot{K}_t}{K_t} = DB - [(DB - \rho) + \frac{\alpha}{1-\alpha} D^2 B] \frac{H_t}{K_t}.$$

In a steady state, therefore, these three equations yield:

$$\frac{C}{H} = \frac{\alpha}{1-\alpha} DB;$$

$$\frac{K}{H} = \frac{1}{\rho}\left[(DB - \rho) + \frac{\alpha}{1-\alpha} D^2 B\right]; \text{ hence,}$$

$$\frac{K}{C} = \frac{1-\alpha}{\alpha} \cdot \frac{1}{\rho DB}\left[(DB - \rho) + \frac{\alpha}{1-\alpha} D^2 B\right].$$

Using these results, it can be shown that a fall in either B or D decreases the steady-state values of C/H, K/H, and K/C. Finally, the aggregate saving rate at the steady state,

$$1 - \frac{C}{BK} = 1 - \frac{\alpha}{1-\alpha} \cdot \frac{\rho D}{\left\{(DB - \rho) + \left[\frac{\alpha}{(1-\alpha)}\right] D^2 B\right\}},$$

declines with a fall in B and increases with a fall in D, but the housing investment ratio to output,

$$\frac{\dot{H}/D}{DB} = \frac{\rho}{DB} \cdot \frac{1}{\left\{1 - \left[\frac{\alpha}{(1-\alpha)}\right] D \Big/ \left[\frac{1-\rho}{DB}\right]\right\}},$$

increases with a fall in B (its direction with a fall in D becomes ambiguous).

Appendix B

Variables and Data Sources

Variables		Notes	Data Sources
House prices		Since the ratio of the sales to *chonsei* prices is not available prior to December 1998, this variable was extended backward using their inflation rates of the sales and *chonsei* prices.	*Monthly House Prices,* Kookmin Bank
Nominal interest rate		Yield rate on 3-year corporate bonds.	*Monthly Bulletin,* Bank of Korea
Expected inflation rate		Obtained by annualizing forecast values for the next three years (twelve quarters) of inflation at every quarter using the structural vector autoregression estimation composed of two variables, GDP and core CPI.	Kim (1996), Cho (2003)
Real estate taxes	On holding	1. Land: aggregate land tax, local education tax, and city planning tax. 2. Building: property tax, local education tax, city planning tax, and common facilities tax.	*Annual Local Tax Statistics Report,* Ministry of Government Administration and Home Affairs
	On purchase	Acquisition tax and registration tax.	
	On capital gains	Capital gains tax, excessive holding land tax (existed during the 1991–1993 period only), and asset revaluation tax.	*Statistical Yearbook of National Tax,* National Tax Service
Total value of real estate		This variable was extended backward using their inflation rates of house and land prices, based on the total value of real estate estimated at the end of 1997 (2,500 trillion won: 1,548 trillion won for land and 952 trillion won for buildings).	*National Wealth Survey,* National Statistics Office
Effective tax rules on real estate		Ratio of the real estate tax revenues to the total value of real estate	

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Comment Toshiki Jinushi

Summary of the Paper

The chapter by Dr. Cho is inspired by the Korean *chonsei* system and analyzes the factors contributed for the divergence between its price and the house price. The *chonsei* is a special type of lease contract, in which the rentee pays the large key deposit (the *chonsei* price) on its beginning, pays no regular rent afterwards, and gets the key deposit back in the end. The rentor receives the returns on the key deposit instead of the regular rents during the lease. In Korea, the majority of the rentee is on the *chonsei* rather than the regular monthly rent contract.[1] The author explains that this system is basically the product of the imperfect mortgage markets and the rapid urbanization in Korea.

After deriving the important arbitrage condition for the *chonsei* price and the house price, the author puts the *chonsei* contract in the simple growth model with some capital-market imperfections. He analyzes how the factors, like the marginal product of the capital, the capital-market imperfections, and the inflation rate, affect the ratio between the two prices. Then, he tries to derive some lessons for monetary-policy operations from the analysis, assuming that the monetary-policy authority cares for the wealth distribution.

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1. Cho (2004) explains that the Korean GDP estimation needs extra steps in the imputed rents calculation because of the prevalent *chonsei* system.

The Arbitrage Condition

There are two arbitrage conditions, one on the house price (P^H) and the rent (R), and the other on the *chonsei* payment (P^C) and the rent:

$$P_t^H = \frac{[R_t + E_t(P_{t+1}^H)]}{(1 + i_t)}$$

$$P_t^C = \frac{(R_t + P_t^C)}{(1 + i_t)},$$

where, the nominal interest rate is referred to as i. The second condition is derived from the choice between the *chonsei* and the regular rent contract, which means $i_t P_t^C = R_t$. These two conditions imply that the relationship between the two prices is determined as follows:

$$\frac{P_t^H}{P_t^C} = \frac{i_t}{[(i_t - E_t(\pi_t^H)]}.$$

This indicates that, thanks to the *chonsei* system, we can estimate the expected capital gain of the house price (π^H) easily from the observable variables, P^H, P^C, and i. This can be very useful information for both the policy-making and the economic analysis. However, Dr. Cho focuses on another implication of this equation. This equation shows that the ratio of the house price over the *chonsei* payment would rise as the expected capital gain of the house price rises, and that it declines as the nominal interest rate declines as long as the expected capital gain (π^H) is positive.

The Two Prices in the Growth Model with Capital-Market Imperfections

Dr. Cho constructs a simple growth model, with the house stock and housing services, and with some capital-market imperfections. The utility depends on the consumption of goods and the housing services, through the Cobb-Douglas functional form. The capital stock and the housing stock are perfect substitutes. The production function is linear with constant marginal product of the capital, B. A part of the saving does not lead to the investment because of some capital-market imperfections, whose degree is denoted by D.[2]

Based on this model, the author derives the house price equation first,

$$P_t^H = \frac{P_t}{D},$$

where P_t denotes the nominal price of the ordinary good. The house price is higher than the ordinary good, because of the capital-market imperfections. Next, he puts the inflation into the model without any influences on

2. D is one when the capital market is perfect. Thus, the imperfection indicates $D < 1$.

to the real variables. Then, the *chonsei* contract is introduced into the model, represented by an arbitration condition, $i_t P_t^C = R_t$. Because the house stock and capital stock are perfect substitutes, the nominal value of the rent should be equal to the nominal value of the marginal product of the capital, so that $R_t = B \cdot P_t$. In the end, the nominal interest rate should be equal to the real interest rate plus the inflation rate.[3] The real interest rate is equal to the marginal product of the capital discounted by the capital-market imperfections, that is, $D \cdot B$. The inflation rate, π, is externally chosen by the monetary authority. These considerations lead to the *chonsei* price equation

$$P_t^C = \frac{BP_t}{(DB + \pi)}.$$

These two equations show that the ratio of the house price over the *chonsei* price rises as the marginal product of the capital, B, declines, since it lowers the *chonsei* price. The ratio also rises as the capital-market imperfections deteriorate, D declines, since the house price rises more than the *chonsei* price. The inflation raises this ratio as well since it lowers the *chonsei,* leaving the house price intact.

Policy Implications

Based on the above analysis, the author reaches to some intriguing policy recommendations. First, under the declining marginal product of the capital, the monetary authority should lower the inflation target in order to avoid the wealth transfer from the *chonsei* rentee to the house owners. Second, the monetary-policy operation should be less active than those implied by ordinary recommended policy rules like Taylor rule in order again to avoid the wealth transfer between the house owner and the *chonsei* rentee, or more broadly between the real-asset holders and the financial-asset holders.

Comments

The *chonsei* contract is fascinating. The historical and/or institutional analysis is due to clarify its origin and evolution. I also like to see the empirical analysis of its implied "capital-gain forecast" of the house prices.

This chapter is inspired by the fact that the gap between the house and the *chonsei* prices is widening recently. But, the author intends to go beyond the mere analysis of that fact and he tries to analyze the relative price fluctuations between the real assets and the financial assets in general. It is a very ambitious research goal. In addition, it reaches to the quite unique policy implications.

3. In this analysis, the author assumes that the house price moves together with the good price, so that $\pi = \pi^H$. This assumption might not reflect the real situation in Korea.

However, I have to point out that the chapter is not dealing with the key points in the debates about how the monetary policy should respond to the asset-price fluctuations. Since the author focuses on the case where asset-price inflation is equal to the general inflation rate, he ignores all the issues related to the asset-price bubbles under the mild inflation rate. Thus, this chapter says almost nothing about the recent experiences in Japan.

The compact growth model with capital-market imperfections is nice by decomposing the real interest rate into the two parts, the marginal product of the capital and the degree of capital-market imperfections. It is understandable that the capital-market imperfections are introduced since they might have generated the *chonsei* system itself. However, their interconnection is not articulated at all. I would like to see some discussion on that point rather than just referring to the *q*-theory.

On the policy recommendations of the chapter, it is notable that those are against the currently popular view that the monetary-policy operation should be more aggressive facing the risk of deflation (see Kato and Nishiyama 2003; and Ahearne et al. 2002). If monetary authority lowers the target inflation rate under the declining marginal product of the capital, as the chapter recommends, the risk of hitting the zero bound of the nominal interest rate gets higher. In addition, the less active policy operation is called for by the chapter in order to avoid the wealth transfer between the real-asset and the nominal-asset holders. If the central bank follows those recommendations, the risk of the deflation might loom up. Though that kind of transfer is serious in Korea since the total balance of the *chonsei* deposit is huge, the deflation spiral would be the more dreadful nightmare.

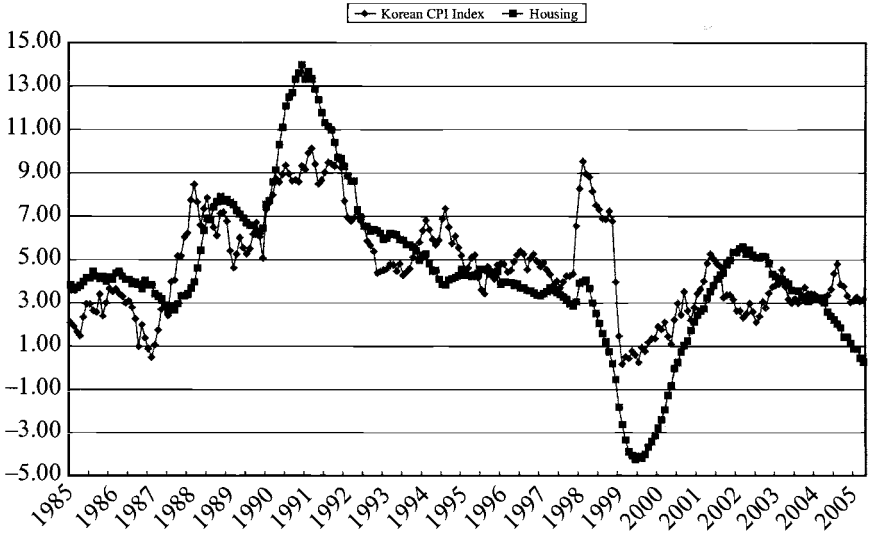

Fig. 9C.1 Korean CPI inflation: the general index and the housing index

In the end, I agree with another commenter that the *chonsei* prices are kept low recently in Korea because of the market expectations and conditions. In particular, a casual look at the Korean CPI shows that the housing part of the CPI inflation is declining recently although the general CPI inflation is picking up (fig. 9C.1). This seems to show the weak market condition for the rental housing under the strong capital gain expectation about the housing price.

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Comment

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Summary

In this chapter the author observes in recent years a divergence in relative housing prices (i.e., the ratio of sales price of a house to house rental or *chonsei* prices). Then, the author goes on to identify factors that could explain such a divergence by first developing a partial equilibrium model in which inflation rate, real interest rate, and rent are exogenously determined. This model produces equation (2), which clearly shows that the relative housing price is determined not by inflation rate alone but by the ratio of inflation rate and real interest rate. What is interesting in this result is that even if inflation rate, which can be the monetary authorities' target, remains the same, the real interest rate could decline, thereby raising the price of house relative to price of *chonsei.*

Then, the author goes on to develop a general equilibrium model that allows inflation rate, real interest rate, and house rent to be endogenously determined. The results shown in equations (8-1) to (8-4) and equation (9) yield important insights. First, the relative price of consumption good to capital (or house) is determined by the parameter D, ($D < 1$), which is a measure of capital-market efficiency. Second, real interest rate is deter-

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mined by two parameters, D and B, where B is the parameter of a linear-production function. A decrease in either D or B or both can lead to reduction in real interest rate. Third, the opportunity cost of owning a house is equal to the rent and capital gains derived from the house. And fourth, the price of *chonsei* contract is determined by the parameters B and D, inflation rate, and the price of consumption goods. In this model, one has to trace the source of the decline in real interest rate because it will have a different impact on the relative prices of house (or capital) and *chonsei.* For instance, a reduction in real interest rate caused by a decline in B will have no impact on the price of house (or capital) but will affect the price of *chonsei* in the same direction. However, if the reduction in real interest rate comes from D, then both prices rise, other things being equal; however, the former rises more than the latter.

Finally, the author develops a monetary rule that takes into account the objective of minimizing fluctuations of the relative prices of house and *chonsei,* or more generally, the relative values between real and financial assets. The results shown in equation (12) suggest that monetary authorities concerned with the relative asset prices should react to output fluctuations less actively than they should by just using the traditional Taylor rule.

Comments

1. In most countries, the housing rental contract involves the amount of monthly rental and security deposit (typically equivalent to one month).[1] The housing rental contract in Korea, however, is entirely different. Under the *chonsei* system, a renter pays a lump-sum deposit for the entire lease period and gets back this deposit at the end of the contract period. However, interest earned from such deposit accrues to the homeowner, which in effect is his rental income. Given the uniqueness of this contract, I suggest that the author provides more information about this system, including its origin, legal framework, and tax incentives. Housing-market analysts and observers would certainly want to understand why it exists only in Korea and why some people choose it over straight purchase of a house.

2. I suggest that the author indicates which interest rate is used in figure 9.4 in the same manner for figure 9.3B.

3. The author was motivated by the growing divergence of house price and *chonsei* price in recent years, as shown in figures 9.1A and 9.1B, which was brought about mainly by the continuing rise of house price and a flat growth rate in *chonsei* price. The result of the author's model, specifically equation (2), predicts that as long as the real interest rate declines faster than the inflation rate, then the price of house relative to *chonsei* will increase, which indeed is borne out by the data in recent years. However, one has to look much further back to see if the result predicted by the model is robust. This can be done by looking at figures 9.3A to 9.3C. As shown, de-

1. Sometimes, landlord asks for one or two months advance in rental.

spite the decline in real interest rate and expected inflation rate in the 1990s, the ratio of house price to *chonsei* price continued to decline, which contradicts the prediction of the model.

4. This brings us to an important point; that is, the behavior of relative prices in recent years could have been affected by other factors. Consider this: when real interest rates decline to a certain level, it would make it attractive for households to buy their own house by borrowing from a bank rather than by continuing to rent an apartment or house. Given the vastly improved condition of the Korean banking system in recent years after KAMCO successfully cleaned up their bad debts, banks could have started providing mortgage loans, which could have explained the construction boom Korea experienced in recent years. At the end of 2002, the average NPL ratio of commercial banks stood at 1.9 percent, which was even lower than the pre-crisis level of 3.9 percent. If the banking system had indeed resumed lending in recent years after cleaning up their NPLs, then they might have been looking for low-risk borrowers with good collateral that will not require huge provisioning. Obviously, banks would favor those who borrow to purchase a house than those borrow to rent a house according to the *chonsei* contract. Landlords could have reacted by freezing the *chonsei* price so as not to lose their customers.

5. I have some misgivings about asking monetary authorities to be concerned about relative prices. They already have problems choosing which price index to monitor to calibrate their monetary policy. One of the author's rationale for including the relative asset prices in the Taylor rule is that uncertainty about the relative asset prices will likely shrink financial transactions and economic activity. It is not clear if this is the case. What is clear, though, from the Korean data is that the increase in relative prices between house and *chonsei* price in recent years has been associated with a construction boom. The other rationale put forward by the author is that the wealth redistribution between real asset holders and financial asset holders itself incurs a cost to society. I think this issue can be better addressed by fiscal policy rather than by monetary policy.

6. The parameters B and D play a crucial role in the model. The author in fact noted that the marginal productivity of capital in Korea has been declining, and this decline is associated with declining real interest rate. In this situation, if the monetary authorities are concerned with fluctuations in relative prices, then they should also lower the target for the inflation rate. Granting that B has changed over time, then I must also ask if D has changed over time, which the author has not touched upon. Given B, the only case in which real interest would decline is when D decreases. However, I suspect that with liberalization and deepening of the Korean financial system, D could have also improved, which could lead to a reduction in relative prices. So, policies aimed at improving capital-market efficiency will have beneficial impacts on relative prices.