An Econometric Analysis of the Seoul Office Market Dynamics

by

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B. S., Architectural Engineering
Seoul National University, 1987

Submitted to the Departments of Architecture and Urban Studies and Planning
in Partial Fulfillment of the Requirements for the Degrees of

Master of Science in Real Estate Development

and

Master in City Planning

at the
Massachusetts Institute of Technology
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ABSTRACT

This thesis applies a structural econometric model to the Seoul Office Market to forecast cyclic trends of rent and office space supply. The model consists of two simultaneous equations. The first equation explains office rent by past rent, office employment, and the stock of office space. The second equation explains new office supply by rent and office employment growth.

Empirically, the model was tested against the data of the Seoul office market since 1974. The estimated rent equation suggests that rent seems to be fully explained by the immediate past rent, current office employment, and current office stock in the Seoul economy – but only when the previous rental boom in the late 1970s is accounted for with the effect of governmental land use policy. On the other hand, the estimated construction equation suggests that new office supply can be well explained by rent and office employment growth, both lagging long six years. The long lag implies that investors have expected current conditions to prevail in the future, a myopic expectation. This myopic expectation can generate market volatility because by the time a space enters the stock, market conditions have changed.

Using the estimated model, ten-year contingent forecasts are made based on three scenarios having different estimated office employment growths. The forecasts for both rent and new supply demonstrate similar cyclic movements in all of the scenarios. In short, the Seoul office market, strongly impacted by the negative economic shock started in late 1997 and the large supply of office space in the 1990s, seems to remain soft or tight for two to three years before rent moves upward and supply reacts. By the middle of the 2000s, however, the market will be fully recovered from the economic shock and it will move toward a strong market.

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ACKNOWLEDGEMENTS

This thesis would never have been completed without the support and guidance of many people around me. I would like to show my sincere appreciation to the following people:

My thesis adviser, Professor William C. Wheaton, who is the original developer of the structural econometric model for commercial real estate, for his guidance from the beginning to the end with his wisdom and intellect, especially for his sincere encouragement throughout the thesis session;

My thesis reader, Professor Lawrence Bacow, Chancellor of MIT, for his valuable comments and advice;

Everyone who helped me in collecting the data for the thesis, in particular, Professor Ju-Hyun Cho at Kun-Kook University and Professor Mack-Joong Choi at Han-Yang University for their precious advice and information;

My parents and my parents-in-law for their continuous support both mentally and financially. I am deeply indebted to them;

My children, Sun-Yeon and No-Hyeon, for the patience and joy they gave to my life;

and my wife, Mi-Ai Lee, who really makes my study and research possible, for her continuous mental support and patience. I dedicate this to her and my children with my thanks and my love.

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CHAPTER 1
INTRODUCTION AND THESIS OUTLINE

1.1 Introduction

Real estate has long been the most popular investment for the Korean people who are mostly born as descendents of farmers. Having historically lived in the agricultural country, the Korean people have long believed that agriculture is the foundation of the Earth. For farmers, land is the center of life, and the resource for production and consumption. This popularity for land, or real estate, has been fortified by the high appreciation of land prices during the 1970s and the 1980s. From 1974 to 1991, the land price index in Seoul increased for 17 consecutive years.[1] It multiplied by 37 times and the average annual rate of return was 26.5 percent. Anyone who bought property - regardless of location, timing, and a type of product - could create a significant amount of fortune even without a rational decision or a professional feasibility study.

But this rapid appreciation seemed too high to be justified through any underlying fundamentals. In fact, this bubble burst after the peak in 1991 and the land value continued to depreciate in the 1990s. Even worse, the economic crisis in Korea started in late 1997 and fueled a more rapid depreciation in 1998.

And today, the Korean real estate market is in the middle of a revolutionary change. With the new "Foreigners' Land Acquisition Act" effective in June 1998, foreigners – including nonresidents and corporations – can acquire land with the same rights as Koreans. They add a new and important variable to the demand side of the Korean property market. Furthermore, to liquidate non-performing loans held by financial institutions, the Government is now trying to create a new system for Mortgage Backed Securities (MBS). Also, to promote the demand for property, it is trying to create a new system for Real Estate Investment Trusts (REITs).

[1] In real, as opposed to nominal, terms, the land price index for Seoul depreciated from 1979 to 1981 during the same periods.

These changes will reshape the Korean property market completely. In addition to existing private players, new public players – for example, MBS investors, REIT managers, and foreign institutional investors – will continue to participate and increase their shares in the property market. As REIT managers and MBS investors are a part of the capital market, the fundamental economic factors affecting the capital market will simultaneously influence the property market too. As they invest in property not speculatively but rationally, professionals in the real estate consulting business will be required to provide a more comprehensive and rational service for their clients. Public market players, including foreign institutional investors, will be mainly interested in commercial properties such as prime office buildings, shopping centers, and hotels.

In spite of the increasing demand, there are a few studies about the Seoul office market, but even they have been restricted by the absence of information on rental rates. Without systematic data about rents, the research hardly expands to the demand characteristics of the property market.

In this emerging context, I had two major questions in the beginning of this study. First, how the Seoul office market behaved in light of the general belief that real estate had experienced a huge appreciation during the past. Second, how the office market will recover from the major downturn that was fueled by the recent economic recession.

In this thesis, I begin with a historical rental index to examine the behavior of the Seoul office market. Then, to foresee the future trend of the market, I have constructed a structural econometric model and estimated structural equations for office space supply and rental movement using the historical data of the Seoul office market. My use of the econometric model is influenced by what DiPasquale and Wheaton (1996) have written about such econometric forecasting:

> Contingent econometric forecasting of local real estate markets offers important advantages over a more intuitive analysis.[2] The systematic collection and analysis of historical data, for example, frequently reveals which economic factors drive both the demand for property as well as new building construction. Often this can yield new insights into the operation of local property markets. Contingent forecasting also provides a range of outcomes that can depict the future degree of risk or uncertainty that is likely in a particular market. More widespread use of such analysis would probably help to stabilize some of the cyclical fluctuations that occurred in the past. (p. 293)

I also believe in the benefits of understanding real estate investment behavior as a tool for forecasting. This study could help potential real estate investors in their rational decision-making by enhancing the understanding of the Seoul office market. At the same time, office owners will benefit not only in projecting future rental income flows but also in valuing their buildings with a rational forecast of the future. Overall, this study can be useful in understanding the fundamentals that drive the Seoul office market and in forecasting the future behavior in a rational manner in order to reduce the uncertainty of the future.

[2] In macroeconomics, the term contingent forecasting refers to a forecast of one sector (e.g., office) given the economic outlook for the overall economy. Here the term is used similarly: a metropolitan office market forecast given the area's expected economic growth and conditions.

1.2 Thesis Outline

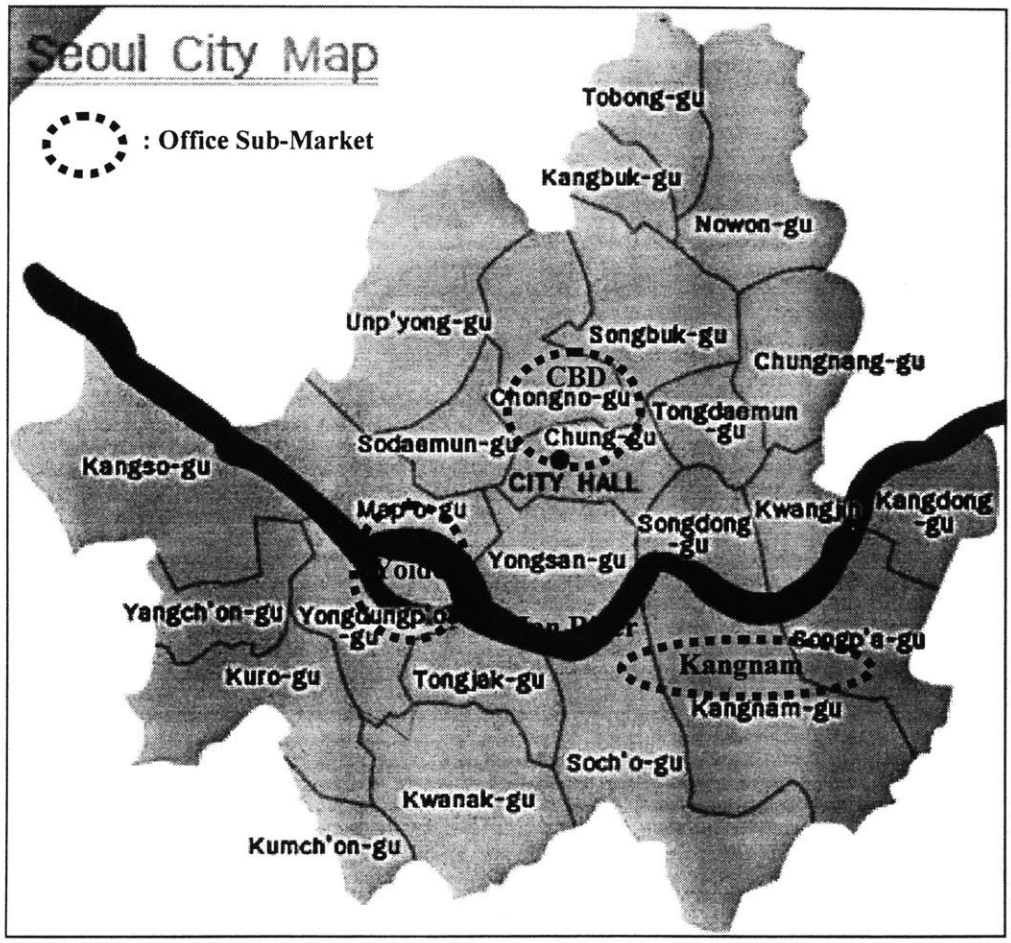
The thesis is comprised of 6 chapters. CHAPTER 1 explains the current situation of the Seoul office market, and introduces the necessity and practical use of this study. CHAPTER 2 reviews the historical trends of the key characteristics of the Seoul office market - rent, supply, office employment, maintenance and operating fees, vacancy, ownership of office building, lease structure, and lease term – for a brief understanding of the market. Also the historical comparisons of rent and land price are conducted. CHAPTER 3 reviews the previous studies on the dynamic models of the office market. It also reviews the previous studies on the Seoul office market, and evaluates methods used in those studies. In CHAPTER 4, after describing the data used in this study, two equations that determine rent and construction are proposed and tested empirically. In CHAPTER 5, using the model developed in chapter 4, the cyclic movements of both rent and new supply are forecasted based on three scenarios having different estimated office employment growths. CHAPTER 6 concludes the thesis with a summary of empirical findings, the office model, and forecasts.

CHAPTER 2
HISTORICAL TRENDS IN THE SEOUL OFFICE MARKET CHARACTERISTICS

2.1 Definition and Historical Development of the Seoul Office Market

The geographic area for this study consists of the City of Seoul, which comprises 25 *Gus* (wards) and 530 *Dongs* (villages) as administrative divisions. Seoul, capital of the Republic of Korea, is home to roughly 10.4 million people (by the end of 1997), representing over 22 percent of the entire county's population, and encompasses 605.52 square kilometers. It is located on the downstream of the *Han* river, which runs across the central part of the Korean peninsula.

Figure 2.1



Upon the founding of the *Chosun* Dynasty, Seoul became the capital of Korea in 1394. The founding King, *Yi Song-Gye,* built royal shrines and palaces, as well as a fortified wall surrounding the capital. The administrative area of the capital was broken down into the five inner-wall zones of North, South, East, West, and the Center; and the outer-wall zone of 4 kilometers all around. The function of these zones was comparable to today's *Gu*s. Historical records from the tenth year of King *Sejong*'s reign (1428) show the population reached 103,328 inside the wall and approximately 110,000 including those on the outside. Then for roughly 200 years, from the 1660s on, the population of Seoul remained close to 200,000. Toward the end of the 19th century, however, the population began to increase as the opening of the nation to foreign countries and establishment of foreign missions in Seoul gave the city its first cosmopolitan touches. Following the annexation of Korea by Japan in 1910, Seoul was renamed *Kyongsong*. In 1936 its population stood at 730,000. With its national liberation on August 15, 1945, the city was given the official name of Seoul, which is derived from an ancient word meaning "Capital". In 1946 Seoul was upgraded to the status of a special city placed directly under the control of the national government. The jurisdictional area of the capital was expanded to 269.73 square kilometers in 1949, when the city had nine *Gu*s and a population of about 1,400,000. Under a special legislative measure enacted in 1962, the Seoul Metropolitan Government was put under direct control of the Prime Minister. This act enabled Seoul to develop into an autonomous administration separated from supervision by the national government. The administrative area of the capital city was again expanded to 593.75 square kilometers in January 1963, and even further to 605.30 square kilometers in March 1973 (the Seoul Metropolitan Government, 1999, Online).

The southern part of Seoul, south of the *Han* river including *Yoido* and *Kangnam*, has been extensively developed in order to meet the increasing demands for urban expansion in the 1970s. Therefore, although office development in Seoul started from the central business district (CBD) and it had accounted for over 80 percent of total office stock until the 1970s, the newly developed *Yoido* and *Kangnam,* and the established CBD

equally contributed to the growth of the office market during the 1980s. But *Kangnam* dominated the new office supply in the 1990s (Choi, 1995).

Currently Seoul has three major office sub-markets: the CBD (a historic heart of the city consisting of *Chung-Gu* and *Chongro-Gu*); *Yoido* (*Youngdungpo-Gu* and *Mapo-Gu*); and *Kangnam* (including *Kangnam-Gu, Seocho-Gu,* and *Songpa-Gu*). They account for 82.6 percent of all space of office buildings with 6 and more stories: 37.4 percent of total office space is located in *Kangnam*; 27.6 percent in CBD; 17.6 percent in *Yoido*; and 17.4 percent in other districts (Choi, 1995).

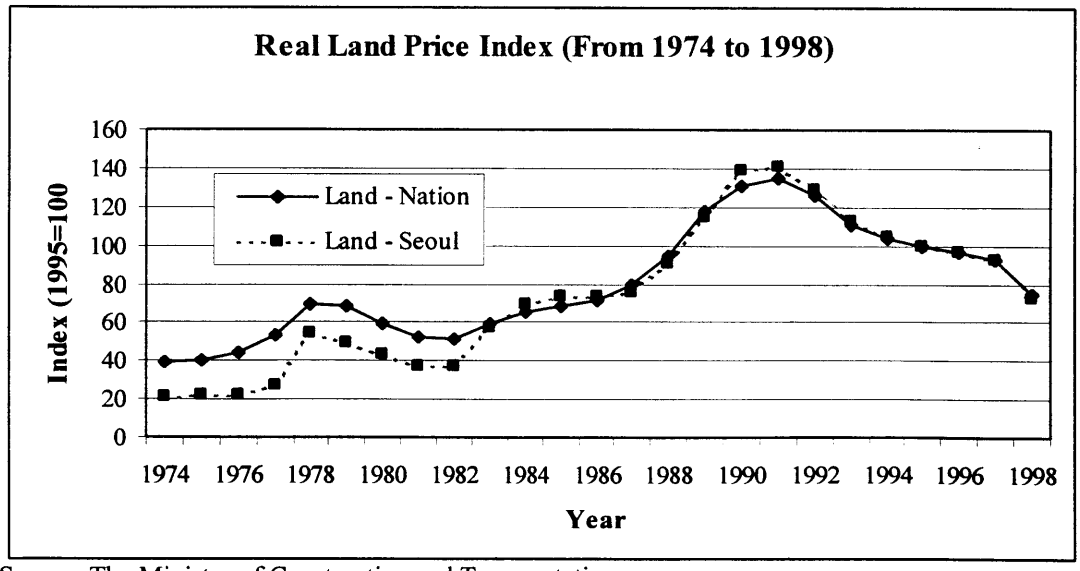
Major tenants in the CBD are financial institutions, the national government, various embassies, and headquarters for the *chaebol*s. Those of *Yoido* consist of financial institutions, information and communication companies. *Kangnam*, on the other hand, consists of headquarters of manufacturing companies and financial institutions (Heo, 1998).

2.2 A Historic Movement of the Land Prices in Seoul and Korea

Using the land price index from the Ministry of Construction and Transportation, the movement of land prices can be analyzed.[3] From 1974 to 1998, land prices both in Seoul and Korea have appreciated dramatically, especially in the 1970s and 1980s. In Figure 2.2 showing the movement of the real land price indexes in Seoul and Korea, two interesting facts can be observed.

First, land prices increased more than inflation during the study period. But the whole picture changed during 1991, when land prices plummeted from their real and nominal historic peaks. From 1974 to 1991, the land price in Seoul increased 6.7 times and that in Korea increased 3.4 times. During the whole study period, land prices increased 3.4 times in Seoul and 1.9 times for the whole country. By contrast, after 1991, land prices continuously decreased. In seven years, land prices both in Seoul and Korea dropped by almost half in 1991.

Figure 2.2

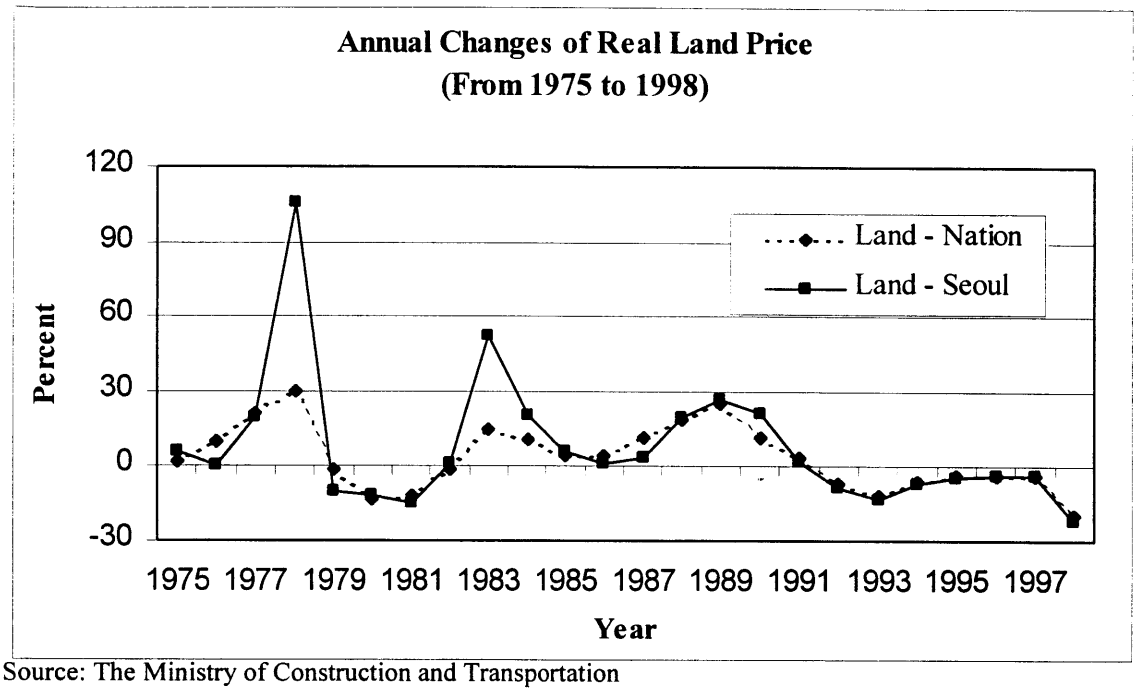


Source: The Ministry of Construction and Transportation

[3] The Land Price Index is the so called *Gong-Si-Ji-Ga*, which is based on appraised values and is publicly announced by the Ministry of Construction and Transportation.

Second, the movements of land prices in Seoul and Korea were closely related to each other and they have a high correlation coefficient of 0.98.[4] However, between the two sub-periods or the pre- and post 1991 period, the latter has a higher correlation coefficient of 0.999.

Figure 2.3



Source: The Ministry of Construction and Transportation

In Figure 2.3, the changes of the real land prices both in Seoul and Korea demonstrate cyclic movements. During the study period, there were three peaks with five to six-year cycles: 1978, 1983, and 1989. However, in the 1990s, the cycle is not clearly noticeable. The annual changes in Seoul and Korea also closely related with a correlation coefficient of 0.82.

[4] The correlation calculation returns the covariance of two data sets divided by the product of their standard deviations. We can use the correlation coefficient to determine whether two ranges of data move together - that is, whether large values of one set are associated with large values of the other (positive correlation), whether small values of one set are associated with large values of the other (negative correlation), or whether values in both sets are unrelated (correlation near zero).

Table 2.1 Comparison of the Annual Changes of Land Price in Korea and Seoul

Description		Nominal Value		Real Value	
		Korea	Seoul	Korea	Seoul
Annual Changes (%)	**Total**	**12.9**	**17.6**	**3.4**	**7.7**
	1975 – 1979	30.6	44.3	12.3	24.2
	1980 – 1989	14.5	18.6	6.3	10.4
	1990 – 1998	1.4	1.6	-4.7	-4.4
Standard Deviation (%)	**Total**	**14.3**	**29.5**	**12.5**	**25.9**
	1975 – 1979	10.7	46.7	11.8	41.7
	1980 – 1989	8.6	16.4	11.7	18.9
	1990 – 1998	9.5	12.6	8.1	11.0

Source: The Author

In Table 2.1, the land price in Seoul increased 7.7 percent per year for 25 years, in real terms, which is more than double that of the whole country. The land price in Seoul has a standard deviation of 25.9, which is significantly higher than the 12.5 of Korea as a whole. Therefore, the land price in Seoul more appreciated than Korea, while it was more volatile or risky in terms of security. In a per decade analysis, the 1970s had the highest returns (e.g., 24.2 percent in real value in Seoul) and they were the riskiest (a standard deviation of 41.7). On the contrary, the 1990s had the lowest returns (minus 4.4 percent) and they were the most stable (a standard deviation of 11).

In short, land prices both in Seoul and Korea have increased rapidly during the study period, especially in the 1970s and 1980s. Conversely, in the 1990s, they have decreased. They were more volatile in the 1970s than in the 1990s.

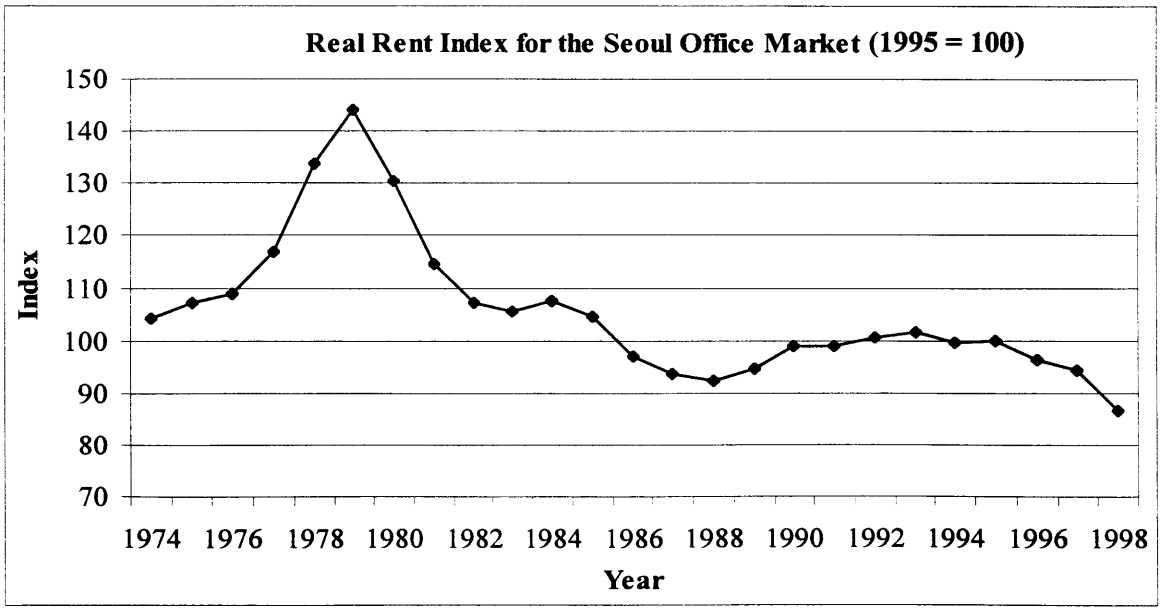
2.3 Rent

Rent generally consists of two components: a payment made by a tenant at specified intervals (usually monthly) in return for the right to occupy or use the property; and an interest (or investment return) for a deposit earned by a landlord during the term of a lease. Rent is a major determinant for the value of a property. The value of a property can be estimated by dividing rent by a capitalization rate.

2.3.1 Historical Rent Index

For this study, a Seoul office rent index for 25 years (from 1974 to 1998) was developed by the author by combining the rent growth data from the Korea Chamber of Commerce and Industries (KCCI) and the study by Um (1988).[5] Then the real (inflation-adjusted) rent index is constructed from the constant value that is based on 100 in 1995.

Figure 2.4

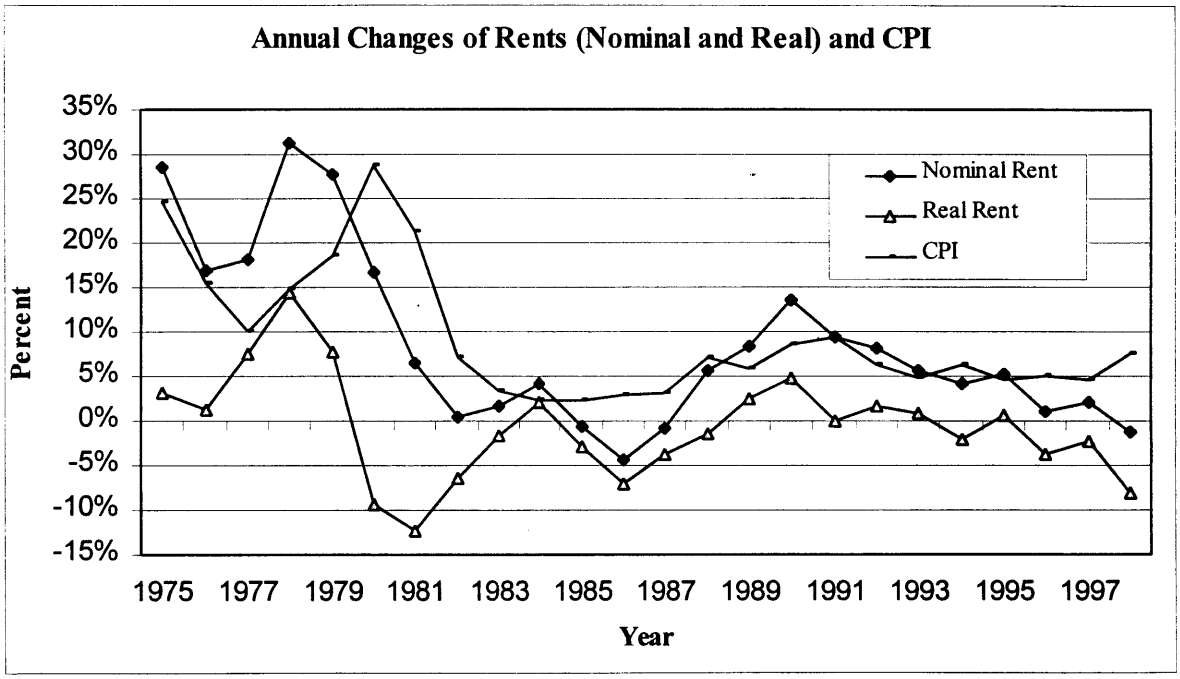


Source: Refer to the Text.

[5] Refer to Section 4.1.1 for the detailed methods for the development of the index.

In the index for the recent 25 years, the highest rent was 143.9 in 1979. While this high rent can be hardly explained by any economic reason, the driving factor might be the mental impact caused by the new governmental policy. According to Choi (1993), from 1977 to the early 1980s, the government prohibited all new development north of the *Han* River, which includes the major office district, for purposes of decentralization of Seoul and national defense. Therefore, rent steeply increased in the beginning of this period (in 1978 and 1979), but soon it fell down to a normal level. Rent was stable in the 1980s and 1990s except for the current decreasing trend caused by the negative economic shock in 1997.

Figure 2.5



Source: The National Statistical Office of Korea (CPI) and the author (rents).

In Figure 2.5, we can clearly notice the cyclic movement of the annual changes of the rent. During the study period, there were three peaks with six-year cycles and the amplitude of the first cycle is noticeably greater than that of the others. But after the peak in 1990, rent changed little until the economic crisis in 1997 pushed it downward. During the study period (from 1975 to 1998), nominal rent has increased on an average of 8.7

percent per year, while the Consumer Price Index (CPI) has increased on an average of 9.3 percent annually. Thus real rent decreased 0.6 percent annually. Especially, from the 1970s to the early 1980s, real rent fluctuated a lot more than in the mid-1980s and the 1990s. Because of the recent economic crisis, real rent in 1998 decreased 8.2 percent.[6]

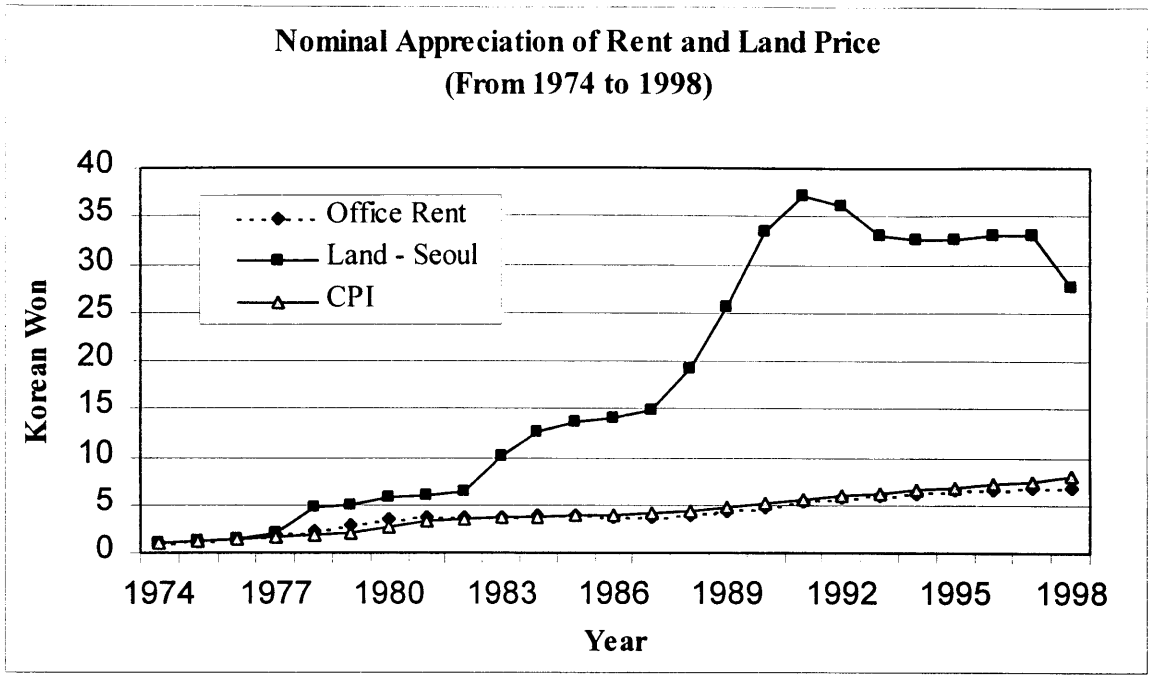
The calculation of correlation between the nominal rent index and the CPI shows that rent is positively correlated with the inflation. The calculated correlation coefficient during the recent 25 years is a high 0.985. This high correlation suggests that owners of Seoul office buildings have regarded the rent as a hedge against inflation.

2.3.2 A Historic Comparison of Rent and Land Price in Seoul

During the study period, in real terms, rent in the Seoul office market depreciated, while the land price in Seoul has significantly appreciated. Figure 2.6 compares what the annual nominal values of rent and land price would be, with the assumption that in 1974, the values are at one Korean *Won* each. After 25 years, in 1998, the nominal land price in Seoul would be 27.7, compared to 6.7 Korean *Won* in rent. As Figure 2.7 indicates, even in real terms[7] the land price in Seoul was 3.4 Korean *Won*, while rent was surprisingly 0.8 Korean *Won*. In both nominal and real terms, the annual land price in Seoul always outperformed rent.

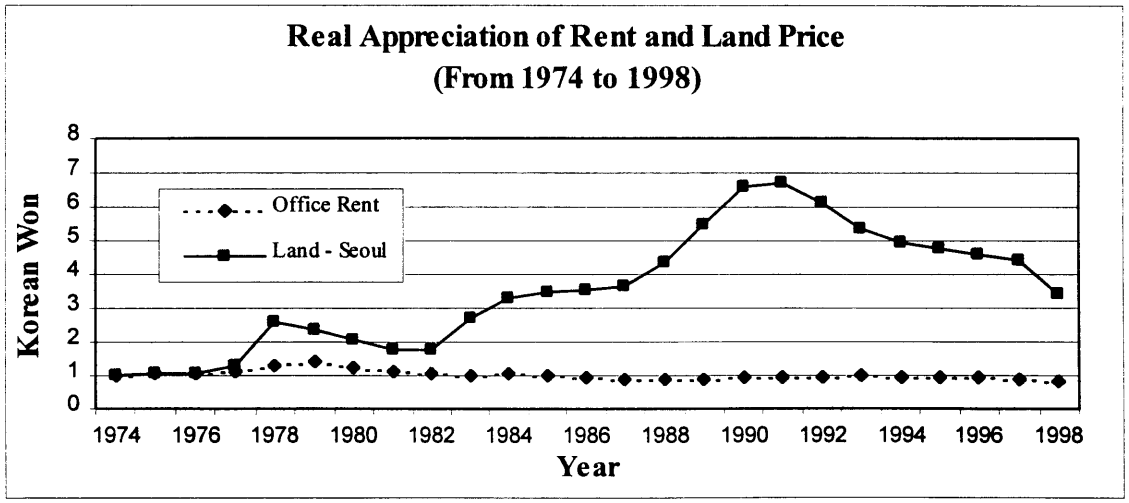
[6] Rent changes were measured at the end of June of each year. Therefore, the annual percent change of 1998 is measured from June 1997 to June 1998.
[7] Nominal values were discounted by the Consumer Price Index.

Figure 2.6



Source: the National Statistical Office of Korea

Figure 2.7



Source: The National Statistical Office of Korea

Table 2.2 shows the average annual changes and standard deviations of real rent and real land price in Seoul. Rent decreased 0.6 percent per year, while land prices increased 7.7 percent. The standard deviation of rent in Seoul also was significantly less than that of land.

Table 2.2 Comparison of the Annual Changes of Real Rent and Real Land Price in Seoul for 25 years (from 1975 to 1998)

Description	Average Changes (%)		Standard Deviation (%)	
	Rent	Land Price	Rent	Land Price
Total	**- 0.6**	**7.7**	**5.8**	**25.9**
1975 - 1979	6.8	24.2	4.5	41.7
1980 - 1989	- 4.0	10.4	4.5	18.9
1990 - 1998	- 0.9	- 4.4	3.5	11.0

Note : The average changes shown are arithmetic averages of annual percentage changes. The arithmetic averages are higher than compound annual changes over the period.

2.3.3 Why did real rent decrease, while land price increased so substantially?

For 25 years (from 1974 to 1998), while the CPI increased 8.1 times, nominal rent only increased 6.7 times. As the CPI increased more than nominal rent, it is noteworthy that the real rent decreased to 0.8 times. During the same period, real land price in Seoul increased 3.4 times. In an income valuation approach, the value of a property can be obtained from rent divided by a capitalization rate. Since the value of a property and its rent value are in a positive relation, one would assume that rent should also increase if the property value increases and a capitalization rate is assumed to be equal. As land price is a portion of overall property value, an interesting question occurs: Why did real rent decrease, while land prices increased so substantially? There are at least two plausible scenarios.

One possible explanation for why rent and the land price index might move differently is that the building density or Floor Area Ratio (FAR) in Seoul has significantly

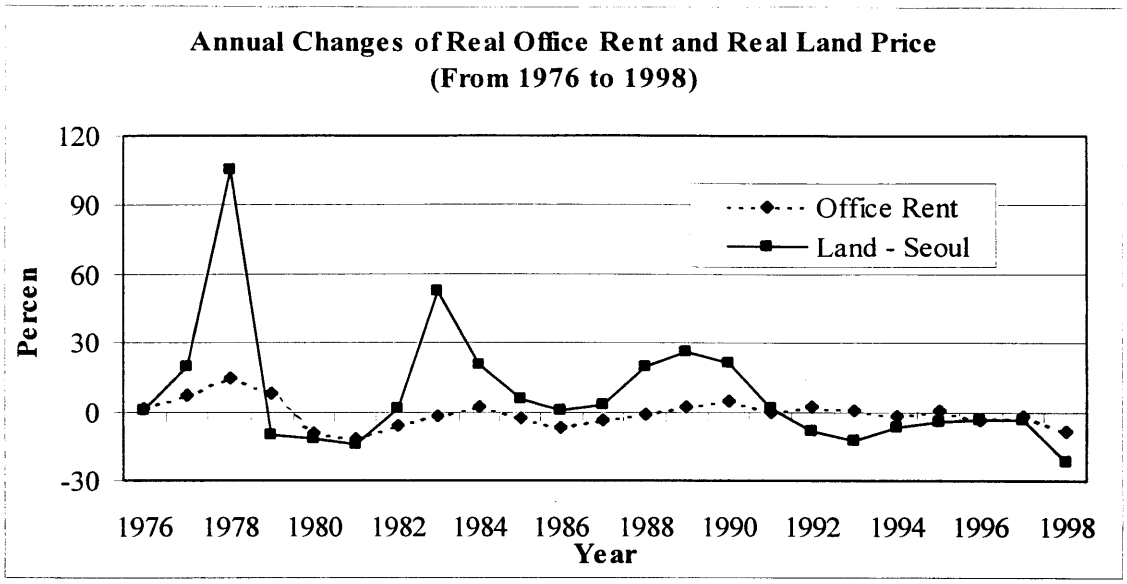
increased during the study period. Total rental income of a building is simply rentable floor area multiplied by unit rental rates. If a FAR of land increases, then, all else being equal, the expected rental income from the land increases also. Thus without change of rent, the land price can increase due to an increase of FAR. Even though the historical data for FAR in Seoul has yet to be compiled, the increase of the FAR during the study period can be easily implied from the many high-rise buildings developed during the 1970s and the 1980s.

A second explanation is that operating costs for office buildings decreased over time because economies of scale for the management of office buildings have increased. The return for an investment is a profit divided by an investment and the profit is total income minus operating costs. Furthermore, operating costs can be reduced when economies of scale increase. According to Choi (1995), over the study period, the average area of office buildings in Seoul has increased from 4,850 square meters in 1975 to 6,234 in 1994. Thus, the economies of scale should have increased.

2.3.4 What causes the different amplitudes between the cycles of rent and land price?

Another interesting question comes from the comparison of the annual growths of real rent and real land price. As in Figure 2.8, annual changes of real rent and real land price demonstrate similar cyclic movements and they are closely correlated with a correlation coefficient of 0.62, while the amplitude of land price is significantly large. The gap between two amplitudes increases especially when the land price and the rent move upward. What causes the different amplitudes between the cycles of rent and land price?

Figure 2.8



Source: The National Statistical Office of Korea and the Author's Calculation

This can be well explained by the concept of the elasticity of supply. In microeconomic theory, the price fluctuates more in a given change of demand when the elasticity of supply is less or the slope of the supply curve is steeper. As the supply of the land is limited, if the reclamation of sea and the change of land uses are ignored, land has a zero elasticity of supply or it has a perfectly vertical supply curve. Even though the elasticity of the supply of office space is very small in the short run, it makes reasonable increases in the long run. Therefore, in a given change of demand, it is expected that the price of land fluctuates more than rent.

2.3.5 Ownership

According to DiPasquale and Wheaton (1996), in 50 U.S. metropolitan areas in 1991, the space in owner-occupied buildings accounts for 32 percent of the office space market, with the other 68 percent owned by someone other than an occupant. However, not all of the space in an owner-occupied building needs to be used by the owner.

According to the Seoul office study by Heo (1998), among office buildings with 10 or more stories in three major office sub-markets, 6.1 percent of the office spaces is exclusively used by the owner, 46.2 percent is occupied by the owner and tenants, and 47.7 percent only for rent. Thus, buildings occupied by owners in part or in whole account for a high 52.3 percent of Seoul office space, compared to 32 percent of the U.S. office space.

Table 2.3 Ownership and Occupant Status in Major Office Sub-Markets

Description	*CBD*	*Yoido*	*Kangnam*	*Total*
Owner Only	7.3 %	7.3 %	2.8 %	6.1 %
Owner + Rent	45.5 %	56.1 %	36.1 %	46.2 %
Rent only	47.2 %	36.6 %	61.1 %	47.7 %
Total	100.0 %	100.0 %	100.0 %	100.0 %

Source: Heo (1998)

2.3.6 Lease Structure

Historically, it has been very difficult for developers or investors to secure long-term financing for either property acquisition or development in Korea. Even when they secure it, the loan to value (LTV) ratio typically does not exceed 50 percent of the property's appraised market value. With limited financing options, they usually turn to the commercial leasing market to cover their financing obligations. There are two prevailing lease structures in the office leasing market.

The first leasing structure is that tenants make one single deposit payment prior to occupation of the premises, which is refunded without interest to the tenants in full upon expiration of the lease: the so-called *Chonsei*. Under the *Chonsei* system, the tenant is not liable for monthly rent. The imputed rent is the interest (or investment return) for the deposit earned by the landlord during the term of the lease.

Another prevailing lease structure is that tenants make a combination of a one-time deposit and a monthly rent payment, or the *Walsei* system. The deposit is returned upon expiration of the lease. Generally, the amount of deposit is ten months of rent. However, Heo (1998) found that the ratio of deposit amount to monthly rent varies according to the office sub-markets and the type of owners. His study shows that the average ratio of deposit is 14 months of rent among three dominant Seoul office sub-markets.

According to the survey of the KCCI (Sep, 1997), the *Walsei* system accounts for 79.5 percent of office lease and the *Chonsei* system accounts for 17.9 percent. The *Chonsei* system, however, is preferred by the owners of newly developed office buildings in the *Kangnam* area, while the *Walsei* system is used to the owners of traditional office buildings in the *Kangbuk* area.

2.3.7 Lease Term

The lease term is simply the length of a lease. Table 2.5 shows the distribution of lease lengths from a stratified random sample of 150 office leases per year in Seoul that were surveyed in the 1990s by the KCCI. The lease term has lengthened over time. In 1997, a short lease length of 1 year or less accounted for 61.7 percent; a length over 1 year to 2 years accounted for 26.8 percent; and a length over 2 years accounted for 11.4 percent. Although the office lease length in Seoul has significantly increased from the KCCI's first survey in 1984 (a lease length of 1 year or less accounted for 98 percent), it is still much shorter than in the U.S.

Table 2.4 Changes of Office Lease Term in Seoul in 1990s

Lease Period	*1992*	*1993*	*1995*	*1997*
1 year or less	83.3%	69.5%	65.8%	61.7%
Over 1 year to 2 years	9.8%	22.9%	21.5%	26.8%
Over 2 years	6.7%	7.6%	12.7%	11.4%

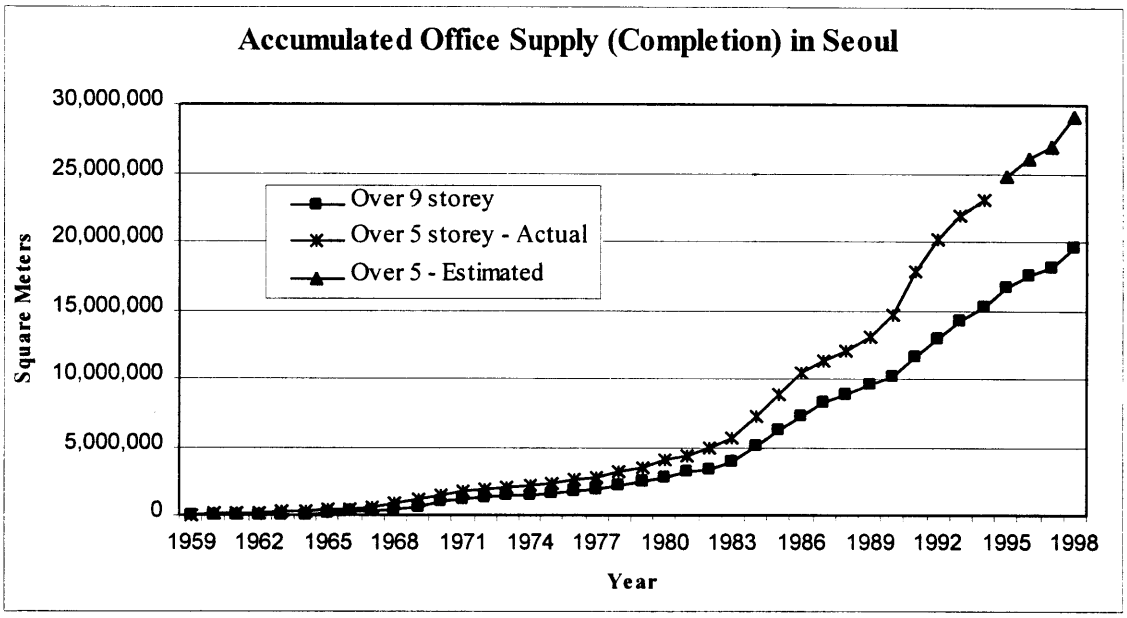
Source: The KCCI

The recent trend toward a longer lease term is desirable for a number of reasons. Both owners and tenants can reduce risk from a severe future rent fluctuation, which will help owners get permanent financing for their buildings as they will have more concrete future cash flows to be appreciated by lenders. Both owners and tenants also benefit from the reduction in costs and time of the re-negotiation of the lease or the extensive search for a new office. If the average lease length were, for example, two years, then half of all leases would expire each year, creating quite a large pool of tenants who potentially might move.

2.4 Supply of Office Space

For the last 40 years, the Seoul office market has experienced an explosive growth. According to *Shinyoung*,[8] by May 1998, the total space of office buildings over 9 stories in Seoul reached 20 million square meters in 1,037 buildings. This figure represents a dramatic increase - 3,432 times in space and 1,037 times in the number of buildings - from a mere 5,719 square meters in one building in 1959. Also, the estimated[9] stock of office buildings over 5 stories reached 29 million square meters in 1998, which increased 471 times, compared to 62,000 square meters in 1959.

Figure 2.9



Source: Over 5 stories – The Korean Fire Protection Association[10] (up to 1994)
Over 9 stories – *Shinyoung* Co.
Note: Areas over 5 stories from 1995 to 1998 are estimated.

[8] *Shinyoung* is a Korean real estate service and development company that maintains a comprehensive database for the Seoul office market.

[9] Areas over 5 stories from 1995 to 1998 are estimated by a regression analysis. Refer to Section 4.1.2 for detailed estimation methods and statistical results.

[10] The Korean Fire Protection Association (KFPA) conducts a mandatory inspection for fire protection systems and facilities for the specific buildings, including office buildings over 5 stories, in compliance with the "Law on Indemnity for Fire Losses and Fire Insurance Contract."

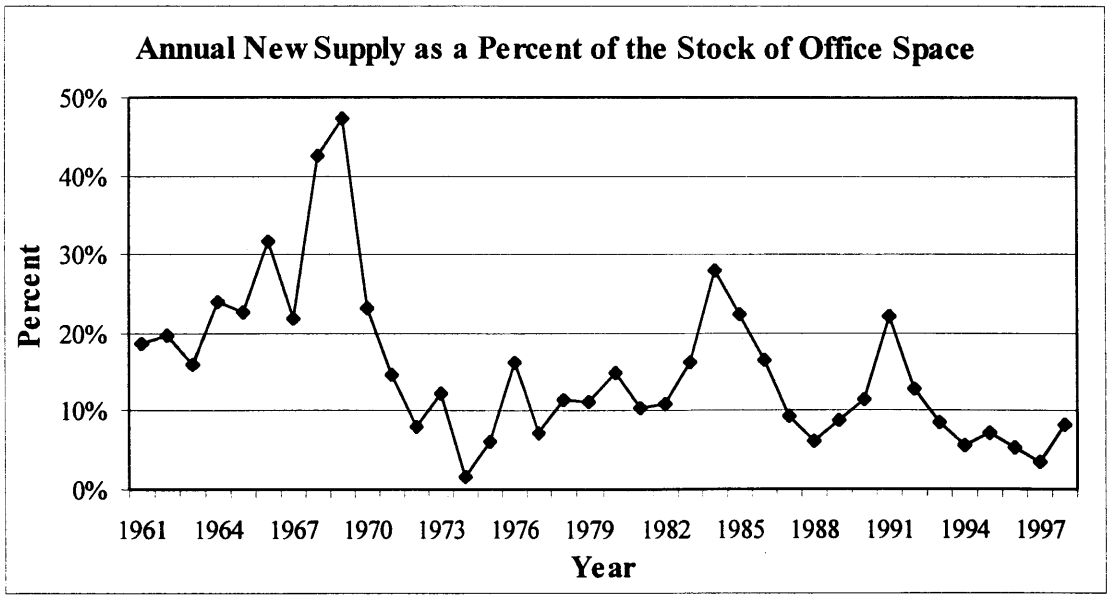
For 40 years, the annual supply of new office space over 5 stories has grown 18.4 percent per year, while that of over 9 stories has grown 28.7 percent per year. As seen in Table 2.5, the amount of annual office supply has rapidly increased each decade, while the annual percentage growth has generally declined.

Table 2.5 Average Annual Office Supply and Growth per Decades

Period	Over 5 Stories		Over 9 Stories	
	Average Annual Supply	Average Growth	Average Annual Supply	Average Growth
1959 – 1969	116,000 M2	37.8 %	55,953 M2	73.9 %
1970 – 1979	225,700 M2	11.2 %	184,922 M2	16.1 %
1980 – 1989	963,400 M2	14.4 %	671,918 M2	14.6 %
1990 – 1998	1,785,600 M2	9.4 %	1,118,453 M2	8.4 %
1959 – 1998	729,600 M2	18.4 %	490,648 M2	28.7 %

Source: the Korean Fire Protection Association & *Shinyoung*

Figure 2.10



Source: the Korean Fire Protection Association & Author's Estimation

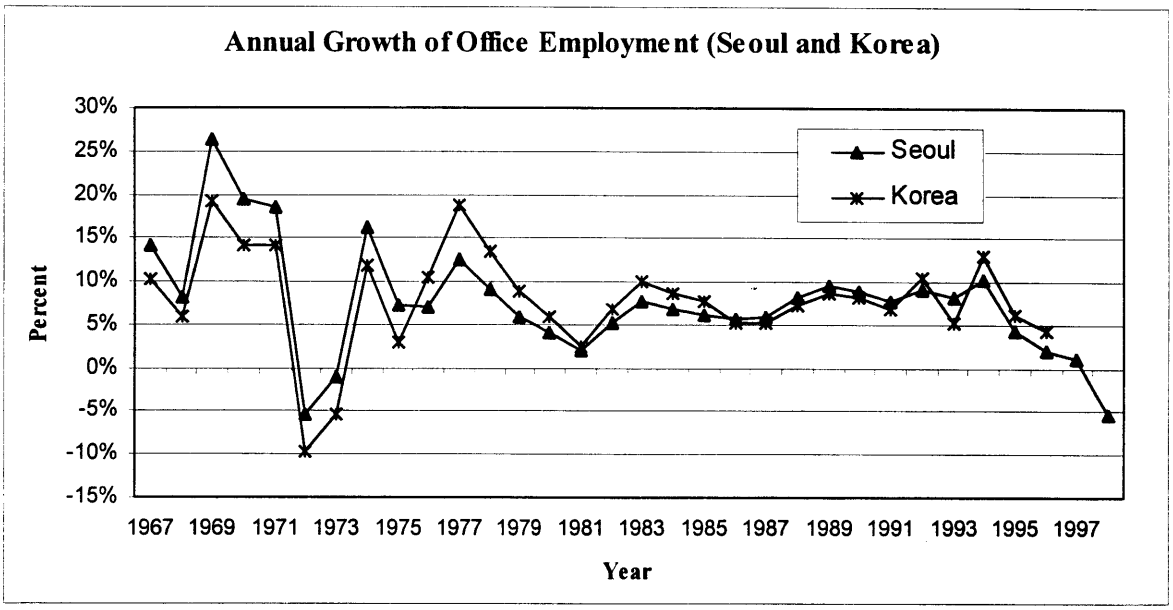
In Figure 2.10, the cyclical movement of the growth of new office supply can be observed. During the 38-year period from 1960 to 1998, there were four peaks with seven to eight year cycles: 1969, 1976, 1984-85, and 1991-92. The peak in 1984 and 1985 can be mainly explained by the high rent period from 1978 to 1980 given the long lead-time for planning and construction of office buildings. The peak in 1991 and 1992 can be explained by the impact of a new tax law. According to Choi (1995), the supply of office spaces burgeoned, especially in *Kangnam* Area where there lay many vacant lots, in anticipation of that the government would impose land value increment tax[11] of January 1990.

[11] This tax targets vacant or under-utilized land to reduce land speculation. The land value increment tax imposes high tax rates (30 – 50%) on any gains from excessive land price appreciation of idle land. The tax base or excessive gain is the appreciated price of the land minus the national average land price appreciation and any necessary expenses for land improvement. The land price calculation is based on the *Gong-Si-Ji-Ga*, an appraised standard land price, announced by the Ministry of Construction and Transportation. The tax period is 3 years, starting from January 1990. A taxpayer can obtain a tax credit for land price depreciation during previous tax periods.

2.5 Office Employment

Although the only data available for Seoul office employment before 1990 is from a population census conducted every 5 years, they become available since 1990 from the Annual Report on the Economically Active Population Survey conducted by the National Statistical Office of Korea. Therefore, office employment data in Seoul before 1990 are estimated using the whole country's data.[12]

Figure 2.11



Source: The National Statistical Office of Korea and Estimation
Note: The annual data for Seoul office employment from 1967 and 1989, and 1998 are estimated.

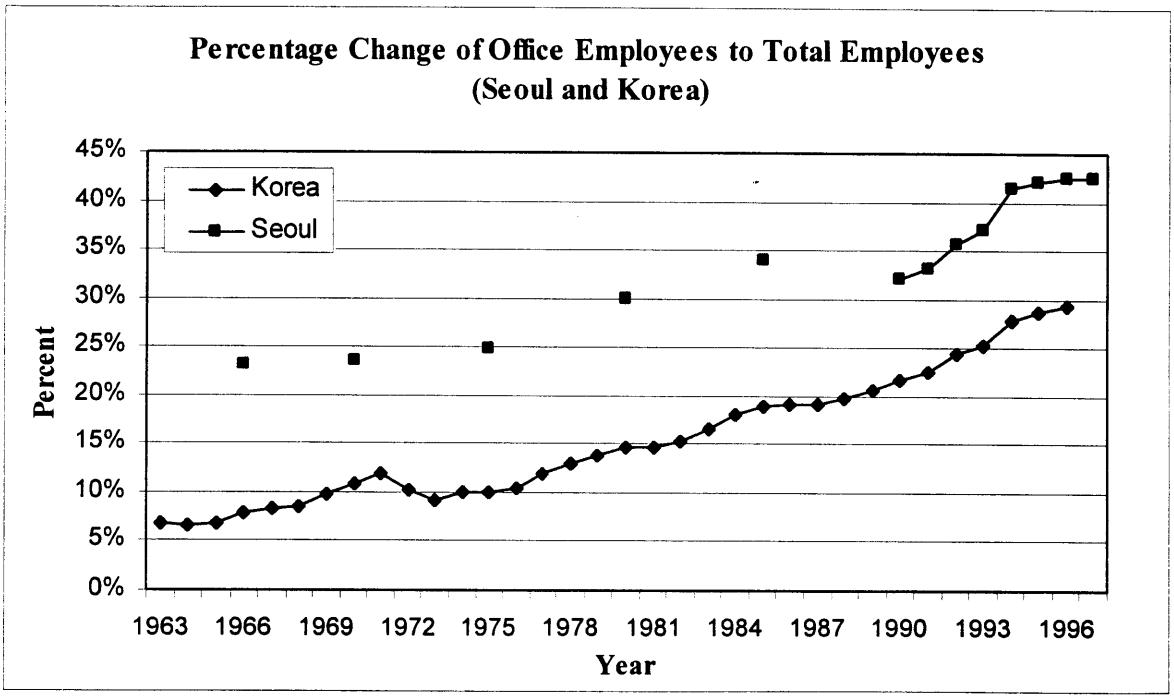
Using the above-mentioned employment data in Figure 2.11, we can trace its growth in Seoul and in Korea. Office employment in Seoul and in Korea experienced significant downturns in 1972, 1981, and 1998. Especially, the recent negative economic shock brought a negative office employment growth in 1998 for the first time since 1972 and 1973 when first worldwide oil shock hit the economy. The long-term growth of office

[12] It has been assumed that office employment both in Seoul and in all of Korea tends to grow at the same rate. Therefore, the annual growths of office employment in Seoul before 1990 are estimated from that of national data. Refer to Chapter 4 for detailed methods.

sector was noticeably more stable in the 1980s and the 1990s than during the 1960s and the 1970s.

Another interesting observation for office employment is the trend in the ratio of office employees to total employees from 1963 to 1997. As shown in Figure 2.12, the percentage of office employment in Seoul has increased continuously from around 23 percent in 1966 to 42.4 percent in 1997. Similarly, that of Korea has increased from around 6 percent in 1963 to 39.4 percent in 1996, but overall growth rate of Korea in the mid-1990s are higher than that of Seoul.

Figure 2.12



Source: The National Statistical Office of Korea

2.6 Maintenance and Operating Fees

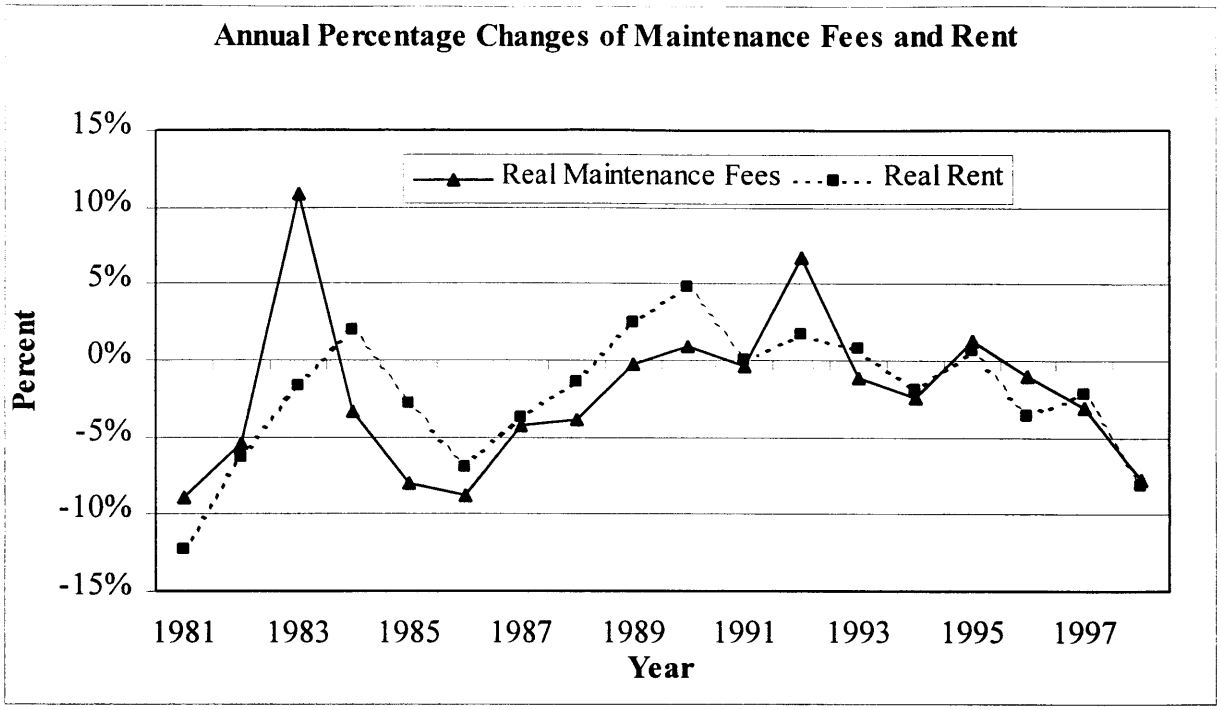
An office tenant usually pays monthly maintenance and operating fees[13] in addition to a rent. A building manager and/or owner uses the collected sum of the fees to maintain and operate the building. The major expenses paid by the maintenance fees are property tax; utilities such as electricity, water, and garbage; and common operating activities such as cleaning and security.

In the Seoul office market, maintenance fees tend to follow the general trend of rent. For 18 years from 1980 to 1998, real maintenance fees have had a strong correlation coefficient of 0.88 with real rents, while both fees and rents have decreased by 2.2 percent per year. This trend implies two contradictory explanations: first, during this period, the management of office buildings has become more efficient. Therefore, maintenance and operating expenses have subsequently been reduced, as is evidenced by the decreasing trend of the fees; second, landowners have regarded the fees as a supplemental rent and simply charged it in addition to rent.

Figure 2.13 shows a few interesting trends. The fees have fluctuated more than the rents, which is evidenced by the higher standard deviations of the fees (5.0%) than that of the rents (4.1%). Annual percentage changes of real maintenance fees have also fluctuated more in the 1980s than the 1990s.

[13] The term maintenance fees will be used to refer to the maintenance and operating fees here.

Figure 2.13



Source: The KCCI & Um (1988)

2.7 Vacancy Rates

According to DiPasquale and Wheaton (1996), vacancy is a period through which parcels of space within buildings pass either as they wait to be rented for the first time or become available after a tenant moves out. Since 1994, the KCCI has included vacancy rate as one of their annual survey items. Even though vacancy rate data has only recently become available beginning in 1994, it can be used as a meaningful indicator for the recent change in the Seoul office market. From 1994 to 1997, vacancy rates were between 3.9 percent and 9.3 percent. But in June 1998, the vacancy rate reached its highest at 16.9 percent because of the widening gap between the continuing large supply and the decreased demand triggered by the recent economic shock.

Table 2.6 Office Vacancy Rates in Seoul

Year	*1994*	*1995*	*1996*	*1997*	*1998*
Vacancy Rate	9.3 %	3.9 %	7.2 %	7.8 %	16.9 %

Source: The KCCI
Note: Vacancy rates are surveyed at the end of June of each year.

The vacancy rate is expected to increase more in the near future. The supply of office buildings will continuously keep a high level until 2000 since the current supply comes from office buildings that were planned and have begun construction before the economic shock. Nevertheless, demand will continue to decrease as companies slowly adjust their spatial needs, so that recent high rates of unemployment do not fully affect the space demand yet. However, in the long term, decreased rent will stimulate companies to consume more space per worker, and vacancy rates will consequently decrease.

CHAPTER 3
PREVIOUS RESEARCH

3.1 Studies on the Dynamic Model of the Office Market

Rosen (1984) proposes a methodology for forecasting key variables of the office space market – namely, the stock of office space, the flow of new office construction, the vacancy rate, and the rent for office space - by developing a statistical model of supply and demand. To develop the model, he proposes three behavioral equations: (1) the desired stock of office space is a function of employment in the key service producing industries and rental rates; (2) the change in net office rents is a function of the difference between actual and optimal vacancy rates, and the change in overall price level; and (3) the supply of new office space is a function of expected rents, construction costs, interest rates, and tax laws affecting commercial real estate. His empirical estimation of the model focuses on the data of the San Francisco office market. Though his equations for the desired stock of office and change in office rents are statistically significant, the equation for the supply of new office space is not statistically significant and only the lagged vacancy rates are found to be meaningful in explaining the supply.

Hekman (1985) has estimated the rental price adjustment mechanism and investment response in fourteen metropolitan office markets by using a two-equation model, in which rent is determined by vacancy and other variables, and quantity supplied is a function of rent and other variables. The empirical estimation shows that market rental rates in buildings under construction respond strongly to vacancy rates in both the central city and suburban markets, and construction of office space responds strongly to real rents and to long-term office employment.

Using national data estimated by aggregating and averaging of local office markets, Wheaton (1987) develops a contingent econometric forecasting model with three behavioral equations and three identities. The demand equation relates absorption of office

space to real rent, the level of office employment, and office employment growth rate. The supply equation relates building permits to real rent, vacancy rates, the stock of office space, and employment growth rates, construction costs, and interest rates. The third behavioral equation relates the change in real rents to both actual and constant structural vacancy rates. In the absence of a reasonably reliable rent series, he assumed that the difference between actual and structural vacancy rates with appropriate lag determines the movement of real rental rates. Based on his model tested with data sets, he forecasts that the U.S. office market will remain soft or tight for several years, which has been later proven correct. After that, Wheaton and Torto (1987) provide some empirical evidence that the change in office rents is determined by the difference between structural and actual vacancy rates. While the past studies assume constant structural vacancy rates, they allow the structural vacancy rates to rise linearly over time.

Based on the models developed by Rosen and Wheaton, recent studies generally consists of three behavioral equations explaining construction, absorption, and the change in rent, and they mainly focus on metropolitan office markets, not national.

3.2. Studies on the Seoul Office Market

Compared to the land or the housing market, the Korean office market is largely overlooked by economists and researchers. Even for Seoul, the primary focus area of real estate studies, merely a few studies in the 1990s for demand and supply characteristics of the office market can be found, while no contingent econometric forecasting can be found at all.

In evaluating the necessity of an additional business district development in Seoul, Samsung Engineering and Construction Co. (1992) has forecasted the demand and supply for the Seoul office market in 2001. While demand is measured by the estimated office employment divided by the estimated office space per employee, supply is measured by the linear extrapolation of the current trend. It concludes that in 2001, the demand for office space will exceed supply and propose a joint (public and private) development for a business district in a potential area in Seoul.

Choi (1995) has analyzed the trend and fluctuation of Seoul office supply during the 1960 – 1995 period. Furthermore, he forecasts the demand for office space by extrapolating the trend of the stock of office space.[14] In conclusion, he expects a considerable amount of the excess demand given the existing land use conditions and he proposes to promote high-density developments.

Park et al (1996) forecasts office demand in Seoul until 2011. Using the building completion data for 33 years, they forecast the demand using two methods: (1) after extrapolating the trend of the stock of office space using time indices, they select several statistically significant models;[15] and (2) they estimate the demand using the estimated

[14] He uses the stock of office space as a proxy for demand. As the rent of the Seoul office market does not fluctuate much over time, the market might be in equilibrium. Therefore, the approximation of demand using supply data is valid. However, to be more precise, demand has to be stock minus vacant space. The approximation of demand from supply might be caused from the unavailability of historic vacancy rates.

[15] They also use the stock of space as a proxy for demand.

total office employment and the estimated unit area per employee. In conclusion, they recommend developing decentralized office facilities at sub-centers or at outskirts of the city.

Because of the absence of information on rental rates, all the above-mentioned studies are restricted in forecasting the demand of office space. Furthermore, they use a simple trend or extrapolative forecasting which misses any economic logic or theory, and which fails to predict the oscillation around the long-term trend.

CHAPTER 4
THE ECONOMETRIC MODEL FOR THE SEOUL OFFICE MARKET

4.1 Data Sets Used in the Study

4.1.1 Rent Index

To construct a historical office rent index, I have used data from two different sources: the Korea Chamber of Commerce and Industries (KCCI), and the study by Um (1988). The KCCI has annually surveyed rental rates and other lease-related items for office and commercial property in Seoul since 1985. In most surveys, it interviewed 150 rented offices comprised of 6 offices in all 25 *Gus* – each two from high, medium, and low-grade offices. In her study, Um (1988) has collected the office rent data from 1974 to 1988.

After combining the percentage growths of deposit and monthly rent payments from the above-mentioned sources, annual rental costs for 25 years (from 1974 to 1998) were calculated using the following equation:

Annual Rent = (Monthly Rent X 12) + (Deposit X Three-Year Corporate Bond Yield)

Even though the prevailing interest rates in calculating the monthly payment by office owners have been fixed rates ranging from 12 % - 24 %, the use of three-year corporate bond yields has several advantages over fixed rates. First, historical data for the fixed rates simply do not exist. In addition, annual rental costs calculated from the above equation might be a more precise index because office tenants are mostly corporations and thus their costs of capital are closely related to market interest rates. Furthermore, three-year corporate bond yields are the best market indicator among many Korean interest rates that have been frequently distorted by governmental interventions.

After estimating the historical annual rental costs for 25 years, they are discounted by the Consumer Price Index (CPI) to adjust for inflation. Finally, real rental index is constructed from the constant value of annual rents, based on 100 in 1995.

4.1.2 Supply of Office Space

For the historical office supply in Seoul, I have used the annual completion data for office buildings with 6 or more stories from the Korean Fire Protection Association.[16] Because the data for 6 or more stories is not available after 1994, I have therefore estimated the supply from 1995 to 1998 through a regression analysis using the data over 9 stories from *Shinyoung*. As shown in Table 4.1, the estimation is statistically significant, as it has a high R square of 0.996 as well as a high t-statistic of 94.18.

Table 4.1 Summary of the Regression Analysis for Estimating the Office Stock over 5 Stories from 1995 to 1998

Regression Statistics	
Multiple R	0.998089
R Square	0.996181
Adjusted R Square	0.996069
Standard Error	422418
Observations	36

	Coefficients	*Standard Error*	*t Statistic*
Intercept	-36961.4	93614.18	-0.39483
Over 9 stories	1.488866	0.015809	94.18005

[16] I have reused the annual data of the Korean Fire Protection Association (KFPA) used in the study of Choi (1995). The KFPA conducts a mandatory inspection for fire protection systems and facilities for the specific buildings, including office buildings, in compliance with the "Law on Indemnity for Fire Losses and Fire Insurance Contract." For the inspection, it collected data such as completion time and floor area of office buildings. Their data for Seoul office completion is quite reliable since building owners are obligated to take the inspection.

4.1.3 Office Employment

Although the only data available for Seoul office employment before 1990 is from a population census conducted every 5 years, they become available since 1990 from the *Annual Report on the Economically Active Population Survey* conducted by the National Statistical Office of Korea.[17] However, the annual data for office employment in Korea is available since 1963. Therefore, the annual office employment in Seoul before 1990 was estimated using the following equations, based on the assumption that office employment both in Seoul and in all of Korea tends to grow at the same ratio. In addition, even though the total employment in Seoul in 1998 is publicly announced, the office employment is not available yet. Thus, it is assumed that the office employment in 1998 has changed identical to the total employment.

1) $S\_Emp_{t+n} / S\_Emp_t = (1+ \alpha\ \%\Delta K\_Emp_{t+1}) \ldots (1+ \alpha\ \%\Delta K\_Emp_{t+n})$

   Therefore, $\%\Delta S\_Emp_{t+n} = \alpha\ \%\Delta K\_Emp_{t+n}$ (For 1966 - 1990 except for 1970 – 1975)

2) $S\_Emp_{t+n} / S\_Emp_t = (1+ \beta + \%\Delta K\_Emp_{t+1}) \ldots (1+ \beta + \%\Delta K\_Emp_{t+n})$

   Therefore, $\%\Delta S\_Emp_{t+n} = \beta + \%\Delta K\_Emp_{t+n}$ (For 1970 – 1975)

Where, S_Emp = Seoul Office Employment; and K_Emp = Korean Office Employment.

[17] The National Statistical Office of Korea publishes its *Annual Report on the Economically Active Population Survey,* which contains data for employment by occupation, and by industry. The annual data for Seoul office employment for this study are estimated by adding three categories in the *employment by occupation* section: 1) legislators, senior officials and managers; 2) professionals, technicians and associate professionals; and 3) clerks.

4.2 Rent Equation

In the market for office use or space, demand comes from the occupiers of space, whether they are tenants or owners. The cost of occupying space is the annual outlay necessary to occupy or use the property, or its rent. For tenants, rent is simply an annual rental payment plus the opportunity (or interest) costs of a deposit, if any, as specified in a lease agreement. For owners, rent is defined as the annualized cost associated with the ownership of properties.

Rent is determined by the intersection of the demand for space use and the supply of space. All else being equal, when the number of employees increases, the demand for space rises and it raises the rent as well. With fixed demand, when new offices are supplied in the market, the rent declines. On the other hand, the level of rent influences both the demand and the supply for space, too. All else being equal, if the rent rises (or falls), the occupiers of space or firms reduce (or expand) the space per worker and thus the demand for space decreases (or increases). Similarly, if the rent rises, the supply of new office buildings slowly increases because of the long lead-time for planning and construction. However, even though the rent falls, the new supply cannot be less than zero.

As rent is determined by the demand and the supply, it can be expressed by the function of office employment (a proxy for demand), E, stock of space, S, and the immediate past rent, R_{t-1}. The immediate past rent is included here as an independent variable since it is the base for the negotiation of rent and thus it influences the current rent.

$$R = f(R_{t-1}, E, S)$$

From 1977 until the early 1980s, the government prohibited all new real estate development north of the *Han* River, which includes the main office sub-market or the

CBD, for purposes of decentralization and national defense (Choi, 1993). Therefore, if we use a shorter 19-year period (as opposed to the 23-year data in the rent equation), we bypass the problem of explaining why extremely high rents in 1978 and 1979 happened without any significant changes of both demand and supply for the office space. Among several sets of lagging employment and stock, the following equation has the best statistical fit.[18]

$$R_t = \alpha_0 + \alpha_1 R_{t-1} + \alpha_2 E_t + \alpha_3 S_t \text{ ..... } (1)$$

Table 4.2 Summary of the Regression Analysis for Rent Equation

Regression Statistics	
Multiple R	0.96138
R Square	0.92425
Adjusted R Square	0.9091
Standard Error	2.8803
Observations	19 (1980 – 1998)

	Coefficients	*Standard Error*	*t Statistic*	*P-value*
Intercept	26.4456	8.6408	3.06055	0.00793
R_{t-1}	0.6089	0.06627	9.18775	1.5E-07
E_t	2.7E-05	9.2E-06	2.89768	0.01105
S_t	-1.8E-06	5.8E-07	-3.0573	0.00798

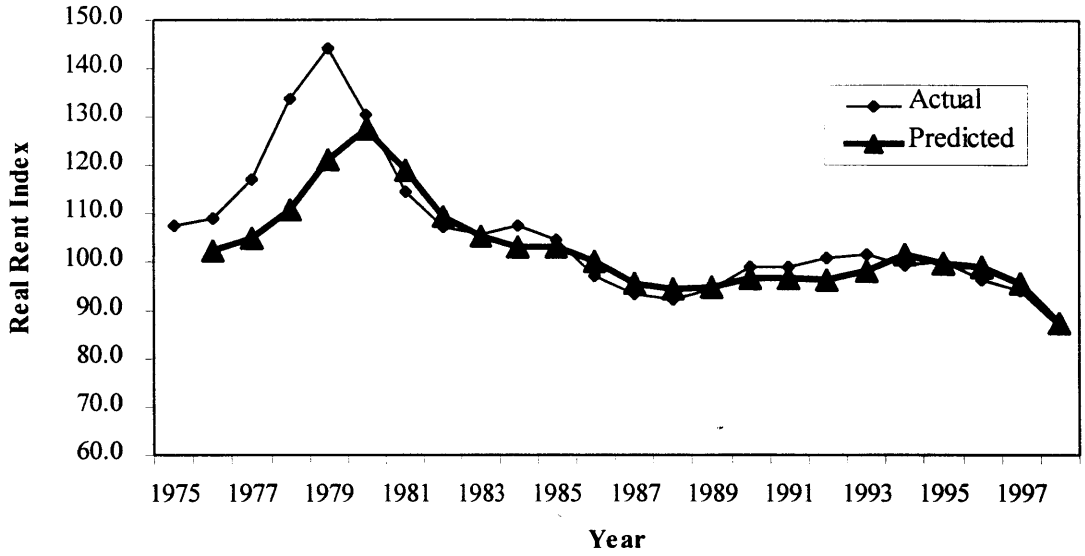
The estimated equation suggests that rent seems to be fully explained by the immediate past rent, current total office employment, and current office stock in the Seoul economy. Since the prevailing lease term in Seoul is one year and most of the tenants can thus move to other buildings providing competitive rent, building owners in Seoul may be forced to immediately adjust rents based on the current employment and the stock of office space. At the current employment and stock, when the employment grows (or declines)

[18] If we use a dummy variable for 1978 and 1979, an equation with similar coefficient can be obtained as follows:

$$R_t = 36.95 + 0.57R_{t-1} + 0.00002E_t - 0.0000016S_t + 21.12D_t$$
$$(3.57) \quad (6.80) \quad (1.75) \quad (-2.08) \quad (6.69)$$
$$R^2 = 0.93, \quad N = 23 \ (1976 - 1998)$$

one percent and all else remains equal, the rent increases (or decreases) 0.63 percent. On the other hand, when the stock of space increases one percent and all else remains equal, the rent decreases 0.59 percent.

Figure 4.1 Rent Model Fit



Source: the author's analysis

4.3 Construction Equation

There are two types of investors for the construction of office buildings: developers (speculators) and owner-occupiers. Each of them has a different motive for his decision to construct office buildings. While developers consider the return on the investment, or rent, owner-occupiers consider adequate working space for their employees.

To understand the behavior of the supply, we need to know the proportion of each type of investor in the market. As discussed in Section 2.7, the space in owner-occupied buildings accounts for 52.3 percent of the Seoul office market, while the other 47.7 percent is owned by someone other than occupiers. However, over 85 percent of owner-occupied buildings lease their surplus spaces to renters. Therefore, while owner-occupiers actively invest in the Seoul office market, their investment decision must be highly influenced by their expectation for future rent as well as future space needs.

As the investment decision is influenced by rent and space needs, the annual new supply or completion of office buildings can be expressed by the function of the rent, R_t, and the employment growth, $E_t - E_{t-1}$.

$$C_t = f(R_t, E_t - E_{t-1})$$

Among several sets of lagging rent and employment growth, the following equation has the best statistical fit – but only when the previous construction boom in 1991 and 1992 is accounted for with the structural effect. Because of the government's plan to impose a land value increment tax in January 1990, thereby placing a heavy tax on vacant or unused land, landowners with vacant land suddenly began construction. Therefore, for the first time in 40 years, the supply of office space in Seoul reached over 2 million square meters (3.2 million in 1991 and 2.3 million in 1992). This abnormality of the supply in 1991 and 1992 is proved by the high t-statistic (5.28) of the dummy variable in the following equation.

$$C_t = \alpha_0 + \alpha_1 R_{t-6} + \alpha_2(E_{t-6} - E_{t-7}) + \alpha_3 D_t \text{ ..... } (2)$$

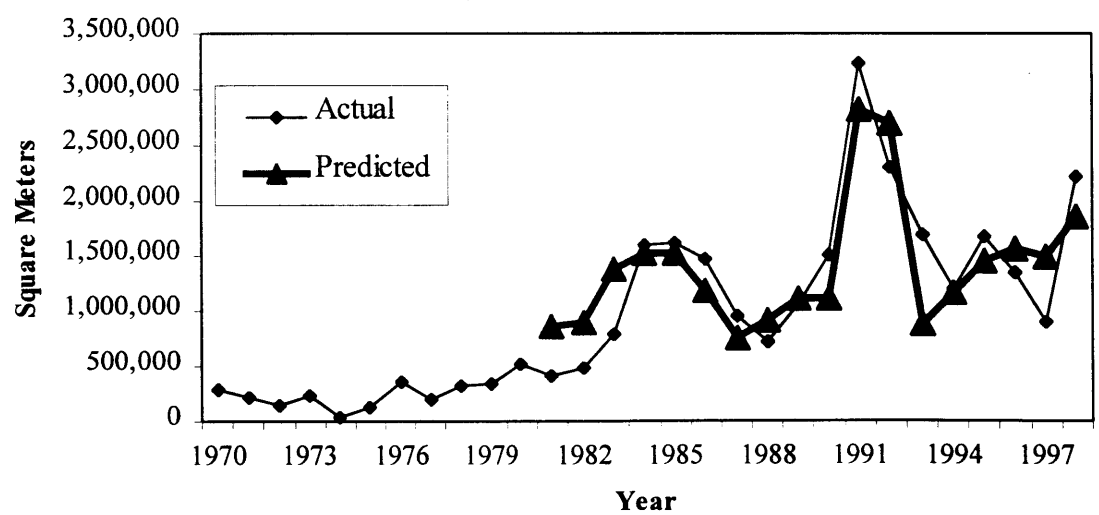
($D_t = 1$ in 1991 and 1992, $D_t = 0$ in other years)

Table 4.3. Summary of the Regression Analysis for Construction Equation

Regression Statistics	
Multiple R	0.8289712
R Square	0.6871933
Adjusted R Square	0.6201633
Standard Error	431331.39
Observations	18

	Coefficients	*Standard Error*	*t Statistic*	*P-value*
Intercept	-1316357	1132065	-1.1628	0.26435
R_{t-6}	16836.1	8861.3	1.89996	0.07823
$E_{t-6} - E_{t-7}$	10.242399	3.60402	2.84194	0.01306
Dummy	1798410.7	340508	5.28156	0.00012

Figure 4.2 Construction Model Fit



Source: The Author

The estimated equation suggests that new office supply can be well explained by the level of rent and employment growth, both lagging six years. This lag can primarily be explained by the long lead-time needed to plan and construct office buildings. Another explanation is the delay of reporting (information) in the market, since information for the Seoul office market is not immediately available and it is costly to obtain. Furthermore, the equation implies that investors, whether developers or owner-occupiers, have expected current conditions to prevail in the future – a myopic expectation. This myopic expectation can generate market volatility since by the time space enters the stock, market conditions may have changed.

The implications of this model are easy to interpret. At the recent ten-year average of rent (97.1) and employment growth (84,580 jobs per year), 1.2 million square meters of new office space will be completed after 6 years. When the rent increases one percent and all else remains equal, the additional new supply will be 1.4 percent or 16,000 square meters after 6 years. If no new office jobs were created at all, the rent index would have to be 78.2 in order to get any new supply after six years.

4.4 Identity Equation

To complete the model, we need an identity equation that explains the relationship between stock and new supply or completion. The following equation explains that the stock of total space in each period, S_t, is updated from that of the previous period with new space deliveries or completions.

$$S_t = S_{t-1} + C_t$$

Using the equations of rent and construction as well as the above identity equation, variables for each period will be given by the conditions of the preceding periods.

4.5 Limits of the Model

4.5.1 Ignorance of the Interrelationship with Adjacent Cities

Since Seoul forms a huge metropolitan area with surrounding cities such as *Inchon* and other satellite cities, the economic area might be bigger than the municipal area of the city. Thus the economic conditions of surrounding cities closely interacts with those of Seoul and they influence the economic variables (e.g., rent, new supply, stock, and employment) affecting the Seoul office market. For example, many employees working in Seoul live in bedroom suburbs and satellite cities located outside of the municipal area of Seoul. On the other hand, employees living in Seoul do not necessarily work in Seoul. However, in this study, this interrelationship is ignored because of the following reasons: (1) the economic boundary is not explicit and hard to define; and (2) the available data such as rent and new supply are collected based on the simple municipal boundary of Seoul.

4.5.2 Ignorance of Demolished Space in Supply Data

The new supply data, used in this study, are generated by adding up all the current buildings completed in each year. This data works reasonably well but it is not complete, since it does not consider the buildings that have been demolished after being constructed and used during the study period. Therefore, the new supply and stock data used here should be less than the actual level. However, since most office buildings in Seoul have been built after the 1960s, few buildings would have been demolished in such a short period of time.

4.5.3 Absence of Absorption Equation

Most of the econometric studies for the office market consist of three equations: rent, construction (supply), and absorption (demand). But in this study, as there are no

historical vacancy rates data available, the absorption equation could not be developed. I hope vacancy rates will become available in the future for a more complete understanding of the Seoul office market.

CHAPTER 5

FORECAST: OUTLOOK OF THE SEOUL OFFICE MARKET

5.1 Economic Outlooks: The Forecast of the Seoul Office Employment

Using the equations of rent and construction as well as that of identity, the future behavior of the Seoul office market can be forecast based on an assumed macroeconomic outlook that provides the estimate of an exogenous variable. The only exogenous variable in this model is the office employment in Seoul.

In microeconomic theory, production is a function of labor and capital. If capital and the productivity of labor are assumed to be constant, then the growth of production depends on the number of laborers. Conversely, if production increases (or decreases) then, all else being equal, the number of labor or employment increases (or decreases). Thus our equation for office employment should contain the real Gross Domestic Product (GDP).[19] With the 1966 – 1997 sample, our employment equation is estimated in the equation below. It is not surprising to find that Seoul office employment is fully explained by the real GDP of Korea.

$$\text{Seoul\_Office\_Emp}_t = 171{,}176 + 0.5998\ \text{Real\_GDP}_t - 0.000000025\ (\text{Real\_GDP}_t)^2$$

(t-statistic) (8.05) (20.90) (-3.56)

Adjusted $R^2 = 0.99$, N = 32 (1966 – 1997)

While two-year forecasts of real GDP growth are widely available from many institutions (IMF, OECD, and many others), long-term forecasts are rarely available. However, the OECD (1998) and the Economist Intelligence Unit (EIU, 1999) provide five-year forecasts of real GDP growth. In the short-term forecast, the estimated GDP growth

[19] To estimate the office employment in Seoul, the Gross Regional Product (GRP) of Seoul seems to be a better indicator than the GDP. But the GRP of Seoul is only available since 1985. Therefore, I have used the GDP in the equation for office employment.

for 1999 ranges from 2 percent (IMF) to 4.8 percent (Morgan Stanley) and in 2000 it ranges from 3 percent (Deutsch Bank) to 4.9 percent (Morgan Stanley). Since the Korean economy is recovering rapidly, recent forecasts tend to estimate a higher GDP growth. For the mid-term, while the OECD forecasts the real GDP growths of 5.8 percent (2001) and 5.9 percent (2002 and 2003), the EIU forecasts 5.9 percent (2001), 6.0 percent (2002), and 6.2 percent (2003).

In order to examine the dynamics of the model, it is useful to consider several alternative outlooks. Using the forecasts of the GDP growth by the institutions, the three scenarios of real GDP growth – base, optimistic, and pessimistic – are estimated as shown in the Table 5.1.

Table 5.1 Three Scenarios for the Real GDP Growth

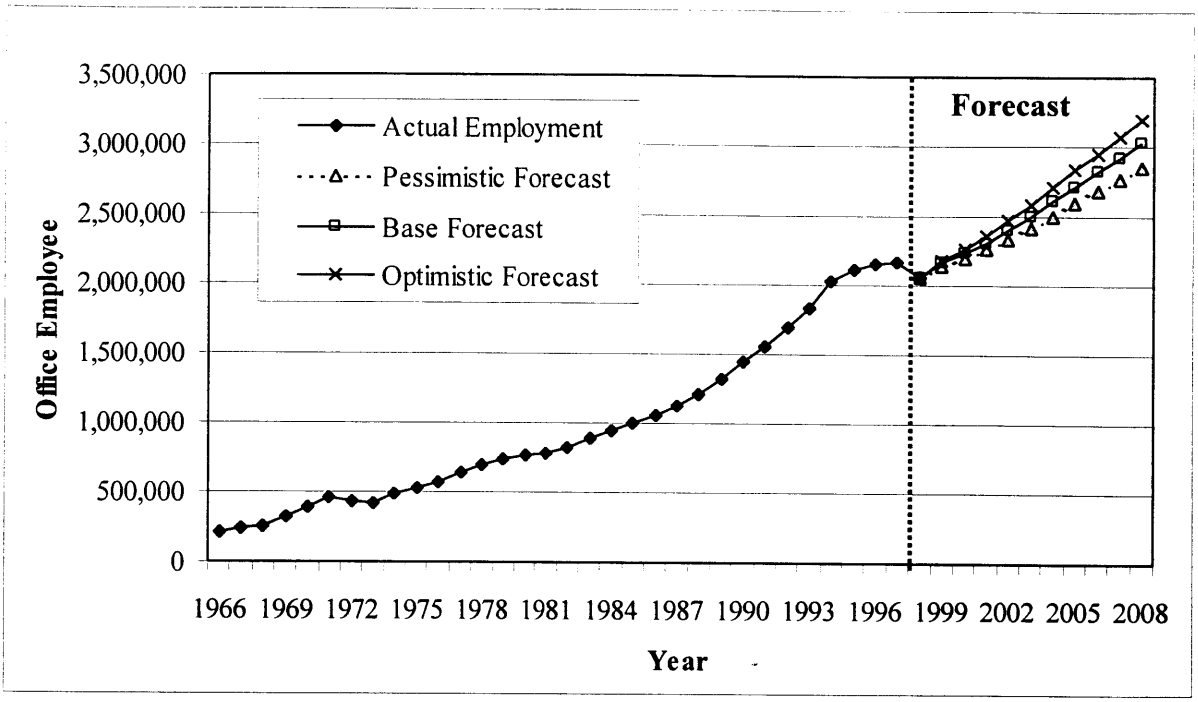
(Unit: Percent)

Year	*1999*	*2000*	*2001*	*2002*	*2003 – 2008*
Optimistic	5.0	5.5	6.0	6.5	7.0
Base	4.0	4.5	5.0	5.5	6.0
Pessimistic	3.0	3.5	4.0	4.5	5.0

Source: Refer to the text

Using the employment equation and the scenarios for GDP growth, Seoul office employment is forecasted as shown in Figure 5.1. In the base forecast, employment is expected to grow an average 3.9 percent per year and in 2000 it will exceed the level of the pre-economic crisis of 1997. The total office employment in 2008 will reach 3 million, which adds 1 million to the current 2-million. Compared to the 5.6 percent growth during the last 10 years (from 1989 to 1998), this estimated growth rate is quite reasonable to accomplish. In the optimistic forecast, the employment is expected to grow an average 4.5 percent per year and the total office employment in 2008 will become 3.2 million. In contrast, in the pessimistic forecast, the employment is expected to grow an average 3.3 percent per year, and the total office employment in 2008 will become 2.8 million.

Figure 5.1 Forecast of Seoul Office Employment



Source: The National Statistical Office of Korea
Note: The forecast is based on the three scenarios of real GDP growth.

5.2 Outlook of the Seoul Office Market

Using the equations and estimated office employment based on the three scenarios, the behavior of the Seoul office market can be forecasted. Obviously, new supply cannot drop below zero. In the forecast, therefore, I have constrained the new supply so that it is always above zero.

The three forecasts – base, optimistic, and pessimistic – demonstrate cyclic movements in both rent and new supply. As the three estimated office employment growths have similar trends with slightly different rates, both rent and new supply generate similar movements, respectively, in all of the scenarios.

The forecasts for new supply generated by the construction model are identical for six years (from 1999 to 2004) because new supply is influenced by the economic condition of the past. In the short-term, the new supply of office space may continue to be strong because of high employment growths and high rents in the early 1990s. It is expected to reach over 1.8 million square meters per year both in 1999 and 2000. However, after new supply reaches a peak in 2000, it will continuously decrease until 2004. Being affected by negative employment growth and decreasing rents caused by the economic crisis started in late 1997, no new supply is expected in 2004. Following a quick rise in 2005, the supply will continuously increase slowly but steadily with different speeds as per the scenarios.

In contrast to the rapid change of new supply, rent seems to show a slow cyclic movement. In the short term, rent will decline further resulting from the large supply of office space and the slow recovery of office employment. After rent hits the historical record trough in 2002 (in the base and the pessimistic forecast) and 2001 (in the optimistic forecast), it will continuously increase until the end of the study period or 2008. This steady increase of rent would be mainly caused by the reduced new supply and the steadily increasing office employment in the 2000s. However, the pace of recovery will vary with the different scenarios.

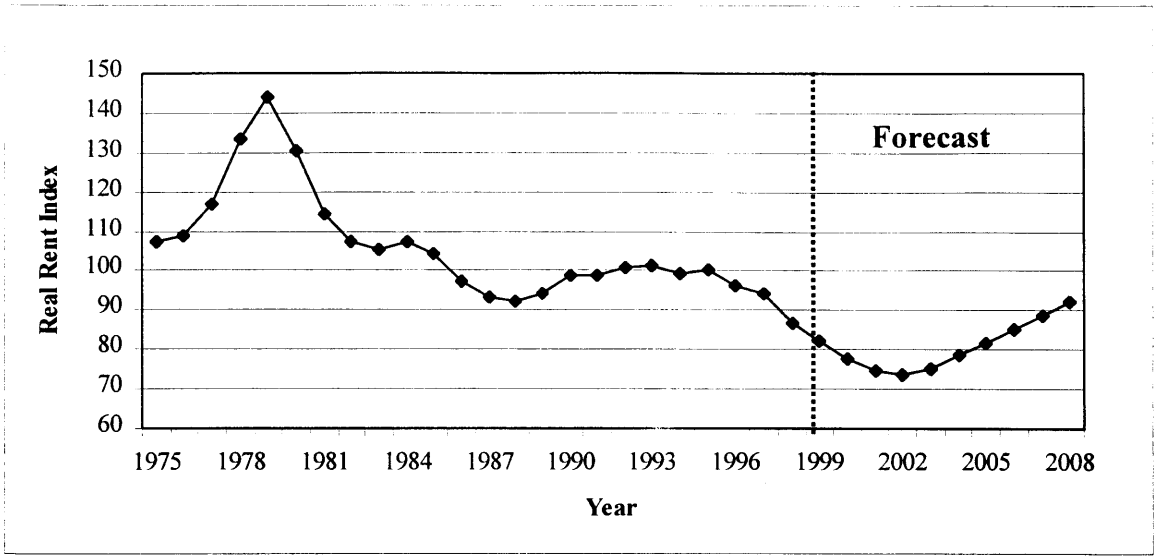
Conclusively, the Seoul office market, strongly impacted by the negative economic shock started in late 1997 and the large supply of office space in the 1990s, seems to remain soft or tight for several years before rent moves upward and supply reacts. By the middle of the 2000s, however, the market will be fully recovered from the economic shock and it will move toward a strong market.

5.2.1 Base Forecast

In the base forecast, the office employment is expected to grow steadily and moderately, at an average of 3.9 percent per year over the next decade.

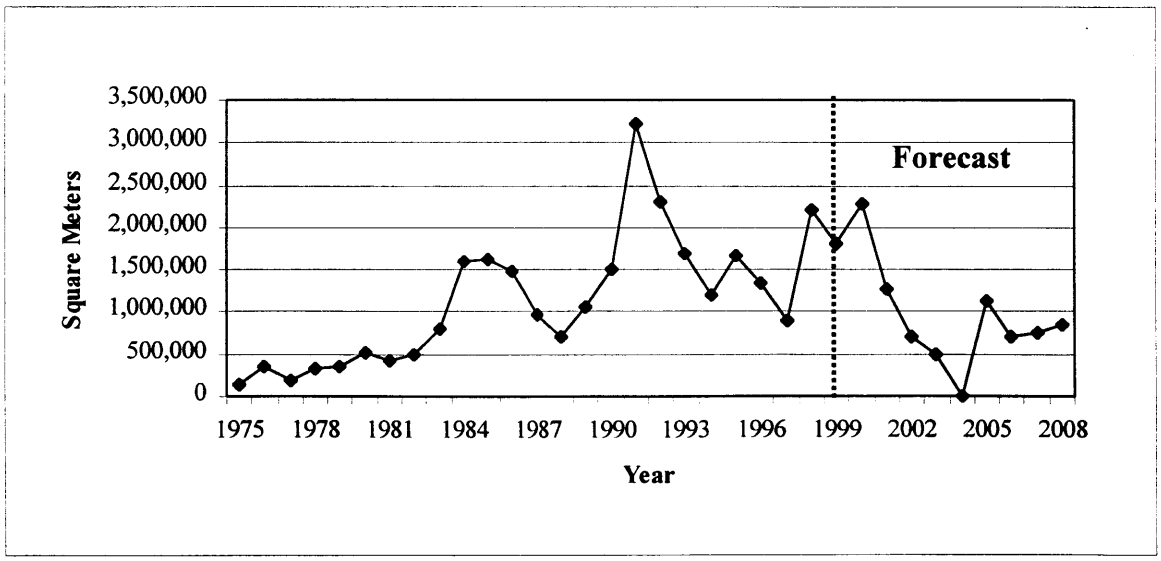
- In the short term (from 1999 to 2002), new supply seems to remain strong up to 2000 resulting from high rent and strong employment growth in the early to mid 1990s. After new supply reaches a peak in 2000, however, it will decline. With the rapidly growing stock of office space and the reduced office employment, rent will continuously decrease further and it will reach the trough (73.7) in 2002.
- In the mid term (from 2003 to 2005), new supply will become almost zero in 2004 mainly caused by the current negative employment growth and the declining rent. But new supply will rapidly rise in reaction in 2005. After rent reaches a trough in 2002, it will continue to rise moderately with the reduced supply of new office space and steadily increasing employment growth.
- In the long term (from 2006 to 2008), both new supply and rent are expected to continue to rise. In 2008, new supply will reach a moderate 0.9 million square meters and real rent index will become 92 in 2008.

Figure 5.2 Base Forecast: Real Rental Index



Source: Refer to the Text

Figure 5.3 Base Forecast: New Supply



Source: Refer to the Text

5.2.2 Optimistic Forecast

In the optimistic forecast, office employment is expected to grow steadily but rapidly, or an average 4.5 percent per year over the next decade.

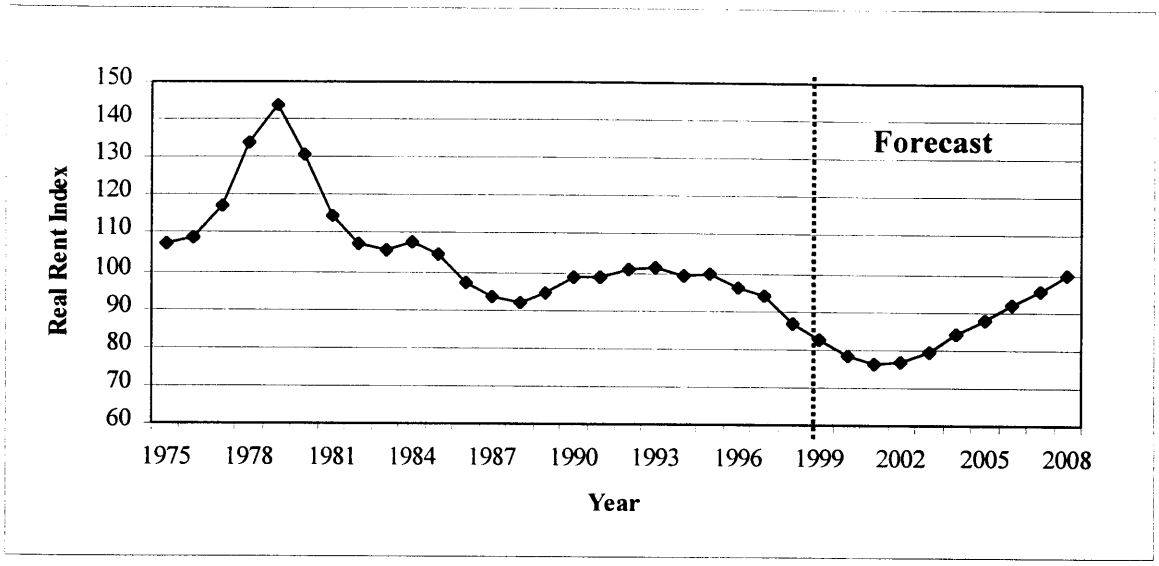
- In the short term, the trend of new supply will be the same as the base forecast. However, compared to the base forecast, rent will decrease less, and it will reach a trough (76.3) in 2001, which is one year earlier.
- In the mid term, new supply will be identical with the base scenario up to 2004. But it will rise more rapidly in 2005. After rent hits a trough in 2001, it will continue to rise but more rapidly than the base forecast.
- In the long term, both new supply and rent are expected to continue to rise. In 2008, new supply will reach 1.1 million square meters and real rent index will become 99.5.

5.2.3 Pessimistic Forecast

In the pessimistic forecast, the office employment is expected to grow steadily but slowly, or at an average 3.3 percent per year over the next decade.

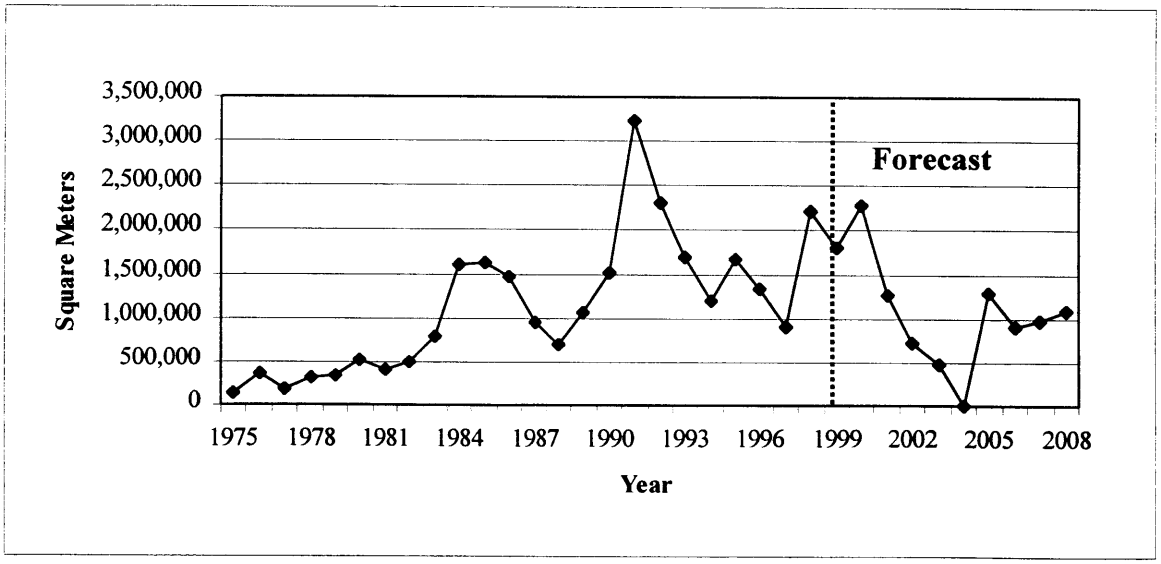
- In the short term, the trends of new supply will be the same as the base forecast. However, compared to the base forecast, rent will decrease more, and it will reach a trough (70.8) in 2002, which is the same year.
- In the mid term, new supply will be identical with the base scenario up to 2004. But it will less rise in 2005. After rent reaches a trough in 2002, it will continue to rise but slower than the base forecast.
- In the long term, both new supply and rent will continue to rise. In 2008, new supply will reach a low 0.6 million square meters, and the real rent index will become a low 84.4.

Figure 5.4 Optimistic Forecast: Real Rental Index



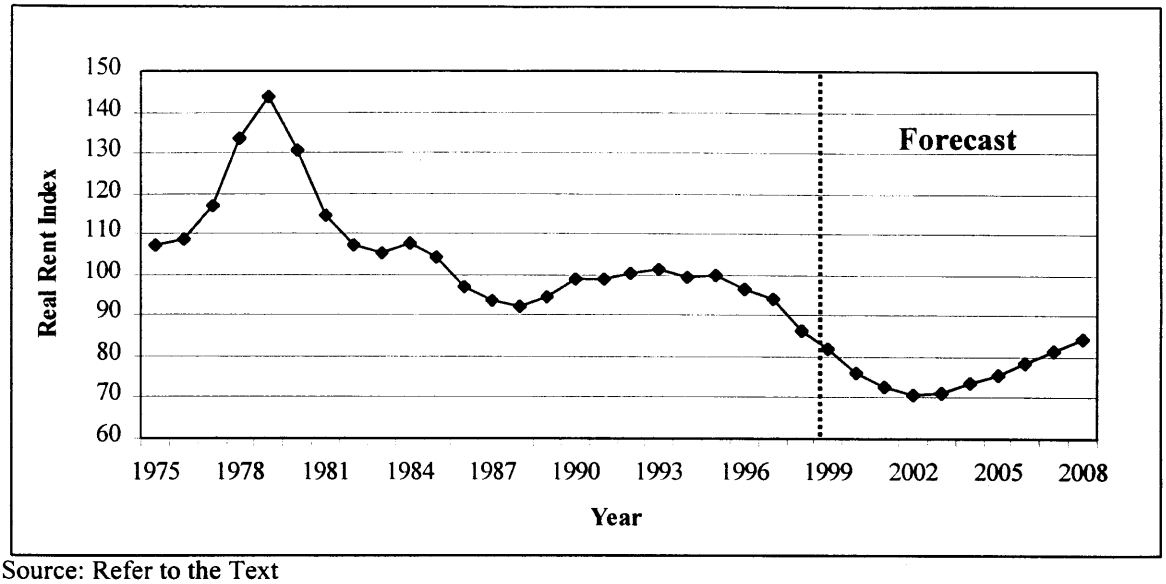
Source: Refer to the Text

Figure 5.5 Optimistic Forecast: New Supply



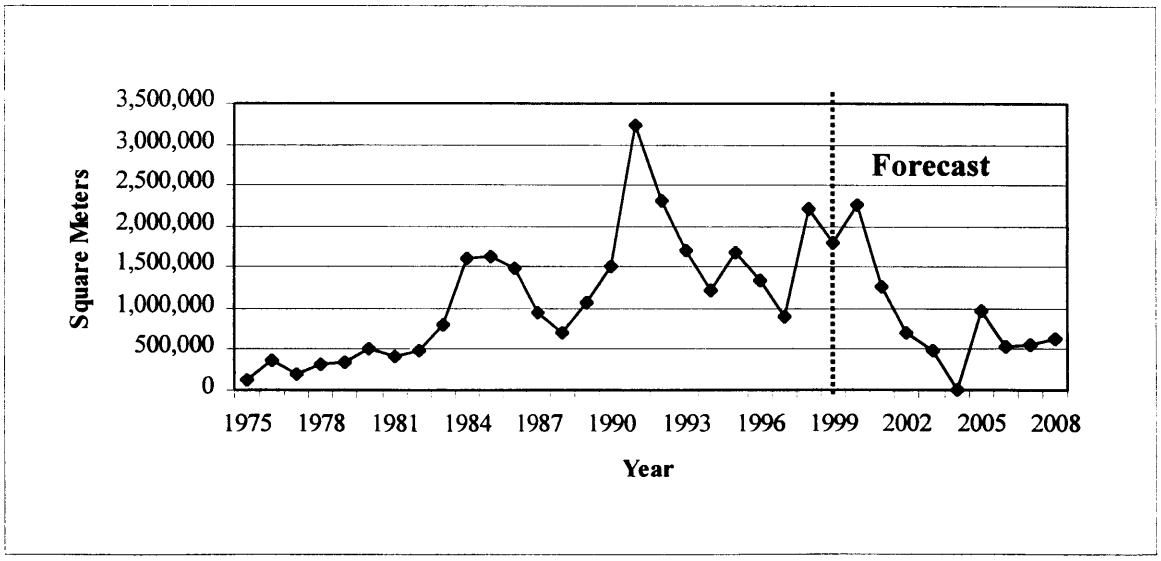
Source: Refer to the Text

Figure 5.6 Pessimistic Forecast: Real Rental Index



Source: Refer to the Text

Figure 5.7 Pessimistic Forecast: New Supply



Source: Refer to the Text

CHAPTER 6
CONCLUSION

6.1 Empirical Findings from the Historical Trends of the Seoul Office Market Characteristics

- In the historical analysis of the Seoul office market, I have found that, real rent actually decreased despite the general acknowledgement that real estate had recently experienced a huge appreciation, as evidenced by substantial increases in the real land price index. This trend can be explained by an increase in both Floor Area Ratio and economies of scale. However, the data for the change of FAR is hard to acquire and this may need to be studied further.

- Using the rent index developed by the author for the study, the cyclic movement of the annual rent changes can be clearly noticed. During the study period (from 1975 to 1998), there were three peaks with six-year cycles. But, after the last peak in 1990, rent changed little until the economic crisis in 1997 pushed rent downward.

- Rent is highly and positively correlated with the inflation of the Korean economy. The correlation coefficient between the nominal rent index and the CPI index for recent 25 years is a high 0.985. This high correlation suggests that owners of Seoul office buildings have regarded rent as a hedge against inflation.

- The growth of new office supply also demonstrates a cyclical movement. During 40 years, there were four peaks with 7 to 8 year cycles. In the 1990s, the annual new supply over 5 stories reached an average 1.8 million square meters, which is almost double that of the 1980s.

- Maintenance and operating fees tend to follow the trend of rent. For 18 years (from 1980 to 1998), real maintenance fees have had a strong correlation coefficient of 0.88 with real rent, and both fees and rent decreased by 2.2 percent per year.

- In June 1998, the vacancy rate reached its highest at 16.9 percent because of the widening gap between the continuing large supply and the decreased demand triggered by the recent negative economic shock. Nevertheless, vacancy rates should continue to increase as companies slowly adjust their spatial needs and recent high rates of unemployment do not fully affect the demand of space yet. However, in the long run, decreased rent will stimulate companies to consume more space per worker, and vacancy rates will consequently decrease.

6.2 Summary of the Office Model and Findings

6.2.1 Rent Equation

As rent is determined by the intersection of the demand for space use and the supply of space, it can be expressed by the function of office employment, stock of space, and the immediate past rent. The immediate past rent is included here as an independent variable since it is the base for the negotiation of rent and thus it influences the current rent.

The estimated equation suggests that rent seems to be fully explained by the immediate past rent, current total office employment, and current office stock in the Seoul economy – but only when the previous rental boom in the late 1970s is accounted for with the effect of governmental land use policy. Since the prevailing lease term in Seoul is one year and thus most of the tenants can move to other buildings providing competitive rent, building owners in Seoul may be forced to immediately adjust their rent based on the current market conditions such as office employment and the stock of office space.

6.2.2 Construction Equation

As the investment decision is influenced by rent and space needs, the annual new supply or completion of office buildings can be expressed by the function of the rent, and the employment growth.

The estimated equation suggests that new office supply can well be explained by the level of rent and employment growth, both lagging a long six years. This lag can mainly be explained by the long lead-time for planning and construction of office buildings. Another additional explanation can be reporting (or information) delay in the market, since information for the Seoul office market is not immediately available and it is costly to get. Furthermore, the equation implies that investors, whether developers or owner-occupiers, have expected current conditions to prevail in the future – a myopic expectation. This myopic expectation can generate market volatility since by the time space enters the stock, market conditions have changed.

6.3 Summary of Forecasts

The economic turmoil in Korea that started in late 1997 seems to be ending earlier than expected. The stock market has turned into a bull market and the Korean government is busy releasing a more positive forecast of economic growth. However, real estate does not show any sign of rebound yet. Many people question when real estate will recover from the current weak market. Even though many research institutes release their forecasts concerning real estate, there are few systematic forecasts for commercial real estate. The recent economic crisis gave a lesson to the developers that more systematic research into forecast was needed to avoid risks. This study is the first contingent econometric forecast for the Seoul office market.

Using the equations of rent and construction as well as that of identity, the future behavior of the Seoul office market can be forecast based on an assumed macroeconomic outlook that provides the estimate of an exogenous variable. The only exogenous variable in this model is the office employment in Seoul. The three forecasts – base, optimistic, and pessimistic – demonstrate cyclic movements in both rent and new supply. As the three estimated office employment growths have similar trends with slightly different rates, both rent and new supply generate similar movements, respectively, in all of the scenarios.

The most basic trend is that the supply of the office space has dramatically increased for the last 40 years caused by the continuous growth of the economy. Due to the long lead-time to plan and construct, it can be predicted that the heavy stream of new office space will continuously enter the market for the next two to three years. In contrast, the employment, heavily decreased by the crisis in 1997, will slowly move upward. This excess supply and declined demand will burden building owners and rent will be pressed to decline. Therefore, the Seoul office market seems to continuously be a weak or tight market for the next two to three years.

In the mid 2000s, the supply of office space will significantly decrease compared to the 1990s caused by the current weak market. In contrast, employment will continue to increase following the expected steady economic growth, if there is no more negative economic shock. This declining supply and increasing demand will press the rent upward, slowly but steadily. Therefore, the Seoul office market will turn to a strong market in the long run.

APPENDIX

DATA SETS

Period	Real Rent Index (1995 = 100)	Office Stock (Square Meters)	Office Employment (Person)	CPI (1995=100)
1959		62,000		
1960		145,000		
1961		172,000		
1962		206,000		
1963		239,000		
1964		296,000		
1965		363,000		5.0
1966		478,000	205,000	5.6
1967		582,000	233,970	6.2
1968		829,000	253,216	6.9
1969		1,222,000	319,951	7.7
1970		1,504,000	382,005	9.0
1971		1,725,000	452,418	10.1
1972		1,864,000	428,142	11.3
1973		2,092,000	423,536	11.7
1974		2,126,000	491,883	14.6
1975	107.3	2,258,000	528,118	18.2
1976	108.8	2,622,000	565,346	21.0
1977	116.9	2,812,000	635,909	23.1
1978	133.6	3,131,000	693,320	26.5
1979	143.9	3,479,000	734,816	31.4
1980	130.4	4,001,000	764,245	40.4
1981	114.4	4,413,000	778,941	49.0
1982	107.2	4,900,000	819,960	52.5
1983	105.4	5,696,000	884,162	54.3
1984	107.5	7,292,000	944,218	55.5
1985	104.4	8,912,000	1,001,536	56.8
1986	97.0	10,386,000	1,058,752	58.4
1987	93.4	11,345,000	1,120,245	60.2
1988	92.1	12,054,000	1,211,196	64.5
1989	94.4	13,113,000	1,326,145	68.2
1990	98.9	14,628,000	1,445,338	74.0
1991	98.9	17,855,000	1,556,000	80.9
1992	100.6	20,156,000	1,699,000	86.0
1993	101.4	21,852,000	1,837,000	90.1
1994	99.4	23,056,000	2,024,000	95.7
1995	100.0	24,731,491	2,112,000	100.0
1996	96.3	26,074,815	2,152,000	104.9
1997	94.2	26,974,915	2,173,000	109.6
1998	86.5	29,183,421	2,057,000	117.8

Source: Real Rent Index: The Author's Calculation
Office Stock: The Korean Fire Protection Association (1959 – 1994) and Estimation (1995 – 1998)
Office Employment : The National Statistical Office of Korea (1966 – 1997) and Estimation (1998)
Consumer Price Index: The National Statistical Office of Korea

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