A COMPARISON OF CENTRAL BUSINESS DISTRICT VERSUS SUBURBAN OFFICE SPACE PERFORMANCE

by

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ABSTRACT

A comparison was conducted of Central Business District (C.B.D.) office Space performance to Suburban office space performance from a mean sample of seven cities, and for the Boston urban area in particular. C.B.D. studies covered the period 1970 to 1986, and suburban studies covered the period 1975 to 1986. The study included a survey of pertinent literature, and tests upon Net Operating Income, major Boston area office population indicators (absorption, vacancy, and occupied area), holding period returns and a valuation model.

Results of the tests indicated that C.B.D. office space returns were equal to or greater than suburban returns while exhibiting lower risk, both across the seven city sample and in the Boston area. Returns on Boston C.B.D. office space were found to be greater than the seven city mean returns, but substantially riskier. Finally, all trends accelerated greatly in the last four years of the study period.

Thesis Supervisor: Dr. Marc Louargand

Lecturer, Department of Urban Studies and Planning

To my father Seymour A. Kaufman M.D.

1926 to 1984

TABLE OF CONTENTS:

FIGURES AND TABLES

Section One: Introduction (1.1 to 1.7)

1.1 The office space industry in the United States reflects both the business practices and condition of the underlying economy. The type, design, location, function, and tenants of office buildings have influenced American commerce and industry. Levels of office construction, vacancy and absorption annually comprise a large portion of the Gross National Product, and are among the first indicators of economic recession or expansion.

1.2 The office space market is divisible into two broad categories based upon location: 1) the Central Business District (C.B.D.), and 2) the Suburbs. Both populations have distinct characteristics, and can respond to local and national economic influences differently. In general, urban office buildings tend to be larger and command higher rents than the suburbs, while catering to the service sector industries. Suburban office buildings usually have superior access to transportation arteries, and better parking facilities than in the C.B.D., and employ a non-urban population.

1.3 The national C.B.D. and suburban office markets are further divisible into broad geographic zones, and then into urban subdivisions. Boston Massachusetts, located in the Northeastern office market zone provides an excellent microcosm for the study of office space trends and cycles.

The area has been inhabited continuously since 1630, always figured prominently in the national economy, and currently has one of the strongest C.B.D. and suburban business environments in the country.

1.4 The national office space market has experience three cycles of recession since 1970. The peak years of these economic downturns occurred in 1973, 1978, and 1982, and all were followed by rebounds. In each case, a period of over-building and speculation had created an excess supply of office space. The subsequent establishment of a new economic equilibrium lowered building rents, which eventually revitalized demand. As demand returned, construction resumed, and the cycle was completed. The Boston C.B.D. and suburban office market participated in the national trends listed above, often performing differently than the national average.

1.5 The cyclicality of the office space market and its associated industries has created problems and opportunities that effect many different parties. Developers, investors, owners, and users of office space are continually faced with vital financial decisions, the consequences of which are susceptible to economic cycles. Among the most frequent choices to be made, is that of C.B.D. versus suburban building location for investment purposes. This determination process is particularly

comprehensive. The positions of all pertinent parties, economic feasibility, logistical and construction factors are but a few of the considerations involved. When all of the applicable data can be viewed from a risk versus return framework, the investor(s) can decided where to build. This framework is primarily the analysis of local and national office space cycles, and other related trends.

1.6 This thesis examines the choice of office space location in the C.B.D. versus suburbs. Its purpose was to determine which location, if either, held its value better from the perspective of the investor. The analysis utilized both national and Boston data, and compared C.B.D. and suburban office space performance among and between these two sources. This information was tested by four analytical procedures: 1) a comparison of Net Operating Incomes, 2) specific measurements of Boston C.B.D. and suburban office building populations, 3) a determination of Holding Period Returns, and 4) a valuation model. When conclusive, the results of these procedures either illustrated pertinent trends in the office market, or were quantified for their comparative values.

1.7 The thesis is divided into six sections. The first section provides introductory material. The second section includes a history of the office space market in general and in Boston, and a survey of literature relevant to both

national and Boston office space. The third section contains a discussion of the major themes found in the office literature. This section also includes a model of urban versus suburban office space value. The fourth section reviews the methodology and results derived from the data sources employed. The fifth section presents the conclusions, including a determination of the relative value of C.B.D. and suburban office space in the Boston area.

Section Two: History (2.1 to 2.16) and Literature (2.17 to 2.54)

2.1 Modern office space is an intrinsically American phenomenon of Chicago origin. In 1885 William Lee Baron Jenny's 10 Story Home Insurance Building ushered in the era of skeletal iron frame works and steel beams. The "Chicago School" of architecture, as it became known, was the first modern response of the office space industry to prevailing economic influences. Industrialization had catalyzed urban development throughout the country, and caused the first large scale appearance of business service industries. In Chicago this trend was accelerated by the Great Fire of 1871, which effectively cleared 2000 acres in the city, at the cost of 18,000 buildings and $196,000,000 in damage. Within the next 9 years Chicago would invest over $316,000,000 rebuilding itself, and in doing redefine the concept of office space. Inevitably, of these events the "Skyscraper" was born.

2.2 Other factors heralded the Skyscraper. American society's agricultural focus was in decline, causing a demographic shift to the cities. Ultimately this migration increased the labor pool available for office jobs. Quantum improvements in transportation communications urbanized the large corporations (indeed modern office space and modern corporations were born around the same time). Suddenly C.B.D. land values soared, and

architectural design stressed height. There were other pertinent breakthroughs. During the 1880's both the electric elevator and poured foundations were perfected and became widely available. Soon the practice of large scale commercial leasing began, creating another new associated industry.

2.3 By the 1920's the Skyscraper had become the very symbol of American business success. Most successful corporations and major cites rushed to build buildings that reflected their power and wealth. These early developers soon experienced the first wide scale demonstration of office space supply versus demand: the over-building of the late Twenties. The excess of space was absorbed slowly, values fell as the first office space recession began. The 1929 stock market crash and the Great Depression that followed prolonged the office space market's woes. Mounting business failures led to further increases in vacancies. American businesses, which had occupied 145 Million sq ft of office space in 1931, dropped to 130.4 Million sq ft in 1933. Rental rates plummeted in an attempt to find equilibrium.

2.4 By 1935 the office space market began to strengthen. The general economy had already began to recover two years before, but office space displayed a delayed reaction to this macro trend. Further

technological advances increased the practicality and desirability of tall buildings. Florescent lighting now illuminated all sections of the office floor plate, making interior core locations equally functional to workers. Air conditioning and sound proofing improved the workplace atmosphere and led to a hike in productivity. The farms experienced further depopulation, as mechanized techniques lowered human labor requirements.

2.5 World War II provided a huge stimulus for the office space market, raising demand to unprecedented heights. When Pearl Harbor was attacked, the Federal government occupied 3.9 Million sq ft, by the time of Hiroshima and Nagasaki, this had increased to 21.15 Million sq ft.

2.6 After the war a pattern of supply and demand cycles imposed itself upon the maturing office space industry. In 1948 the first post war slump hit the market causing an eventual construction slow down. Yet significant vacancies did not reappear until the late 1950's, after a surge of construction in the new "International Style" of Architecture. During the 1960's office construction again accelerated, as did the expansion of America's highway system. Concurrently, office space development began to leave the cities and head out into the suburbs, where so many American's now preferred to live,

shop and now work. Greatly improved highway systems and airports made the suburban sites even more attractive and practical.

2.7 The 1970's began with another phase of severe over supply, tumbling rents and construction halts, but by mid decade this process started to correct itself. By 1979 office development had rebound, which predictably led to another space glut in the early 1980's as the newest set of technological improvements had impacted the supply-demand equilibrium. Since 1970 the average size of the new buildings coming on line exceeded 500,000 sq ft, twice that of their pre-1970's counterparts. As oil prices soared after 1973, energy consciousness changed building designs and values. Architects now sought to reduce outside surface area of buildings, and in a few examples actually started to build down instead of up. Advances in computer technology and data processing exerted an influence, as "smart buildings" (predesigned to accommodate large computers and telecommunications needs) became popular. The movement away from the cities continued, as larger corporations now chose to relocated their headquarters in the suburbs.

2.8 The 1980's have been a period of uneven prosperity for the American office space industry. As a whole, the nation experienced a small recession around 1982. Some

parts of the country have since experienced an unprecedented boom, while for others a devastating bust. The cities of the East and West coasts have been particularly favored by recent times. Foreign and pension fund investments, recent Federal tax reforms, strong F.I.R.E. & Service (Financial, Insurance and Real Estate) economies, and stringent local regulations have created a tremendous growth in central business district (C.B.D.) values. As a result, the skylines of Boston, New York, Philadelphia, Washington, Los Angeles, San Francisco and many others have changed substantially each year. The cities of the nation's industrial interior (with some exceptions), and oil cities especially, have been the victims of severe economic downturns. Property values, rents and vacancies in Houston, Dallas and Denver are at all time negative extremes. In Houston, the epitome of Real estate disaster, net absorption was until recently negative.

2.9 Thus the office markets of the eighties have reflected to a greater extent than ever before the changing nature of the base economy that supports them. This relationship will intensify as the basic of the American economy redefine themselves over the next decade. Office space will measure the magnitude of change, as heavy and labor intensive industries continue to leave for other countries, and high tech, F.I.R.E. and professional

services grow.

2.10 Due to its commercial orientation, Boston has always had some type of office space market. For the purposes of this thesis, the modern stock of office space began towards the end of the Nineteenth century (as it earlier in Napoleonic France). By 1890, after another convenient downtown fire helped clear the way (IE Nov. 9, 1872) the city acquired its first modern office buildings in its financial district. Yet full scale development of Boston's office space was to lag far behind Chicago, New York and other cities. Boston was still primarily a port, struggling with immigrant housing problems, as well as being the nucleus of the region's manufacturing based economy. The city's future role of F.I.R.E. and service sector industries mecca was many years off.

2.11 For decades, the 1915 Custom House tower dominated the Boston Skyline. Large scale construction began in 1940's, when the city's insurance companies and banks began to assert a national presence. By the mid-1950's, as part of the nationwide construction boom, Boston experienced dramatic office space construction. The first John Hancock Tower appeared in the Back Bay during the 1950's giving the insurance district a new look. In 1965 this same district put up Boston's first giant office tower, the million sq ft plus Prudential Tower.

Simultaneously, in the financial district, State Street Bank erected a structure of similar magnitude. Several other large complexes followed, including the conversion of the seady Scollay Square into Government Center, until the market slowed as part of a national trend in the late 1960's.

2.12 It was during this period that the Boston suburban ring developed its first appreciable amounts of office space. A proliferation of high tech companies and related industries throughout the Route 128 region created a large demand. Financial and insurance corporations reinforced the trend by moving back room clerical offices out to the suburbs. Suburban communities encouraged such development to secure tax revenues with minimal infrastructure impact.

2.13 During the mid-seventies Boston revived (again mirroring the national cycle) with most of the major downtown banks following State Street's lead. The First National Bank of Boston, Shawmut Bank, and the Bank of New England all put up large towers that quickly increased Boston's available office Space. The trend continued throughout most of the seventies, with only a small slow-down during the national recession of 1982. Since that time the construction of office space (especially Class A luxury) in Boston has proceed at an unprecedented pace, and

made Boston a national leader in that category.

2.14 Since 1984 Boston has added over 50,000 new jobs, and unemployment has dropped to 3.5% by the end of 1986 (it has since then fallen even further). Real estate development to accommodate such growth has exceeded $3.5 Billion dollars, and fostered a growth of office space from 37.2 million sq ft in 1980 to over 46 million sq ft today. As a related indicator, Boston Hotel space has also undergone a tremendous increase. Yet Boston has begun to diverge from some national trends by continuing its development boom while other strong areas of the country have begun to slow down. Despite the volume and rate of production, Boston's space absorption is still very high and vacancies (at 6%) are below the national average. Over the last five years downtown Boston demand has averaged 1.6 million sq ft per year.

2.15 This healthy market has attracted a great deal of investor capital because of the high appreciation rates it has offered. In many cases, newly constructed office space in Boston is selling at prices far above the actual development cost. Despite the negative effects that the tax reform act of 1986 has had upon many forms of real estate, Boston office space was not adversely affected by it. (This is because most if not all of Boston's major office buildings are income deals and not tax shelters.) This is

particularly true for Boston's proliferation of luxury class buildings, which typifies most of the larger projects in the city. Boston's working population has also greatly expanded in the office worker segment, and is predicted to expand further as demonstrated below:

Employment in Boston's Principal Service Industries (1985 and 2000)

Year	1985	2000
Business Services	47,200	87,800
Professional Services	36,300	63,500
Finance	85,100	108,000
Health	65,900	88,300
Higher Education	27,700	31,900
Total	262,200	379,500

Source: Boston Redevelopment Authority

2.16 Indeed, the prognosis for Boston's next decade is very good. All major office space areas are predicted to increase their square footage dramatically. Some of this growth represents buildings planned in the eighties that will come on line in the nineties, but the bulk of it will meet the needs of Boston's expanding economy. According to reports of the U.S. Bureau of Economic Analysis, of the nation's 330 major metropolitan areas, Boston shall move from 7th place to 6th in personal income, from 15th to 11th place in per capita income, from 6th to 5th in total population, and 5th to 4th in total employment **[2]**. Office

employers will provide 2 out of every 3 jobs in the Boston area, and total employment gain in the metropolitan region shall exceed 775,000 jobs [2].

2.17 The office space market has long been the subject of academic research and study. Practioners and academicians alike have consistently sought a cyclical formula that can explain the various swings routinely experienced by this industry. In pursuit of this goal, certain characteristics of the office space market receive recurring attention; a) the nature of the cycles themselves, of which timing is a sub-subject, b) the effects of over-building, c) the nature of construction, d) interest rates and inflation, e) vacancy rates and absorption, f) demography and location, and g) the current status of the market and forecasts.

2.18 Cycles in the real estate industry are referred to with such frequency that their existence appears to be factual, but conclusive evidence to this effect is lacking. Cycles remain simultaneously as difficult to prove as they are to deny. While an all encompassing theory of the office market is not practical, there are key elements, that if these cycles exist, would serve as leading indicators. The testing of historical data for statistically significant relationships is the most compelling research methodology. Yet real estate's ever

changing nature frequently defies classification, and challenges previous theory. As a general rule, M.I.T. econometrician William Wheaton has stated that office space cycles are triggered roughly once every 10 years [10].

2.19 The office market has been characterized by two dominant themes since 1945. First, is overall growth in the office sector due to continually increasing levels of office sector employment. (Yet the labor force should grow smaller in the future as baby-boomer pass into middle and old age.) Secondly, in the short run, the chronology of the market can be broken down into a series of shorter, 8-10 year cycles. Both themes exist simultaneously, and influence all sectors of the office space market.

2.20 Office space data is chiefly supplied by two sources: first, new construction permits and the Commerce Department's series on current value of office permits, and secondly, additions to the stock of office space. Other reliable sources are general construction trends, levels of completion, levels of office employment (IE 75% of occupied office space in all urban areas is occupied by F.I.R.E. and service sector enterprises), absorption rates, and vacancy rates. In general this data is constrained by incompleteness, and time lags, the effects of which must be calculated into the relevance of any study.

2.21 The above factors and sources have been intensely scrutinized for the 1967-1986 period, and much of the current cycle theory is derived from this work. The prevailing cycle theory is as follows: The high office employment growth during 1966-69 created a tight market by 1969 and a flurry of office space construction. Profit speculation led to over-building, which contributed to the national economic recession of 1969-71, and boosted vacancy rates. Construction slowed but did not cease, which illustrates lag effect so central to this industry. Building finally did stop by 1975, at which time the nation was in the midst of a major national recession. The economy recovered and experienced a boom by 1979-80, but construction did not pick until almost two years later, this time illustrating the other side of the lag effect. In 1982 yet another recession hit the industry, but it was short lived and its effects minimal. Construction did slow down, but it remained strong by historical comparison.

2.22 This see-saw effect underscores the sensitivity of both sides of the office market to macro as well as micro economic factors. Demand is primarily influenced by levels of employment, and the cyclical nature of the employment growth rate. Supply is chiefly effected by growth of office employment. Supply can actually curtail the magnitude of a given cycle. As the economy heads into a recession, absorption falls and vacancies rise. This

takes several months (or years) to occur, and even more time for these effects to translate into lower rents and asset values. During this period observant developers have time to ascertain the trends, and can freeze existing projects and cancel others. If enough projects are halted the market can start to head back towards equilibrium. In this fashion a boom or recession in the national economy can be regulated by an efficient play off of construction and absorption.

2.23 Timing is central to the nature of cycles. As stated above, the market does not clear itself during the short run, it experiences a lag effect. It must remain "soft" or "tight" for several years before vacancies, absorption and rents respond to it. When rents do change, supply seems to be more elastic than demand. This causes a brief market instability as developers and owners quickly try to impose a equilibrium on the market which causes market instability.

2.24 Timing problems are intrinsic to the inefficient nature of stable office space markets. The lengthy process of "Landlord-tenant matching", and long term rental leases keep the market from peak efficiency. Because of the imperfect state of both parties' information, negotiations can drag on for months, entailing compromises from both parties. While these compromises are for the good of the

lessor and lessee, they often fail to maximize the full economic potential of the building from either parties' point of view. Theoretically, this phenomenon represents an economic loss because the building does not generate the most income possible. Long term leases amplify this effect.

2.25 Wheaton [10] describes the office market as different from many others in its tenure structure. Eighty-five percent of the market is rented not owned, and the leases usually span 10-15 years. During any given year only about 10% of those leases roll over, at which time the bulk of those tenants usually move. Therefore, the property is consistently locked into long term deals where rent sooner or later does not match prevailing market rates. This creates an artificial burden or windfall for one of the two parties, and adds to market inefficiency. Long term leases are beginning to correct these flaws. Operating cost pass through clauses and escalation indexes attempt to realign the property to the market, but are subject to time lags before they take effect. Generally, the longer the term of the rental contract, the more unresponsive the building is to shifts in the economy.

2.26 In a more abstract sense, timing defines the expectations by which so much of the office space industry functions. Developers build buildings and owners lease

them out, all on projected returns over time. The value created by a developer and represented by a rental income stream are capitalized to determine the deal's value.

2.27 Finally, the corporate life stage of a tenant presents a critical office market timing issue. A growing firm will at first try to house its expansion internally. Then the company will attempt to obtain noncontiguous space, and finally, at the end of the lease, the company will regroup at another location. Conversely, declining firms will at first try to hold on to excess space as they vacate it. Eventually they will move out to smaller, more cost effective, locations. In a given market or nationally, the trends of corporate growth or decline directly influence the office market.

2.28 Over-building is often cited as the most observable manifestation in office space development cycles. There are several different scenarios that explain an over-abundance of office space, and the depression of values that follows. Myopic profit anticipation is the most widely accepted model. In this situation developers project their eventual profits based upon the characteristics of a currently strong market. Then, during the time lag between proforma and product, the market becomes soft and the developments are subject to reduced demand. The market quickly becomes over saturated, as

buildings in the pipe line can not be stopped. Absorptions and rents fall accordingly, while vacancies rise forming a new equilibrium. This process of readjustment can then take years, and defines a peak or trough in the office market cycle of values.

2.29 Academicians have proposed that the office space industry could be regulated, and extremes in the cycle avoided, through a careful management of supply [10]. If the production of office space were monitored so as not to outpace demand, consistent long term profits would be assured. This theory is impractical for many reasons; attractive short term profits, the independent nature of developers, poor communication, and largely imperfect knowledge about the market do not encourage such coordination. Furthermore, in planned state economies, were such regulation is supposedly practiced, office space construction is still subject to cyclical swings.

2.30 Cyclical office space models must account for a construction period "lag factor". In the years in which it might take a building to proceed from concept to completion, the nation or a particular city might experience several swings in the economy. Furthermore, construction is a function of the local economy in which it is occurring. Labor, logistics and climatic considerations might all influence the progress of a building, that might

in turn contribute to a still larger trend.

2.31 Because office space construction cycles are a process of current conditions used to project future profits, unanticipated variations in demand are ignored at the outset. Given the frequency of macro economic changes, and their direct impact upon construction and valuation of office space, the industry is inherently inefficient. Absorption is influenced by the reaction of office employment demand to the overall amount of occupied space. On a per employee basis, this relationship is higher in product abundant markets as the price of space declines. Absorption is constrained in tight markets by an inadequate supply of space. The demand for space per employee is effected by the general economic outlook and by particular recessions. Office space cycles are also influenced by trends in demand or consumer preferences. Some components of this demand include non-contiguous back office space, historic structures, and prestige highrises is very high. The construction industry in and of itself represents a large part of the economy (11% of G.N.P. [5]) and is cyclically unstable. Downturns in the construction industry have durable effect, because of the reassemble time of construction crews and materials that are required. Employment statistics show that the industry retains its labor pool throughout bad times, but that it redistributes itself to follow available work. Seventy-five percent of

all persons reporting earnings in contract construction derived most of their earnings from construction jobs. Even more had their longest full time employment within that industry [5]. Yet reassembling the necessary labor to build a project can represent tremendous expense.

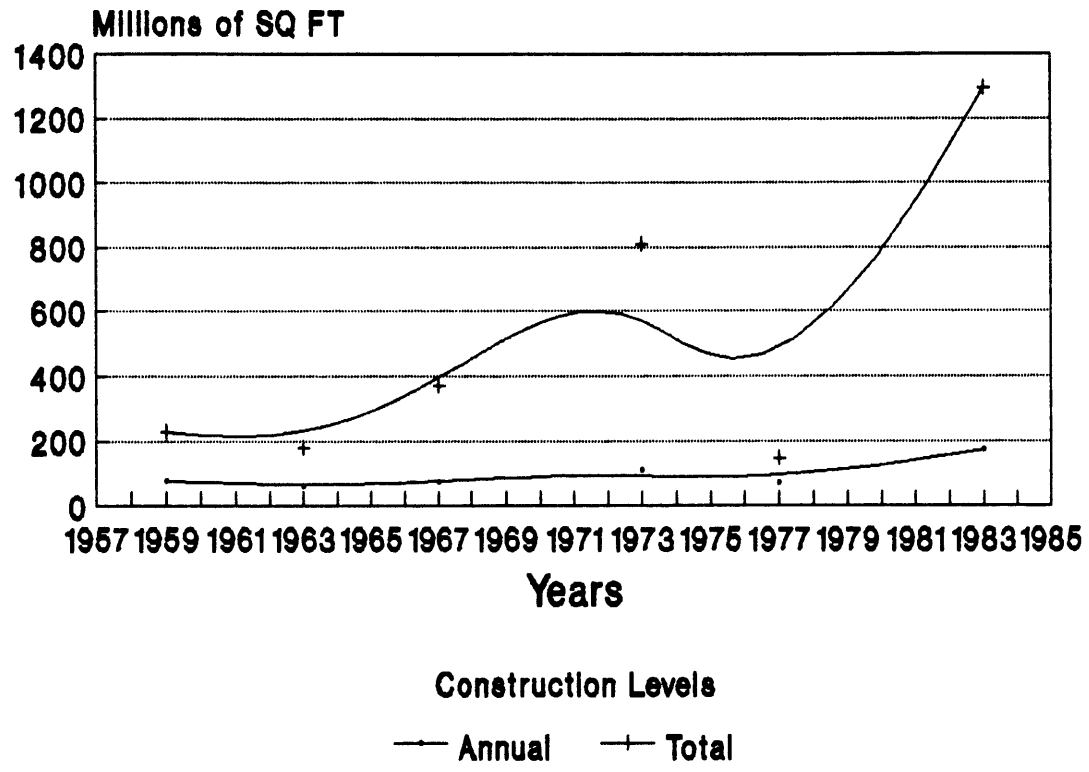
2.32 Construction cycles are the reflection of office space cycles, and there is a wealth of empirical evidence to document them. Over the 1950 to 1978 period there were 5 iterations of the construction cycle on a national level, 6 in the private construction sector, 4 in the private non-residential sector (offices), and 3 for the public sector. There were seven and four respectively in federal and state construction sectors [5]. Construction is a highly volatile segment of the economy, and it can fluctuate without parallel in other industries. According to trend adjusted data, cyclical swings have become increasingly severe since the late 1960's. The sharply differing fiscal policies of the Eisenhower and Kennedy/Johnson administrations initiated this trend [5], and it has yet to abate. This phenomenon is particularly true of private sector construction, which is becoming increasingly more erratic and difficult to analyze by trend. Construction as a whole displays greater volatility than any of its subsectors, with extremes in any one segment rarely offset in another. Cyclical changes in private and public sectors are similarly unrelated. Fluctuations in construction often

exceed those of the G.N.P.

2.32 The construction of new office space has experienced several cyclical peaks since World War II. The late fifties, early seventies, and the mid eighties have all been periods of intense growth in the field (see Fig. 1 on next page). The first two peaks amplified their effect by combining with national economic recessions. The result of this amalgam were historical highs in the vacancy rate in both 1967 and 1976, and inevitably, construction shut downs. (This pattern so defined the that last two construction cycles.) Yet the current construction boom has not conformed to the trends established earlier. Vacancies rates have risen (as high as 16% in 1985), but construction in many cities is still strong and growing. This prolonged "good health" is due, at least in part, to the favorable tax treatment and changing investor attitudes and objectives that have characterized this decade (Especially the tax acts of 1981 and 1986). Finally, the boom's persistence has been fueled by the infusion of massive debt and equity in the 1980's.

2.33 Interest rates are among the most important tools by which developers project profit. When the nominal rate declines developers usually opt to build. This decision is based upon the assumption that operating costs will decline

Fig 1: Office Space Construction Cycles National Trends 1957 - 1985



Source: Wheaton & Torto

(or hold steady), and that the pool of funds available to tenant for investment will increase. This theory is a component of the more generalized belief that interest rate reductions act as a spur to the macro economy.

2.34 Peaks in office construction have been observed to occur on an average of 14-27 months after peaks in the nominal interest rate according to Kling & McCue [8]. (Once again highlighting real estate's time lag effect.) Yet the theory of the lower interest rate catalyst is only accurate in the short term. In the longer scenarios the increased productivity born of these rates will in itself foster an over-built state, and eventually cause the nominal rate to recover. Thus the nominal rate is both cyclical in and of itself, and influential to the greater of cycles in the office space market.

2.35 Inflationary trends, and the classic role of real estate as a hedge against them, have been important factors in the 1980's office space market. The holding period of office space as an investment is strongly correlated to the escalation, decline, or stability of the inflation rate. Higher inflation erodes the real value of tax depreciation benefits which have acted as such a catalyst to real estate since 1981. As the relative tax advantage diminishes, investment capital is rerouted for more sheltered environments, causing a construction slow down.

Furthermore, high inflation severely discounts income streams and lowers the value of capital gains benefits. Developers and owners try to offset these effects by charging higher sales prices for their assets, which in itself contributes to the general inflationary trend. Inflation can be offset by using shorter depreciable tax lives for real assets. This technique was the cornerstone of the Tax Act of 1981 and the Accelerated Cost Recovery System. The tax act provided such a boost to construction, that eventually the government determined that it was losing revenues and reversed the act in 1986. Conversely, lower inflation strengthens the office market, by preserving tax benefits and income flows.

2.36 Leveraging, and its relation to the inflation rate are intrinsically connected to investments in the office market. The holding period of fully leveraged assets is governed by the inflation rate. In prolonged periods of high inflation, office buildings (and the leases held on them) should be held for full tax life to take maximum advantage of depreciation. When such assets are fully depreciated, and no longer provide shelter from taxes, they should be sold soon after. Quick disposal maximizes the owner's value (which would otherwise be subject to unsheltered N.O.I. and discounted capital gains), and renews the asset's depreciable life which is good for the macroeconomy. With the advent of flexible rate debt

instruments, low inflation now extends its positive effects to leveraging (though under traditional fixed rate obligations high inflation favored leveraging) [11]. In a low inflation period, the borrower's fixed capital costs maintain lower nominal and real costs. Costs are held down, profits stabilize, and the industry as a whole becomes more predictable and efficient (which benefits everyone). This process is even more critical to mortgagees of adjustable rate instruments, whose exposure is high, or who have to buy expensive rate caps. Unleveraged assets, a rarity in the office market where buildings now command prices in the hundred millions, should be held until the expiration of their tax life when inflation is low, and indefinitely if inflation is high [11].

2.37 Literature on the office space market often advances the opinion that the eighties are unprecedented, and constantly setting new record highs and lows, especially in the field of vacancy. The current national office space glut and excess vacancies levels are expected to last longer than in the past, with double digit vacancies until the mid-1990's.

2.38 Changes in rent are influenced by the prevailing vacancy rates. The level of rent can be approximated in any given period using a distributed lag factor of past

vacancy rates. The most commonly accepted time lag is 3 years [10]. This represents the amount of time which the market must remain soft before the owners will offer rent concessions to encourage absorption. Conversely, if the market is tight for an extended period, rents will rise to a point that will dampen absorption. From the supply side of the office market, the lag between vacancies and new construction is due to a market's slow vacancy-rent adjustment, and indecisiveness on the part of developers. Supply is more price (vacancy) elastic than demand, and fosters market instability [10].

2.39 Variations in the vacancy rate reflect a desired vacancy rate, and are significant in determining price and output responses to changes in demand. Reactions of output and prices to demand changes are strongest when the gap between desired and actual inventories is largest. Inventory holding is also largest when the related marginal carrying costs are lowest. Landlords react to fluctuations in demand by building up or drawing down their inventories of unlet or vacant office space.

2.40 Normal vacancy rate equals that occurring over a long span of time. The actual vacancy rate is that occurring at the moment. Landlords establish a desired inventory of vacant space which they are willing to hold on to. This affords the landlord the luxury of flexibility in

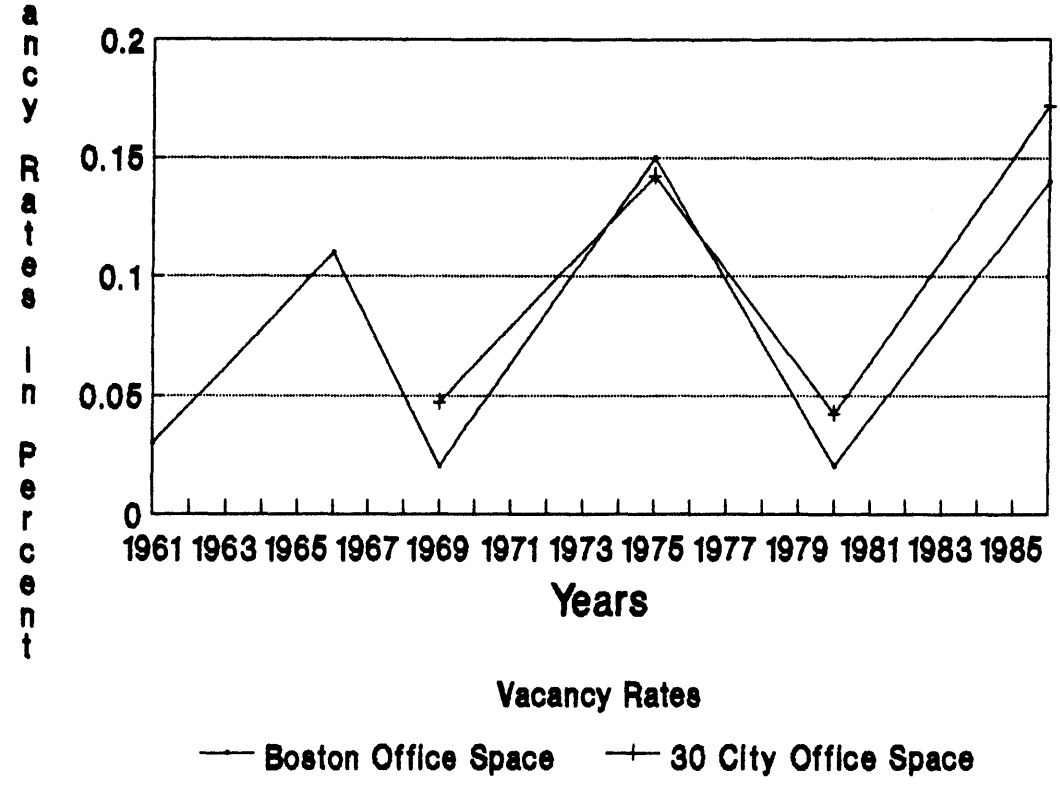
dealing with demand fluctuations and tenant turnover (especially in cases where the leases are long term). The landlords ability to respond to unexpected favorable events in the market is enhanced by holding on to this space. Essentially it allows the landlord to speculate upon the vacancy rate. The holding of this space is to the mutual benefit of the landlord and the tenant. Landlords can raise rents of rented space to cover the costs of the vacancies (ie passing them through). Such an inventory will also allow tenants to reduce their search costs, as well as the moving costs of occupying the new space. They are also freed from the obligations and expenses of a long term precommitments. Vacant space can therefore generate higher per square footage rents for the land lords, and save tenants money when this optimal macro-economic balance is maintained [9]. Conversely, if vacancies are too high, landlords will lower rents to reduce the stock to a desired level. Yet for landlords whose inventory carrying costs are constant, the level of vacant office space is not critical (ie his exposure is minimal even if prices start to rise). Obviously these landlords have greater waiting power. Current vacancy rates have tended to increase in older buildings, as tenants favor newer structures. The rent adjustment process may also be influenced by taxes.

2.41 Vacancies greatly influence the setting of short run rent levels, while risk increases directly as a

function of rents. Normal vacancies strongly correlate with the costs of carrying and leasing office space, and the level of demand uncertainty prevailing. On the demand side, holding vacancies has economic value to the tenants and also reduces the costs of future relocations. Finally, the greater the current fixed operating costs for commercial office space, the greater the cost of holding vacant space, and hence the lower the vacancy rate (due to a drop in rent).

2.42 Each of the three booms office construction have been matched by peaks in office vacancy. (The City of Boston provided a typical illustration of this national trend- see Fig. 2 on next page.) This is a function of the industry's cyclical self-regulation, and the inability of developers and operators to forecast the industry correctly. Developers tend to initiate projects only if the future product would be profitable in the current market. This is erroneous, because the market tends to change during the development life of the building, especially if it began towards the end of a favorable phase in the cycle. Unfortunately, economic cycles are a matter of hindsight, and a developer usually can not determine his position in the cycle as it is occurring. Under favorable economic conditions newly available space is absorbed as it comes out on the market, keeping it "soft". During periods of economic downturns, the market becomes "tight", with

Fig: 2 Boston Office Vacancy Rates '61 to '85 & 30-City Average Vacancy Rates '69 to '85



Courtesy William Wheaton

large amounts of space becoming and remaining available. Due to these market inefficiencies the office space cycle is set in motion, and eventually completes and repeats itself.

2.43 Office space Cycles and trends are also being examined for relative merit by demographics and a inter-city rank order. J.S. Hekman contends that local office construction reflects rent levels and growth in office related employment for a given market, independent of national trends [8]. Therefore office space is unique by location, and it is flawed logic to assume an applicable national model. According to Hekman, a "shift and share" problem derails any unified theory of office space values and performance. Specifically, each city has its own rate of growth or "shift". These rates of growth, even if the same for different cities, are based upon intrinsically unique characteristics that may or may not be subject to change across cities. "Share" is a description of the specificity of employment mix to a given city. For example, Boston and Houston may have had a similar size work force, but employed these people in different quantities in different industries. The respective response of these cities to macro economic changes (in this case the global drop in the price of oil), is therefore very different. Boston's work force has so far proven recession-proof to those same factors which have plagued the oil cities.

2.44 Despite the relative decline of American manufacturing's role in the total economy, its proportion of white-collar workers has increased since W.W. II. While layoffs and automation have reduced the number of blue collar workers, the need for centralized administrative functions and other non-manufacturing services has grown. Similarly, F.I.R.E industries have increased their labor force from 3 million in the fifties, to 12 million by the mid-eighties. In most areas the bulk of this expansion has occurred since the sixties, with major expansions happening in the 1980's. Such patterns in labor demography and office employment are directly reflected in office space developments. Net absorption of office space closely parallels the level of office employment, and the supply of office space has grown from 1 billion sq ft in 1955 to over 3.8 billion sq ft today.

2.45 The move out of the cities has created two distinct and competing office markets around most major urban centers; the suburban and the downtown. The location option has been the concern of a changing clientele over the last three decades, and has been influenced by everything from technological advances to fashion. Convenience, cost effectiveness, access to labor, and tax incentives, have all motivated the development of suburban office space. The occupation of that space can be

classified firm type; either executive or clerically intensive [1]. Executive oriented businesses are primarily sensitive to "linkages", while clerical firms respond to commuting costs. Thus knowledge of a firm's business is above all else, the key to determining whether or not it will opt for downtown or suburban office space.

2.46 "Linkages" represent the need for face-to-face interaction among offices and their access to amenities [1]. The availability of various support services, communications technology, and the joint use of data processing facilities is also covered by the term. In statistical tests, the a given firm's attraction towards the downtown positively correlated with the frequency, variety and urgency of meetings it must accomplish with other offices.

2.47 Personnel commuting costs tend to counteract the effects of linkages. When a business's employees mostly reside in the suburbs, the cost and effort for them to commute to a downtown location is high (if not prohibitive). If the business is not willing to compensate its employees for high commuting costs then its must bring itself to its labor source; it should locate in the suburbs. (Though often the person who selects the office site or owns the company picks it in relation to his own house.) Since commuting costs effect the wage rate, they

also effect a firm's ability to bid on a specific location, thus many firms find themselves priced out of the downtown option, especially if they are very labor intensive.

2.48 Parking costs represent an associated commuter expense. If they are substantial, as they would be for any major downtown American city, an employer faces the risk of loosing potential employees over the cost. This tendency would be reduced in a city with a well developed public transportation system (such as Washington), or one which was created in the automobile age (such as Los Angeles). In a city that has neither amenity parking would become a major problem. In such a situation firms with the small parking requirements will tend to locate in downtown offices. (Big Eight Public Accounting Firms in Boston represent the worst case scenario. All are located downtown, serviced by mediocre public transportation, have large parking requirements, and rely upon cars to transport their auditors out to clients.) If the business is torn between the need for downtown linkages and suburban labor costs, it will have to prioritize one or the other, or select an in-between location. During the eighties, large technological advances in all aspects of linkages and rising wages have tilted the location dilemma in favor of the suburbs. However, this does not indicate a whole sale flight of all businesses to the suburbs, some business can only succeed in a downtown location. Because of the

combination of linkages and personnel commuting costs, downtown firms are becoming increasingly restricted to certain industries.

2.49 The significance of linkages and personnel commuting costs in the office location decision of is beginning to fade. Rapid advances in electronic communication, data processing and transportation, are encouraging location regardless of face-to-face contacts, and the prestige factor of the C.B.D. has faded. Workers in the eighties now either tolerate long and expensive commutes, or can avail themselves of greatly improved public transportation, depending upon which city the work in. In either case labor is proving itself more willing to get itself to the job; not less.

2.50 The influence of a firm's age, and its stage in the business live cycle have been extensively studied for insight into office space location choice. One theory suggests that new firms frequently locate downtown to avail themselves of services, which they otherwise would have to employ in-house. Then, as the business grows and matures, it may then leave the downtown for cheaper suburban rents to house an expanded staff. However, there are many considerations that make firms reluctant to move. The high cost of relocating, and severe interruptions to business that accompany it, often keep firms anchored to their

cramped downtown locations. Only when the benefits of a move are clearly evident will the firms move. This hesitation period adds credence to the age theory. Yet statistical evidence has demonstrated that the desire to be and remain downtown is most strongly related to the given characteristics of a city, rather than the age of a firm. There are many other considerations that influence a firm's choice of office location. In varying degrees, companies, firms tend to locate near the center of their geographic market region. Firms must also consider the ability of a given area to provide the type of space which they require, the comparative cost efficiencies between different sites, and the cost of transportation between the customer location and office.

2.51 In the short run perspective the office space available in a given city will be distributed according to some mix of the above criteria. Yet these are all immediate factors with a fleeting relevance to the current situation. Over time all of the parameters above will change in response to macro economic forces such as energy prices, transportation improvements and urban growth or decay.

2.52 Employment levels outside of America's C.B.D. have been increasing rapidly. Firms may opt for suburban locations for many reasons, a major one of which is invitation. Firms have often been viewed by suburbs with

available white collar work forces as a good source of revenue with little offsetting expense. The impact of office space upon suburban infrastructure has proven slight. The companies usually tie into the local sewer system, but often provide their own security and maintenance services. They make no additional use of the school system (usually any communities largest expense), and often bring income to local business. Their greatest negative impact is traffic congestion. Yet often suburban developers are willing to bear or split the necessary improvements with the town. In general, suburban office buildings represent potential expenses for the town (such as fire fighting), and actual tax revenues. Resistance to suburban office migration usually comes from wealthier communities who favor zero growth. They oppose any change to the character of their community, and are wary of possible associated low income housing needs for the employees. They also argue, that office buildings situated in their town provide benefits (such as employment) to other towns. The town can block proposed office space by means of zoning, which developers are becoming increasingly savvy in circumventing. There are situations office development is sometimes solicited by a well to do town, especially when it is viewed as a lesser evil than a shopping mall who happens to be after the same location.

2.53 Currently the office space market is affected by

demand increases, the source of which can be traced to certain events. In January 1981 the depreciable lives of real estate assets were shortened, making them in to a more attractive investment. (This act opened the office market up to syndication, which did a thriving tax shelter business until the tax reform act of 1986). Secondly, in December 1982 banks were deregulated and allowed to offer insured money markets funds. This created a dramatic increase in the supply of funds available to finance the development of new office space. Yet, this same deregulation has also increased the cost of real capital, which has forced businesses to use their existing space more effectively rather than expand. This effect is coupled with the high transaction costs inherent to buildings, whose irreversability in the short term can scare investors away.

2.54 Wheaton **[10]** provides three forecasts of the future office market based upon the previously detailed market characteristics. The Base forecast: smooth but slow growth over the next 6 years with vacancy rates reaching 18% by the end of the decade. The Recession forecast: A strong national recession will start by 1988 followed by a quick recovery in 1990. The duration of this cycle will also be about six years, and vacancies will be pushed upwards to 20%. The Growth Forecast: the national office market will experience steady overall growth, with a

dramatic shift into the service economy. Vacancy will peak at 12%. None of these forecasts predict a single digit vacancy rate, because both sides of the market must respond to economic changes. Demand and supply usually offset one another in order to avoid extreme conditions.

Section Three: Components of Office Space Performance (3.1 to 3.6).

3.1 As a result of the histories examined, the literature surveyed and the data collected, this thesis has identified several main issues that influence the value of office space in the C.B.D. and the suburbs. These issues impact the national market as a whole, and the Boston urban market in particular. The manner in which they interact in a given urban area, and effect the C.B.D. and suburban office populations within that area, directly determine which of the two will maintain the greater value.

3.2 The health of a C.B.D. or suburban office population can be ascertained from the associated levels of construction. High construction usually indicate high office space values, and the developer's perception that his/her building will not lower those values through oversupply. Provided that supply and demand are relatively balanced, the developer's risk is exposure becomes local and national economic cycles. These events may dramatically increase or decrease office space values in the C.B.D., the suburbs, or both. Often there is a lag effect, in which the suburbs lead the decline, and are then slower to recover [7]. The more recession proof a given building or area, (via a tenant, an industry, the government etc.) the higher the associated value. Generally, the C.B.D. and the suburbs do not always respond

to economic cycles simultaneously.

3.3 C.B.D. rent levels tend to be higher than in the suburbs based on a variety of reasons. Primarily, C.B.D. buildings experience a variety of expenses that are intrinsically higher than in the suburbs, and must be passed on to the tenants. Operating expenses, cost of land, construction costs and taxes are all higher in the C.B.D., and require higher rents to offset them. Non-expense factors also drive up C.B.D. rents. Prestige factors, scarcity of buildable sites, and a long permitting process all cost more in the C.B.D. than in the suburbs. These factors further subdivide the C.B.D. itself, creating more or less expensive downtown addresses. Although the C.B.D.'s higher rent levels are offset by higher expenses, C.B.D. N.O.I tends to exceed its suburban counterparts. This higher N.O.I. is a major factor contributing to the greater value to investors of C.B.D. office space.

3.4 Absorption levels and vacancy rates help determine office space values, and tend to be inversely related. High absorption rates raise rent levels in markets where space is scarce, and lowers them where it is overabundant. Conversely, high vacancies lower rents to encourage absorption, and low vacancies keep them high to take advantage of a strong market. While they are inversely related, absorption and vacancy are not perfectly

synchronized, and the strength of one does not absolutely mean a weakness in the other. Therefore, both vacancy and absorption, through their influence on rent, help determine the value of office space in any given market. Finally, these rates, like construction, are susceptible to national and local trends. Yet both absorption and vacancy tend to be much more volatile on the urban area level than nationally.

3.5 These basic determinants of value were quantitatively examined by use of secondary data. The N.O.I. data allows for the manipulation of income and expense categories that compared relative office value across and within seven cities (which included Boston). The specific Boston building population data provided measurements of total available area, total occupied and available area, vacancy rates and absorption, that compared C.B.D. and suburban values. The combination of these two sources allowed a risk and reward analysis between and within the seven cities (holding period gain), and the calculation of C.B.D. and suburban portfolio values for the Boston urban area.

3.6 Given the role of construction, rent, absorption and vacancy as determinants of the value of office space, and the research, data and analyses conducted by this thesis, the following assumption about office space value

was tested: that in general, the value of equivalent amounts of C.B.D. office space exceeds that of suburban office. Specifically, during the years 1970-1986 for C.B.D. office space, and 1975-1986 for suburban office space, the value of the former exceeded that of the later (in those years where comparison was possible) both nationally and locally in Boston. Furthermore, from the perspective of an investor in Boston office space, if the property was held for the entire period, he/she would have received a return on investment in C.B.D. office space that was equivalent or greater than in the suburbs at substantially reduced risk.

Section Four: Data (4.1 to 4.4) Methodology (4.5 to 4.13) and Results (4.14 to 4.36)

4.1 The main data sources for this thesis are as follows; the annual Experience Exchange Reports from the Building Owners and Managers Association (BOMA) for the years 1970 to 1986, and the Spaulding and Slye Boston Area Office Reports, quarterly from 1979 to April 1988. Additional include: the Capitalization Rate reports from the American Council of Life Insurance Companies, quarterly from 1970 to 1978. Several major economic measures such as the Frank Russell Indices, Gross National Product data, the Consumer Price Index, and the Constant Value of the dollar (100 = 1970). The AA Industrial Bond ratings and the 10 Year Treasury Bill Rate from 1970 to 1986. Various publications by the Boston Redevelopment Authority. A survey of prevailing pertinent literature on the office space market, both nationally and Boston specific. Finally, interviews with persons both influencing and influenced by the office space industry. These sources have provided the data for a series of tests of the basic assumption about the office space market.

4.2 According to BOMA, the "Experience Exchange Reports provided published tables of operating income and expense data for office buildings throughout North America. The data is based upon a voluntary survey of building owners and managers whose buildings represent a wide and varied selection of office space. Building owners and

managers receive the survey forms in January of each year and submit them prior to the March 15th deadline. BOMA International reviews the forms and compiles the data statistically into tables during April and May: publication and distribution of the book occurs in June" [3]. While basic gathering and processing procedures have remained constant since the 1950's, scope of the analysis has increased over time adding both new cities and types of analyses. Suburban data collection begin in 1975.

4.3 The Spaulding and Slye data represents a comprehensive broker's survey of most of the existing buildings in the greater metro Boston Area. This series lists the buildings individually, giving their dates of completion, number of floors, total rentable area, sq ft available, estimated rent per sq ft (rents are based upon owner operator quotes or S&S's own estimation), and percentage of vacancy. The reports are updated on a quarterly basis, and released in January, April, July and October of each year since 1979. The Spaulding & Slye reports are generally held as Boston's most comprehensive publicly available office market data source.

4.4 This study examined a selection of nineteen downtown buildings (see appendix #2) and eighty-two suburban building in the Boston metropolitan area. All cases these buildings were completed before 1973. The

downtown buildings include such Boston landmarks as the Prudential Tower, the State Street Bank building, and the Bank of Boston Building. The portfolio ranges in size from 1.3 million square feet down to 45,000 square feet, with an average size of 436,503 sq ft. The suburban sample included such buildings as the Technology Square buildings in Cambridge, New England Executive Park in Burlington, and the Bear Hill Road and Totten Pond Road Buildings in Waltham. The largest building in the portfolio is 751,000 sq ft, the smallest is 15,000 sq ft, and the average size is 66,093 sq ft.

4.5 Using income statement data from the BOMA reports, a series of both downtown and suburban N.O.I. for several cities was tabulated for comparative purposes. These cities include: Boston, Chicago, Denver, Los Angeles, Minneapolis, San Francisco and Washington D.C. The cities were selected to represent a broad spectrum, and for their continuity throughout the BOMA data (1970 -1986 for Downtown and 1975 to 1986 for suburban). Chicago and Los Angeles represent a contrast to Boston due to their immense populations and geographical area. San Francisco, Denver, Minneapolis and Washington D.C., more closely resemble Boston, and provide a valuable comparison.

4.6 The Spaulding and Slye data was used to determine general characteristic for the entire Metropolitan Boston

office space population. By aggregating quarterly data, gross totals for urban and suburban office space were derived in the following areas: total rentable area, total available sq ft, rates of vacancy, supply added in a given year, Total occupied Space, Annual absorption, and average building rent. These totals were applicable to the years 1979 to 1987, and the results can be observed in appendix #3.

4.7 N.O.I. tables for Boston and the six other cities listed earlier were constructed according to the following N.O.I. formula:

Rental Income
- Operating Expenses
- Construction (tenant Improvements)
- Fixed Charges (Insurance & Property Taxes)
= Net Operating Income

In all cases the data for these accounts represents the median value for the population of buildings surveyed. These populations differ widely, from 8 buildings for some cities in some years to over 60 in others. This data is also only from BOMA members, and therefore may be biased due to self-selection of each respondents in a given city.

4.8 N.O.I. was compared among the seven cities

examined, and on a urban versus suburban level for the same cities. Average N.O.I. for urban and suburban populations were calculated for comparative purposes. Boston N.O.I. in both situations was compared to the mean for trend and timing differences. N.O.I. for both Boston and the other sample cities compared to other major financial indicators such as G.N.P. data for gross private investment in non-residential property, the 10 year T-Bill rate, the AA industrial bond rate, the C.P.I. index and the Constant value of the dollar. (See summary N.O.I. tables on next two pages).

4.9 Data from the aggregated Spaulding and Slye reports was used to examine relationships of Rent, Vacancy and Absorption, and in some cases, their correlation to N.O.I. In each category data for the period 1979 to 1987 was analyzed for both the suburban and urban office space, both individually and in comparison to one another. Individual tests included: Urban versus Suburban Vacancy Rates for Boston, Urban versus Suburban Total Square Footage in the Boston Metropolitan Area, Urban versus Suburban Absorption Levels for Boston, Urban versus Suburban Rental Rates for Boston, Urban and Suburban N.O.I. versus Applicable Rents for the period 1970 -1986, Suburban and Urban Indexed changes in Rent, Absorption level, Vacancy, Total Area Available and N.O.I., and a comparison of Asked for and Average Earned Rent in Suburban and Urban

TABLE 1: 7-City Mean C.B.D. and Suburban N.O.I. 1970 - 1986

Downtown Office Space:

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	'75-'86	'70-'86	'82-'86
Operating Expenses	$1.94	$2.08	$2.16	$2.40	$2.63	$2.81	$2.77	$3.11	$3.48	$3.87	$4.30	$4.81	$5.06	$5.06	$5.24	$5.42	$4.93	$4.24	$3.65	$5.14
Construction	$0.22	$0.28	$0.22	$0.26	$0.17	$0.12	$0.13	$0.16	$0.40	$0.23	$0.24	$0.08	$0.15	$0.21	$0.19	$0.51	$0.24	$0.22	$0.22	$0.26
Fixed Charges	$1.01	$1.06	$1.13	$1.27	$1.35	$1.21	$1.34	$1.28	$1.48	$1.40	$1.53	$1.79	$1.87	$2.33	$2.47	$2.65	$2.89	$1.85	$1.65	$2.44
Total Expenses	$3.17	$3.42	$3.51	$3.92	$4.14	$4.14	$4.24	$4.55	$5.37	$5.50	$6.06	$6.68	$7.08	$7.60	$7.90	$8.59	$8.06	$6.31	$5.53	$7.85
Rental Income	$5.46	$5.55	$5.58	$6.21	$6.33	$7.10	$7.15	$7.72	$8.33	$9.36	$10.55	$11.21	$13.00	$14.34	$15.42	$17.20	$17.68	$11.59	$9.89	$15.53
N.O.I.	$2.29	$2.13	$2.07	$2.29	$2.19	$2.96	$2.91	$3.17	$2.97	$3.86	$4.49	$4.53	$5.91	$6.74	$7.51	$8.61	$9.62	$5.27	$4.37	$7.68
Rent Inc.- N.O.I.	$3.17	$3.42	$3.51	$3.92	$4.14	$4.14	$4.24	$4.55	$5.37	$5.50	$6.06	$6.68	$7.08	$7.60	$7.90	$8.59	$8.06	$6.31	$5.53	$7.85
Rent Inc./N.O.I.	2.38	2.61	2.69	2.71	2.89	2.40	2.46	2.43	2.81	2.43	2.35	2.47	2.20	2.13	2.05	2.00	1.84	2.30	$2.40	2.04

Suburban Office Space:

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	'75-'86	'70-'86	'82-'86
Operating Expenses	N/A	N/A	N/A	N/A	N/A	$2.22	$2.60	$3.04	$2.92	$3.12	$3.33	$3.72	$4.23	$4.54	$4.42	$4.19	$4.15	$3.54	N/A	$4.30
Construction	N/A	N/A	N/A	N/A	N/A	$0.18	$0.18	$0.13	$0.52	$0.21	$0.34	$0.10	$0.18	$0.17	$0.18	$0.56	$0.20	$0.25	N/A	$0.26
Fixed Charges	N/A	N/A	N/A	N/A	N/A	$0.87	$1.01	$0.97	$1.02	$0.97	$1.17	$1.21	$1.25	$1.43	$1.57	$1.96	$1.78	$1.27	N/A	$1.60
Total Expenses	N/A	N/A	N/A	N/A	N/A	$3.28	$3.79	$4.13	$4.46	$4.30	$4.84	$5.03	$5.66	$6.14	$6.17	$6.72	$6.13	$5.05	N/A	$6.16
Rental Income	N/A	N/A	N/A	N/A	N/A	$5.90	$6.16	$6.92	$8.42	$7.72	$8.83	$9.63	$10.75	$11.20	$12.59	$14.62	$13.52	$9.69	N/A	$12.54
N.O.I.	N/A	N/A	N/A	N/A	N/A	$2.63	$2.37	$2.79	$3.96	$3.42	$3.99	$4.61	$5.09	$5.06	$6.42	$7.90	$7.39	$4.64	N/A	$6.37
Rent Inc.- N.O.I.	N/A	N/A	N/A	N/A	N/A	$3.28	$3.79	$4.13	$4.46	$4.30	$4.84	$5.03	$5.66	$6.14	$6.17	$6.72	$6.13	$5.05	N/A	$6.16
Rent Inc./N.O.I.	N/A	N/A	N/A	N/A	N/A	2.25	2.60	2.48	2.12	2.26	2.21	2.09	2.11	2.21	1.96	1.85	1.83	2.17	N/A	1.99
Downtown N.O.I. - Suburban N.O.I.						$0.33	$0.55	$0.38	($1.00)	$0.44	$0.50	($0.08)	$0.82	$1.68	$1.09	$0.71	$2.23	$0.64	N/A	$1.31

TABLE 2: Boston C.B.D. and Suburban N.O.I. 1970 - 1986

Downtown Office Space:

	1970	1971	1972	1973	1974	1975*	1976*	1977	1978	1979*	1980	1981	1982	1983	1984	1985	1986	'75-'86	'70-'86	'82-'86
Operating Expenses	$1.85	$1.77	$2.07	$2.68	$2.91	$3.84	$3.29	$3.61	$4.54	$4.66	$5.13	$5.15	$5.26	$5.23	$5.62	$5.90	$5.41	$4.80	$4.05	$5.48
Construction	$0.20	$0.18	$0.13	$0.14	$0.10	$0.15	$0.05	$0.02	$0.05	$0.30	$0.40	$0.03	$0.12	$0.10	$0.17	$0.75	$0.21	$0.20	$0.18	$0.27
Fixed Charges	$1.73	$1.80	$1.92	$2.11	$1.73	$1.69	$1.94	$1.62	$2.28	$2.23	$2.49	$2.84	$2.83	$3.24	$3.45	$3.59	$3.91	$2.68	$2.44	$3.40
Total Expenses	$3.77	$3.75	$4.12	$4.93	$4.74	$5.68	$5.28	$5.26	$6.87	$7.19	$8.03	$8.02	$8.21	$8.57	$9.24	$10.24	$9.53	$7.68	$6.67	$9.16
Rental Income	$6.68	$6.41	$6.65	$7.08	$6.47	$7.97	$7.89	$8.81	$9.46	$9.44	$11.18	$11.61	$11.63	$14.77	$17.22	$17.30	$17.86	$12.09	$10.49	$15.76
N.O.I.	$2.90	$2.67	$2.53	$2.15	$1.73	$2.29	$2.61	$3.55	$2.59	$2.25	$3.15	$3.59	$3.42	$6.20	$7.98	$7.06	$8.33	$4.42	$3.82	$6.60
Rent Inc.- N.O.I.	$3.77	$3.75	$4.12	$4.93	$4.74	$5.68	$5.28	$5.26	$6.87	$7.19	$8.03	$8.02	$8.21	$8.57	$9.24	$10.24	$9.53	$7.68	$6.67	$9.16
Rent Inc./N.O.I.	2.30	2.41	2.63	3.29	3.74	3.48	3.02	2.48	3.66	4.20	3.55	3.23	3.40	2.38	2.16	2.45	2.14	3.01	2.97	2.51

Suburban Office Space:

	1970	1971	1972	1973	1974	1975*	1976*	1977*	1978*	1979*	1980	1981	1982*	1983	1984	1985	1986	'75-'86	'70-'86	'82-'86
Operating Expenses	N/A	N/A	N/A	N/A	N/A	$2.51	$3.25	$2.96	$3.02	$3.52	$4.01	$3.74	$4.64	$5.54	$5.57	$4.35	4.78	$3.99	N/A	$4.98
Construction	N/A	N/A	N/A	N/A	N/A	$0.11	$0.13	$0.12	$0.47	$0.38	$0.17	$0.30	$0.26	$0.22	$0.04	$0.11	$0.22	$0.21	N/A	$0.17
Fixed Charges	N/A	N/A	N/A	N/A	N/A	$0.75	$0.99	$0.81	$0.95	$0.97	$2.05	$1.90	$1.90	$1.90	$2.53	$1.95	$2.16	$1.57	N/A	$2.09
Total Expenses	N/A	N/A	N/A	N/A	N/A	$3.37	$4.36	$3.89	$4.44	$4.87	$6.22	$5.94	$6.80	$7.66	$8.14	$6.41	$7.16	$5.77	N/A	$7.23
Rental Income	N/A	N/A	N/A	N/A	N/A	$6.27	$6.34	$6.32	$6.72	$7.46	$11.98	$9.56	$9.66	$9.75	$12.58	$13.91	$12.34	$9.41	N/A	$11.65
N.O.I.	N/A	N/A	N/A	N/A	N/A	$2.89	$1.98	$2.44	$2.29	$2.58	$5.76	$3.62	$2.86	$2.09	$4.44	$7.50	$5.18	$3.64	N/A	$4.41
Rent Inc.- N.O.I.	N/A	N/A	N/A	N/A	N/A	$3.37	$4.36	$3.89	$4.44	$4.87	$6.22	$5.94	$6.80	$7.66	$8.14	$6.41	$7.16	$5.77	N/A	$7.23
Rent Inc./N.O.I.	N/A	N/A	N/A	N/A	N/A	2.17	3.20	2.59	2.94	2.89	2.08	2.64	3.38	4.67	2.83	1.85	2.38	$2.80	N/A	3.02
[N.O.I. Downtown - N.O.I. Suburban]						($0.61)	$0.63	$1.12	$0.30	($0.34)	($2.61)	($0.03)	$0.57	$4.11	$3.54	($0.44)	$3.15	$0.78	N/A	$2.18

Boston.

4.10 Holding Period Returns were calculated from the seven city mean C.B.D. and suburban N.O.I. trends from 1976 -1986, Boston C.B.D. and suburban N.O.I. trends for the same period, and the seven city C.B.D. and Boston C.B.D. N.O.I. trends from 1971-1986. The holding period return was calculated using the following formula: [(N.O.I. during the period + imputed sales proceeds) / imputed acquisition cost] - 1.

[(N.O.I. yr.1 + (N.O.I. yr.1/Cap Rate yr. 1)) / (N.O.I. yr.o/Cap Rate yr.o))] -1
= Holding Period Return yr. 1

Statistical measurements of Means, Standard Deviation and Coefficient of Variation were then applied to the results to yield reward to risk analysis.

4.11 Using N.O.I. averages from the BOMA data, and total population square footage from the Spaulding and Slye reports, values of specific buildings as well as total portfolios were estimated. Trend value patterns for all buildings in the portfolio were generate utilizing the Gordon Constant Growth Dividend Valuation Model: N.O.I.o

(1+g)/(ke-g) * occupied square footage o = capitalized value of a given building (N.B. o = year zero). In this model N.O.I.o (1+g) = the value of next years N.O.I. today, and g is the growth rate (over 17 years for downtown office space and 12 years for suburban office space). Ke is the required return to equity, which in this model is the American Council of Life Insurance's New England Office Building Cap Rate (see appendix #4).

4.12 When the N.O.I. capitalization model was applied to the suburban and urban office building populations as a whole, value and trends of the entire metropolitan area from 1979 to 1986 were observed. The model summarized the values of both portfolios of buildings generated by the capitalization model. This value was then divided by the total number of square feet in the given portfolio in order to obtain a value per square foot. Average value per square foot by given year was then multiplied by the total amount of rentable area in both the suburban and urban Boston office space markets to obtain a valuation.

4.13 This model produced valuations for all buildings in the portfolio and populations as a whole that were tested in several ways. The value patterns of individual buildings from each portfolio were examined over their applicable test life span (1970-1986 for urban and 1975-1986 for suburban). These buildings were then compared to

one another both among and across their urban-suburban categories. (Specific buildings examined were: Downtown: The Prudential Tower, State Street Bank, One Center Plaza, and in the Suburbs: One Heritage Drive, 7 New England Executive Park, and the Coolidge Bank Building.) The indexed change in value of total office stock was then compared to indicators such as the National and Eastern Frank Russell Indexes for Income and Appreciation.

4.14 C.B.D. seven city mean N.O.I. for the period 1970 to 1986 had a low of $2.07 per sq ft, a high of $9.62 per sq ft, and an average of $4.37 per sq ft. For the seventeen year period covered, seven city mean N.O.I. grew at an annual rate of 9%. Yet this growth was neither gradual nor smooth, it proceeded in a series of phases that had stable N.O.I. for several years with periodic large increases. These phases are summarized below:

Seven City Mean N.O.I. Increases

1970-1974	$2.19	N/A
1975-1978	$3.00	36.85%
1979-1981	$4.29	42.99%
1982-1983	$6.33	47.32%
1984-1986	$9.12	44.11%

Rental rates during the same period exhibited a similar pattern to N.O.I., growing at an annual rate of 7%, while expenses relatively constant growing at 6% annually.

Therefore, the increase in the seven city mean C.B.D. N.O.I. was primarily driven the by strong later period growth in rents that were not offset by corresponding expenses. When the growth in N.O.I. is examined for the period 1982 to 1986, the average N.O.I. was $7.68, with a growth rate of 10% annually, which illustrates the acceleration of N.O.I. growth in the later part of the study period (see Fig. 3 on next page).

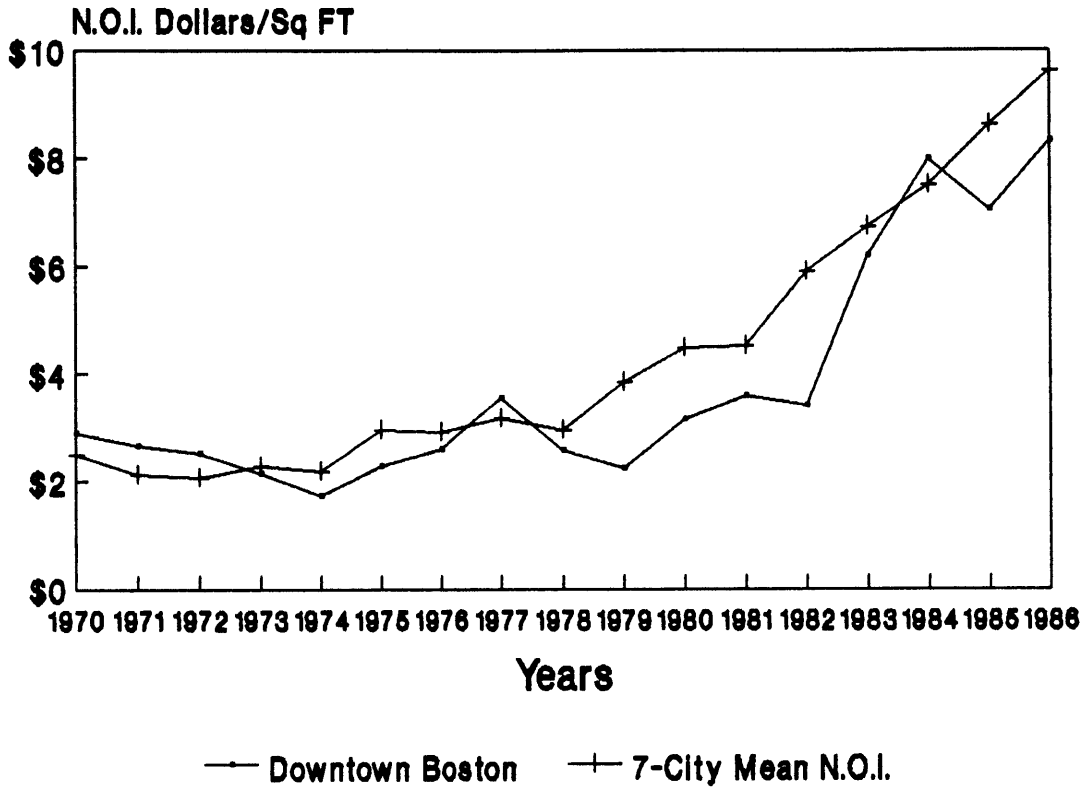
4.15 Suburban seven city mean N.O.I. for the period 1975 to 1986 had a low of $2.37 per sq ft, a high of $7.90 per sq ft, and an average of $4.64 per sq ft. For the twelve year period covered, seven city mean N.O.I. also grew at an annual rate of 9%. N.O.I. can be summarized as follows:

Seven City Mean Suburban N.O.I. Increases

1975-1977	$2.60	N/A
1978-1981	$4.00	53.85%
1982-1983	$5.08	27.00%
1984-1986	$7.24	42.52%

As with their urban counterparts, suburban seven city mean rents grew faster and greater than corresponding expenses. For the period examined, rents averaged $9.69 at an annual growth rate of 7%, while expenses averaged $5.05 at an annual growth rate of 5%. Also, as in the C.B.D. case, all

Fig 3. Downtown Boston Vs. 7-City Mean Office Space N.O.I



major measures of N.O.I. greatly accelerated during the 1982 to 1986 period. N.O.I. increased by 37%, rents by 29%, and expenses by 37% (see Fig. 4 on next page).

4.16 C.B.D. N.O.I. for the seven city mean exceeded their suburban counterparts for 10 out of the 12 years from 1975 to 1986. The maximum absolute difference was $2.23, the minimum was $0.08, and the average difference was $0.64. The growth in the rate of difference was 17% annually, while the actual trend was divided into two phases:

Increases between C.B.D
& Suburban Seven City Mean N.O.I.

1975-1982	$0.24	N/A
1983-1986	$1.43	495.83%

The average rental rates for the C.B.D. was $11.59 compared to $9.69 for the suburbs, a difference of $1.90 or 16.39%. Operating expenses were lower in the suburbs, $5.05 versus $6.31 in the C.B.D., but this difference of $1.26 (24.95%) was less than the difference in rents of $1.90. As observed in the individual C.B.D. and suburban cases, all pertinent N.O.I. measures accelerated after 1982. The average difference in N.O.I. for the 1982 to 1986 period was $1.31, an increase of 105% from the 1975 to 1986 average (see Fig. 5 on page 59).

Fig 4. Suburban Boston Vs. 7-City Mean Office Space N.O.I

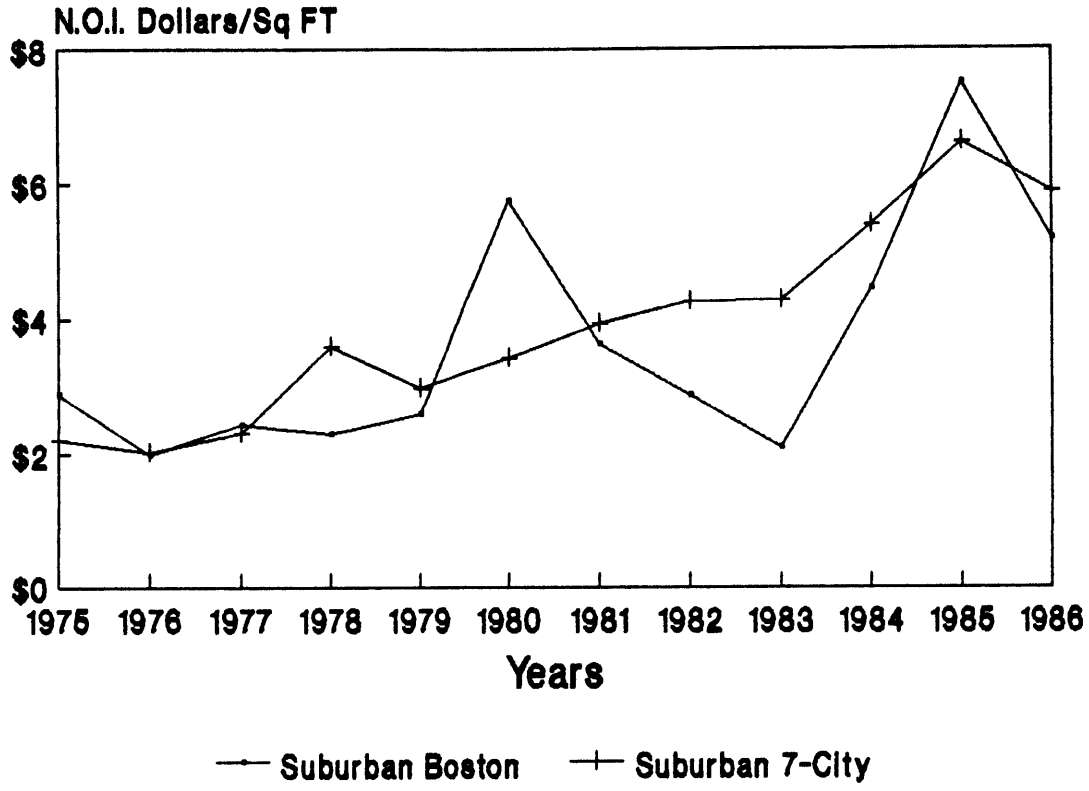
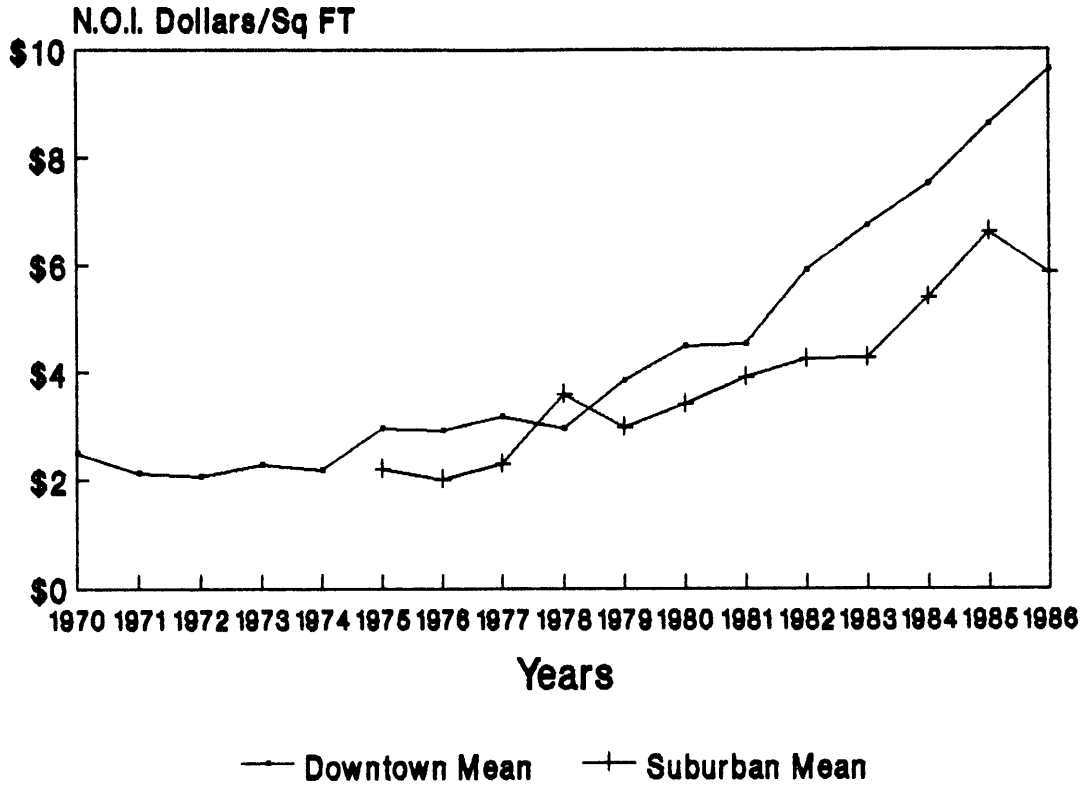


Fig 5. Downtown 7-City Mean N.O.I. Vs. Suburban 7-City Mean N.O.I.



4.17 Boston C.B.D. N.O.I. for the period 1970 to 1986 had a low of $1.73 per sq ft, a high of $8.33 per sq ft, and an average of $3.82 per sq ft. For the seventeen year period covered, Boston C.B.D. N.O.I. grew at an annual rate of 6%, 3% less than the seven city average for the same period. N.O.I. growth was much smoother than the average, having three major periods of consistency compared to the seven city average of five (see Fig. 3).

Boston C.B.D. N.O.I. and Increases

1970-1979	$2.53	N/A
1980-1982	$3.39	33.99%
1983-1986	$7.39	117.99%

Rental rates during the same period were less consistent than N.O.I., changing more frequently, with an average level of $10.49 and a growth rate of 6%. (compared to the seven city mean average of $9.89 at 7%). Expenses for the period averaged $6.67, and grew annually at 6%, with the seven city mean average being $5.53 also at 6% growth. As in the case of the seven city mean C.B.D. N.O.I. was driven the by strong later period growth in rents not matched by expenses. Like all previous cases of N.O.I. examined, there was substantial growth after 1982. Average N.O.I. for the period 1982 to 1986 was $6.60, an increase of 73% over the 1970 to 1986 period level of $3.82. Rental and expense rates also increased dramatically over the

later period.

4.18 Boston suburban N.O.I. for the period 1975 to 1986 had a low of $1.98 per sq ft, a high of $7.50 per sq ft, and an average of $3.64 per sq ft. For the twelve year period covered, Boston suburban N.O.I. grew at an annual rate of 5%. The N.O.I. can be summarized as follows:

Boston Suburban N.O.I. Increases

1975-1979	$2.44	N/A
1980-1983	$3.58	46.72%
1984-1986	$5.71	59.50%

Like the previous trends, suburban rents grew faster and greater than corresponding expenses. For the period examined, rents averaged $9.41 at an annual growth rate of 6%, compared to the seven city average of $9.69 and 7%. Expenses averaged $5.77 at an annual growth rate of 6%, compared to the seven city average of $5.05 at 5%. Also, as in the C.B.D. case, all major measures of N.O.I. greatly accelerated during the 1982 to 1986 period. N.O.I. increased by 21%, rents by 24%, and expenses by 25%, compared to the seven city mean respective increases of 37%, 29%, and 37% (See Fig. 4).

4.19 Boston C.B.D. N.O.I. exceeded its suburban counterpart for 7 out of the 12 years from 1975 to 1986. The maximum absolute difference was $4.11, the minimum was $0.03, and the average difference was $0.78. The growth in

the rate of difference was 15% annually, (compared to the seven city mean results of max. $2.23, min. $0.08, avg. $0.64 and growth of 17%) while the actual trend was divided into the same two phases as in the seven city mean comparison:

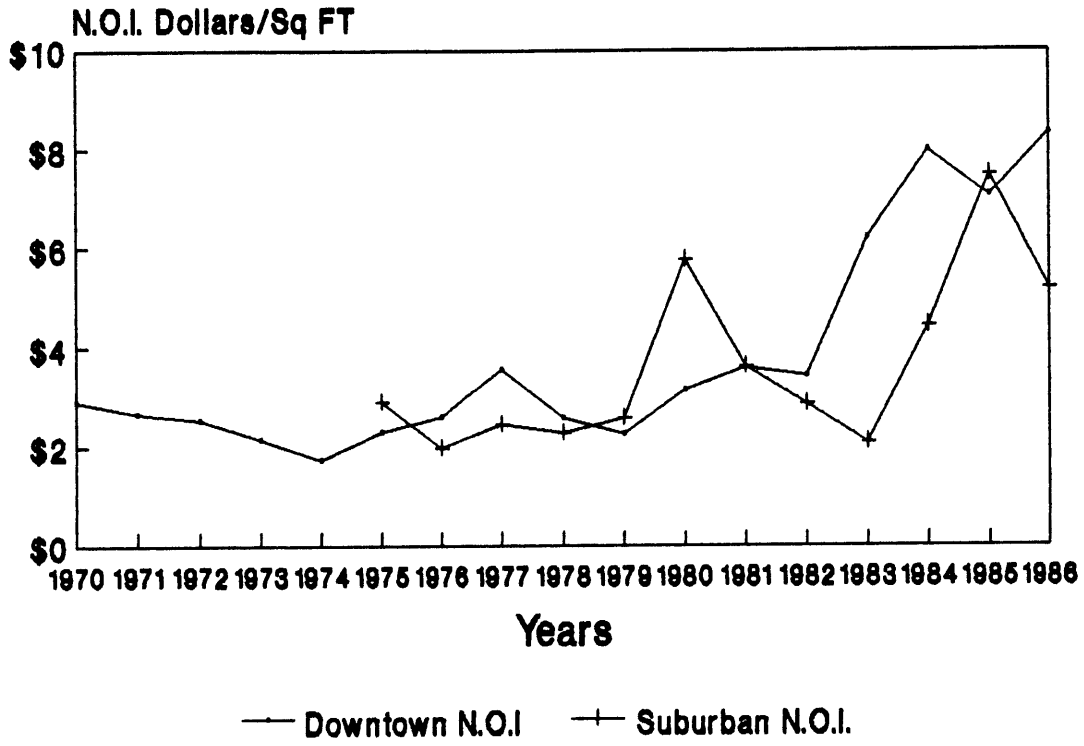
Increases between C.B.D & Suburban Boston N.O.I.

1975-1982	$0.78	N/A
1983-1986	$2.81	260.26%

The average rental rates for the C.B.D. was $12.09 compared to $9.41 for the suburbs, a difference of $2.68 or 28%. Operating expenses were lower in the suburbs, $5.77. versus $7.68 in the C.B.D., but this difference of $1.91 (33%) was exceeded by $0.77 per sq ft by the difference in rents (which was greater than the $0.64 surplus for the seven city mean case). As observed in the individual C.B.D. and suburban cases, all pertinent N.O.I. measures accelerated after 1982. The average difference in N.O.I. for the 1982 to 1986 period was $2.18, an increase of 179% from the 1975 to 1986 average, and greater than the respective seven city mean growth of $1.31 at 105% (see Fig. 6 on next Page).

4.20 From the Spaulding and Slye data provided major office space indicators for both C.B.D. and suburban populations. These indicators included; rental rates, absorption, total rentable area, total occupied space,

Fig 6. Downtown Vs. Suburban
Boston Office Space N.O.I



total available square footage and vacancy, were examined for period of 1979 to 1988 (except where comparisons with N.O.I. data limit it to 1986).

4.21 As with N.O.I. data, rental rates were the key driver that increased office space value. Also, as with the N.O.I. data, C.B.D. rents were found to be far greater than those of the suburbs, averaging $23.63 per sq ft versus $17.19 per sq ft respectively.

	C.B.D. Average Building Rent	Suburban Average Building Rent	Deviation:
1979	$13.00	$10.50	$2.51
1980	$16.59	$12.30	$4.29
1981	$21.08	$14.70	$6.38
1982	$23.66	$17.10	$6.57
1983	$24.97	$17.70	$7.28
1984	$27.82	$19.26	$8.56
1985	$26.26	$20.37	$5.89
1986	$27.03	$20.15	$6.88
1987	$27.59	$19.96	$7.63
1988	$28.29	$19.84	$8.46
Averages:	$23.63	$17.19	$6.44

The average rental difference was $6.44 for the entire period with a growth rate of 13%, and $ 7.32 from 1982 to 1988, confirming the acceleration trends identified in the N.O.I. studies. Actual rent for the C.B.D. population attained a high of $28.29 in 1988, a low of $13.00 in 1979, with an average of $23.63, and an annual growth rate of 8%. Suburban rents reach a high of $20.37 in 1985, a low of $10.50 in 1979, with an average of $17.19 and a annual growth rate of 7%. The peak of suburban rents in 1985, and

the continued growth of C.B.D. rentals through 1986 was confirmed by the N.O.I. data.

4.22 Absorption for both populations was strong over the entire period studied. The suburbs absorbed more space on average per year than the C.B.D., at 563,665 sq ft versus 483,443 sq ft respectively, for an annual average difference of 80,222 sq ft.

	C.B.D. Absorption	Suburban Absorption	Deviation:
1979	786,415	423,238	363,176
1980	96,583	238,874	(142,291)
1981	341,095	486,537	(145,442)
1982	231,972	373,998	(142,026)
1983	244,970	491,227	(246,257)
1984	217,051	493,143	(276,092)
1985	833,473	720,903	112,570
1986	745,213	1,067,183	(321,970)
1987	910,077	677,060	233,017
1988	427,579	664,489	(236,911)
Averages:	483,443	563,665	(80,222)

C.B.D. absorption peaked in 1987 at 910,077 sq ft, and was lowest in 1980 at 96,583, and was very volatile throughout the study period. Suburban absorption peaked at 1,067,183 ft sq in 1986, with a low of 238,874 sq ft also in 1980. Suburban absorption led C.B.D. absorption for seven out of the ten test years. The difference in average absorption, though higher for the suburbs did not necessarily correlate to higher suburban values. Since absorption for both populations is strong and relatively constant, the indication is one of overall metropolitan area strength

versus suburban versus C.B.D. predominance. Higher suburban absorption undoubtedly reflects the lower rents commanded by buildings in that population.

4.23 As with absorption, total rentable area, total occupied space, and total available square footage were more indicative of general market strength in the Boston urban area, than quantifiers of comparative C.B.D. versus suburban office space values. For the period under study, urban total rentable area always exceeded the suburbs by an average rate of 6,974,444 sq ft. This difference has steadily declined over the last few years from a high of over 10 million sq ft in 1979, to a low of under 4 million in 1988 (although only two quarters of this year have been completed at the time of this study). The size of both office space populations now is relatively equal, with greater growth having occurred in the suburbs during this study period. Suburban office space growth exceeded C.B.D. growth on an average of almost 200,000 sq ft per year, and by as much as 450,000 sq ft in peak years. Offsetting this excess in supply was Boston's lower amount of available space and added supply, making existing downtown stock a scarcer commodity in the suburbs and driving up its value. Available supply has averaged over 1 million feet less per year in the C.B.D. than in the suburbs, with the difference growing dramatically over the last three years. (The average difference for the last three years has been just

under 2.3 million square feet, indicating that a scarce resource is getting scarcer.) Added supply in the same three year period has also been much smaller downtown, 1.9 million sq ft versus 2.8 million sq ft respectively, further confirming the comparative scarcity of C.B.D. versus suburban office space.

4.24 They key measure generated from the area and absorption indicators in support of C.B.D. claim to greater value, is the vacancy rate. The C.B.D. vacancy rate in the 1979 to 1988 period attained a high of 10.3% in 1985, a low of 0.4% in 1980, and averaged 4.99%. Concurrently, suburban vacancy rates had a high of 18.7% in 1896, a low of 2.6% in 1979, and averaged 11.75% for the period.

	C.B.D. Vacancy Rate	Suburban Vacancy Rate	Deviation:
1979	2.4%	2.6%	-0.25%
1980	0.4%	3.3%	-2.86%
1981	1.3%	7.5%	-6.21%
1982	3.0%	10.5%	-7.47%
1983	3.5%	14.5%	-11.00%
1984	6.4%	11.9%	-5.52%
1985	10.3%	16.1%	-5.76%
1986	9.6%	18.7%	-9.10%
1987	6.9%	16.6%	-9.67%
1988	6.1%	15.9%	-9.82%
Averages:	4.99%	11.75%	-6.77%

Vacancies in the C.B.D. have been lower than in the suburbs each year of the period examined, and averaged 6.77% less than in the suburbs. The magnitude of difference between the two populations grew at a rate of 44% since 1979, with a minimum difference of 0.25% in 1979, and a maximum of 11%

in 1983. The average rate of difference for the last three years was been 9.53%.

4.25 These vacancy measures indicated a strong C.B.D. office space market from 1979 to 1988, that had little problem absorbing new office space as it came on line. On average the downtown market is occupied 93% of each year's added space at a vacancy rate just below five percent. This combination made Boston one of the strongest C.B.D. office space markets in the country. The suburban office space market, which was also strong by national standards, was weak compared to the downtown. Occupancy of new product stood at 81%, twelve percentage points less than the C.B.D., at a vacancy rate 11.75%. The suburban market absorbed less space, at a slower pace and for less rent than the C.B.D.. Furthermore, while the C.B.D. market had not yet to abated its growth by the end of this study, the suburbs had already peaked, and the gap between them grown larger for the last two years of the study.

4.26 The Holding Period Return model (see paragraph **4.10** for formula) yielded risk and return analysis for seven city mean and Boston N.O.I. trends for both the suburbs and C.B.D..

4.27 Holding Period Returns (H.P.R.) for the seven city mean C.B.D. N.O.I. for the period 1971 to 1986 had a

high of 50.74%, and a low of -3.43%. Mean return for the population, 23.36%, with a risk factor of 16.69%. H.P.R. for the suburban seven city mean N.O.I. had a high of 56.09%, and a low of -9.75% for the period 1976 to 1986. Average return for the population was 25.05%, with a risk factor of 20.64%.

Holding Period Returns:

Year	7-City C.B.D. '71-'86	7-City Suburban '76-'86
1971	13.42%	
1972	10.58%	
1973	22.04%	
1974	-3.43%	
1975	44.00%	
1976	12.39%	2.97%
1977	22.31%	32.31%
1978	0.70%	53.03%
1979	35.99%	-9.75%
1980	15.94%	16.17%
1981	2.12%	16.87%
1982	50.74%	27.65%
1983	37.59%	19.93%
1984	37.00%	56.09%
1985	36.48%	46.46%
1986	35.91%	13.83%
Mean	23.36%	25.05%
STD. DEV.	16.69%	20.64%
COEF. VAR	0.71	0.82

A comparison of both populations for the period 1976 to 1986 yielded:

	Average H.P.R.	Risk Factor
7-City C.B.D.	26.11%	16.39%
7-City Suburbs	25.05%	20.64%

4.28 Holding Period Returns for Boston's C.B.D.

office N.O.I. for the period 1971 to 1986 had a high of 118.73%, and a low of -21.68%. Mean return for the population was 23.71%, with a risk factor of 35.49%. H.P.R. for the Boston suburban office N.O.I. had a high of 161.10%, and a low of -36.37% for the period 1976 to 1986. Average return for the population was 31.53%, with a risk factor of 66.47%.

Holding Period Returns:

Year	Boston C.B.D. '71-'86	Boston Suburban '76-'86
1971	12.16%	
1972	7.66%	
1973	-5.77%	
1974	-19.08%	
1975	41.09%	
1976	30.34%	-21.70%
1977	52.90%	37.93%
1978	-21.68%	0.97%
1979	-9.20%	18.18%
1980	39.64%	122.11%
1981	15.48%	-36.37%
1982	10.05%	-8.89%
1983	118.73%	-11.68%
1984	58.19%	161.10%
1985	5.33%	101.11%
1986	43.57%	-15.96%
Mean	23.71%	31.53%
STD. DEV.	35.49%	66.47%
COEF. VAR	1.50	2.11

A comparison of both populations for the period 1976 to 1986 yielded:

	Average H.P.R.	Risk Factor
Boston C.B.D.	31.21%	38.57%
Boston Suburbs	31.53%	66.47%

4.29 Comparisons between holding period return for the seven city mean and Boston populations at both the C.B.D. and suburban levels, for both periods (ie 1971 to 1986 and 1976 to 1986) were as follows: For the period 1971 to 1986, the difference between H.P.R. on C.B.D. N.O.I. for both populations had a high of 45.19%, a low of -40.69% with a mean of -0.35%, and a standard deviation of 31.93%. Suburban populations for the period 1976 to 1986 had the following difference results: High 53.24%, low -105.94%, mean of -6.48%, and a standard deviation of 59.13%.

Boston Versus 7-City Average
Holding Period Returns:

Year	C.B.D. Deviation '71-'86	Suburban Deviation '76-'86
1971	1.26%	
1972	2.92%	
1973	27.81%	
1974	15.65%	
1975	2.91%	
1976	-17.95%	24.67%
1977	-30.59%	-5.62%
1978	22.38%	52.06%
1979	45.19%	-27.93%
1980	-23.70%	-105.94%
1981	-13.36%	53.24%
1982	40.69%	36.54%
1983	-81.14%	31.61%
1984	-21.19%	-105.01%
1985	31.15%	-54.65%
1986	-7.66%	29.79%
Mean	-0.35%	-6.48%

[N.B. 7-City Mean -Boston]

4.30 For the period 1976 to 1986 Boston C.B.D. H.P.R. had a high of 118.73%, a low of -21.68% with an average

Comparison of Holding Period Returns:

Year	7-City Suburban '76-'86	Boston Suburban '76-'86	Difference
1976	2.97%	-21.70%	24.67%
1977	32.31%	37.93%	-5.62%
1978	53.03%	0.97%	52.06%
1979	-9.75%	18.18%	-27.93%
1980	16.17%	122.11%	-105.94%
1981	16.87%	-36.37%	53.24%
1982	27.65%	-8.89%	36.54%
1983	19.93%	-11.68%	31.61%
1984	56.09%	161.10%	-105.01%
1985	46.46%	101.11%	-54.65%
1986	13.83%	-15.96%	29.79%
Mean	25.05%	31.53%	-6.48%
STD. DEV.	20.64%	66.47%	
COEF. VAR	0.82	2.11	

4.31 The valuation model combined aspects of the N.O.I. and Boston office space data. The two sections of the model, the urban and suburban test portfolio, and the total office space population, both demonstrated greater value for urban versus suburban office space. The test period for these models was 1978 to 1986, based upon the chronological limitations of the BOMA and Spaulding & Slye data.

4.32 The test portfolio of C.B.D. office buildings had an average value of $1,010,981,436 for the period examined, and an average size of 8,293,553 sq ft, yielding an average value per sq ft of $121.90. The portfolio had a growth rate of 17.61% from 1978 to 1986. The test portfolio of suburban office space buildings had an average value of $346,745,383, an average size of 5,419,592 sq ft, and an

average value per sq ft of $63.98. The growth rate for the suburban portfolio was 11.78% for the period examined. The average difference in values was $664,236,053, on 2,873,961 sq ft, averaging $57.92 per sq ft , and growing from 1978 to 1986 at 20.11% (See summary Tables on Next Page).

4.33 The results indicated a clear value predominance for the C.B.D. portfolio. In all measures, whether absolute or relative, C.B.D. office space displayed greater value, size and growth. The value difference of $57.92 per sq ft provided the key insight from this exercise. Though the difference itself reflects only the buildings in the portfolio, and should not be abstracted to all buildings in the metropolitan area, it does characterize the situation in general. On a per sq ft basis, suburban office space in this portfolio maintains only 52% of the value of the

Year	C.B.D. Portfolio Rentable Area	C.B.D. Portfolio Values	Value Per sq ft
1978	8,293,553	$610,569,924	$73.62
1979	8,293,553	$457,430,373	$55.15
1980	8,293,553	$488,950,069	$58.96
1981	8,293,553	$443,414,840	$53.47
1982	8,293,553	$440,062,788	$53.06
1983	8,293,553	$924,689,717	$111.50
1984	8,293,553	$1,495,267,935	$180.29
1985	8,293,553	$1,609,626,116	$194.08
1986	8,293,553	$2,628,821,158	$316.97
78-'86 Avg	8,293,553	1,010,981,436	$121.90
83-'86 Avg	8,293,553	1,664,601,232	$200.71

Year	Suburban Portfolio Rentable Area	Suburban Portfolio Values	Value Per sq ft
1978	5,419,592	$220,733,833	$40.73
1979	5,419,592	$225,501,370	$41.61
1980	5,419,592	$412,867,590	$76.18
1981	5,419,592	$217,273,365	$40.09
1982	5,419,592	$198,414,296	$36.61
1983	5,419,592	$171,945,769	$31.73
1984	5,419,592	$365,281,920	$67.40
1985	5,419,592	$707,380,816	$130.52
1986	5,419,592	$601,309,485	$110.95
78-'86 Avg	5,419,592	346,745,383	$63.98
83-'86 Avg	5,419,592	461,479,498	$85.15

Year	Difference in Portfolio Rentable Area	Difference in Portfolio Values	Difference in Value Per sq ft
1978	2,873,961	389,836,091	$32.89
1979	2,873,961	231,929,003	$13.55
1980	2,873,961	76,082,479	($17.23)
1981	2,873,961	226,141,475	$13.37
1982	2,873,961	241,648,492	$16.45
1983	2,873,961	752,743,948	$79.77
1984	2,873,961	1,129,986,015	$112.89
1985	2,873,961	902,245,300	$63.56
1986	2,873,961	2,027,511,673	$206.02
78-'86 Avg	2,873,961	664,236,053	$57.92
83-'86 Avg	2,873,961	1,203,121,734	$115.56

C.B.D.. When the difference of total urban versus suburban portfolios was considered, suburban worth fell to 34% of the C.B.D. Yet annual average total suburban office space in the portfolio occupied an area equivalent to 64% of that of the C.B.D., indicating an inconsistency between value and size. The suburban portfolio maintained a value approximately one third of the C.B.D. group, but as indicated above occupied two thirds of its size. This indicates a disparity in values of approximately 50% (ie

(1/3)/(2/3)) between the two portfolios.

4.34 As the analyses has demonstrated, C.B.D. versus suburban value superiority is accelerated in the later years of the study. For the period 1983 to 1986, the average value of a C.B.D. portfolio square foot increased $78.81 to $200.71 per sq ft, or 65%. The commensurate suburban increase was $21.17 to $85.15, or 36.75% per sq ft. The average total portfolio valuation difference increased $538,885,681 to $1,203,121,734 per year, or 81%.

4.35 The valuation of total Boston office space, for both the C.B.D. and the suburbs highlighted the theme of C.B.D. value predominance. The average value of all Boston C.B.D. office space was $3,089,841,294, which grew at an annual rate of 19.5% for the years 1978 to 1986. The average total rentable area for this population was 21,290,166 sq ft, which yielded an average value per sq ft of $145.13.

Year	C.B.D. Total Rentable Area	Gross C.B.D. Boston Area Values
1979	16,041,670	$884,777,277
1980	17,108,586	$1,008,644,222
1981	18,151,115	$970,449,400
1982	19,973,531	$1,059,812,104
1983	20,723,138	$2,310,526,321
1984	22,629,898	$4,080,007,791
1985	26,435,921	$5,130,726,119
1986	29,257,466	$9,273,787,119
Average:	21,290,166	$3,089,841,294

Year	Suburban Total Rentable Area	Gross Suburban Boston Area Values
1979	5,774,763	$240,279,521
1980	7,094,588	$540,469,735
1981	9,389,450	$376,426,380
1982	11,605,607	$424,887,758
1983	14,226,853	$451,371,079
1984	16,138,881	$1,087,764,771
1985	19,809,441	$2,585,585,443
1986	24,596,472	$2,729,004,678
Average:	13,579,507	$1,054,473,671

Year	Total Rentable Area Difference	Gross Boston Area Values Difference
1979	10,266,907	$644,497,756
1980	10,013,998	$468,174,487
1981	8,761,665	$594,023,020
1982	8,367,925	$634,924,346
1983	6,496,285	$1,859,155,242
1984	6,491,018	$2,992,243,020
1985	6,626,481	$2,545,140,676
1986	4,660,994	$6,544,782,441
Average:	7,710,659	$2,035,367,624

The average total value for all Boston area suburban office space was $1,054,473 671 with a commensurate growth rate of 35.49%. The average total for rentable area was 13,579,507 sq ft, which yielded a average value per square foot of $77.65. Therefore, on a per sq ft basis, C.B.D. office space exceed the value of its suburban counterpart by $67.48, or 87%. Average total population differences make this trend even more apparent. The average annual difference in value of the two populations over the period

examined was $2,035,367,624, with a difference in total rentable area of 7,710,659 yielding an average difference in value per square foot of $263.97. This gap grew over the course of the test period at a rate of 33.65%.

4.36 All trends and variances were again accelerated in the latter years of the study period. C.B.D. average value per square foot increased $64.82 to $209.95, or 45%. Suburban average square foot values increased $14.01 to $91.66 or 18%. C.B.D. values then exceeded the suburbs by $118.29, up from $67.48, an increase of 75% from the years 1983 to 1986. All other pertinent trends such as growth rate, total rentable area and the variances between the two populations supported this trend.

Section Five: Conclusion (5.1 to 5.7)

5.1 As a result of the literature surveyed, data collected, and tests conducted on that data, it is the conclusion of this study, that the assumption discussed in paragraph 3.6 is proven true. Therefore, during the years 1970 to 1986 for the C.B.D., and 1975 to 1986 for the suburbs, the value of C.B.D. office space was greater than of the suburbs both nationally and in the Boston metropolitan area from the perspective of an investor.

5.2 The examination and testing of N.O.I. illustrated a pattern of consistently higher C.B.D. values, which conferred greater capitalized value to the C.B.D. The seven city mean N.O.I. was consistently higher in the C.B.D. both absolutely and in terms of growth (see 4.14 to 4.16) than in the suburbs. The variance between increases in rental rates and operating expenses also favored the C.B.D. In the Boston C.B.D., N.O.I. was also absolutely and relatively greater than in the suburbs, (see 4.17 to 4.19) though not as consistently on an annual basis as the seven city mean (58% of the time for Boston versus 80% for the seven city mean). Seven city mean C.B.D. and suburban N.O.I. consistently exceeded their Boston counterparts, despite the fact that Boston had higher rents. This would indicate that Boston buildings had higher operating ratios.

5.3 At the specifically Boston urban level, C.B.D.

values were again shown to exceed the suburbs. Over the 1979 to 1988 period, C.B.D. rental rates were always greater than the suburbs, by an average factor of 37% (see 4.21). Absorption for both populations was strong, and displayed little quantitative variance (see 4.22), but since rents were lower in the suburbs, and more space was available (see 4.22), equivalent levels of absorption indicate stronger C.B.D. values. Vacancy levels (see 4.23 to 4.25) for the entire period were lower in the C.B.D. by an average of almost 7%, which again indicated a stronger and more valuable C.B.D. office space market.

5.4 In both the N.O.I. and the specific urban Boston studies, a trend of value acceleration was observed beginning around 1982. In all cases, the bulk of total growth observed over the period 1970 to 1986 for C.B.D. values, or 1975 to 1986 for suburban values, was loaded into those later years. Rates of growth acceleration frequently exceeded 50%, and were especially strong in the area of rental levels and absorption.

5.5 Holding Period Return data further confirmed C.B.D. value predominance, in both the seven city mean and Boston. In the seven city mean data, average returns on C.B.D. N.O.I. exceeded the suburbs by 4%, and were 21% less riskier (4.27). While in Boston, C.B.D. and suburban average returns were equal, but returns were 72% more at

risk in the suburbs (4.28). Boston C.B.D. returns averaged more than 5% above the seven city mean, but were 37% more at risk (4.30).

5.6 Portfolio and population valuation studies for urban Boston further illustrated the trend of C.B.D. value predominance and the rapid acceleration of that trend after 1982. C.B.D. portfolio value per square foot exceeded its suburban counterpart by 90% for the period 1978 to 1986, and by 135% for the period 1983 to 1986 (4.33). C.B.D. population value per square foot was 87% for the period 1978 to 1986, and 117% for the period 1983 to 1986 (4.33).

5.7 The performance of C.B.D. N.O.I. was briefly compared to other majors indicators. In all comparisons, indexed changes in N.O.I. value were found to be much more volitile than the smoother progressions of the the Consumer Price Index, the Eastern Frank Russell index, and the AA Composite Bond Rating. Indexed C.B.D. N.O.I. changes displayed similarities with the G.N.P. measure of gross private investment in non residential real estate. While only intended as a minor area of investigation for this study, these cursory findings indicated that C.B.D. N.O.I. investments would be subject to much greater volitility, return and risk than alternatives based upon the other measurements.

5.8 In summary, the results of the tests performed indicated that C.B.D. office space values were consistently greater and at lower risk than their suburban counterparts, both across the seven city mean and in the Boston urban area. Returns on Boston C.B.D. office space were found to be greater than the seven city mean returns, but substantially riskier. Finally, all trends accelerated greatly in the last four years of the study period.

Appendix # 1:

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Appendix # 2:

Portfolio of Boston C.B.D. Office Buildings

Building Name/Address	Year Complete	Average Rent	Total SQ FT	SQ FT Vacancy	Occupancy Rate
Prudential Tower	1965	25.00	1226539	5271	99.57%
State Street Bank Building	1966	30.00	854000	0	100.00%
One Center Plaza	1966	32.00	187276	0	100.00%
Two Center Plaza	1967	32.00	193082	11020	94.29%
Bank of New England Building	1968	28.00	580016	4965	99.14%
Three Center Palza	1969	32.00	195844	22000	88.77%
One Boston Place	1970	30.00	769000	0	100.00%
15 New Chardon Steet	1970	22.00	78745	56750	27.93%
Bank of Boston Building	1971	39.00	1355610	17975	98.67%
Keystone Building	1971	26.50	728000	9832	98.65%
101 Huntington Avenue	1971	26.00	432000	0	100.00%
One Washington Mall	1972	33.00	154406	0	100.00%
One Beacon Place	1973	30.50	1100000	3600	99.67%
One Bulfinch Place	1973	22.00	45000	0	100.00%
535 Boylston Street	1964	28.00	91000	24100	73.52%
70 Federal Street	1966	28.00	45000	31605	29.77%
100 Charles River Plaza	1968	22.00	118035	0	100.00%
25 New Chardon Street	1968	22.00	90000	0	100.00%
55 Court Street	1969	22.00	50000	0	100.00%

Portfolio of Boston Suburban Office Buildings

Address	Year Complete	Average Rent	Total SQ FT	Occupancy Rate
1) Kendal Square/East Cambridge				
545 Technology Square	1960	23.00	140000	100.00%
549 Technology Square	1965	23.00	36000	100.00%
565 Technology Square	1966	23.00	181000	100.00%
575 Technology Square	1963	23.00	111566	100.00%
2) Allston /Brighton				
1505 Commonwealth Avenue- Brighton	1967	13.50	55270	72.86%
380 Washington Street- Brighton	1965	0.00	13450	100.00%
Coolidge Bank- Watertown	1970	16.00	40000	70.00%
3) Route 128 North				

131 Middlesex Turnpike- Burlington	1973	16.50	23000	85.07%
3 New England Executive Park- Burlington	1968	20.00	64569	63.23%
5 New England Executive Park- Burlington	1969	20.00	26506	100.00%
7 New England Executive Park- Burlington	1972	22.00	183500	100.00%
12 New England Executive Park- Burlington	1970	22.00	94860	100.00%
14 New England Executive Park- Burlington	1969	22.00	15000	100.00%
5 Old Concord Road- Burlington	1972	15.00	40000	100.00%
One Essex Center Drive- Peabody	1972	0.00	125000	100.00%
1 Newbury Street- Peabody	1973	15.00	38000	96.22%
80-88 Main Street- Reading	1967	12.50	17000	100.00%
100 Main Street- Reading	1967	14.00	18000	100.00%

4) Route 128 North

161 Forbes Road- Braintree	1964	15.00	34000	100.00%
166 Forbes Road- Braintree	1966	15.00	60000	100.00%
220 Forbes Road- Braintree	1968	15.00	56000	82.14%
220R Forbes Road- Braintree	1968	15.00	22000	100.00%
222 Forbes Road- Braintree	1969	15.00	30000	100.00%
10 Forbes Road East- Braintree	1967	17.00	40000	78.31%
420 Washington Street- Braintree	1972	14.50	30000	84.98%
140 Wood Road- Braintree	1970	15.00	43000	100.00%
150 Wood Road- Braintree	1972	15.00	38000	81.58%
886 Washinbgton Street- Dedham	1966	15.50	31611	82.28%
888 Washington Street- Dedham	1966	15.50	31665	65.89%
1776 Heritage Drive- Quincy	1973	19.50	751878	100.00%
420 Providence Highway- Westwood	1971	18.00	40000	100.00%

5) Route 128 West

850 Boylston Street- Brookline	1971	18.50	120000	64.51%
111 Washington Street- Brookline	1971	24.50	140473	91.46%
29 Hartwell Avenue- Lexington	1969	20.00	56000	100.00%
4 Maguire Road- Lexington	1970	17.00	54114	100.00%
2 Militiea Drive- Lexington	1972	21.00	21000	88.49%
191 Spring Street- Lexington	1971	18.00	220000	75.00%
1050 Waltham Street- Lexington	1973	17.00	33000	81.67%
220 Boylston Street- Newton	1962	19.00	30000	100.00%
Gateway Center- Newton	1970	23.00	180000	88.89%
1 Wells Avenue- Newton	1971	18.00	88000	100.00%
110 Cedar Street- Wellesley	1968	20.00	30000	100.00%
40 Grove Street- Wellesley	1970	18.00	43700	95.89%
20 Walnut Street- Wellesley	1965	20.00	40000	86.21%
65 Walnut Street- Wellesley	1971	22.00	69725	100.00%
1 Washington Street- Wellesley	1966	20.00	48000	73.75%
36 Washington Street- Wellesley	1969	20.00	50000	89.27%
40 Washington Street- Wellesley	1969	19.00	24000	100.00%
20 William Street- Wellesley	1973	25.00	127000	94.29%

40 William Street- Wellesley	1970	25.00	71904	93.32%
56 William Street- Wellesley	1968	25.00	52636	100.00%
60 William Street- Wellesley	1966	25.00	49826	100.00%
65 William Street- Wellesley	1963	25.00	29502	91.53%
165 Worcester Street- Wellesley	1973	18.00	21000	100.00%
173 Worcester Street- Wellesley	1973	17.50	31500	84.13%
888 Worcester Street- Wellesley	1973	20.00	54000	100.00%
9 Riverside Road- Weston	1970	23.00	63486	100.00%
235 Bear Hill Road- Waltham	1963	17.00	19480	86.28%
240 Bear Hill Road- Waltham	1963	16.00	16600	83.84%
303 Bear Hill Road- Waltham	1964	11.00	24000	26.04%
60 Hickory Drive- Waltham	1967	13.50	64000	100.00%
69 Hickory Drive- Waltham	1964	13.50	21600	80.39%
590 Lincoln Street- Waltham	1970	21.00	81312	100.00%
610 lincoln Street- Waltham	1971	21.00	81312	100.00%
214 Third Avenue- Waltham	1963	18.00	11000	72.73%
300 Third Avenue- Waltham	1966	18.00	21578	100.00%
391 Totten Pond Road- Waltham	1967	15.00	15000	92.33%
393 Totten Pond Road- Waltham	1966	15.00	15000	100.00%
395 Totten Pond Road- Waltham	1969	15.00	15000	100.00%
400 1 Totten Pond Road- Waltham	1970	16.00	80000	98.88%
400 2 Totten Pond Road- Waltham	1969	16.00	80000	95.29%
440 Totten Pond Road- Waltham	1969	15.00	15000	100.00%
460 Totten Pond Road- Waltham	1971	16.00	140000	92.61%
470 Totten Pond Road- Waltham	1970	21.00	66500	95.25%
486 Totten Pond Road- Waltham	1969	21.00	31253	29.61%
504 Totten Pond Road- Waltham	1968	21.00	28604	84.62%
225 Wyman Street- Waltham	1954	21.00	143942	100.00%
235 Wyman Street- Waltham	1968	23.00	97919	100.00%
275 Wyman Street- Waltham	1963	22.00	81663	98.16%
260 Cochituate Road- Framingham	1967	17.50	23088	90.05%
160 Speen Street- Framingham	1972	18.00	16000	91.88%
1661 Worcester Road- Framingham	1973	16.00	50000	94.25%

Appendix # 3:

Boston C.B.D. Office Market Annual Indicators

	Total Rentable Area	Total Available SF	Vacancy Rate	Added Supply	Total Occupied Space (SF)	Absorption	Average Building Rent
1979 Year Total	16,041,670	374,485	2.4%	670,050	15,667,186	786,415	13.00
1980 Year Total	17,108,586	107,845	0.4%	38,508	17,000,741	96,583	16.59
1981 Year Total	18,151,115	247,432	1.3%	418,709	17,903,683	341,095	21.08
1982 Year Total	19,973,531	581,581	3.0%	303,336	19,391,951	231,972	23.66
1983 Year Total	20,723,138	668,825	3.5%	173,762	20,054,313	244,970	24.97
1984 Year Total	22,629,898	1,435,378	6.4%	574,049	21,194,520	217,051	27.82
1985 Year Total	26,435,921	2,715,458	10.3%	1,060,742	23,720,463	833,473	26.26
1986 Year Total	29,257,466	2,800,674	9.6%	719,453	26,456,792	745,213	27.03
1987 Year Total	32,120,060	2,222,578	6.9%	812,083	29,897,482	910,077	27.59
1988 Year Total	33,887,285	2,072,697	6.1%	408,800	31,814,589	427,579	28.29

Boston Suburban Office Market Annual Indicators

	Total Rentable	Total Available SF	Vacancy Rate	Added Supply	Total Occupied Space (SF)	Absorption	Average Building Rent
1979 Year Total	5,774,763	149,015	2.6%	417,200	5,625,748	423,238	10.50
1980 Year Total	7,094,588	234,734	3.3%	283,150	6,859,855	238,874	12.30
1981 Year Total	9,389,450	704,969	7.5%	590,591	8,684,481	486,537	14.70
1982 Year Total	11,605,607	1,223,033	10.5%	562,437	10,382,574	373,998	17.10
1983 Year Total	14,226,853	2,057,939	14.5%	560,728	12,168,914	491,227	17.70
1984 Year Total	16,138,881	1,926,020	11.9%	625,310	14,212,861	493,143	19.26
1985 Year Total	19,809,441	3,197,416	16.1%	1,133,504	16,612,025	720,903	20.37
1986 Year Total	24,596,472	4,573,604	18.7%	1,166,741	20,022,869	1,067,183	20.15
1987 Year Total	27,825,431	4,608,860	16.6%	741,867	23,216,571	677,060	19.96
1988 Year Total	30,122,748	4,794,404	15.9%	860,277	25,328,344	664,489	19.84

[Source: Spaulding and Slye Reports]

Appendix # 4:

American Council of Life Insurance Annual Capitalization Rates
For the years 1970 to 1987.

Summary:	New England Office Bldg. Cap Rate	National Office Bldg. Cap Rate Average	National Cap Rate All Properties
1970 Year Total	10.80%	10.75%	11.18%
1971 Year Total	9.70%	9.80%	10.49%
1972 Year Total	9.33%	9.40%	10.06%
1973 Year Total	9.23%	9.33%	9.75%
1974 Year Total	10.08%	9.95%	10.15%
1975 Year Total	10.43%	10.53%	10.85%
1976 Year Total	10.05%	10.25%	10.33%
1977 Year Total	9.83%	9.80%	9.98%
1978 Year Total	10.05%	9.85%	10.00%
1979 Year Total	10.63%	10.35%	10.48%
1980 Year Total	11.95%	12.00%	12.18%
1981 Year Total	13.38%	13.03%	13.08%
1982 Year Total	13.10%	12.33%	12.33%
1983 Year Total	12.18%	11.00%	11.08%
1984 Year Total	11.00%	10.73%	10.83%
1985 Year Total	7.93%	10.03%	10.10%
1986 Year Total	9.13%	9.18%	9.25%
1987 Year Total	9.45%	9.20%	9.23%