Back to the City:
Differences in Economic and Investment Performances between Downtowns and Suburbs

by

Inae Hwang

B.Eng., Architectural Engineering, 2000
Yeungnam University, Korea

M.S., Architectural Engineering, 2004
Seoul National University, Korea

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Signature of Author_____
Center for Real Estate
July 30, 2012

Certified by_____
William C. Wheaton
Professor of Economics, Department of Economics
Thesis Supervisor

Accepted by_____
David Geltner
Chair, MSRED Committee, Interdepartmental Degree Program in Real Estate Development

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ABSTRACT

Recently, we have observed significant changes in which corporate offices and residential buildings have been relocated from the suburbs back into the city. Does the observation mean that there is a real economic movement back into the cities by firms or households? If there is any movement, how does this trend drive any changes in the commercial real estate properties? Does it significantly affect the performance of properties in the cities as opposed to the other areas? Does the performance of the properties in the city exert any influence on the investors who prefer commercial real estates in the US metropolitan areas?

This thesis aims to provide answers to the major question on the "back to the city" movement and its influence on real estate markets. The answers are summarized as five major conclusions. First, the result of this study clearly points out that there is the "back to the city" movement although the change has happened only in the Urban Cores (UC) not the entire Metropolitan Statistical Area (MSA). Second, the economic performances between UC and MSA maintain a close link with each other. However, the volatility of the office net rental rate is much less in UC while the change in gross rental growth is almost same between UC and MSA. The UC rental growth of the multifamily is a little less volatile than the MSA growth. Third, the investment performances in MSA closely relates with the capitalization rate of UC. While the level of cap rates of UC offices is more volatile, the UC cap rate of apartments is more stable than the MSA rate. Fourth, the effects of population and employment on the real estate market enable the research to understand the current pricing behaviors. The difference in population and employment between UC and MSA explains the disparity in investment performances of the two areas. However, while the MSA rental growth explains the movements in the cap rate of MSA in accordance with the "rational" pricing, the effect of UC rental growth rates on the cap rate doesn't match with the pricing model, indicating that the rental growth rate of UC empirically leads to increases in the cap rate of the area. The nature of these outcomes offers that the UC market is not explicable by the "rational" pricing model. The result also indicates that the difference in rental growth rates reveals the positive relation with the gap in cap rates, which is complete opposite to the "rational" investors' behavior. Lastly, finding the differences in economic and investment performances between UC and MSA motivates to explore the determinants of the relationship. Although the study experiments the effects of manifold market characteristics, the explanatory variables used in the model do not fully explain the inequality between two specific markets. Thus, it is required to study further the determinants.

Thesis Supervisor: William C. Wheaton
Title: Professor of Economics, Department of Economics

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CHAPTER 1 INTRODUCTION

Until 2000's, population and employment have been growing rapidly in suburban areas while most central cities have been declining or growing slowly. (Voith, 1992) That is, the population and employment centers of the United States have been undergoing a process of decentralization. (Garner, 2002) According to Garner (2002), most of the large metropolitan areas in the United States have had the majority of employment and population in the suburbs rather than in the central cities.[1] However, we have recently observed significant changes in which corporate offices and residential buildings have been relocated from the suburbs back into the city and, in terms of rents and occupancy rate, the properties in the cites have been outperforming those in suburbs. Does the observation mean that there is a real economic movement back into the cities by firms or households? This study raises a question of whether the shift acts as a determinant of real estate performances.

1.1 Research Background and Motivation

Recently, there have been active debates on the "back to the city" movements. According to Wieckowski (2010), "the suburbs have lost their sheen; Both young workers and retiring Boomers are actively seeking to live in densely packed, mixed-use communities that don't require cars- that is, cities or revitalized outskirts in which residences, shops, schools, parks, and other amenities exist close together." [2] In addition, Wieckowski (2010) states that "companies such as United Air Lines and Quicken Loans are getting a jump on a major cultural and demographic shift away from suburban sprawl. The change is imminent, and business that don't understand and plan for it may suffer in the long run." [3]

Christie also mentioned, "The trend, which began in the late 1990s, marks a reversal of the post-war urban flight to the suburbs. Now, it's strengthening". [4] There is another recent discussion on "back to the movement", written by Jaffe on the Atlantic Cities. "The silver lining for urban advocates was the city core. Even in places that experienced general declines in city population, such as St. Louise, downtowns showed some impressive residential growth." [5]

Considering these arguments, however, this study questions whether these relocations of firms or households lead any real economic movement back into the cities. If there is any movement, how does this trend drive any changes in the commercial real estate properties? Does it significantly affect the

[1] Laurence Garner, Decentralization of Office Market and The Effects on Rates of Return, 2002
[2] Ania Wieckowski, Back to the City, Harvard Business Review, 2010
[3] Ania Wieckowski
[4] Les Christie, Cities are hot again, CNNMoney.com, 2006
[5] Eric Jaffe, So are people moving back to the city or not?, 2011

performance of properties in the cities as opposed to the other areas? Does the performance of properties in the city exert any influence on the investors who prefer commercial real estates in UC metropolitan areas?

1.2 Problem Statement and Research Objectives

As Jaffe stated, the finding of the "back to the city" movement also caused additional layer of the debate on the downtown-suburban migration. Cox and Kotkin argued, "Cities are even having trouble retaining younger population groups, calling them temporary way stations before people migrate somewhere else-namely, the suburbs." [6] According to Jaffe, there was a disagreement with them, pointing out that "their analyses failed to properly define the terms city and suburb." [7] It is important to note that, without a clear identification of the specific regions the result would distort the actual movement and cause misunderstanding of the change.

Considering a number of research have been focused on real estate pricing across sections, the recent debate arouses the interest in investment return variations in accordance with geographic locations. That is, if the relocations of office and housing occur with a significant amount, the alteration would lead a reaction of real estate commercial markets, affecting performances such as rental income and price of properties. With this hypothesis, this study raises a question of whether this shift acts as a determinant of real estate performances. If so, does the pricing of commercial properties effectively respond to the market transformation? Are there any myths or misconceptions about the real estate pricing?

1.3 Research Scope, Assumptions, and Framework

Answering the questions requires several considerations, taking the issues in previous literatures into account. First, a defining "downtowns" is an inevitable element to assess population growth and employment shifts based on the specific area in a city relative to the rest of the city and to compare the growth and performance in two parts of a metropolitan area. Second, identifying the measurements of demographic movements and properties performance is an important factor in order to examine the difference between the two areas and as so to quantify the impact of the movement within the area. Third, collecting data in accordance with the measurements is an essential part so as to understand empirical market conditions and to produce compelling results. Lastly, devising a model is the critical component that explains observations and effects among the indicators.

[6] Eric Jaffe
[7] Eric Jaffe

Throughout this process, this thesis intends to provide the quantitative approach that examines impacts of economic movement between downtowns and suburbs on commercial real estate markets and to address the relation between the economic movement and properties pricing within a metropolitan market. In addition, it is hoped that this thesis will be utilized by investors and developers as a tool for assessing their potential sub-markets in the US metropolitan areas.

1.3.1 Scope and Assumptions

This study observes the trends and interactions between downtowns and suburbs over 23 years and across 69 Metropolitan Statistical Areas (MSAs) in the United States. It uses population, employment, rental income, and investment return as the four major indicators. The analysis is conducted on two property types: office and multifamily housing.

In order to measure the migration between a city center and the broader city, this study employs population and employment as parameters. The reason why this study examines the population and employment is because these data not only demonstrates the change in city size but also presents the demand side's indication of office and apartment properties. Therefore, using the data allows this study to describe the relation between demographic changes and real estate markets. The data is obtained by the US Census Bureau.

The gauge used for economic performances is the economic rent, i.e., a property's rent multiplied by its occupancy rate. The reason why this research uses economic rent as an indicator is because the economic rent is the most reliable rental rates that reflect the conditions of a competitive and open market.[8] Thus, examining the data enable the research to capture the realistic economic performances of properties. The research explores the rental data from 1993 to 2012, which is provided by CBRE Econometric Advisors (CBRE EA, formerly Torto Wheaton Research), the leading real estate research firm owned by CBRE, the largest real estate service company.

The measurement used for investment performances is the capitalization rate (cap rate), which is "the ratio of current net operating income to valuation".[9] The reason why this study employs the cap rate is because the return rates "play a central role in real estate investment, financing, and valuation decisions, and average market-wide capitalization rates are widely quoted and followed as a gauge of current real estate investment market conditions".[10] The research explores the capitalization data from 2003 to 2012,

[8] It is referred to http://www.investorwords.com/1645/economic_rent.html#ixzz21k3pnDd0 and http://appraisersforum.com/showthread.php?t=156120.
[9] Petros Sivitanides et al.,The determinants of appraisal-based capitalization rates, 2001
[10] Jim Clayton et al, Cap Rates & Real Estate Cycles: A historic perspective with a look to the future, 2009

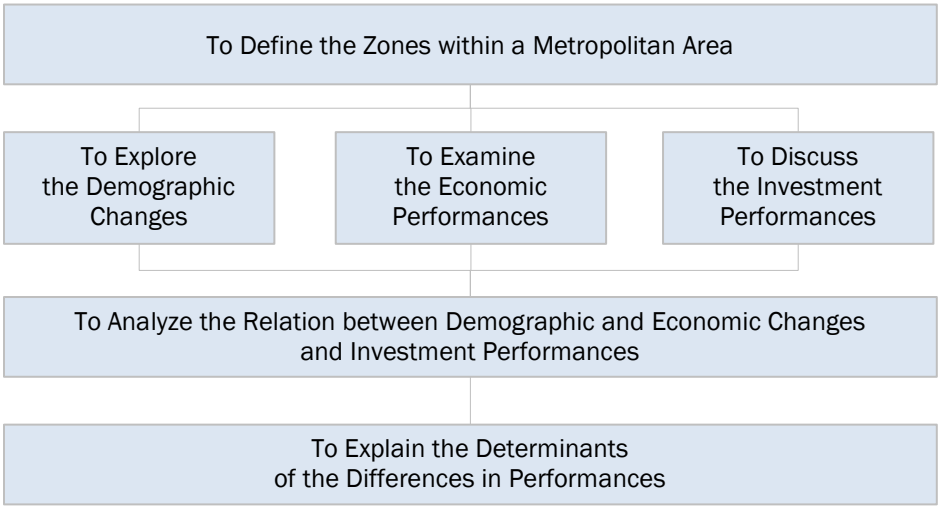
which is originally provided by Real Capital Analytics (RCA), a global research and consulting firm focused on the investment market for commercial real estate, and processed by CBRE EA.

While using data from RCA for office and multifamily properties, this research designs regression models that explore the population, employment, economic rents, and capitalization rates. Based on the real transaction data, this thesis provides a convincing analysis, taking most of the factors previously described in the literature into account. More importantly, it should be noted that this study is the first to examine RCA's investment return data at a specific zone level within a metropolitan area, even though these data from RCA have been widely used in other research.

1.3.2 Thesis Outline and Framework

The thesis is structured by five major analyses along with background knowledge as follows. The second chapter reviews the previous research on the "back to the city" movement and the real estate pricing. The third chapter outlines the data and methodology used for the entire thesis. The fourth chapter presents the empirical results on population and employment changes between the center of cities and their broader areas. The fifth and sixth chapters provide the results on economic rental changes and capitalization rate levels between the separate areas within a metropolitan market. The seventh chapter describes the relationships among the four major measurements, considering their dissimilar effects between the distinct zones in a city. The eighth chapter examines determinants that lead the difference in performances between the two defined locations. The conclusion summarizes the findings and contributions, and suggests ideas for further study. Figure 1 illustrates the thesis framework as below.

[Figure 1] Thesis Framework



CHAPTER 2 LITERATURE REVIEW

This study reviews previous literatures on two major topics such as the demographic movement within the metropolitan areas and the difference of investment performances associated with geographical markets. First, the thesis discusses the recent articles and empirical studies about the economic movement between downtowns and suburbs. Second, this research endeavors to investigate the performance of properties across MSAs, the pricing model, and the determinants for office and residential pricing in the US markets. Finally, it addresses key issues related to the "back to the city" movement and geographical variation in investment returns, while building the ground of this study.

2.1 "Back to the City" Movement

In Harvard Business Review, Wieckowski states, "The suburbs have lost their sheen: Both young workers and retiring Boomers are actively seeking to live in densely packed, mixed-use communities that don't require cars-that is, cities or revitalized outskirts in which residences, shops, schools, parks, and other amenities exist close together."[11] Furthermore, he cites, "In the 1950s, suburbs were the future; the city was then seen as a dignity environment. But today it's these urban neighborhoods that are exciting and diverse and exploding with growth"[12], commented by University of Michigan architecture and urban-planning professor Robert Fishman.

In this article, the writer addresses the causes and effects of the intra-regional movement, while exemplifying the relocations of office and housing. He argues that this movement caused by the issues in suburban areas such as health problems and transportation costs. Moreover, the article mentions the effect, saying "A shift to an urban model affects corporate strategy – especially for retail businesses currently thriving in strip malls on busy commuting arteries. Firms base many decisions on store locations and the types of customers served, and a move to the city changes both."[13]

This argument arouses the question of whether there is a real "back to the city" movement and motivates this thesis to examine the economic movement within a metropolitan area. Despite the motivation, the article doesn't present any quantitative approach to the topic because the writer focuses on addressing the concept of broader recent changes in cities. In short, the literature lacks the assessment of the urban shift and its impact, while it contributes to attract interests into the current trends of the economic changes in cities.

[11] Wieckowski
[12] Wieckowski
[13] Wieckowski

Contrary to Wieckowski, Aaron M. Renn illustrates the topic with numerical data. In 2011, he wrote the article of "back to the city?" while using the migration data provided by the International Revenue Service. In the writing, he stresses, "There is intriguing evidence of a shift in intra-regional population dynamics in the migration numbers. The one bright spot was downtowns, which showed strong gains, albeit from a low base. Migration from the suburban counties to the core stayed flat or actually increased, even late in the decade when again overall migration declined nationally."[14]

This literature clearly discusses the back to the city movement with empirical data. It displays the changes of in and out migration with a specific scale such as "Migration Index" and "Migration Values". In addition, the article provides the trend in four major cities in US over decade, saying "There has clearly been a shift affecting the net migration in these cities. In particular, the fact the in-migration from the suburbs to the core held steady or even increased is a sign of some urban health."[15]

However, he shows the limited approach to the clarification in the intra-regional migration. That is, the urban core's definition used in the article is the combination of city and county. This issue was caused because the article used the data from the Internal Revenue Service, which aims to "track movements of people around the country on a county-to-county and state-to-state basis"[16]. Therefore, the data and definition are hardly applied to most of the US metropolitan areas since many places where have central cities also include their broader suburban areas. (Renn, 2011) Consequently, he only examined a limited number of cities that matches the data mapping: New York, Philadelphia, San Francisco, and Washington DC. In addition, he didn't consider any other demographic data, except for IRS migration number, on economic movements in cities, so that the examination couldn't describe the overall demographic changes in urban centers and broader cities, and failed to explore market-specific characteristics.

None of these articles clearly identified the definition of city centers and suburbs mentioned in the findings. There is also the limit of quantitative approaches to the economic movement in cities. Because of these constraints, the articles examined a limited number of city or specific cases rather than an extensive range of markets. Furthermore, few studies have focused on the relationship between the "back to the city" movement and the real estate markets.

[14] Aaron M. Renn, back to the city?, Newgeography.com, 2011
[15] Renn
[16] Renn

2.2 Differences in Investment Returns across Geographical Locations

Petros Sivitanides et al. (2001) say, "Capitalization rate levels exhibit persistent differences across markets as a result of variations in fixed market characteristics that influence investor perceptions of risk and/or income growth expectations. Movements in market-specific capitalization rates strongly incorporate components that are shaped by the behavior of the local market and, more specifically, by the time path of rental growth and rent levels relative to their historical averages."[17]

According to Sivitanides (2001), his paper was the first study to explore capitalization rates at the local level, based on the property database obtained from National Council of Real Estate Investment Fiduciaries (NCREIF). Besides, the paper shows different approach from others because it "used a panel-based model, rather than just time series."[18] Applying both time series and cross-section to the model enables the analysis to enrich and to obtain thorough statistical results. (Sivitanides et al., 2001)

Despite these accomplishments, the paper has a few limits such as using the NCREIF data and analyzing the capitalization rate at MSA level; the writer used periodic appraisals data from NCREIF rather than actual transaction data of property values; the paper analyzed the variation in capitalization rate levels of MSAs, leaving further study on "the issues of variation of capitalization rates across sub-markets within the same metropolitan area, or alternatively, between suburban versus downtown locations."[19] In addition, the paper restricted the number of market to 14 metropolitan areas in the US.

Doina Chichernea et al. (2007) studied cross sectional differences in cap rates across the US metropolitan markets. In the study, they say, "while capitalization rates have received a lot of attention in recent empirical real estate literature, most research has focused on explaining the patterns in cap rates over time or the variation in cap rates across different property types. Our study extends the existing literature by addressing a question that has received far less attention than needed, namely what are the factors driving the geographical cross-sectional variation in these cap rates."[20]

In the paper, the writers focus on the determinants that cause the spatial variation in capitalization rates across the geographical markets and explore models with variables such as demand, supply, liquidity, risk, and their interaction. (Chichernea et al., 2007) The result shows that "such variations are largely determined by the supply constraints and the liquidity of different geographical markets."[21] Meanwhile, they found that there is no strong effect of demand growth on capitalization rates. (Chichernea et al.,

[17] Petros Sivitanides et al., The determinants of appraisal based capitalization rates, 2001
[18] Sivitanides et al.
[19] Sivitanides et al.
[20] Doina Chichernea et al., A cross sectional analysis of cap rates by MSA, 2007
[21] Chichernea et al.

2007) Finally, it addresses the contribution of the study, saying "uncovering the driving factors behind geographic variation of cap rates is important as it can help us better understand and identify conditions of disequilibrium among different markets."[22]

Even though the paper provides the understanding in major factors driving the geographical variation in capitalization rates, it remains several limits in the approach. First, the study examined 22 MSAs, a limited number of metropolitan areas, which might be hard to explain an extensive range of markets. Second, this article limits the scope of analysis on multifamily properties from 2000 to 2005, which would cause the model a difficulty in taking the time effects into account. In addition, since the writer focused on the spatial variation in capitalization rate at the MSA level, he didn't explore differences in investment returns across specific areas within the same metropolitan market.

As Sivitanides et al. (2001) said in their paper, "Real estate capitalization rates have been the focus of a growing body of empirical research. A few other studies have attempted to explore spatial differences in capitalization rates, across either broadly defined regions or markets within a given metropolitan area (Sirmans et al., 1986; Saderion et al., 1994; Grissom et al., 1987; Hartzell et al., 1987; Sivitanides et al., 2001)"[23] Especially in order to explain the impact of the "back to the city" movement on real estate markets, it is essential to analyze how the capitalization rate level varies between downtowns and suburbs.

[22] Chichernea et al.
[23] Sivitanides et al.

CHAPTER 3 DATA AND METHODOLOGY

This chapter gives the description of data and methodology. First, it introduces the re-definition of "downtowns"[24], which was identified by CBRE EA. Second, this chapter clarifies four major measurements used for assessing the economic movement within a metropolitan area. Third, the section describes the data and the sources. Lastly, this part presents the methodology used in the study.

3.1 Zone Definition: Urban Core, Center City, and MSA

3.1.1 Definition Methodology

In order to examine the difference between city cores and broader cities, it is critical to ascertain the specific areas with reasonable criteria. This thesis uses the new definition of downtowns identified by CBRE EA; the research firm re-defines a downtown as the area where is broader than Central Business District (CBD)[25] and narrower than central city. (CBRE EA, 2012) According to CBRE EA, central cities defined by jurisdictional extent are hard to use as central locations because the areas are so far-reaching that they cover other areas where have particularly suburban characteristics. (CBRE EA, 2012) Moreover, the firm pointed out that "CBD or downtown definitions are too narrow, focusing mainly on just business districts, and so will be unable to adequately capture variations in demographic and employment trends with acre taking place in cities."[26] Considering these issues, this thesis uses the newly defined downtowns, which are called the city's Central Urban Core or Urban Core (CUC or UC).

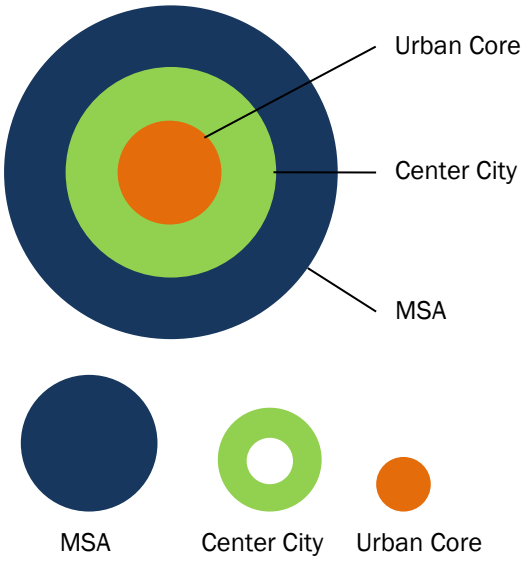
The firm re-defined downtowns with several characteristics: first, the major employment spots such as financial and business districts within each city; second, major attractions such as shopping center, museums, theaters and sports complexes; third, main residential areas where are densely packed and walkable places of living, enabling residents to work at the employment spot and walk to the commercial and cultural areas. (CBRE EA, 2012)

The methodology that CBRE EA used for re-defining urban core is as below.

[24] This study uses the market definition used by CBRE EA. The firm defined downtown as "the sum of all submarkets associated with the primary office business activity area of a city. Market areas with an approved "downtown" designation in most cases will have a significant number of high-rise office buildings that represent the majority of the square footage of these submarkets."
[25] CBRE EA defines this area, saying "The Central Business District (CBD) is generally a submarket and is given this name. The Central Business District generally will not represent all of the properties within the "Downtown" area of a particular city."
[26] CBRE EA, Defining America's Downtowns: From Central Business District to Central Urban Core, 2012

"To re-define this kind of "Central Urban Core" we developed a Google Earth GIS-based application that overlaid a variety of data. We began with the existing boundaries currently used by the leasing agents of CBRE for identifying "downtown" office buildings. We then superimposed on them current ZIP code boundaries. The primary reason for using zip codes as building blocks for our new definitions is that ZIP is the smallest level of geography at which employment and demographic data is readily available. Such an approach also allowed us to develop a set of definitions that are not tied to any one data vendor but instead to publicly available sources such as Decennial Census and ZIP Code Business Patterns data."

[Figure 2] Zone Definition



In order to re-define zones within MSA, CBRE EA used criteria: 1) population density and growth, 2) income levels, and 3) inclusion of special uses. The detailed requirements are as Table 1.

[Table 1] Criteria for Zone Definition[27]

Items	Criteria	Requirements
Population	Density Growth	Greater than average population density Positive growth Between 2000 and 2010
Income	Per capita income levels	At least metropolitan average of income
Uses	Special uses	Universities, museums, convention centers, sports complexes, etc

3.1.2 Defined Zones

Based on the methodology of defining zones, CBRE EA examined 69 metropolitan areas and identified Urban Cores for each city. For office markets, 69 metropolitan areas have been classified while 51 urban

[27] CBRE EA

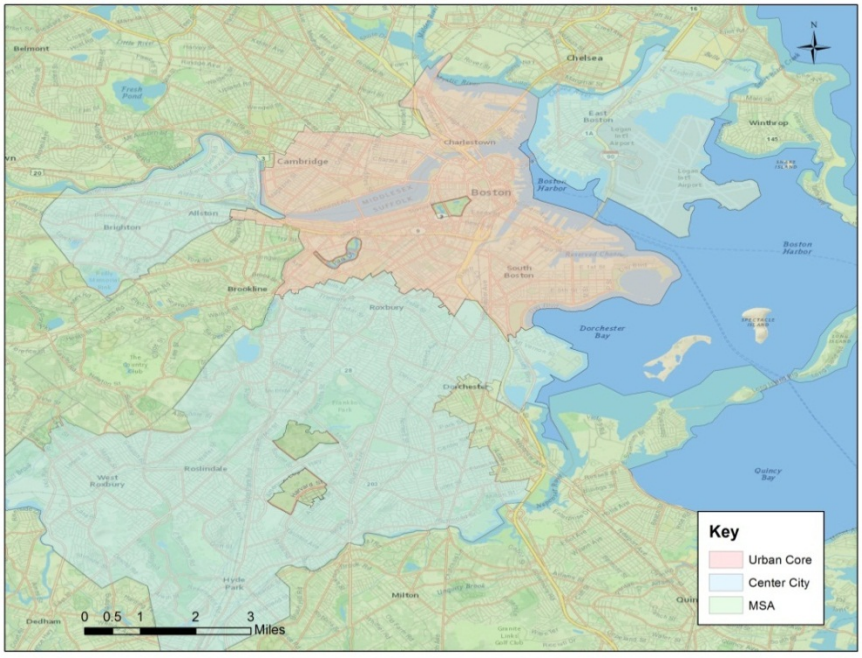
cores defined. For multifamily housing, of 46 MSAs, 46 Urban Cores have been identified. The newly defined cores vary in the size and the number of ZIP codes ranging from a single code to around 30 ones.[28]

[Table 2] Summary of Defined Zones

Markets	Central Urban Core (UC)	Center City (CC)	MSA
Office	51	49	69
MFH	46	41	46

Of the defined zones, this research focuses on the Urban Cores and MSAs, leaving the Center City in the further study. This is because the comparison between Urban Core and MSA allows the study to clearly explain the back to the city movement and its effect on real estate markets. In addition, examining two areas helps extensive cross-section analysis since Core markets have been identified more than Center City. The example of the defined zones is as Figure 2, which shows the case of the Boston metropolitan area. The green area is MSA, the blue part is Center City, and the red is Urban Core.

[Figure 3] Defined Zones in Boston



[28] CBRE EA

3.2 Data Description

This thesis employs the four types of data to answer the research question on the geographical variation. The four major indicators used are population, employment, rental incomes, and investment returns. In addition, the study focuses on two property types: office and multifamily housing.

This study observes the trends and interactions between downtowns and suburbs over 23 years and across 69 Metropolitan Statistical Areas (MSAs) in the United States. This thesis uses population, employment, rental income, and investment return as the four major indicators. The analysis is conducted on two property types: office and multifamily housing.

In order to measure the migration between a city center and the broader city, this study employs population and employment as parameters. The reason why this study examines the population and employment is because these data not only demonstrates the change in city size but also presents the demand side's indication of office and apartment properties. The data is obtained by the US Census Bureau.

3.2.1 Population Data

In order to measure the migration between an urban core and MSA, this study examines population as a parameter. The reason why this study explores the population is because this data not only demonstrates the change in city size but also acts as the demand indication of multifamily housing market. Using demographic data at the local market level allows this study to resolve the issue[29] in which previous article had. The data consists of the population level of 52 MSAs over last three decades from 1990 to 2010, the data originally obtained by the US Census Bureau and processed at the newly defined zone level by CBRE EA. Since population data is provided every decade, this study examines the demographic changes in every 10 years.

3.2.2 Employment Data

In order to examine the effect of the job market within a metropolitan, this study also uses employment data. The reason why this study scrutinizes the employment is because this data demonstrates the city characteristic of its size and growth as well as indicates the demand side of the office property market. The data comprises of the employment level of 52 metropolitan markets from 1994, 1999, 2004, and 2009 at ZIP code level, originally provided by the US Census Bureau and handled at the specific zone level by

[29] Renn(2011) didn't consider any demographic data on economic movements in cities except for the IRS migration number, so that the study couldn't describe the overall demographic changes in urban centers and broader cities, and failed to explore market-specific characteristics. For the detail, please refer to Chapter 2 Literature Review.

CBRE EA. Since the employment data at the zip code level is not provided until 1994 and also is not currently available for 2010, this study detects the changes of job markets in last 15 years.

Through the data transition from a ZIP level to a zone level, CBRE EA found that there were land area changes at the MSA level between 2000 and 2010. Of 52 MSAs used in the study, some metro areas had gone through fairly large changes which vary among the newly defined zones. Despite the finding, the study lets the boundary changes have their impact. Table 3 below shows the metropolitan areas where the land area changed more than 5%.

[Table 3] Land Area Changes

	ZoneName	Mnemonic	aland10	aland00	LevelDifference	PercentDifference
1	EA Metro Area	MIAMI	2486176772	3806612432	-1320435660	-34.688
2	EA Metro Area	SALTLA	12550301689	14469451963	-1919150274	-13.263
3	EA Metro Area	SDIEGO	6963968705	7994195068	-1030226363	-12.887
4	EA Metro Area	FORTWO	4965671006	5566811693	-601140687	-10.799
5	EA Metro Area	OAKLAN	3928789248	4175192656	-246403408	-5.902
6	EA Metro Area	LVEGAS	13450074167	12786889895	663184272	5.186
7	EA Metro Area	ALBUQU	13712790473	12917935439	794855034	6.153
8	EA Metro Area	FORTLA	1113409683	1043660655	69749028	6.683
9	EA Metro Area	PORTLA	10808018402	9829759545	978258857	9.952
10	EA Metro Area	LANGEL	9787368310	8859924753	927443557	10.468
11	EA Metro Area	PHOENI	31054240223	23665236420	7389003803	31.223
12	EA Metro Area	SEATTL	12827577331	9487113927	3340463404	35.211

3.3.3 Property Data

The study uses property rental data as the gauge for economic performances of offices and apartments. Rather than using the rental rate level, this study examines the economic rent, i.e. a property's rent multiplied by its occupancy rate. The reason why this research uses economic rent as an indicator is because the economic rent is the most reliable rental rates that reflect the conditions of a competitive and open market.[30] The data on rental rates from 1993 to 2012 comes from CBRE EA, which are thousands of actual lease transactions in each market. The rental rates consist of 3,772 of asking gross rates and 3,349 of asking net rates for offices in 69 MSAs, and 2514 of rental data for multi-housing in 46 MSAs originating from databases compiled by the CBRE EA. Jennen et al. offers the reason why asking rents was used in office rental analysis, citing Dunse and Jones (1998). They reasoned, saying "The first explanation is the proprietary nature of office transaction rents, which makes analysis based on

[30] It is referred to http://www.investorwords.com/1645/economic_rent.html#ixzz21k3pnDd0 and http://appraisersforum.com/showthread.php?t=156120.

transaction rents often impossible. The second, more sensible, rationale mentioned is the existence of unknown incentives in quoted transaction rents, which distort the analysis of rent levels."[31]

3.3.4 Transaction Data

In order to capture investment performances, this study uses the capitalization rate, which is "the ratio of current net operating income to valuation".[32] The reason why this study employs the cap rate is because the return rates "play a central role in real estate investment, financing, and valuation decisions, and average market-wide capitalization rates are widely quoted and followed as a gauge of current real estate investment market conditions".[33] The research explores the capitalization data from 2003 to 2012, which is originally provided by Real Capital Analytics (RCA), a global research and consulting firm focused on the investment market for commercial real estate, and processed by CBRE EA. Originally, the RCA reports monthly series of average transaction cap rates, dating back to 2001. However, this study uses the data from 2003 to 2012 because the data from 2001 to 2002 are quite incomplete that it is hard to apply to the examination based on the Urban Cores and MSAs which are defined at ZIP code level. Using the transaction data enables the study to conduct a compelling analysis, providing actual movements in cap rates over time. Moreover, compared to NCREIF, "RCA data is derived from a broader sample of properties including institutional transactions".[34]

3.3 Panel Data Regression Model

Using data described above, the author applies the panel regression model to examine the effect of economic movements on properties performances. Since this research employs major indicators such as the population, employment, economic rents, and capitalization rates over 20 years and across 69 metropolitan areas, this study utilizes a panel-based model rather than just time series or cross section. Before illustrating the model used, this section briefly reviews the panel data and the regression model.

3.3.1 What is Panel Data?

Unlike time series or cross-section data, panel data allows to be investigated the same cross-sectional data over time. For this reason, the panel data is also called other names such as pooled data or combination of time series and corss-section data. The data basically enables researchers to obtain robust results, by letting them analyze the observations over time in cross sections. The advantages of panel data are clearly mentioned in the book of Basic Econometrics as follows:

[31] Maarten G.J. Jennen et al., The Effect of Clustering on Office Rents: Evidence from the Amsterdam Market, 2009
[32] Petros Sivitanides et al.
[33] Jim Clayton et al.
[34] Jim Clayton et al.

"By combining time series of cross-section observations, panel data give more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency; By studying the repeated cross section if observations, panel data are better suited to study the dynamics of change; Panel data can better detect and measure effects that simply cannot be observed in pure cross-section or pure time series data; In short, panel data can enrich analysis in ways that may not be possible if we use only cross-section or time series data." [35]

3.3.2 Why Use the Panel Data Regression Model?

The research uses panel data regression model in order to explore the relation between Urban Cores and MSAs based on several data sets such as population, employment, rents, and capitalization rates over 20 years and across 69 metropolitan markets. The basic formula of panel data regression model is as below.

$$Y_{(jt)} = \beta_1 + \beta_2 * X_{(jt)} + FE_{(j)} + FE_{(t)} \qquad (1)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The equation shows the effect of X*(jt)* on Y*(jt)*, indicating that a unit of increase in X*(jt)* leads to gain the β_2 amount of change in Y*(jt)*. The dummy variable of FE*(j)* captures the metropolitan fixed effects; the statistically significant coefficient of the dummy indicates that there are market-specific characteristics that explain the difference between markets. Likewise, another dummy variable of FE*(t)* measures the time fixed effects; if the coefficient of the dummy is statistically significant, the specific time gives impact on the dependent variable. Since regression model allows the researchers to analyze the impact of an explanatory variable to the independent variable, this study use the model for measuring the relation between two designated areas within MSA. Since this research uses a different number of observations among metropolitan areas, the data is an unbalanced panel and the regression model analyzes the effects of variables based on the unbalanced data set.

3.3.3 Panel Data Regression Model with the Fixed Effects

The models developed in this research assume that there are both individual metropolitan effect and time effect together, which means that the intercept varies over cross-section as well as time. Therefore, the regression model includes the metropolitan dummies as well as time dummies. This study allows the fixed effects in the model because adding dummies helps the data set enrich and results in a compelling outcome. Sivitanides (2001) also clarified the reason why dummies are used in the model, stating "Since fixed effects are normally part of a panel analysis, including them was almost a requirement; Once included in the analysis, adding any other variables that exhibited only cross-section variation would be

[35] Damodar N. Gujarati, Basic Econometrics, Fourth Edition, 2004

redundant; Thus, the fixed effects will be interpreted largely as reflecting market-specific differences and time-specific variations".[36]

3.3.4 Scatter Diagram and Linear Regression

While this thesis uses the panel data regression model, it also explores the observation using scatter diagrams with simple linear regressions. Since this study examines the correlation and differentials between two areas within a metropolitan market, the scatter diagram plotting the distribution of data allows the analysts to simply find out corresponding of a parameter to a given or fixed value.[37] That is, "Scatterplots can show you visually the strength of the relationship between the variables, the direction of the relationship between the variables, and whether outliers exist."[38]

[36] Petros Sivitanides et al.
[37] web2.concordia.ca/Quality/tools/25scatter.pdf; personnel.ky.gov/NR/rdonlyres/CF0C40D5.../ScatterDiagrams.pdf
[38] http://www.r-statistics.com/2010/04/correlation-scatter-plot-matrix-for-ordered-categorical-data/

CHAPTER 4 POPULATION & EMPLOYMENT CHANGES

Answering the question as to the "back to the city" movement requires investigating the changes in population and employment within the metropolitan area. As previous literatures pointed out, the only part that shows a strong gain in population was downtown within a city. (Renn, 2011) To examine the difference between downtowns and suburbs, the definition of UC and MSA is employed. The goal of this chapter is to measure any shift in intra-regional population and employment and to discuss the trends across the metropolitan markets over decades.

4.1 Data and Methodology

In order to measure the migration between an urban core and MSA, this study examines population as a parameter. Using demographic data at the local market level allows this study to compare the performance of the city core as opposed to MSA. In addition, measuring the level of population provides the market-specific characteristics such as the size and the growth rate of a market as well as the level of demand in real estate markets. The population data draws from 52 MSAs from 1990 to 2010. Since the census data is provided every decade, this study examines the trend in population changes in every 10 years, focusing on comparison between the two specific markets.

The level of employment is also an important indicator of demographic dynamics. Therefore, this study tracks employment data so as to examine the changes in the job market within a metropolitan area. Scrutinizing the employment also offers the regional characteristics of the market size and the growth rate. The level of employment also indicates the demand side of the office property market. The data comprises of the employment level of 52 metropolitan markets from 1994, 1999, 2004, and 2009 at ZIP code level, originally provided by the US Census Bureau and handled at the specific zone level by CBRE EA. Since the employment data at the zip code level is not provided until 1994 and also is not currently available for 2010, this study detects the changes of job markets in last 15 years.

4.2 Population Changes between Urban Core and MSA

Based on the newly defined zones, this section compares the demographic changes between Urban Cores and MSAs. By examining the trends by year, metropolitan areas, and cross-specific sections, the migration between cores and suburbs is illustrated from 1990 to 2010.

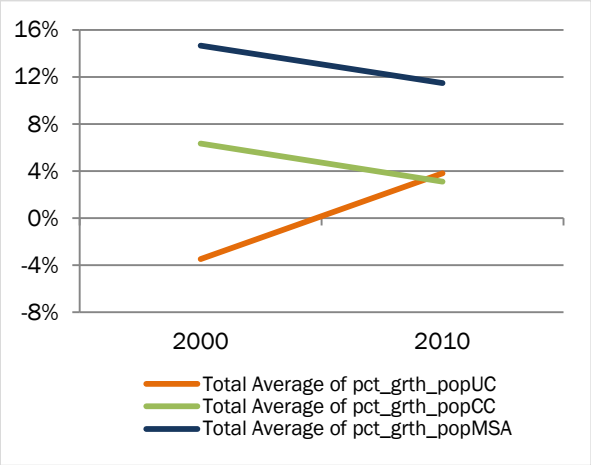
4.2.1 Population Changes by Year

Last two decades, the trend in population dynamics clearly shows the new aspect of awakening of the US city, at least in terms of the population growth rate. The average of UC population from 1990 to 2000 decreases by around 4,580 per city while the average population in MSA increases by about 322,452 per city during the same period. This number testifies that there was the decentralization during the 1990s. However, when it comes to the 2000s, the city and suburban growth moderates the view of suburbanization phenomenon. As seen in Table 4, the intra-regional movement to UC increased by 4,827 per city while the gain of MSA was 289,611 of population over the decade, indicating that the demographic growth rate of UC has been greater than that of MSA over 10 years. This result renders that the urban area has been growing rapidly, turning the net changes in population from the loss to the gain since 2000. In respect of the growth rate, there was only one UC that grew faster than MSA in 2000 but, in 2010, the number of UC that shows greater growth rate in population increased by 11, which takes 21.15% of the total. Figure 4 and 5 show the result of the change in population between downtowns and suburbs.

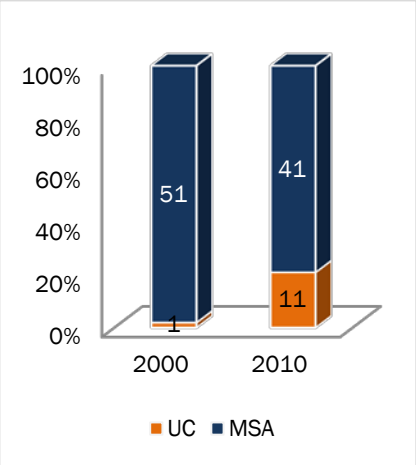
[Table 4] Summary of population changes

	1991~2000	2001~2010
Total Average of Population Growth in UC	-4,580	4,827
Total Average of Population Growth Rate in UC	-3.48%	3.80%
Total Average of Population Growth in MSA	322,452	289,611
Total Average of Population Growth Rate in MSA	14.66%	11.48%

[Figure 4] Population Growth Rates between UC and MSA



[Figure 5] Comparison of Growth Rates between UC and MSA[39]



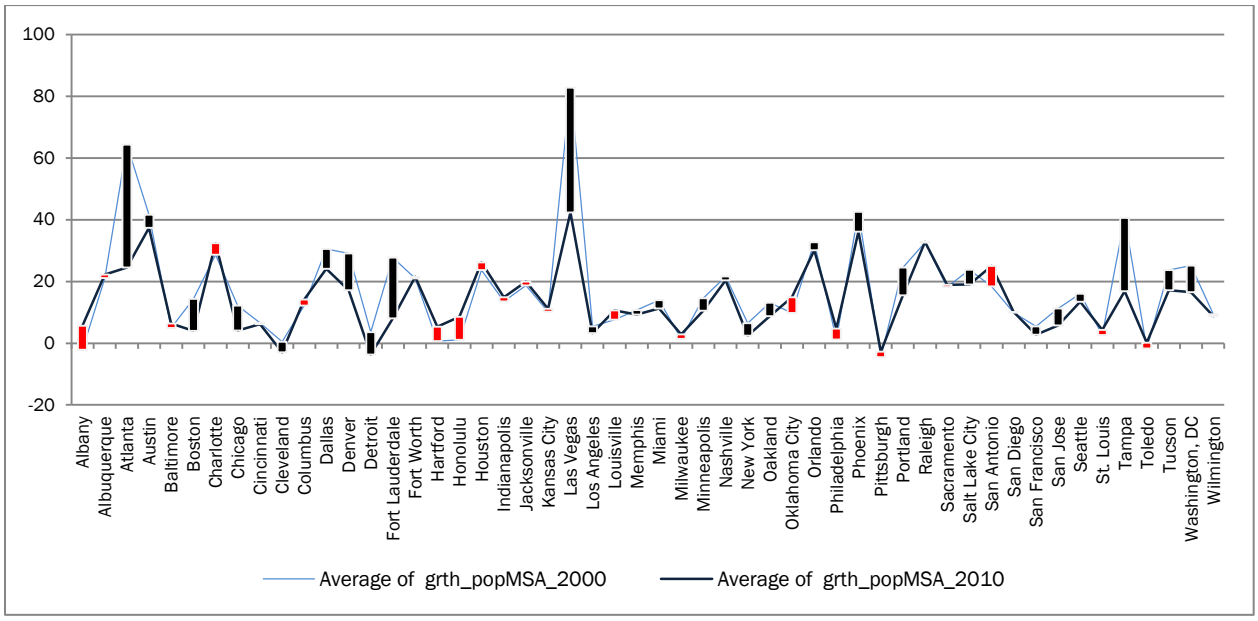
[39] The number indicates that the number of zones where show the better performance between UC and MSA. That is, in 2000, the only one UC grew faster than the MSA. In 2010, however, 11 UC outperformed MSA in terms of the population growth.

4.2.2 Population Changes by Zone

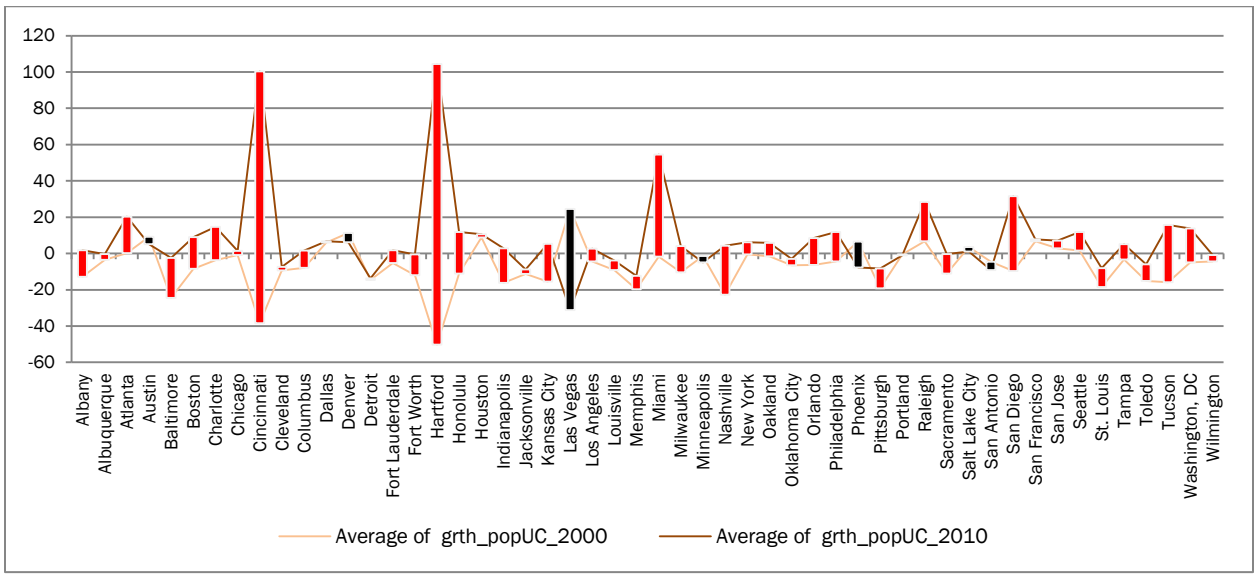
First of all, this section describes the demographic changes in MSA. Figure 6 provides the difference in the growth rate across the US markets over two decades. The total average growth rate of these cities decreased from 14.66% to 11.48% and the population changes are +322,452 in 2000 and +289,611 in 2010. Of 52 MSAs, 29 cities grew slower in 2000s than 1990s, more than half of the cities.

Second, since 1990 the total average growth rate of population in UC increased from -3.48% to 3.80%, supporting an assertion of the urban renaissance. In the 1990s, UCs experienced, on average, the loss of 4,580 people per city. However, the same area gained the amount of 4,827 people per MSA in 2010, showing the dramatic change. As can be seen from Figure 6, the average growth rate of population in 2010 outperforms that in 2000. Of 52 MSAs, 44 UCs presented the rapider growth of population in 2000s than 1990s, the portion of 84.62%.

[Figure 6] Average of the MSA Population Growth Rate in 52 Metropolitan Areas from 1990 to 2010



[Figure 7] Average of the UC Population Growth Rate in 52 Metropolitan Areas from 1990 to 2010



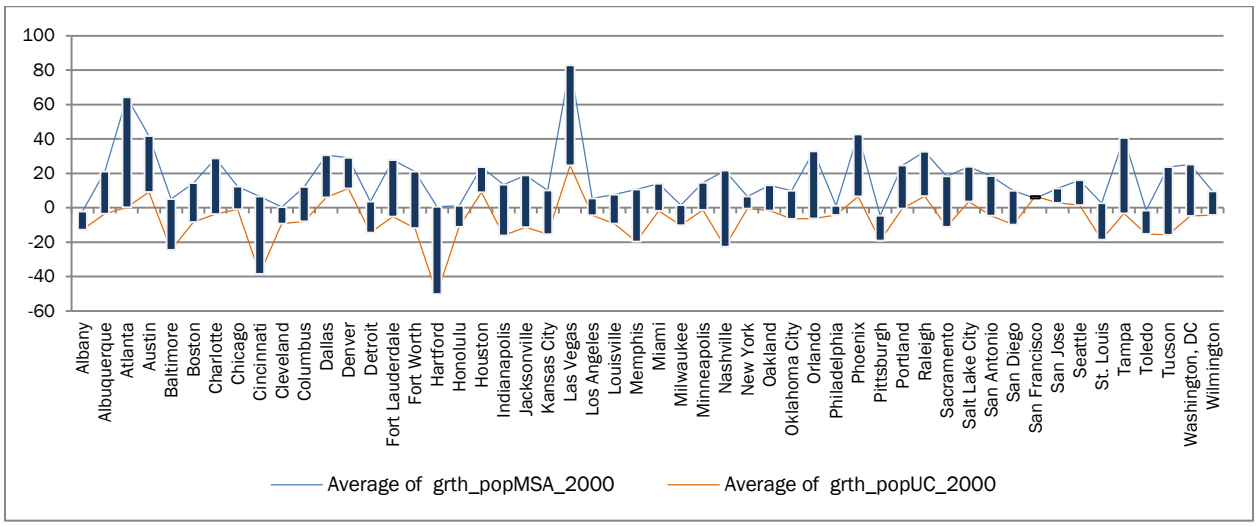
4.2.3 Population Changes between UC and MSA

As clearly rendered in Figure 8 and Figure 9, the different facet of the movement between 1990 and 2010 is observed regarding the population growth rate between UC and MSA. In the chart of the year of 2000[40], San Francisco is the only city that the UC growth rate is greater than MSA growth rate. Moreover, the urban cores in the most of metropolitan areas underwent negative growth rates, 40 UCs of 52 in total. On the other hand, most of MSA grew faster from 1991 to 2000, noting that there are only three places that the number of people in the area decreased.

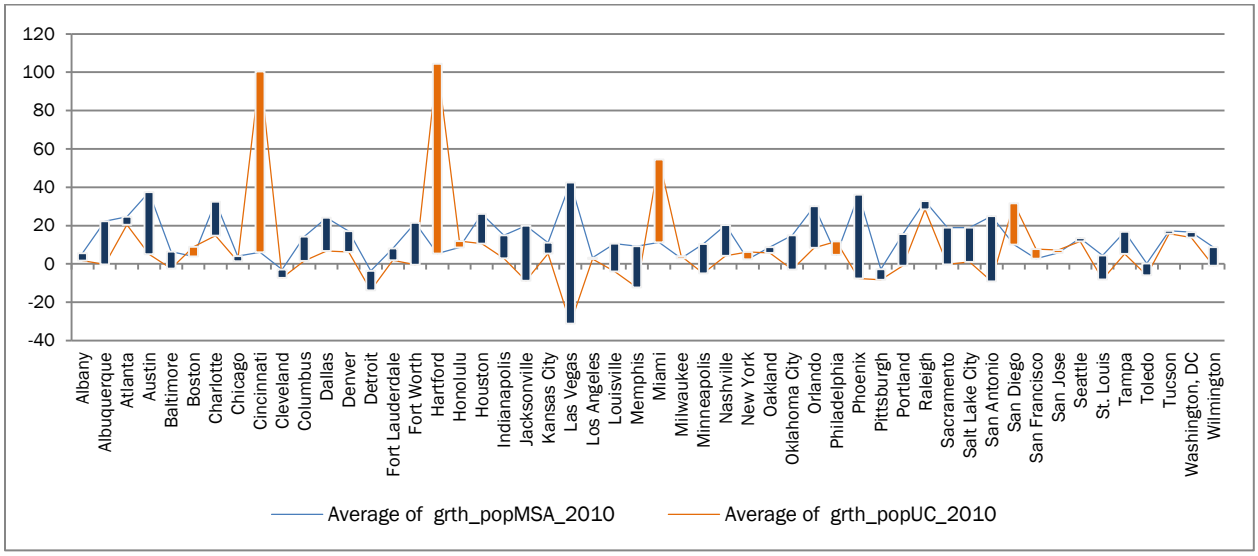
However, this trend of suburbanization changed from 2001 to 2010. During the period, the fewer number of UC are notified that their population decreased, indicating that the total average growth rate is 3.80% in 2010. In contrast, MSAs show slower growth in population, decreasing the grow rate from 14.66% to 11.48%. Even though the total average growth rate of MSA is greater than that of UC, it is important to note that there are changes in the urban growth in US 52 metropolitan areas since 2000.

[40] The average of the population growth rate in 2000 indicates the change from 1991 to 2000. Likewise, the 2010 growth rate of population calculated from the difference from 2001 to 2010.

[Figure 8] Average of the Population Growth Rate between UC and MSA in 2000



[Figure 9] Average of the Population Growth Rate between UC and MSA in 2010[41]



[41] There are a couple of dramatic increase in UC such as Cincinnati and Hartford. These changes might be explained by the changes of land area and, accordingly, increase in the number of ZIP codes which are the criteria for aggregation of the Census data.

4.3 Employment Changes between Urban Core and MSA

Like the analysis on the population growth, the comparison in employment changes between UC and MSA is conducted based on the raw data obtained from US Census Bureau. Following the specifically defined zones, this study performs the analysis on the employment changes between Urban Cores and MSAs, illustrating the trend by year, metropolitan areas, and two identified zones using the data from 1994 to 2009.

4.3.1 Employment Changes by Year[42]

As not only shown by Table 5 but also expected, it is apparent that the employment growth has been slow down since 1994. The total average of growth rate in MSA is getting lower and lower, so that the MSA rate from 2005 to 2009 became -0.43%, decreasing average 4,745 employees per city. Unlike MSA, UC shows a recovery in the growth rate from -1.22% in 2004 to 1.85% in 2009.

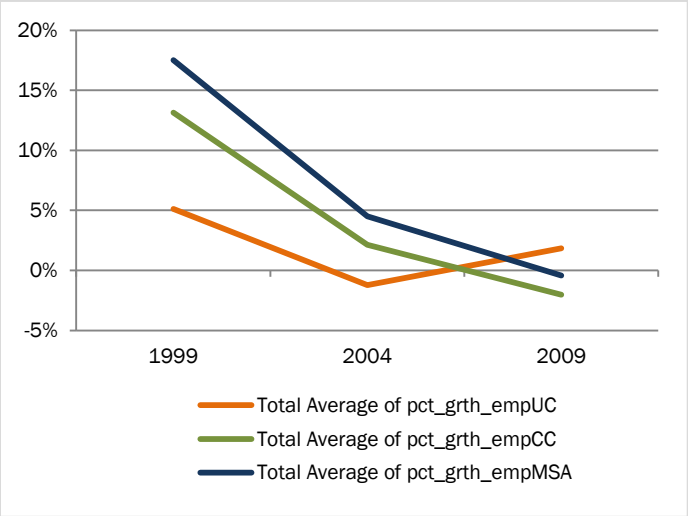
The average of UC employment from 2000 to 2004 decreases by around 2,064 per city while the average population in MSA increases by about 47,966 per city during the same period[43]. However, since 2005, the trend in the job growth of the city and suburban has been changed. As seen by Table 5, the job in UC increased by 3,088 positions per city while workers in MSA lost around 4,745 numbers of jobs for 5 years, indicating that the employment growth rate of UC has been improving during the period. This result describes that the MSA area has been left behind in rebound of job markets while UCs have been started creating jobs since 2004. In respect of the growth rate, there was only five UC that grew faster than MSA in 1999 but, in 2009, the number of UC that shows greater growth rate in employment increased by 21, which takes 40.38% of the total. Figure 10 and 11 show the result of the change in employment between urban centers and broader cities.

[Table 5] Summary of Employment Data

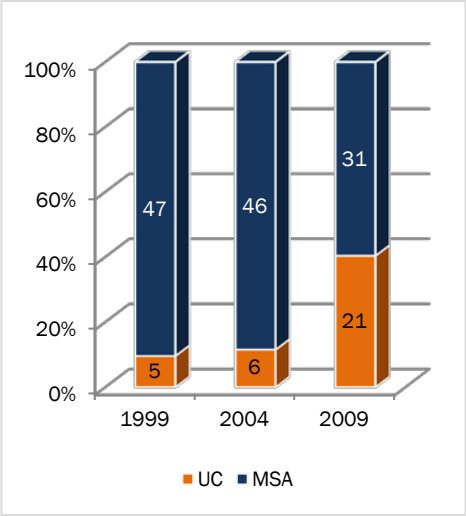
	1994~1999	2000~2004	2005~2009
Total Average of Employment Growth in UC	8,242	(2,064)	3,088
Total Average of Employment Growth Rate in UC	5.12%	-1.22%	1.85%
Total Average of Employment Growth in MSA	158,848	47,966	(4,745)
Total Average of Employment Growth Rate in MSA	17.51%	4.50%	-0.43%

[42] The average of the employment growth rate in 1999 indicates the change of employment from 1994 to 1999. In the same way, the 2004 and 2009 growth rate of employment calculated by the difference from 2000 to 2004 and from 2005 to 2009 respectively.
[43] Please see the appendix for the detail.

[Figure 10] Employment Growth Rates between UC and MSA



[Figure 11] Comparison of Growth Rates between UC and MSA[44]



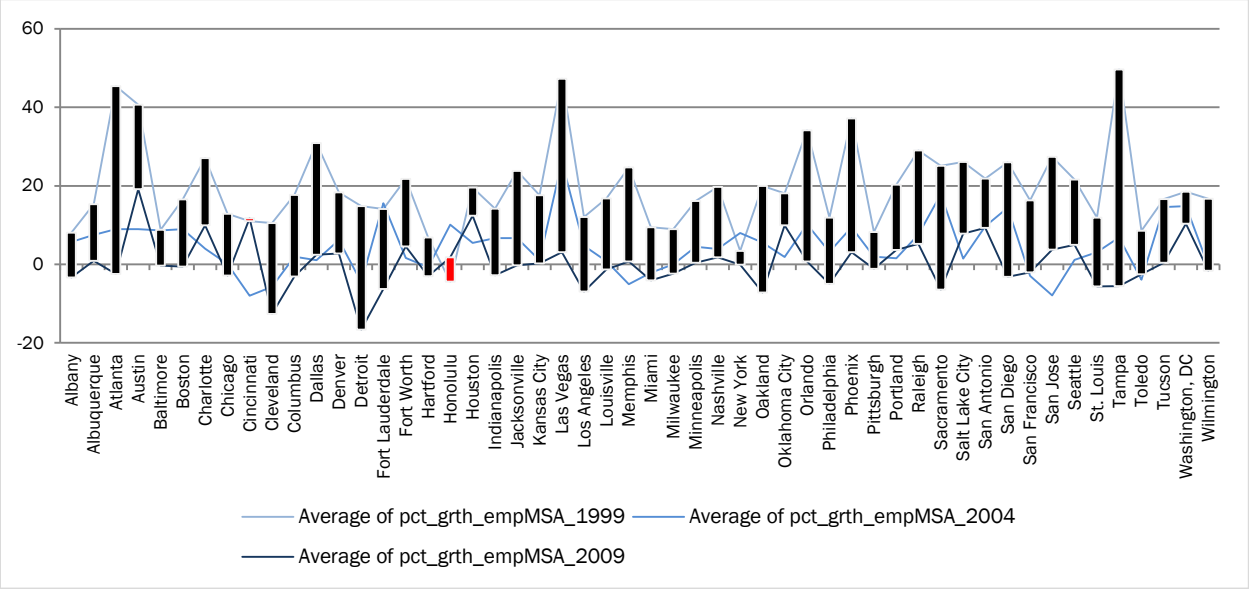
4.3.2 Employment Changes by Zone

This section compares the employment changes cross time between the broader city and its core. In Figure 12 and 13, the movement in the grow rates is provided across the US markets over 15 years. The total average growth rate of MSAs decreased from 17.51% to -0.43% and the number of employment increased by 158,848 in 1999 and decreased by 4,745 in 2009. Of 52 MSAs, 50 cities grew slower in the period from 2004 to 2009 than the duration from 1994 to 1999.

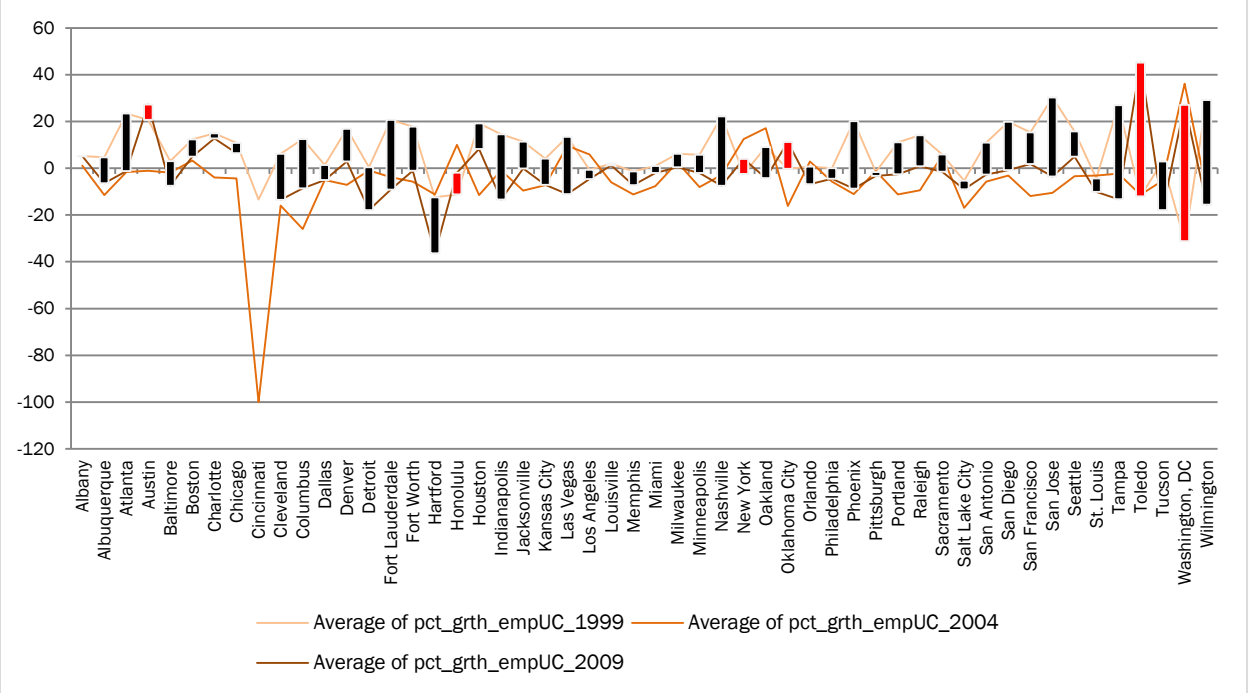
Second, since 1994 the total average growth rate of employment in UC decreased from 5.12% to 1.85%, showing the less change in the growth rate than the difference in MSAs where the indicator changed from 17.51% to -0.43%. From these results, the view of the urban resurgence is partially supported because, most recently, the total average of employment growth rate in UC increased while the broader cities experienced the decline in the number of jobs. However, it should be noted that the level of employee is still higher in MSA rather than the UC and the UC growth rate considerably varies across the geographic markets.

[44] The number indicates that the number of zones where show the better performance between UC and MSA. That is, in 1999, the only five UCs grew faster than the MSA. In 2009, however, 21 UCs outperformed MSA in terms of the employment growth.

[Figure 12] Average of the MSA Employment Growth Rate in 52 Metropolitan Areas from 1994 to 2009



[Figure 13] Average of the UC Employment Growth Rate in 52 Metropolitan Areas from 1994 to 2009

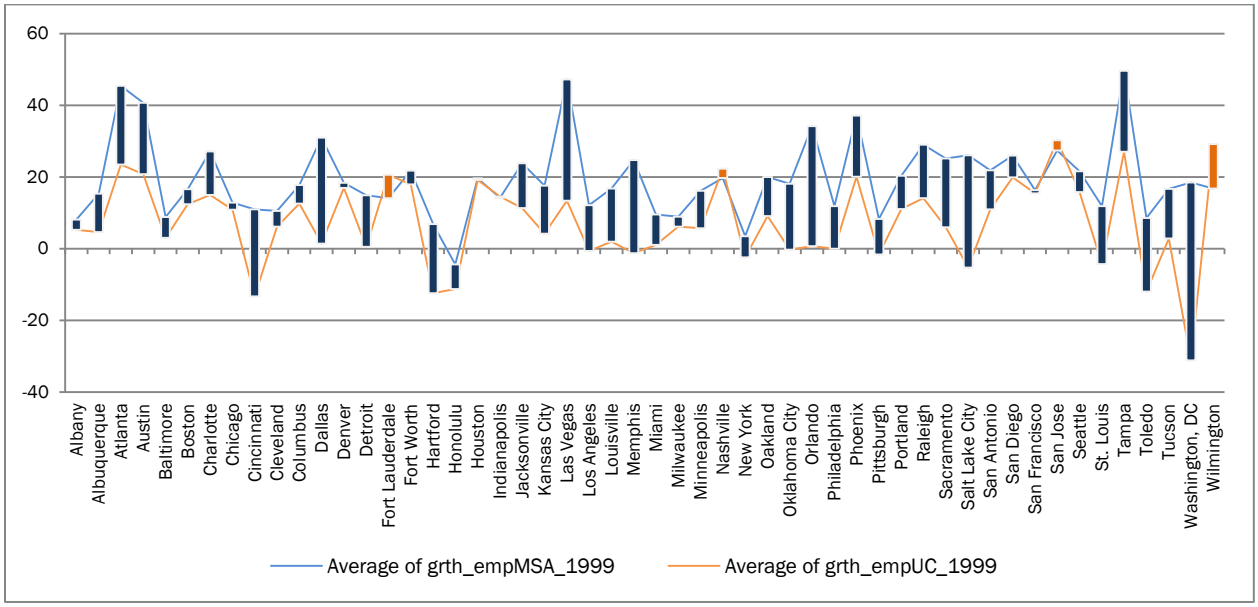


4.3.3 Employment Changes between UC and MSA

The Figure 14 and 15 depict the changes in employment from 1999 to 2009 between UC and MSA. The chart of the year of 1999 presents that the broader cities outperformed the city centers from 1995 to 1999. It is shown that 47 of total 52 MSAs grew faster than UC in the metropolitan areas in 1999, displaying that only Honolulu decreased in the number of employment. On the other hand, there are only five UCs that their growth rates are greater than the MSAs' growth rates.

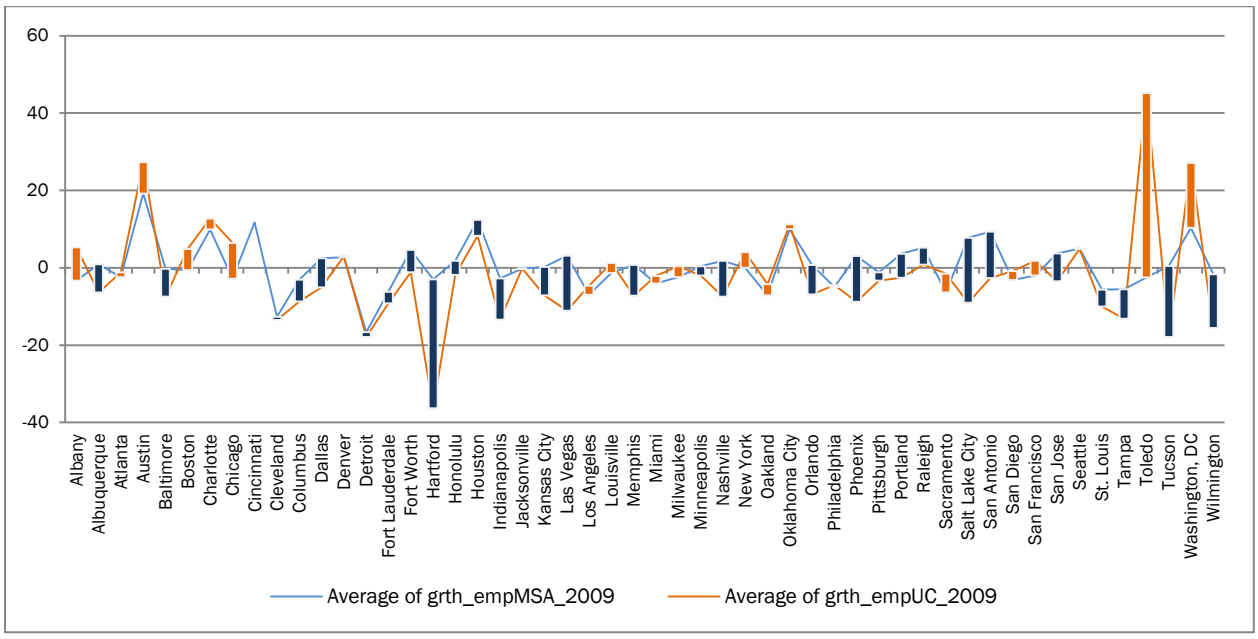
The trend in employment, however, illustrates the distinctive performance from 1999 to 2009[45]. The more number of UCs are notified that their employment growth rate is greater than the MSAs' rates. Even though the total average of employment growth rates describes that the suburbs do better than downtowns in job markets, the difference has become much narrower than before, the disparity from 12.08% of total average in 1999 to 2.46% of total average in 2009.

[Figure 14] Average of the Employment Growth Rate between UC and MSA in 1999



[45] It should be noted that the performance in 1999 is assessed by the data from 1995 to 1999 and the indicator in 2009 is aggregated by the employment from 2005 to 2009. In order to compare apple to apple, the 5 years change is applied to each assessment.

[Figure 15] Average of the Employment Growth Rate between UC and MSA in 2009



4.4 Summary

Throughout the findings, this chapter clearly points out that there is the "back to the city" movement. Based on the newly defined zones within a metropolitan area, however, the change has happened only in the Urban Cores not the entire MSAs. In terms of the population, the average growth rate of UC population is still lower than that of MSA population, but UC growth rate has been increased by around 7.28% while MSA growth rate has been decreased by around 3.18% in the last decade. With regard to the employment, the movement back into the city is more obvious, indicating that the employment of UC has grown faster than that of MSA. For the last 10 years, the UCs lost fewer employees (-3.27% of the decrease in jobs) while the job market in MSA dramatically shrank by around -18% of the decrease in employment.

CHAPTER 5 ECONOMIC PERFORMANCES OF PROPERTIES

This chapter focuses on the examining the differences in economic performances between Urban Cores and MSAs. Based on the rental data provided by CBRE EA, this chapter shows the trends in rental rates by year and region, scatter diagram, and panel regression analysis to compare the measurements between the two regional zones within a metropolitan area.

5.1 Data and Methodology

5.1.1 Data: Rental Rates of Office and Multifamily Properties

The raw data comes from actual lease transaction values from CBRE EA. The office data contains vacancy rates as well as both gross asking rents and net asking rents of 69 metropolitan markets from 1987 to 2012. The data of apartments also includes vacancy rates and rental rates of 46 markets from 1992 to 2012. The rental rates used in the study is asking rental rates. Jennen et al. offers the reason why asking rents is useful in the office rental analysis, citing Dunse and Jones (1998). They reasoned, saying "The first explanation is the proprietary nature of office transaction rents, which makes analysis based on transaction rents often impossible. The second, more sensible, rationale mentioned is the existence of unknown incentives in quoted transaction rents, which distort the analysis of rent levels."[46] The summary of data set is as Table 6 and 7.

[Table 6] Summary of the Rental Rate Data

	No. of MSA	year	indicator	Total observation
Office	69	1987~2012	Gross Asking Rent	3,772
			Net Asking Rent	3,349
Multifamily	46	1992~2012	Rent/sq.ft.	2,514

[Table 7] Summary of the Rental Rate and Vacancy Data

VARIBLES	Observation (OBS)	MEAN	STD. Dev.	MIN	MAX
Office_Gross Asking Rent	3,772	19.26	5.91	8.80	69.04
Office_Net Asking Rent	3,349	16.39	5.98	5.26	71.19
Office_Vacancy Rate	3,855	15.46	7.54	0	100
Multifamily_Rent (Rent/Sq.Ft)	2,514	1.00	0.44	0	3.48
Multifamily_ Vacancy Rate	2,514	5.58	2.69	0	36.36

[46] Maarten G.J. Jennen and Dirk Brounen, The Effect of Clustering on Office Rents: Evidence from the Amsterdam Market, 2009

5.1.2 Methodology: Scatter Diagram and Panel Regression Model

The raw data on rental rates are thousands of actual lease transactions provided by CBRE EA, and utilizes the data in order to compare the performances between the two areas. First, the economic parameter is created by calculating the economic rents. Second, the scatter diagram with the simple linear regression is employed in order to explore the observations of economic rental rates. Third, the panel data regression model is applied to the data.

It should be noted that, since this study aims to analyze the relation between economic performance and investment returns by region in later parts, it uses economic rent[47], rather than asking rental rates. The reason why this research uses the economic rental rate as an indicator is because the economic rent is the most reliable rental rates that reflect the conditions of a competitive and open market.[48] It is important to note that the economic rent is defined as the measurement of the asking rent multiplied by the occupancy rate of a property. This measurement is formulated as equation (2).

$$Economic\ Rent\ =\ asking\ rent\ *\ (1-\ vacancy\ rate) \qquad (2)$$

Based on the equation, the study analyzes what part of metropolitan areas performs better than the other. In order to estimate the relationship between these two areas, the scatter diagram and the regression model are applied to the panel data of rental rates of Urban Cores and MSAs. The reason why this study uses the diagram is because the scatter plots with the distribution of rental rates allows the research to simply find out corresponding of a parameter to a given or fixed value. [49] Also, the fixed effects of cross-section and time are included in the regression analysis by introducing dummy variables. This is because this research assumes there are both individual metropolitan effect and time effect together.

As explained above, the model of the properties' performance between Urban Cores and MSAs is shown in equation (3). It is formulated to be able to compare the measurements of these two areas.

$$Economic\ Rent\ of\ Urban\ Core_{(jt)}\ =\ \beta_1 +\ \beta_2 * Economic\ Rent\ of\ MSA_{(jt)} +\ FE_{(j)} + FE_{(t)} \qquad (3)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The equation shows the effect of the economic rent of MSA(*jt)* on the economic rent of UC(*jt)*, indicating that a unit of increase in rent of MSA(*jt)* leads the β_2 amount of change in the rental rate of UC(*jt)*. That is, the coefficient of MSA informs that how volatile the rental rate is of the two zones. The dummy variable of FE(*j)* captures the

[47] The economic rent is a property's rent multiplied by its occupancy rate.
[48] It is referred to http://www.investorwords.com/1645/economic_rent.html#ixzz21k3pnDd0 and http://appraisersforum.com/showthread.php?t=156120.
[49] web2.concordia.ca/Quality/tools/25scatter.pdf; personnel.ky.gov/NR/rdonlyres/CF0C40D5.../ScatterDiagrams.pdf

metropolitan fixed effects; the statistically significant coefficient of the dummy indicates in what markets the UC economic rental rates is higher or lower than the MSA rates. Likewise, another dummy variable of FE(*t)* measures the time fixed effects; if the coefficient of the dummy is statistically significant, the specific time gives impact on the difference between the two sub-markets. Using this formula, this study provides the relation of rental rates between two specific areas within a metropolitan market.

5.2 Economic Performances between Urban Core and MSA

Based on the data and methodology mentioned above, this section compares the economic performances between UC and MSA in order to better understand the relation between these two geographic regions in terms of property's rental rates. The office and multifamily markets are described through yearly and regional trends, a panel data regression model, and scatter diagrams.

5.2.1 Office Markets

- *Trends in Economic Rent Growth Rates by Year and City*

Before estimating the analysis on economic performances between Urban Core and MSAs, this study introduces trends in rental rate growth in each region by both year and city. Even though this analysis focuses on the comparison between UC and MSA, this section includes the Center City as well. In addition, both gross asking rents and net asking rents are considered in this research because office markets present their performances by both indicators.

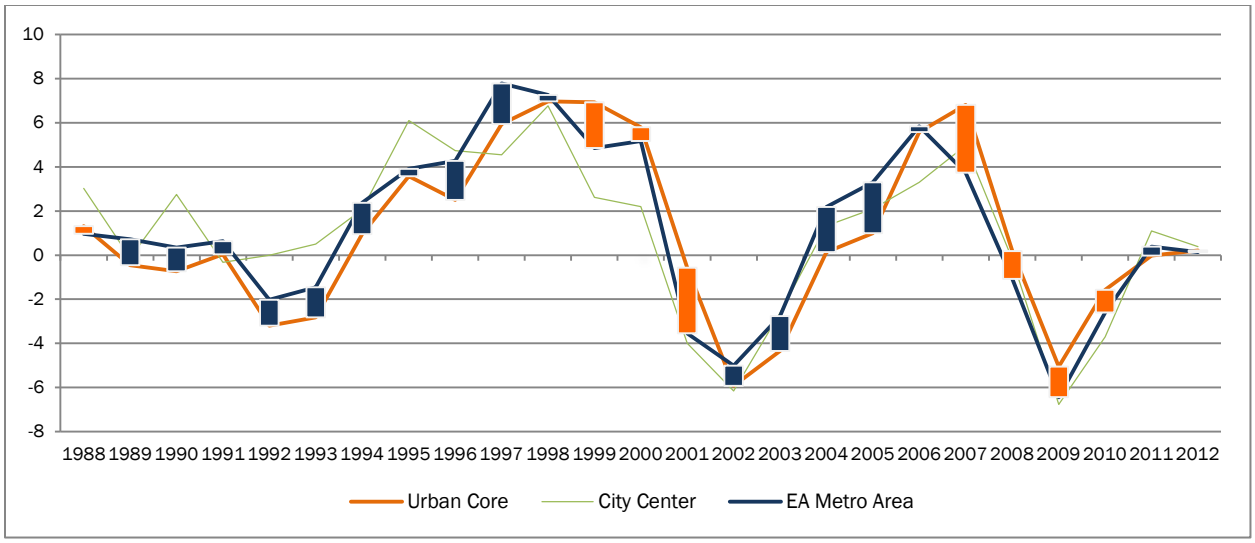
- Gross Rents

Based on the economic gross rents of the data, the growth rate of 69 metropolitan areas shows that the MSA's growth rates are generally greater than UC's growth rate before 1999. For the following 3 years, however, the growth rate of UCs outperforms that of MSAs. Since 2001, the change rate in rental levels of MSA is higher than that of UC except for from 2007 to 2009. In 1999 and 2007, the differences between two areas are greater than any other periods and the Urban Cores of two years outperforms the MSAs. On the other hand, the growth rates of MSAs are around 2% greater than that of Urban Cores in 1994, 1996, 2005, and 1988. The trends in economic gross rents by zones are as Table 8 and Figure 16.

[Table 8] Summary of the Gross Rental Rate Data

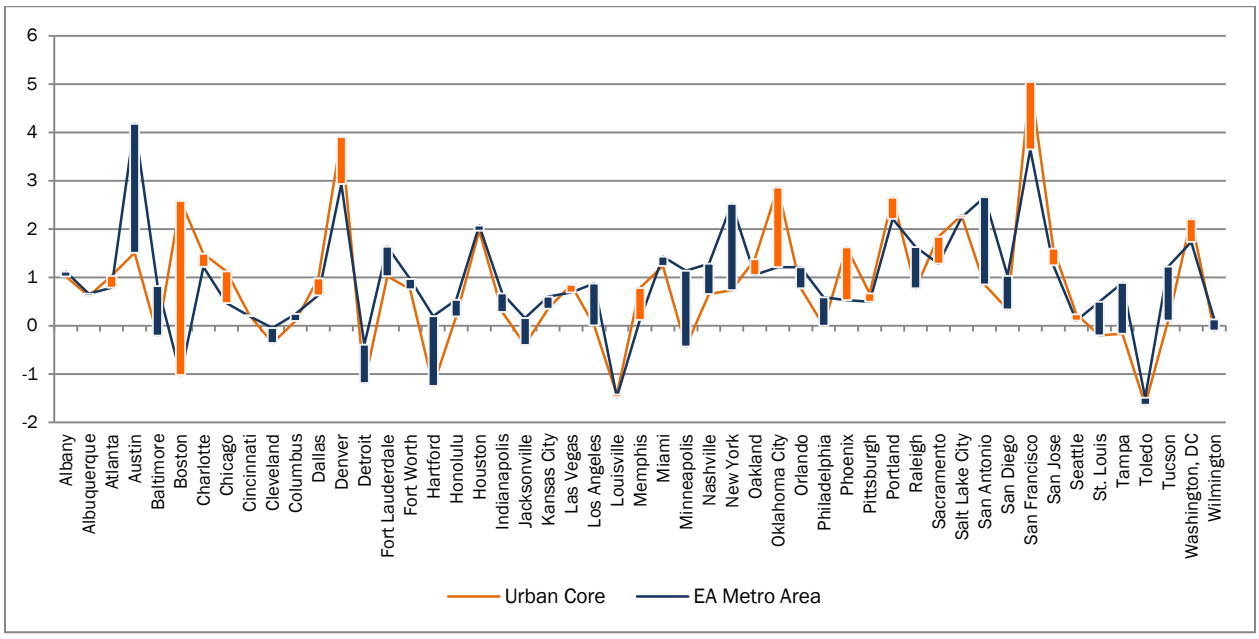
VARIBLES	OBS	MEAN	STD. Dev.	MIN	MAX
Vacancy Rate UC	1,193	14.70	5.54	0	33.6
Gross Asking Rent UC	1,188	20.15	6.644	10.35	66
Vacancy Rate CC	1,115	16.32	9.86	0	100
Gross Asking Rent CC	1,076	18.05	5.47	8.8	57.84
Vacancy Rate MSA	1,547	15.42	6.87	0	82.5
Gross Asking Rent MSA	1,508	19.43	5.45	9.58	69.04

[Figure 16] Changes in Economic Gross Rents of 69 Metropolitan Areas (%)



Unlike the changes in gross rent levels by year, the average growth of rental rates from 1988 to 2012 shows similar changes in both Urban Cores and MSAs. Those growth rates are between 4.82% to -1.63% and the movement cross section looks very close. In terms of Center City, however, the differences among cities are greater than others. For example, Boston, Cleveland, Philadelphia, San Francisco, and Wilmington show the difference greater than ±4%. Figure 17 shows the summary of rental rates of 69 metros and their cross-section values.

[Figure 17] Average Gross Rental Growth from 1988 to 2012



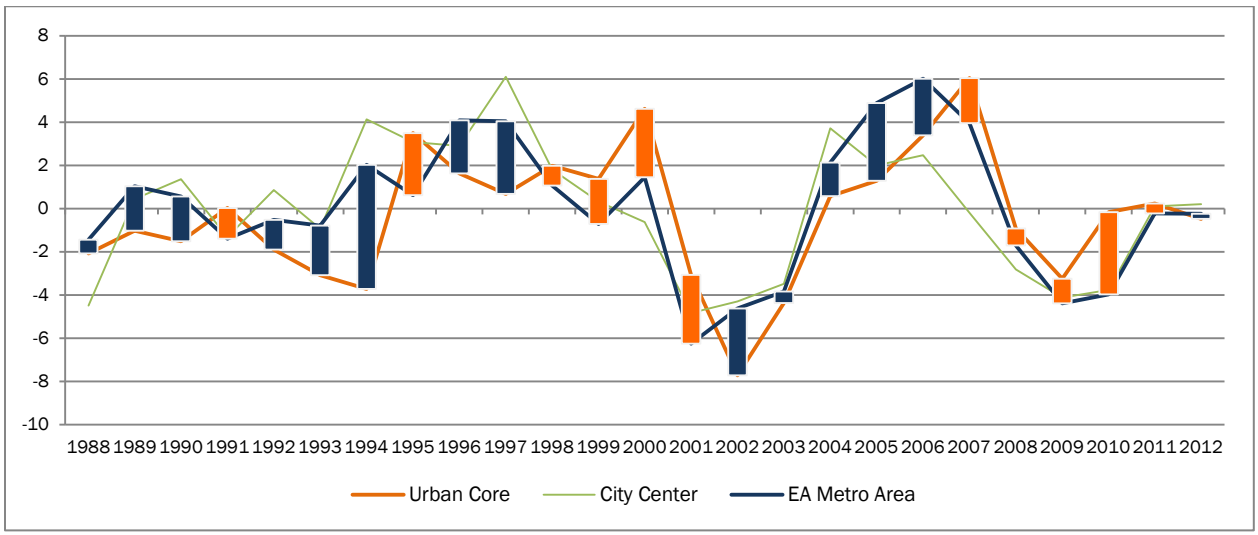
- Net Rents

The net rental growth trends illustrate similar movements with the gross rental growth patterns both yearly and regionally. The yearly rental growths of UC and MSA move closely to each other. The greatest difference of the rental growth rates is 5.74% between UC and MSA in 1994. It is hardly to say that one of them generally outperforms the other for the last 25 years, showing there are only three years when the average growth rate in rents of MSA was greater than that of UC. In terms of Center City, the growth rate also shows similar pattern but the movement of CC is closer to that of MSA rather than UC.

[Figure 18] Summary of the Net Rental Rate Data

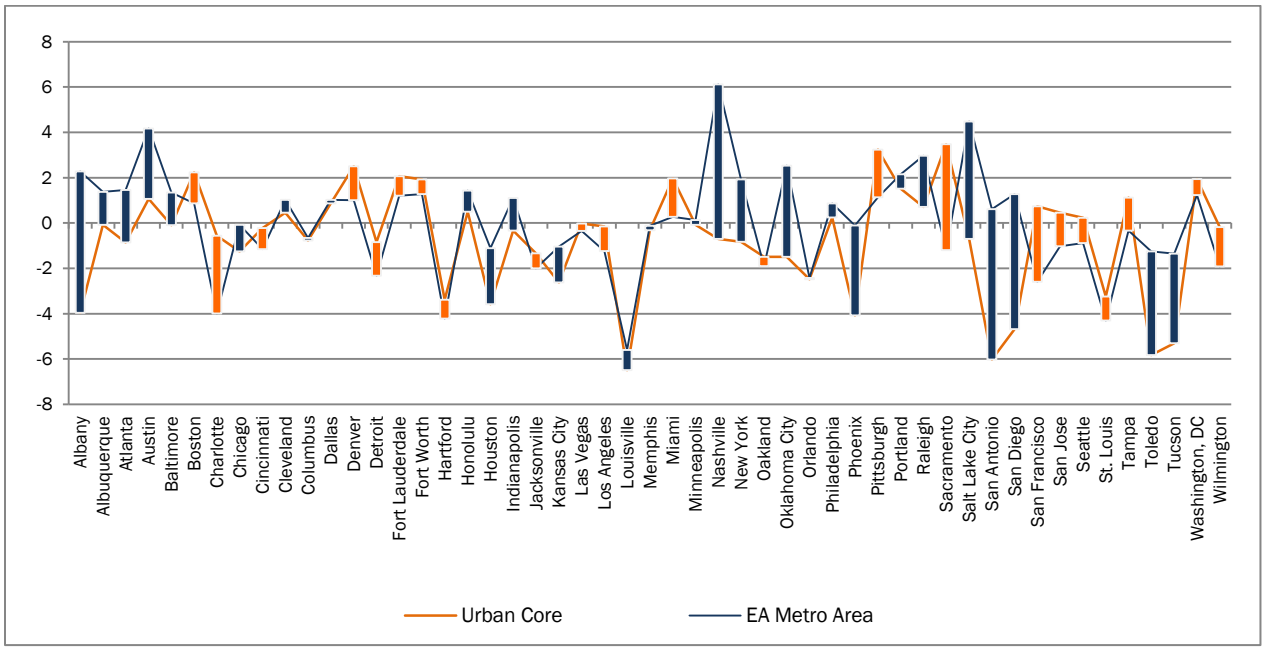
VARIBLES	OBS	MEAN	STD. Dev.	MIN	MAX
Net Asking Rent UC	1,029	17.70174	7.021051	5.26	57.93
Net Asking Rent CC	860	15.46001	5.841122	5.41	61.16
Vacancy Rate MSA	1,460	16.00498	5.029063	6	71.19

[Figure 19] Changes in Economic Net Rents of 69 Metropolitan Areas (%)



In Figure 20, the cross-sectional changes also show that the net rental growth rates of UC and MSA move closely. The top 5 cities of the difference in growth rate are Nashville, San Antonio, Albany, San Diego, and Salt Lake City in the order named. However, this cross-section trend shows that there are geographic characteristics that explain the difference in the net rental growth rates in both UC and MSA. In case of the average of net rental growth rates, the range of UC varies from 3.5% to - 6.5% and that of MSA extends from 6.1% to -5.6%.

[Figure 20] Average Net Rental Growth from 1988 to 2012



- *Comparison of Economic Rents Growth Rates between UC and MSA*

This research utilizes the scatter diagram with the simple linear regression, in order to figure out the economic measurement of UC with relation to that of MSA. By showing scatter plots of data set, the comparison between UC and MSA is clearly described with the distribution of data and the regression line. As both gross and net rental rates are examined in the trend in economic rents, this section illustrates both economic indicators of UC and MSA.

- Gross Rents

Figure 21 offers the relation of the change in economic performances between UC and MSA. The data set consists of 3,772 observations in 69 markets from 1993 to 2012. As can be seen from the chart, the rental rates movement of UC has strong positive correlation to that of MSA, displaying the majority of data in 1st and 3rd quadrants. That is, the two geographic regions show the corresponding growth rates in gross rental levels, closely fitting the regression line to the 45º line. In terms of gross rental rates, this diagram explains that the economic performance of UC positively relates with that of MSA. The additional lines of x-axis and y-axis are mean values of each area's rental growth rate, 0.82 of UC and 1.05 of MSA.

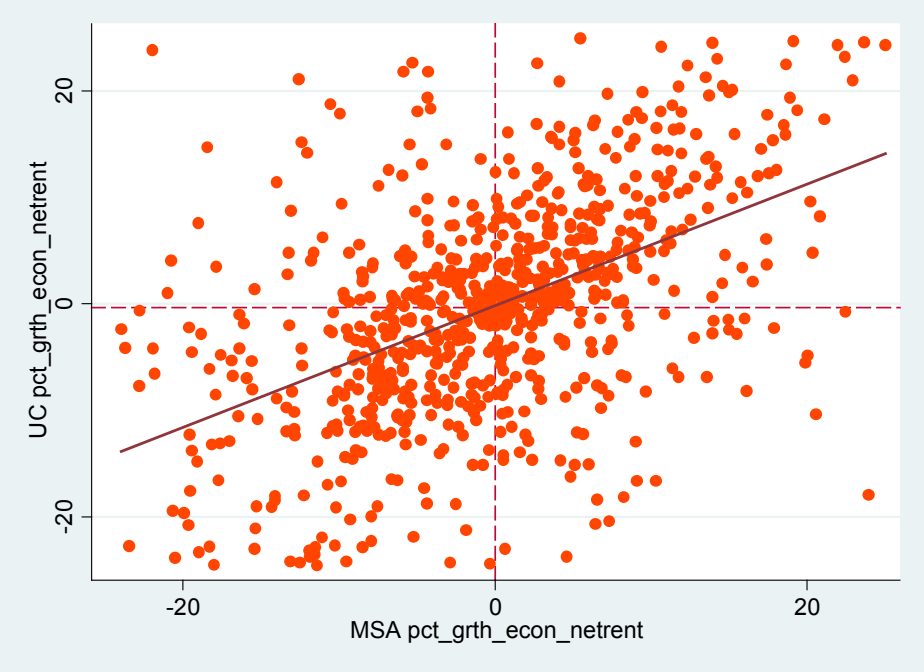
[Figure 21] Relation of the Growth Rate of Gross Rents between UC and MSA[50]

[50] See the 'Appendix _ Chapter 5: Economic Performances of Properties' for the detail with data labels.

- Net Rents

Figure 22 provides the distribution of net rental data and the relation of the rental rate changes between UC and MSA. Compared to the gross rental data, the net rental plots more scatter, describing that the relationship of the net rent growth rate between the sub-markets is weakly positive to each other. Additionally, this plot explains that there are more markets where a zone outperforms the other zone, locating at 2nd and 4th quadrants. In other words, the metropolitan areas in 2nd quadrant have greater rental growth rates in UC than MSA while those in 4th quadrant do better in MSA than UC. Despite the weak relation, the regression line depicts the tendency that the rental changes of the two areas have a positive relation. The additional lines of x-axis and y-axis are mean values of each area's rental growth rate, -0.34 of UC and 0.01 of MSA.

[Figure 22] Relation of the Growth Rate of Net Rents between UC and MSA



- *Panel Model of Economic Rent Growth Rates between UC and MSA*

In order to discuss the relationship of the economic rents between UC and MSA, this study utilizes the panel regression model. By allowing the dummies of a metropolitan area and the time, the model incorporates market characteristics and time effects in each market.

- Gross Rents

Following the methodology explained above, the model for estimating the properties' performance between Urban Cores and MSAs is shown in equation (4). The regression model is formulated to be comparable the growth of gross rental measurements of these two areas.

$$EGR\ GR\ of\ UC_{(jt)} = 0.6588872 + 0.9400895 * EGR\ GR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \quad (4)$$

In the panel, *j* is cross-section market (city) and *t* is time. The variables are as follows:
EGR GR of UC*(jt)*: Economic Gross Rent Growth Rate measured as a change of gross rent data from asking gross rent for a given Urban Core in a given year
EGR GR of MSA*(jt)*: Economic Gross Rent Growth Rate measured as a change of gross rent data from asking gross rent for a given MSA in a given year
FE*(j)*: Fixed market-specific effects in connection with each city
FE*(t)*: Fixed time effects in connection with each year

As described in equation (4) and Table 9, the coefficient on economic performance of MSA is around 0.94, demonstrating that there is a close link between UC and MSA so that two variables move with a very similar pattern even though the MSA rental rate grows slightly faster than UC rental level. According to the constant, the UC's rental growth rate is slightly greater that MSA's rental growth rate. The individual result on market dummies shows that all markets are not statistically significant in estimating the gross rental levels between UC and MSA. However, the time dummies yields that some years are significant such as 1992 (with the coefficient of -2.670727), 1994 (-2.739872), 1996 (-2.89614), and 2005 (-3.022596) while the others are not. The result conveys that these periods caused the lower growth rate of the office gross rents in UC than MSA.[51]

[Table 9] Panel Model of Economic Gross Rents Growth Rates between UC and MSA

```
Linear regression                                   Number of obs =    1095
                                                    F(75,  1019) =   24.53
                                                    Prob > F      =  0.0000
                                                    R-squared     =  0.6411
                                                    Root MSE      =  4.7147
                          |               Robust
pct_grth_econ_grossrentUC |  Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
pct_grth_econ_grossrentMSA | 0.9400895 0.0340214  27.63  0.000   0.8733295    1.006849
                     _cons | 0.6588872 1.775395    0.37  0.711   -2.824961    4.142735
Fixed Effects of MSA
Fixed Effects of Year
```

[51] See 'Appendix _ Chapter 5: Economic Performances of Properties' for the detail.

- Net Rents

Just like the model for gross rental growth rates, the panel regression for estimating the net rental changes between Urban Cores and MSAs is shown in equation (5).

$$ENR\ GR\ of\ UC_{(jt)} = -1.949367 + 0.5649599 * ENR\ GR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \quad (5)$$

ENR GR of UC*(jt)*: Economic Net Rent Growth Rate measured as a change of net rent data from asking net rent for a given Urban Core in a given year
ENR GR of MSA*(jt)*: Economic Net Rent Growth Rate measured as a change of net rent data from asking net rent for a given MSA in a given year

The model structure is the same as the regression of gross rental effects. Compared to the result of the gross rental relation between UC and MSA, the net rental growth rates between UC and MSAs show great difference, the coefficient of around 0.56. In other words, the result offers that the net rental level of offices located at UC are much more stable than the office net rents of MSA. Meanwhile, the coefficient of constant has the negative sign and indicates that the net rental growth rate of UC is approximately 2% less than that of MSA. However, the constants yields insignificant statistics about the relationship between the two zones and, more importantly, the R-squared is very low, implying the data cannot be fully explained by the model. In terms of the market fixed effects, some markets show the significant statistics such as Denver (with the coefficient of 7.590141), Miami (7.266258), Pittsburgh (6.576477), San Jose (11.54742), and Washington, DC (5.862838), implying that the UCs in these markets experiences the higher growth rate of net rents than their MSAs. The time dummies also present the significant impact on the net rent changes of UC in 1989 (with the coefficient of -6.099382), 1993 (-4.968097), 1994 (-6.805698), 1996 (-4.389881), and 2002 (-6.025071), indicating that each period leads the lower growth rate of UCs than MSAs.[52]

[Table 10] Panel Model of Economic Net Rental Growth Rates between UC and MSA

```
Linear regression                                   Number of obs =     768
                                                    F( 75,   692) =    4.46
                                                    Prob > F      =  0.0000
                                                    R-squared     =  0.3253
                                                    Root MSE      =  8.8563
                         |               Robust
 pct_grth_econ_netrentUC |   Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
pct_grth_econ_netrentMSA | .5649599  .0467774    12.08  0.000    .4731173    .6568026
                   _cons | -1.949367  3.234661    -0.60  0.547   -8.300294    4.401559
Fixed Effects of MSA
Fixed Effects of Year
```

[52] See 'Appendix _ Chapter 5: Economic Performances of Properties' for the detail.

5.2.2 Multifamily Housing Markets

Using yearly and regional trends, a panel data regression model, and scatter diagrams, this section depicts the US multifamily market of 46 cities over last two decades.

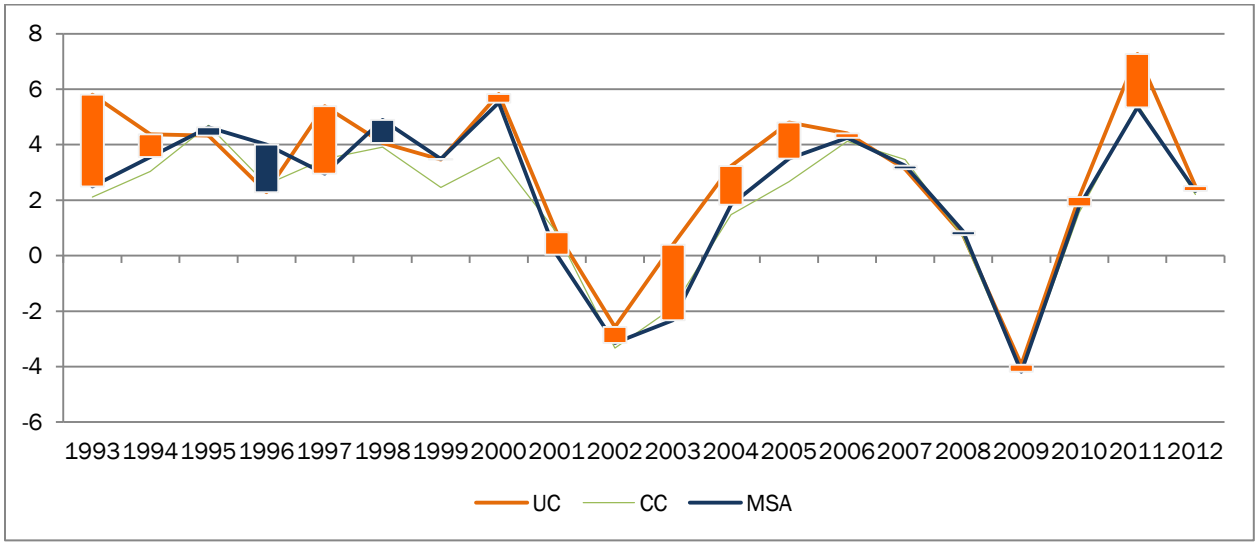
- ***Trends in Economic Rent Growth Rates by Year and City***

The Figure 23 indicates that US multifamily housing markets of UC and MSA grow in the same pattern based on the yearly trends in the economic performance. As can be seen by the chart, the growth rates in both UC and MSA are positive over last 20 years except for 2002 and 2009 of UC and 2002, 2003, and 2009 for MSA. Not only that, but also the difference between these two zones is relatively less since 2006. The gap in rental rates of CC and MSA is narrower than that between UC and MSA.

[Table 11] Summary of the Rental Rate Data

VARIBLES	OBS	MEAN	STD. Dev.	MIN	MAX
Vacancy Rate UC	805	5.28	3.36	0	36.36
Rent/Sf UC	805	1.18	0.53	0	3.48
Vacancy Rate CC	795	5.85	2.64	0	22.16
Rent/Sf CC	795	0.90	0.38	0	3.08
Vacancy Rate MSA	914	5.61	1.94	0.87	12.10
Rent/Sf MSA	914	0.91	0.34	0	2.70

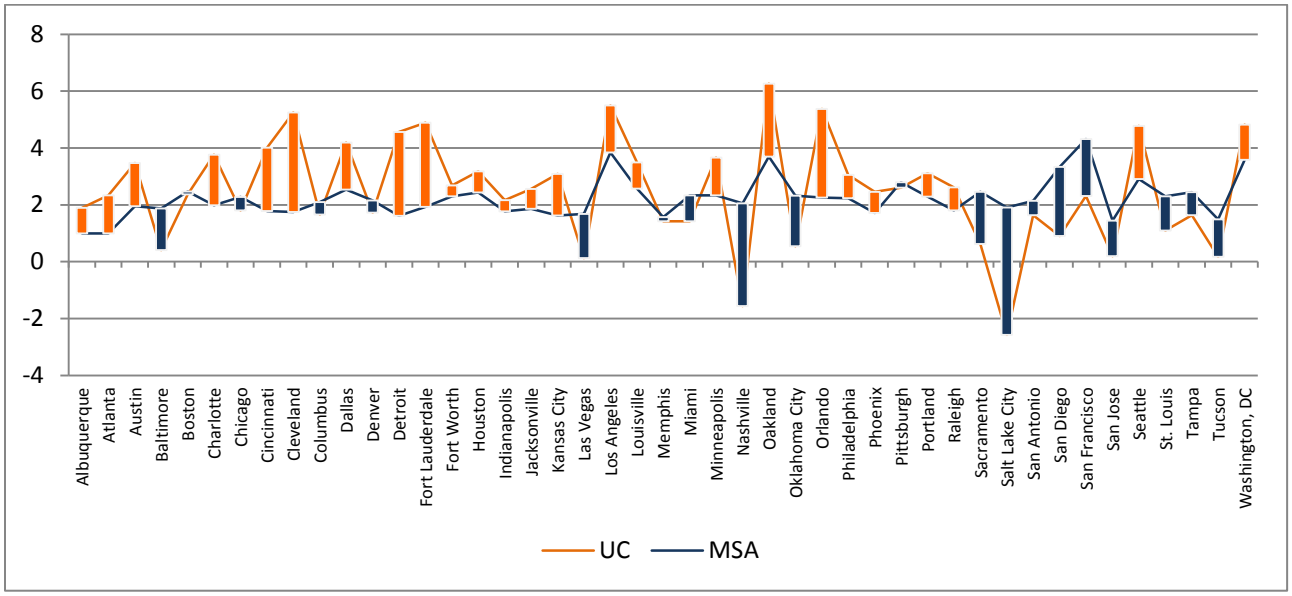
[Figure 23] Changes in Economic Rental Rates (%)



Unlike the yearly growth rate of MSA, the rental change of each city indicates a positive sign. UC rental growth level is also positive except for Nashville and Salt Lake City. Compared to the economic

performance in MSA, the growth rates of UC vary with the city for the last two decades. That is, the UC rental growth rate of multifamily housing has market-specific effects. To be specific, the greatest difference in UC rental change levels is 8.8%, while the gap in MSA rental growth rates is 3.3%.

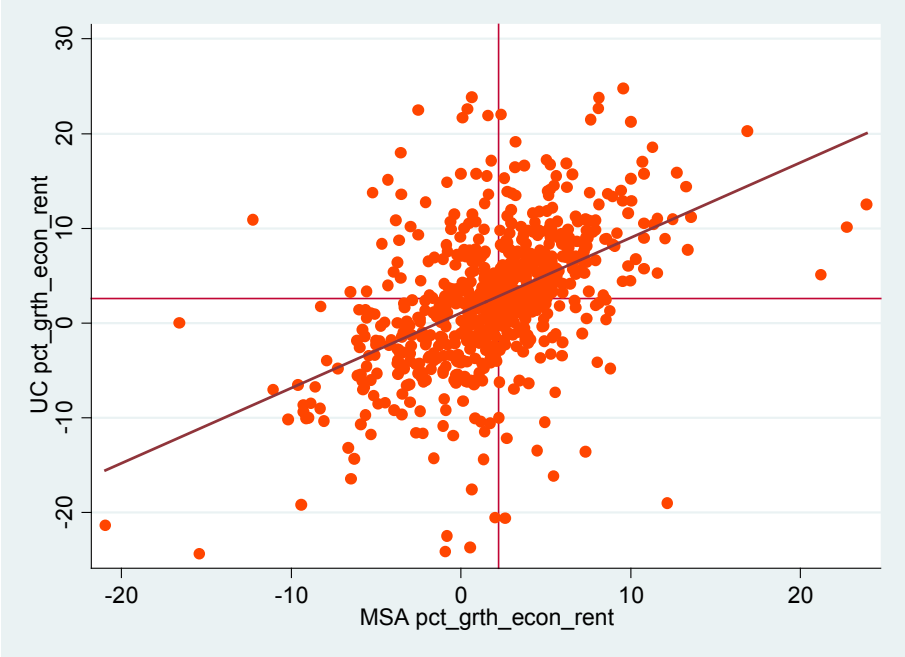
[Figure 24] Average Rental Growth from 1993 to 2012



- *Comparison of Economic Rent Growth Rates between UC and MSA*

In Figure 25, this study introduces the correlation of economic performances between UC and MSA for multifamily housing properties. While the more data concentrates in near mean values of the UC rental growth rate and MSA rental growth rate, there are a considerable number of the markets where the UC rental growth rate is less related with the MSA rental growth rate, observed in 2nd and 4th quadrants. However, the linear regression indicates that the performances between the two zones have positive correlation. The mean values of each area's measurement are 2.59 of UC and 2.23 of MSA, lining with x-axis and y-axis.

[Figure 25] Relation of the Growth Rate of Economic Rents between UC and MSA



- ***Panel Model of Economic Rents Growth Rates between UC and MSA***

Just like the model for the office market, the panel model for measuring the economic performance of multifamily of Urban Cores and MSAs is shown in the equation (6). The regression model is formulated to be comparable the growth of gross rental measurements of these two areas.

$$ER\ GR\ of\ UC_{(jt)} = 1.325962 + 0.7010768 * ER\ GR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \quad (6)$$

In the panel, *j* is cross-section market (city) and *t* is time. The variables are as follows:

ER GR of UC*(jt)*: Economic Rent Growth Rate measured as a change of rental data for a given Urban Core in a given year

ER GR of MSA*(jt)*: Economic Rent Growth Rate measured as a change of rental data for a given MSA in a given year

FE*(j)*: Fixed market-specific effects in connection with each city

FE*(t)*: Fixed time effects in connection with each year

The result suggests that the economic rents of MSA changes the greater the rental rate of UC moves relatively less, indicating that the UC rental growth rate is a little less volatile than the MSA rental change. The coefficient on percentage changes of MSA is around 0.7 demonstrating that when the rental growth rates of MSA increases 1% the UC rental rate moves up 0.7%. Combining the effect of MSA

rental changes with the constant value implies that the UC's rental rate grows faster than MSA's rental rate until the MSA rental growth rate is less than around 4%. The individual result on market specific fixed effects shows that all markets are not significant statistics for estimating the rental levels between UC and MSA. Likewise, the time dummies yields that all of the time fixed effect are not significant in the model.[53]

[Table 12] Panel Model of Economic Rental Growth Rates between UC and MSA

```
Linear regression                               Number of obs =     692
                                                F( 64,   627) =    5.81
                                                Prob > F      =  0.0000
                                                R-squared     =  0.3077
                                                Root MSE      =  6.4371
                     |               Robust
 pct_grth_econ_rentUC |    Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
pct_grth_econ_rentMSA |  .7010768  .0865429     8.10   0.000     .5311278    .8710258
                _cons |  1.325962  2.423946     0.55   0.585    -3.434072    6.085997
Fixed Effects of MSA
Fixed Effects of Year
```

5.3 Summary

This section reveals that the economic performances between UC and MSA maintain a close link with each other. Concerning the office market, the gross rental growth rate of MSA greatly affects the rental changes of UC so that the two parameters move with a nearly identical pattern, implying that the volatility of both sub-markets is almost the same. The scatter diagram of these two indicators also reveals the close correlation between them. In addition, the net rental change of MSA also leads the movement in net rental rate of UC, with statistical significance. Compared to the gross rental data, the net rental plots more scatter, describing that the relationship of the net rent growth rate between UC and MSA is weakly positive to each other. More importantly, the regression model illustrates that the range of UC net rental changes is relatively narrower than the movement of MSA net rental rates, indicating that the economic net rental growth rate of UC is much less volatile than that of MSA.. Regarding the multifamily housing market, the economic rental growth of MSA exerts the effect on the change in economic rental rates of UC. While the movement in UC renal growth rate is relatively less volatile than the change of MSA rental growth, the two variables closely relates with each other.

[53] See 'Appendix _ Chapter 5: Economic Performances of Properties' for the detail.

CHAPTER 6 INVESTMENT PERFORMANCES OF PROPERTIES

Continuing the analysis on the performance between UC and MSA, this chapter concentrates on the investment return of properties in these different locations. In order to examine the investment performance, this study employs as the performance indicator average Capitalization Rates for last decade and across 51 metropolitan markets.

6.1 Data and Methodology

6.1.1 Data: Cap Rates of Offices and Multifamily Housing Properties

This study utilizes the actual transaction database of office and multifamily properties, the data set obtained by Real Capital Analytics. The total 3,074 transaction data is composed of detailed information such as the square feet, the number of units, and the type of a property as well as the Cap Rate from 2003 to 2012 1st quarter. Although the RCA data is available from 2000, this research limits the period from 2003 to 2012 because the data are relatively incomplete until 2003. After eliminating MSAs that have the number of Cap Rates fewer than four, the data set consists of 3,074 applicable transaction observations that cover 51 MSAs. The summary of data set is as Table 13.

[Table 13] Summary of Transaction Data

	No. of MSA	year	Total observation
Office	50	2003~2012	1,369
Apartment	51	2003~2012	1,705

[Table 14] Summary of the Cap Rate Data

VARIBLES	OBS	MEAN	STD. Dev.	MIN	MAX
Office Cap Rate	1,369	7.70	1.34	3.5	13.40
Multifamily Cap Rate	1,705	6.92	1.32,	2.40	12.60

6.1.2 Methodology: Scatter Diagram and Panel Regression Model

The methodology used in this section involves three steps so as to investigate the difference in performance between UC and MSA. First, this study aggregates the raw data at ZIP code level to the newly defined zone scope. In order to combine the individual property data, the weighted average of Cap Rate is applied to the measurement, proportionally calculated by square foot or the number of units of an asset in the specific area in a given year. Also, this study conducts the analysis on the level of cap rates

rather than the excess of the risk free, assuming that the effects of risk free rate are not significant in this study. The calculation of weighted average cap rate is showed in the equation (7).

$$Weighted\ Average\ Cap\ Rate\ = \sum_{i=0}^{n} Weight(i) * \ Cap\ Rate(i) \qquad (7)$$

Second, this thesis explores the observations of weighted average cap rates using scatter diagrams with the simple linear regression. Since this study examines the correlation and differentials between two areas within a metropolitan market, the scatter diagram plotting the distribution of cap rate levels allows the research to simply find out corresponding of a parameter to a given or fixed value.[54]

Third, panel data regression model is applied to the weighted average cap rates at the zone level previously obtained to formulate a combination of time series and cross-section data, so that the data set allows this study to make sure time effects and market specific effects. Since this study aims to compare the investment performances by the particularly identified region, this study develop a regression model for examining the relation of spatial variation between UC and MSA. The equation is shown in the equation (8).

$$Weighted\ Average\ Cap\ Rate\ of\ Urban\ Core_{(jt)} =$$
$$\beta_1 + \ \beta_2 * Weighted\ Average\ Cap\ Rate\ of\ MSA_{(jt)} + \ FE_{(j)} + FE_{(t)} \qquad (8)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The equation shows the effect of the level of cap rates of MSA(*jt)* on the level of cap rates of UC(*jt)*, indicating that a unit of increase in cap rates of MSA(*jt)* leads the β_2 amount of change in cap rates of UC(*jt)*. That is, the coefficient of MSA informs that how volatile the level of cap rates is of the two zones. The dummy variable of FE(*j)* captures the metropolitan fixed effects; the statistically significant coefficient of the dummy indicates in what markets the UC cap rate level is higher or lower than the MSA cap rate. Likewise, another dummy variable of FE(*t)* measures the time fixed effects; if the coefficient of the dummy is statistically significant, the specific time gives impact on the difference between the two sub-markets. Using this formula, this study explores the relation of the level of cap rates between two specific areas within a metropolitan market.

[54] web2.concordia.ca/Quality/tools/25scatter.pdf; personnel.ky.gov/NR/rdonlyres/CF0C40D5.../ScatterDiagrams.pdf

6.2 Investment Performances between Urban Core and MSA

Based the data and methodology mentioned above, this section compares the investment performances between UC and MSA in order to better understand the relation of these two geographic regions in terms of cap rates provided by actual transaction. The office and multifamily properties are described using the yearly and regional trends, a panel data regression model, and scatter diagrams.

6.2.1 Office Markets

- ***Trends in Cap Rates by Year and City***

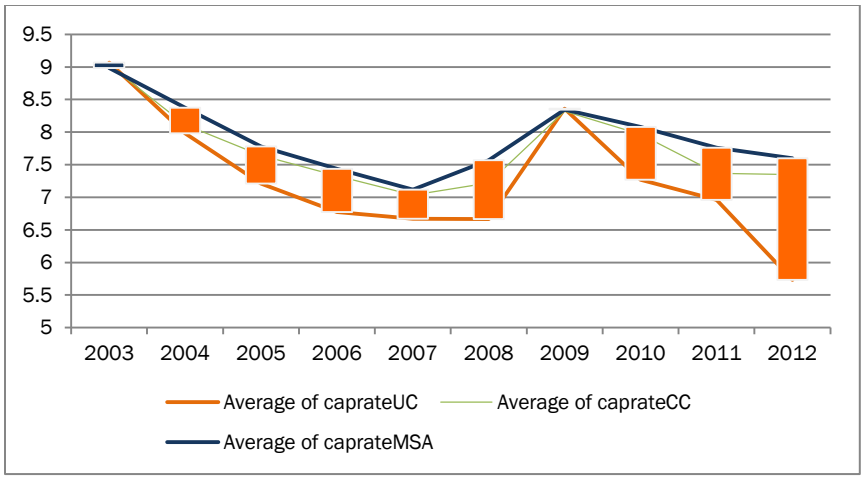
This section introduces the trends in cap rates in each region by both year and city, before examining the analysis on economic performances between Urban Core and MSAs. As the trends in economic performance showed the entire three locations within a metropolitan market, this part also includes the Center City in the trend demonstration.

[Table 15] Summary of Cap Rate Data by Zone

VARIBLES	OBS	MEAN	STD. Dev.	MIN	MAX
Cap Rate UC	289	7.27	1.48	4	11.86
Cap Rate CC	241	7.65	1.23	3.5	11.3
Cap Rate MSA	833	7.83	1.21	4.68	12

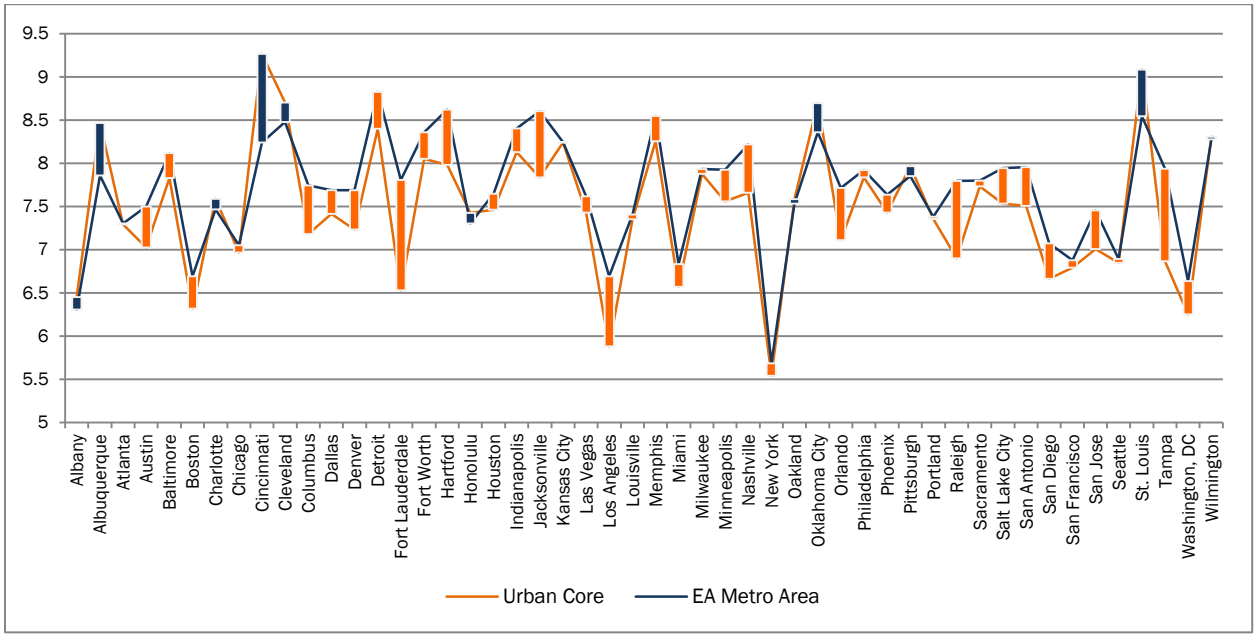
Based on the weighted average cap rates of the data, the office cap rate of 69 metropolitan areas shows that the cap rates in UC are generally lower than MSA's cap rate last decade except for 2003 and 2009. The most recent transaction shows the greatest variation on the cap rates between UC and MSA. However, the 2012 data includes only the first quarter deals so that it is not entirely comparable with the rest of years. Taking the point into account, the greatest differences between two areas is 90 basis points in 2008. The yearly change shows that the cap rates are more volatile in UC than in MSA, describing that the difference in UC is from around 5.73% to 9.07% while that in MSA is from approximately 7.12% to 8.99%. From this result, this study considers the time effects in regression model in later section. The summary of office cap rates is shown in Table 15 and Figure 26.

[Figure 26] Average Cap Rates of 50 Metropolitan Areas



The cap rate level in cross-section shows variable aspects among the MSAs. The difference in investment performance between UC and MSA is from -1.28% to 1.02%. Of all cities, Fort Lauderdale shows approximately 1.28% the greatest difference between the two specific areas, whereas Kansas City exhibits around 0.5 basis point of variation which is the least. Tampa and Cincinnati are the cities that have more than 100 basis point of the gap between two areas while Atlanta and Portland are the places that produce similar performances in investments in two areas. The average cap rates of UC are distributed between 5.54% and 9.26% while the indicators of MSA are presented from 5.69% to 8.82%. The disparity among geographic markets of UC and MSA is 3.72% and 3.14% respectively.

[Figure 27] Average Cap Rates from 2003 to 2012

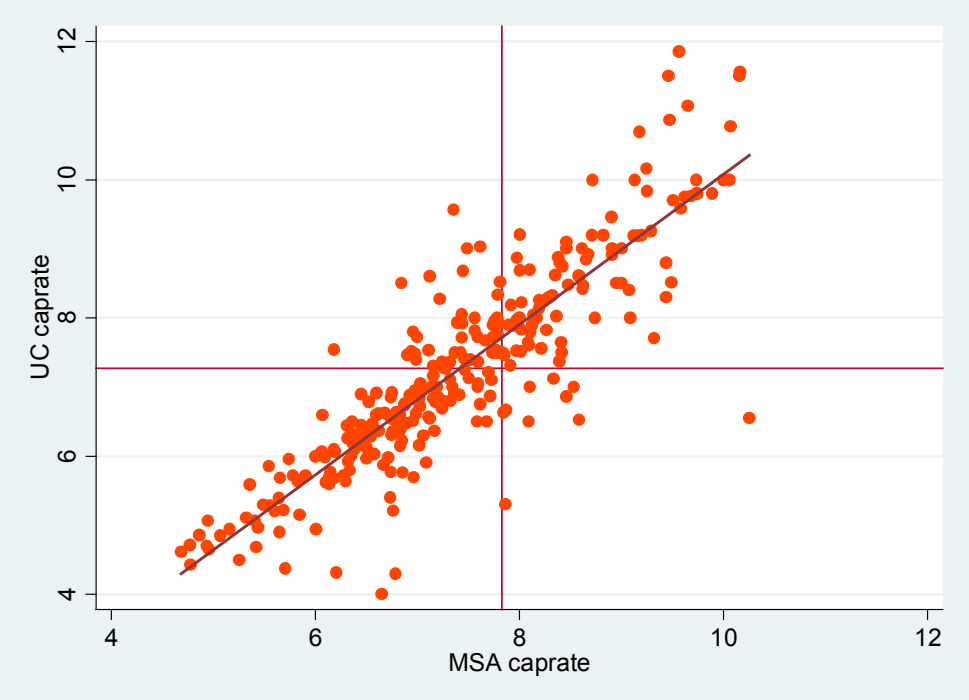


- *Comparison of Cap Rates between UC and MSA*

Considering the trends in cap rates of UC and MSA, this section compares the performance between UC and MSA through the scatter diagram. By plotting 289 observations of the weighted average cap rates, it is easy to illustrate the correlation of downtowns and suburbs in terms of the investment performance.

In Figure 28, this study clearly offers the relation of the level of cap rates between UC and MSA. The data set consists of 289 observations in 50 metropolitan areas from 2003 to 2012. As can be seen from the chart, the cap rates of UC have the strong positive correlation to that of MSA, displaying the majority of data in 1st and 3rd quadrants along with the regression line. It is explained that the two geographic regions have the corresponding response in the cap rate level, closely fitting the regression line to the 45º line. Addition to the positive correlation, this diagram explains that the level of cap rates of UC is slightly lower than that of MSA. The plots in the 2nd quadrant suggest the higher investment performance in MSA than UC while the data in the 4th quadrants demonstrate the superior outcomes of investment returns in UC rather than MSA. The additional lines of x-axis and y-axis respectively presents the mean values of each area's the weighted average cap rates, 7.27 of UC and 7.83 of MSA.

[Figure 28] Relation of the Cap Rates between UC and MSA[55]



[55] See 'Appendix _ Chapter 6: Investment Performances of Properties' for the detail.

- *Panel Model of the Cap Rates between UC and MSA*

As this study applied the panel regression model to the economic rental rates, this section discusses the panel regression model for investment performances in order to delve into the relationship of the cap rates between UC and MSA. Allowing the fixed effects of metropolitan areas and time, the model is designed to capture the interactive reactions that occur across markets and time. Following the methodology explained in the previous section, the equation (9) articulates the model for assessing the difference in cap rates between Urban Cores and MSAs. The regression model is formulated to be comparable the level of weighted average cap rates of these two areas.

$$WACR\ of\ UC_{(jt)} = -0.627856 + 1.122697 * WACR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \quad (9)$$

In the panel, *j* is cross-section market (city) and *t* is time. The variables are as follows:
WACR of UC*(jt)*: Weighted Average Cap Rate measured from cap rate levels weighted by square foot for a given Urban Core in a given year
WACR of MSA*(jt)*: Weighted Average Cap Rate measured cap rate levels weighted by square foot for a given MSA in a given year
FE*(j)*: Fixed market-specific effects in connection with each city
FE*(t)*: Fixed time effects in connection with each year

As indicated in the equation (9) and Table 16, the coefficient on the cap rate of MSA is around 1.12 and the intercept is about -0.63, explaining that the cap rate levels of MSA increase would generate a similar change in the cap rate levels of UC but slightly greater than those of MSA. That is, the change of the level of UC cap rate is greater by 1.12 than that of MSA, so that the UC cap rates are more volatile than MSA cap rates. The individual result on the fixed effect of geographic markets shows the significant statistics for estimating the level of cap rates across US cities, indicating in what markets the UC outperforms the MSA in terms of the properties pricing. Of 49 markets, 41 UCs shows the lower level of cap rates than their MSAs. Describing that the p-values of year dummies are pretty high, the time coefficient yields negative values except for 2007, the coefficient of 0.06. That is, all years except for 2007 causes the lower level of cap rates in UC than MSA. Since the R-squared of this regression is 0.8325, the model statistically explains the relation of cap rates between UC and MSA. The summarized information is in Table 16.[56]

[56] See 'Appendix _ Chapter 6: Investment Performances of Properties' for the detail.

[Table 16] Panel Model of Cap Rates between UC and MSA

```
Linear regression                                   Number of obs =     289
                                                    F( 55,   229) =       .
                                                    Prob > F      =       .
                                                    R-squared     =  0.8325
                                                    Root MSE      =  .67756
                 |               Robust
      caprateUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+----------------------------------------------------------------
     caprateMSA |   1.122697   .0722628    15.54   0.000     .9803124    1.265082
          _cons |   -.627856   .4891322    -1.28   0.201    -1.591631    .3359189
Fixed Effects of MSA
Fixed Effects of Year
```

6.2.2 Multifamily Housing Markets

This section depicts the US multifamily market of 51 cities for last two decades, using yearly and regional trends, a panel data regression model, and scatter diagrams. Like the office market, the multifamily properties are also analyzed by the weighted average cap rates since 2003.

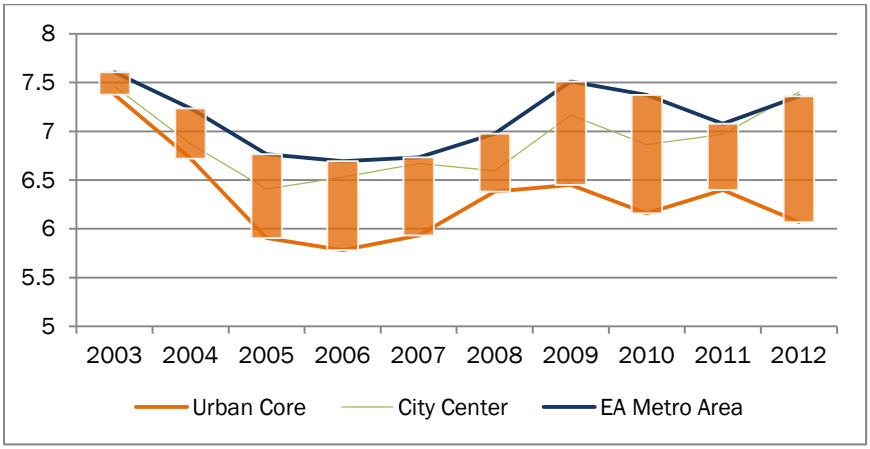
[Table 17] Summary of Average Cap Rates of 51 Metropolitan Areas

VARIBLES	OBS	MEAN	STD. Dev.	MIN	MAX
Cap Rate UC	236	6.27	1.46	2.95	10.9
Cap Rate CC	367	6.84	1.35	2.4	10.63
Capr Ate MSA	1101	7.07	1.23	2.79	12

- ***Trends in Cap Rates by Year and Cities***

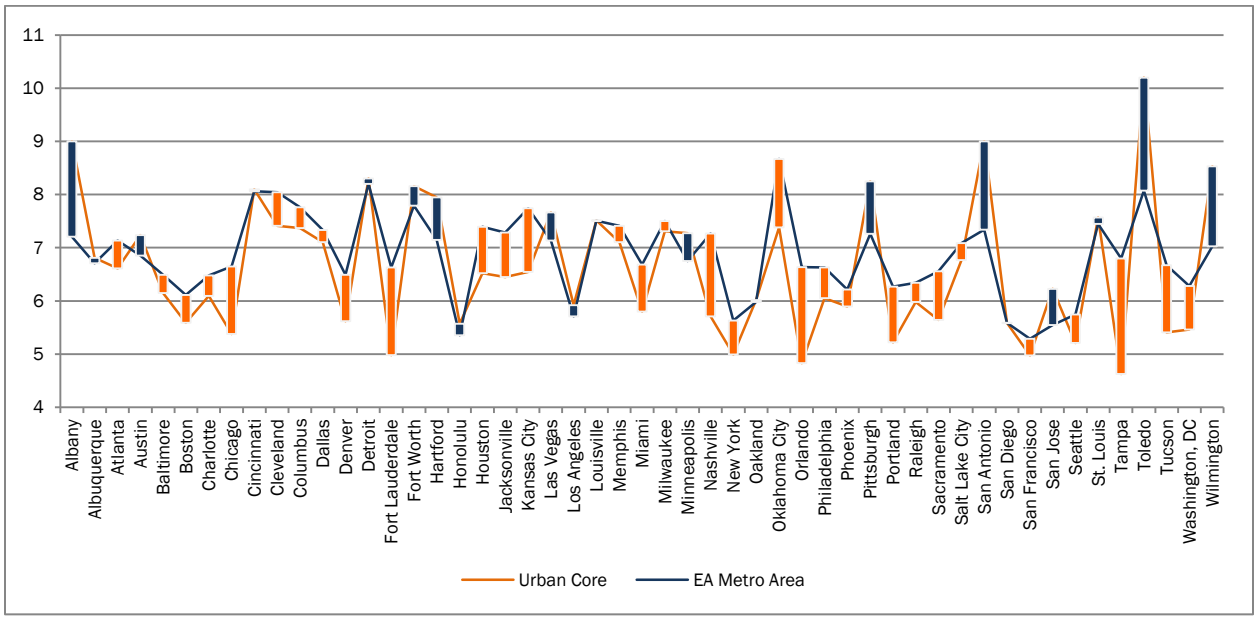
The multifamily data set obviously reveals that the cap rates in UC are lower than MSA's cap rate during the whole period. As the office data did, the most recent transaction shows the greatest variation on the cap rates between UC and MSA. As it was previously mentioned, the 2012 data includes only the first quarter deals so that it is not entirely comparable with the rest of years. Considering the issue, the greatest differences between two areas is around 120 basis points in 2010. The magnitude of UC cap rates is measured between around 5.78% and 7.38% when the range in MSA is provided from approximately 6.69% to 7.60%. Based on the time series in the investment performance, the Figure 29 indicates that US multifamily housing markets of UC and MSA move in the same pattern Compared to office properties, the multifamily housing is less volatile over time. The summary of apartments' cap rates is shown in Table 17.

[Figure 29] Changes in Cap Rates of 51 Metropolitan Areas (%)



Compared to the office cap rates, the residential properties' cap rates in the cross-section show the greater variation among the MSAs. The difference in investment performance between UC and MSA is from -2.17% to 2.12%. Of all cities, Tampa has approximately 2.17% the greatest difference between the two specific areas, whereas San Diego exhibits around 0.2 basis point of variation which is the least. Orlando, Fort Lauderdale, and Nashville are the cities that the difference in cap rates between UC and MSA is less than -150 basis points, which describes that the UC performs better than MSA. On the other hand, Toledo, Albany, San Antonio, and Wilmington are the places that the difference is greater than 150 basis points, which implies that the investment performance in MSA excels than UC. The average cap rates of UC are distributed between 4.63% and 10.20% while the indicators of MSA are presented from 5.29% to 8.67%. The disparity among geographic markets of UC and MSA is 5.57% and 3.38% respectively.

[Figure 30] Average Cap Rates from 2003 to 2012

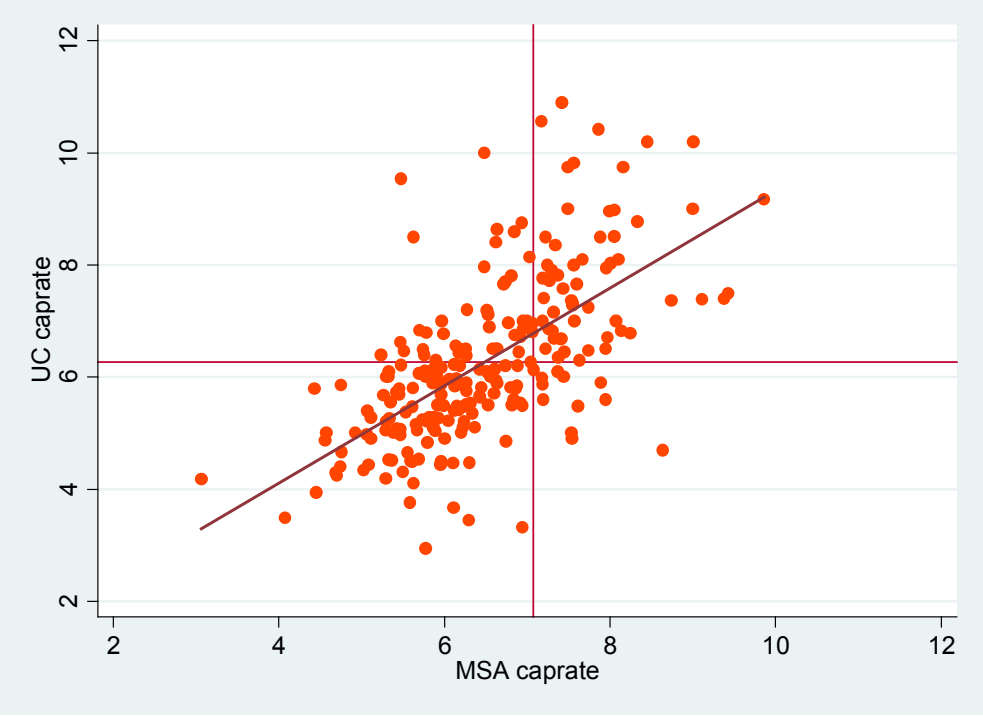


- *Comparison of Cap Rates between UC and MSA*

By plotting 289 observations of the weighted average cap rates of the multifamily housing, it is easy to understand the correlation of UC and MSA in terms of the investment performance.

As expected, the scatter diagram suggests the relation of the level of cap rates between UC and MSA. The data set consists of 289 observations in 51 metropolitan areas from 2003 to 2012. As can be seen from the figure, the cap rates of UC have a positive correlation to that of MSA while outliers also lay on the chart. It is implied that, in terms of the cap rate levels in US multifamily market, the change in one geographic region would lead the corresponding adjustment in the other market, showing the fitted regression line with the slope of almost 45 degree. Addition to the positive correlation, this diagram explains that the level of cap rates of UC is slightly lower than that of MSA. However, it is also interpreted that there are local-fixed effects across the markets as the plots located further from the line. The plots in the 2nd quadrant suggest the higher investment performance in MSA than UC while the data in the 4th quadrants demonstrate the superior outcomes of investment returns in UC rather than MSA. The additional lines of x-axis and y-axis respectively presents mean values of each area's the weighted average cap rates, 6.27 of UC and 7.07 of MSA.

[Figure 31] Relation of the Cap Rates between UC and MSA[57]



[57] See 'Appendix _ Chapter 6: Investment Performances of Properties' for the detail.

- ***Panel Model of the Cap Rates between UC and MSA***

This section deliberates the panel regression model for investment performances between UC and MSA. Complying with the methodology, this study also defines the model for assessing the difference in cap rates between Urban Cores and MSAs in the equation (10).

$$WACR\ of\ UC_{(jt)} = 5.257213 + 0.5343859 * WACR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \quad (10)$$

In the panel, *j* is cross-section market (city) and *t* is time. The variables are as follows:
WACR of UC*(jt)*: Weighted Average Cap Rate measured from cap rate levels weighted by unit for a given Urban Core in a given year
WACR of MSA*(jt)*: Weighted Average Cap Rate measured from cap rate levels weighted by unit for a given MSA in a given year
FE*(j)*: Fixed market-specific effects in connection with each city
FE*(t)*: Fixed time effects in connection with each year

As indicated in the equation (10) and Table 18, this study finds that the cap rates of MSA has a statistically significant positive effect, indicating that the UC cap rates increases when the MSA cap rates rise.

The magnitude of the effect of the MSA cap rate implies that, if the MSA cap rates increases by 100 basis points, the UC cap rates would raise around half of the change. That is, the UC cap rate level is much less volatile than MSA level. The individual result on the fixed effect of geographic markets shows the statistical significance, indicating the places where the UC cap rate is different from the MSA cap rate. For example, of 51 markets, 47 UCs own the higher valued properties than their MSAs do. The individual time coefficients are statistically significant, yielding negative effects ranging from -60 to -120 basis points across the markets. That is, each year affects the UC cap rate level to be lower than the MSA level. Since the R-squared of this regression is 0.6292, the model statistically accounts for the relation of cap rates between UC and MSA. The detailed information is in Table 18.[58]

[58] See 'Appendix _ Chapter 6: Investment Performances of Properties' for the detail.

[Table 18] Panel Model of Economic Rental Growth Rates between UC and MSA

```
Linear regression                                       Number of obs =     236
                                                        F( 52,   175) =       .
                                                        Prob > F      =       .
                                                        R-squared     =  0.6292
                                                        Root MSE      =   1.032
                |               Robust
     caprateUC  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+----------------------------------------------------------------
    caprateMSA  |   .5343859   .1370543     3.90   0.000     .2638939     .804878
          _cons |   5.257213   1.343993     3.91   0.000     2.604691    7.909735
Fixed Effects of MSA
Fixed Effects of Year
```

6.3 Summary

The findings of this chapter suggest a number of important points. First, the scatter plot of office cap rates indicates the close correlation between the MSA cap rate level and the UC cap rate level. Second, the regression models statistically explain that the investment performances in MSA closely relates with the capitalization rate of UC. In addition, the regression analysis of office markets addresses the MSA investment returns are relatively more stable than UC returns because the UC cap rates are more volatile than MSA cap rates. The individual result on the fixed effect of geographic markets shows the significant statistics for estimating the level of cap rates across US cities, indicating in what markets the UC outperforms the MSA in terms of the properties pricing. Describing that the p-values of year dummies are pretty high, the time coefficient yields negative values except for 2007, which illustrates that all years except for 2007 causes the lower level of cap rates in UC than MSA.

Moreover, the outcome of the multifamily housing market also presents the close connection between UC cap rates and MSA cap rates. The correlation between the UC cap rate and the MSA cap rate is observable in the scatter diagram. However, the variation in prices of UC properties is comparatively slighter than the changes in values of MSA properties because the magnitude of the effect of the MSA cap rate implies that the UC cap rate level is much less volatile than MSA level. The individual result on the fixed effect of geographic markets shows the statistical significance, indicating in what market the UC cap rate is different from the MSA cap rate. In addition, the individual time coefficients are statistically significant, yielding the result in which period causes the UC cap rate level to be lower than the MSA level.

CHAPTER 7 RELATIONSHIP BETWEEN DEMOGRAPHIC AND ECONOMIC CHANGES AND INVESTMENT PERFORMANCES

As the integrated analysis, this chapter examines whether the changes in population and employment affect the properties' performances or not. Combining the findings from previous chapters, this study discusses the relation between the population and investment performances, between employment and investment performances, and between economic performances and investment performances.

7.1 Data and Methodology

7.1.1 Data: Population, Employment, Economic Rents and Cap Rates

In order to analyze the effects among population, employment, economic performances, and investment performances, this section uses the outcomes already obtained from the previous analysis. For the indicator of population, the growth rate from 2001 to 2010 is used so as to compare with the investment returns from 2003 to 2012. For the employment, the changes both from 2000 to 2004 and from 2005 to 2009 are included in the assessment with rental changes and investment performances. In terms of economic performances, the gauge is to be economic rental growth of both office and multifamily housing. Lastly, the level of cap rates is the measurement of investment performances.

7.1.2 Methodology

- ***Comparison between the Changes in Population and Employment and Cap Rate levels***

In order to figure out the effect of MSA size to the real estate performance, the growth in population and employment in a specific area is compared with the level of capitalization rates. By making use of the scatter diagram and the fitted regression line together, the relation between the growth rate of population and the cap rate level is examined in both UC and MSA.

- ***Panel Model of Economic Rents and Cap Rate Levels***

It should be noted that, in this research, the economic performance is estimated by economic rent, which takes both rental rates and vacancy rates into account. Since this study aims to analyze the relation between economic performance and investment returns by region, the panel regression model is also used in this section. Allowing the fixed effects of cross section and time series, the study estimates the relationship between the economic performance and the investment returns in UCs and MSAs.

Following the methodology explained above, the equation (11) shows the model of how the level of cap rates is determined by the changes in economic rental rates. It is formulated to measure the relation by the newly defined zone such as UC and MSA.

$$Cap\ Rate\ of\ Zone_{(jt)} = \beta_1 + \beta_2 * Economic\ Rent\ Growth\ Rate\ of\ Zone_{(jt)} + FE_{(j)} + FE_{(t)} \quad (11)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The equation shows the effect of the growth of rental rates of a Zone(*jt)* on the level of cap rates of the Zone(*jt)*, indicating that a unit of increase in renal growth rates (*jt)* leads the β_2 amount of change in cap rates of the area(*jt)*. The dummy variable of FE(*j)* captures the metropolitan fixed effects; the statistically significant coefficient of the dummy indicates that there are market-specific characteristics that explain the difference between markets. Likewise, another dummy variable of FE(*t)* measures the time fixed effects; if the coefficient of the dummy is statistically significant, the specific time gives impact on the dependent variable. Using this formula, this study aims to provide whether the pricing of each zone incorporates the rental growth of the local market within a metropolitan area.

7.2 Relationship between Population and Cap Rates of UC and MSA

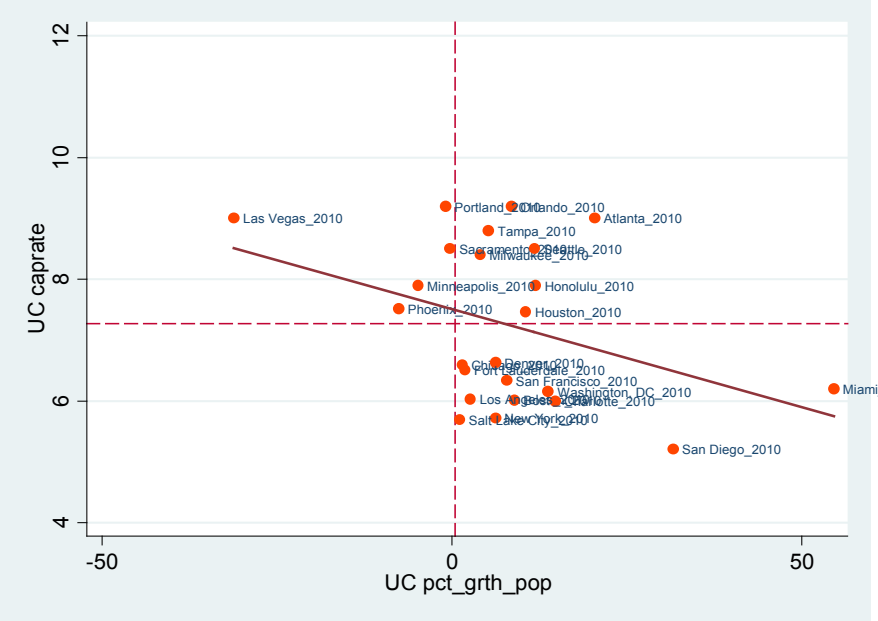
With the result that this study discussed in previous chapters, the section examines the relation between the change in population and the level of cap rates of both office and multifamily housing within the US metropolitan areas. Not only does this study investigate the relation between these two indicators, but also it analyzes the relation between the two specified areas such as UC and MSA.

7.2.1 Population Growth Rates and Office Cap Rate Levels

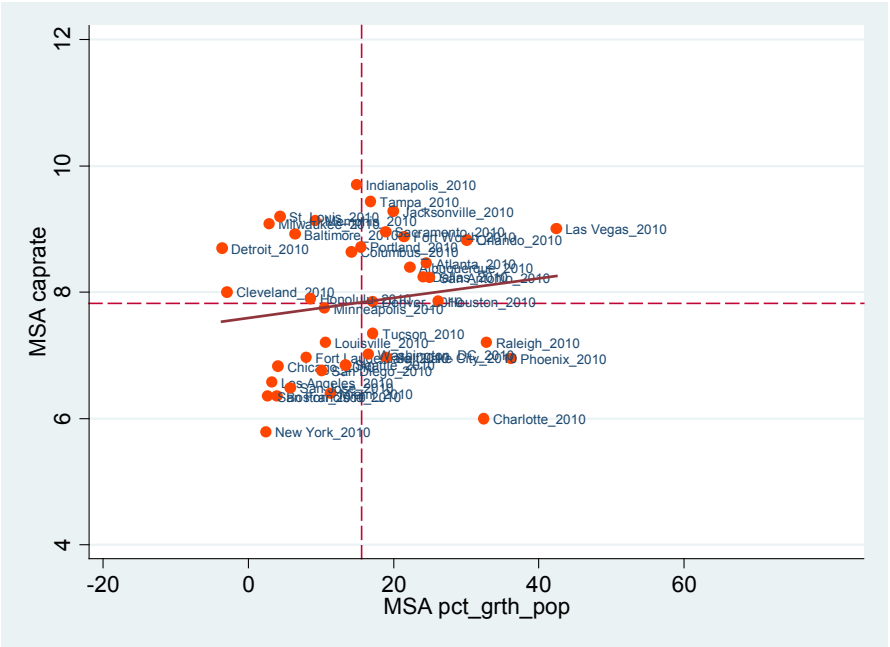
The scatter plot of Figure 32 exhibits the relation between population growth rates and cap rate levels in UC. The data set of cap rates consists of 1,369 observations in 50 markets from 2003 to 2012 while the data of population is based on the 2010 Census. As expected, the chart with the regression line suggests that the UC with higher growth rate in population shows the lower level of cap rates while the properties in UC where the population grows slowly is priced lower. The downtowns such as Miami, San Diego, and Charlotte where the population have been increased faster than other places represent that their properties are priced higher. However, it is also seen by the scatter plots that although Atlanta gained significant amount of people into the UC, the level of its cap rate is almost same with the one of Las Vegas where the population in UC decreased last decade.

In terms of MSA, the result suggests different movements from the one of UC. As can be seen by Figure 33, the regression line tells that as the population grows more rapidly the cap rate levels also get higher. Even though the line indicates the weak relation between the demographic growth and investment returns, this outcome might explain that the office capitalization rates especially in MSA responds less to differences in population in that area. For example, although the population of New York hardly changed over last decade, the chart reveals that the city enjoyed the highest price in office properties.

[Figure 32] Relation between Population Growth Rates and Cap Rate Levels of UC

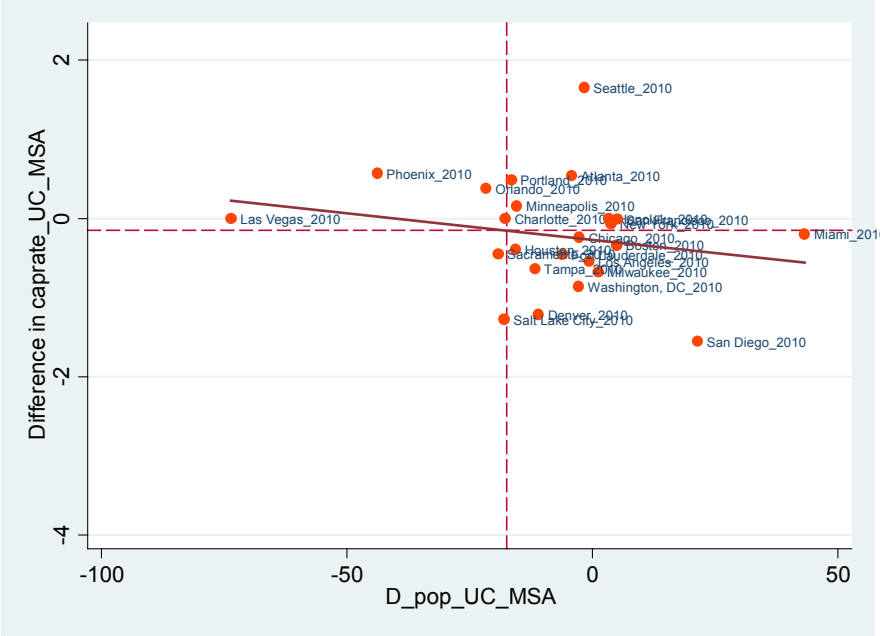


[Figure 33] Relation between Population Growth Rates and Cap Rate Levels of MSA



Taking these outcomes into account, this study examines the relation of the differences in cap rates and population between UC and MSA. The result of this analysis is illustrated in Figure 34. According to the fitted line, it could be interpreted that if the population grows faster in the urban core than the broader city, the properties in the downtown area would be estimated in the higher price than those in its suburbs. Although the relationship is considerably weak in the chart, it could be explained by the previous finding that the movements of the office pricing in MSA less respond to the changes in its population.

[Figure 34] Differences in Cap Rates and Population Growth Rates between UC and MSA



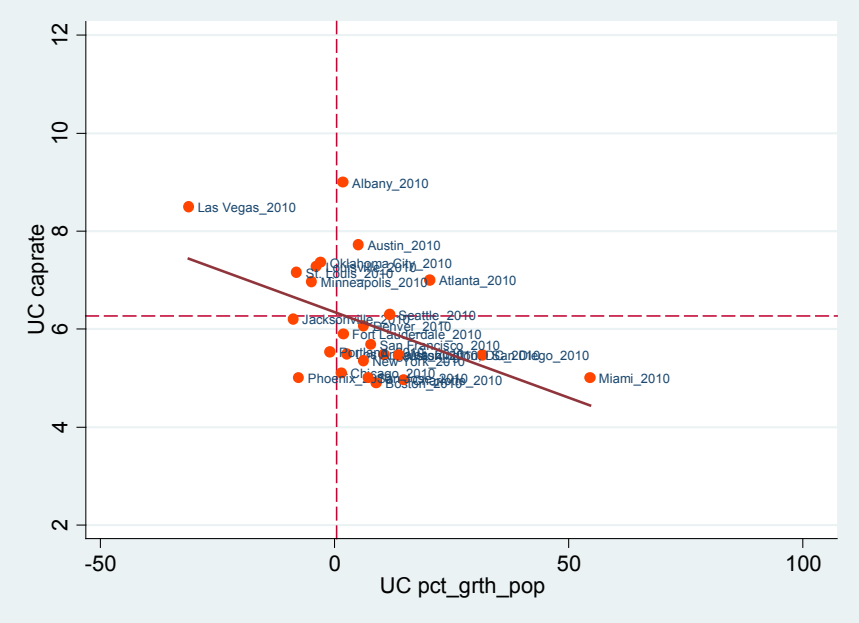
7.2.2 Population Growth Rates and Multifamily Housing Cap Rate Levels

In this section, the US multifamily housing is discussed how its pricing is related with the population growth rate across the specific local market. Figure 35 exhibits that the movements in UC cap rates of apartments associates with the change in population of the area, illustrating the negative regression line in the chart. That is, the price of an apartment was higher in the city's center where the number of people increased than other cities' center where the population grew relatively slower. For example, the cap rate of Multi-housing in Miami UC was overall very low because the population growth rate in UC was more than 50% during last 10 years.

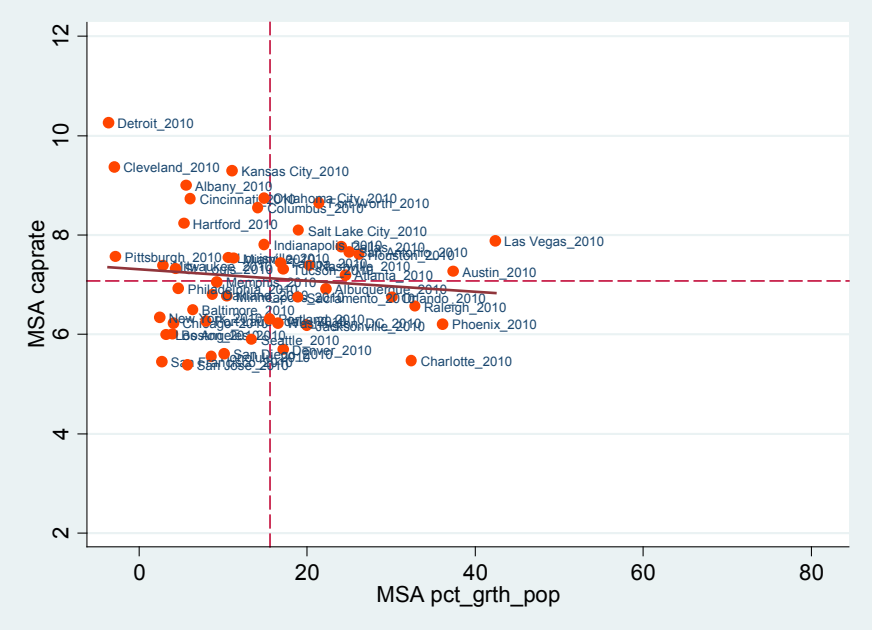
In Figure 36, this study also introduces the relationship between the price of multifamily properties in MSA and the area's population trend. Even though the relation between these two parameters is noticeably weak, the properties in metropolitan area are likely to move adversely with the population

growth. For instance, Phoenix grew so rapid last decade that its cap rates were relatively lower than other MSAs while Cleveland decreased in population so that the regional cap rate was relatively higher than other areas' indicators. However, there is a case that the properties' price was relatively low although the city gained more people than others, which might be explainable by market specific characteristics and supply side effects.

[Figure 35] Relation between Population Growth Rates and Cap Rate Levels of UC



[Figure 36] Relation between Population Growth Rates and Cap Rate Levels of MSA



As pointed out for office market, the research analyzes the relationship of the differences in the cap rate levels and population between UC and MSA. As the population in UC grows faster than that in MSA, the difference in cap rate levels gets greater, presenting the fitted line with a negative slope into data.

[Figure 37] Differences in Cap Rate Levels and Population Growth Rates of UC and MSA

7.3 Relationship between Employment and Cap Rates of UC and MSA

In this section, it is discussed how the cap rate levels of properties incorporates the change in employment, comparing between UC and MSA. The methodology used for the analysis is identical with those in assessment for the office market.

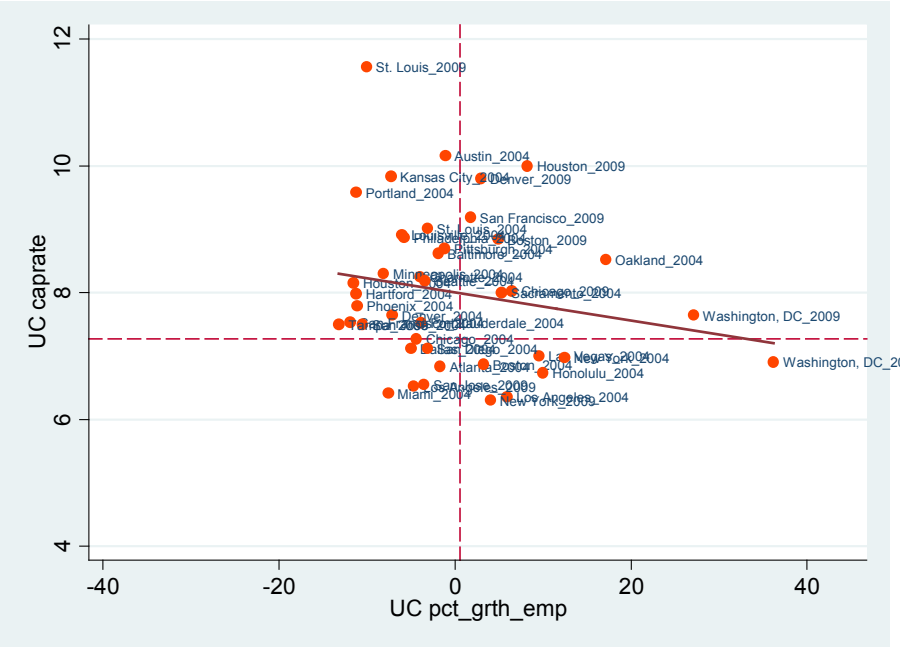
7.3.1 Employment Growth Rates and Office Cap Rate Levels

- ***Relationship between Employment and Cap Rates of UC and MSA***

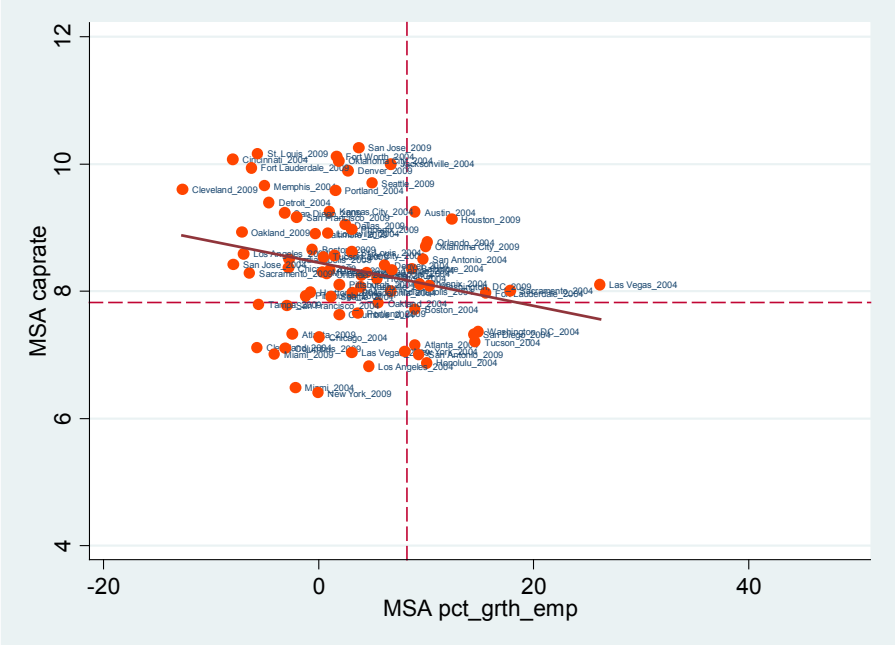
In order to figure out the relation between employment and investment performances, this study utilizes the scatter diagram with regression line between two parameters such as the growth rate in employment and cap rate levels. As shown by Figure 38, the level of cap rates in UC is adversely related with the change in job markets. The data created a weak line of regression while the slope is not steep and each value locates further from the fitted line. However, the outcome partially describes that the employment growth rate of UC is the greater the properties' price in UC is evaluated the higher.

Like the result in UC, MSA data also depicts the weak relationship between the change in employment and the pricing of properties in the area. Despite the movements in cap rate levels associated with the employment growth rate, the relation is not fully explainable in this chart because the movements vary across the markets.

[Figure 38] Relation between Cap Rate Levels and Employment Growth Rates of UC

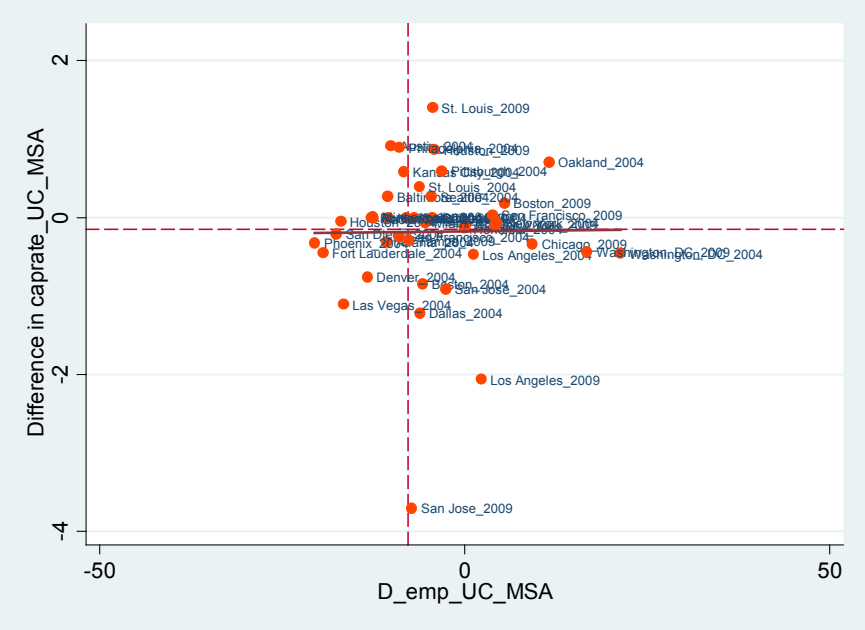


[Figure 39] Relation between Cap Rate Levels and Employment Growth Rates of MSA



Not only the fact that there are weak relations between employment and office cap rates for both UC and MSA, but this study also indicates that there is no influence of the employment change in order to discriminate the price of the properties between UC and MSA. By creating the regression line without slope, the result suggests that the changes in employment between two regions do not affect the difference in pricing of the office properties in two markets.

[Figure 40] Differences in Cap Rate Levels and Employment Growth Rates between UC and MSA

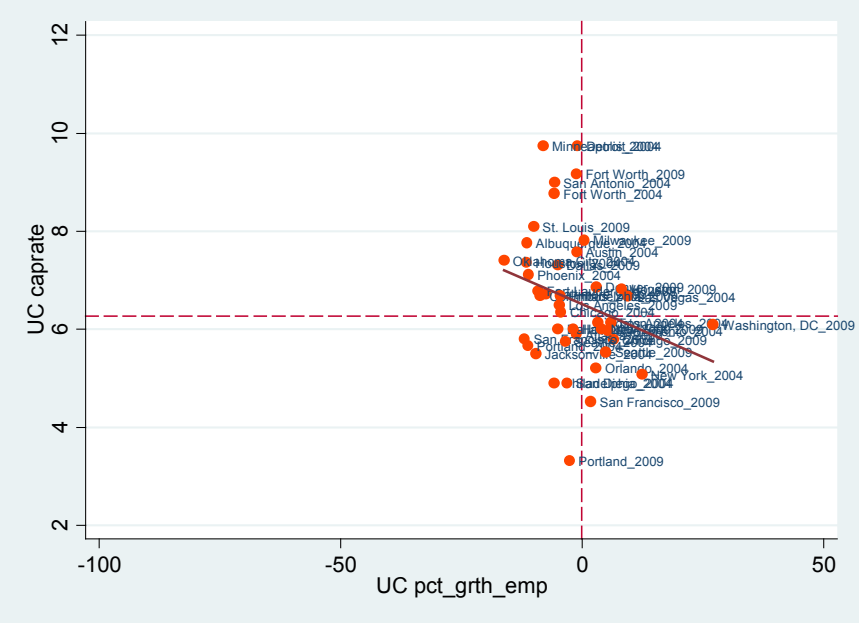


7.3.2 Employment Growth Rates and Multifamily Housing Cap Rate Levels

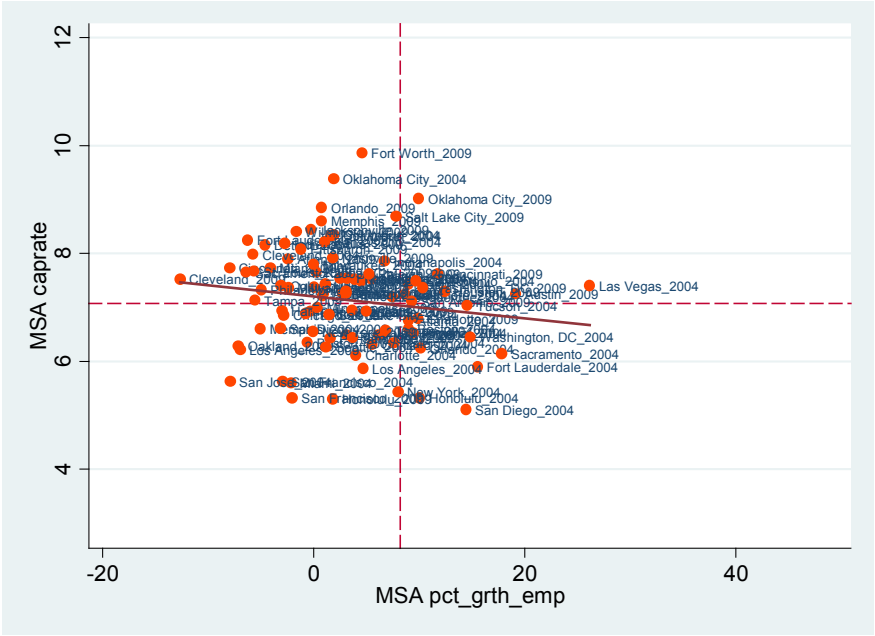
Figure 41 exhibits that there is a link between the growth rate of UC employment and the cap rate levels of the multifamily housing in UC. Although the correlation seems to be weak, the fitted line clearly indicates that the properties in UC area where the number of jobs increases would be priced higher than other UC markets where the volume of employment grows slower.

Similarly to the result of UC, the outcome of MSA also displays that the cap rate levels responds to the change in the employment level of MSA. Even though the relation between the change and the level is not strong, it implies that the growth in the MSA job market generates the lower level of cap rates of apartments in MSA.

[Figure 41] Relation between Cap Rate Levels and Employment Growth Rates of UC



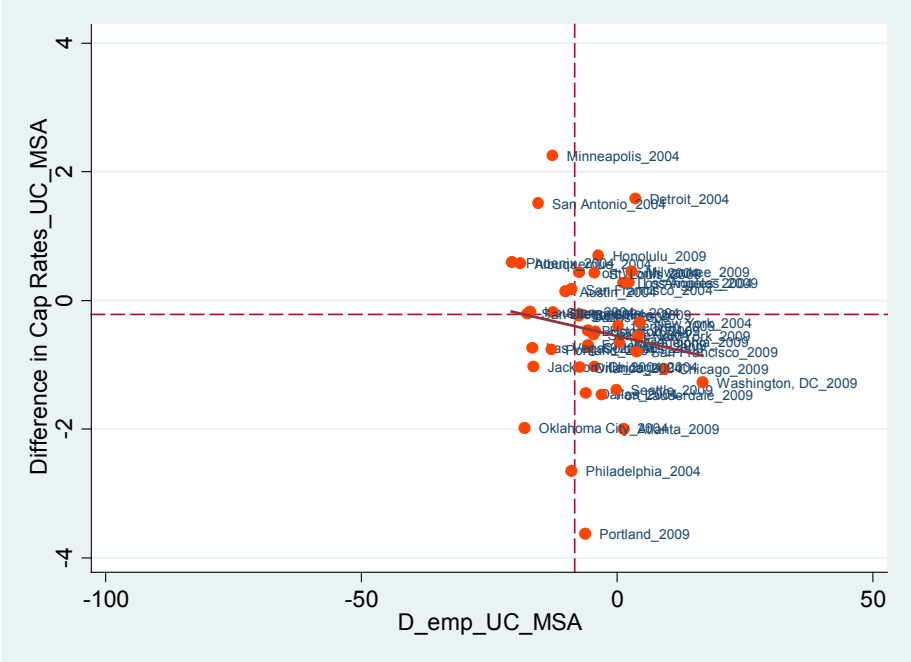
[Figure 42] Relation between Cap Rate Levels and Employment Growth Rates of MSA



As expected, multifamily housing indicates that the pricing difference between the UC and MSA adversely responds to the changes in employment between the two zones. For example, the increase in employment of UC in Washington DC was greater than the growth rate of MSA from 2005 to 2009 so

that the UC cap rate levels were lower than MSA levels. However, as described in Figure 43, the magnitude varies across the geographical markets.

[Figure 43] Differences in Cap Rate Levels and Employment Growth Rates between UC and MSA



7.4 Relationship between Economic Rents and Cap Rates of UC and MSA

This section focuses on analyzing how investment performances relate to economic performances such as the rental rate changes in UC and MSA respectively. Plus, this study examines whether the difference in cap rates level between UC and MSA incorporates the changes in economic rents between the two zones.

7.4.1 Office Markets

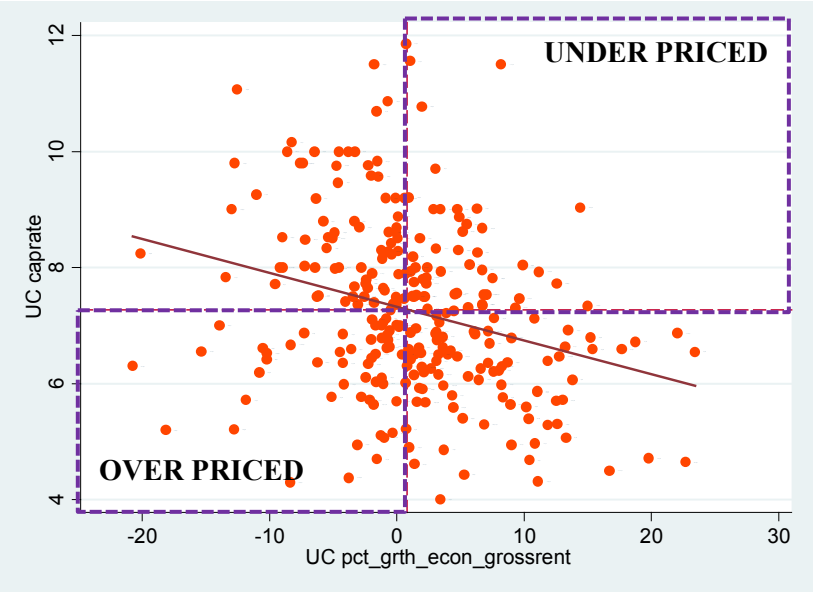
- ***Comparison between Economic Rents and Cap Rates of UC and MSA***

  - Rents and Cap Rates

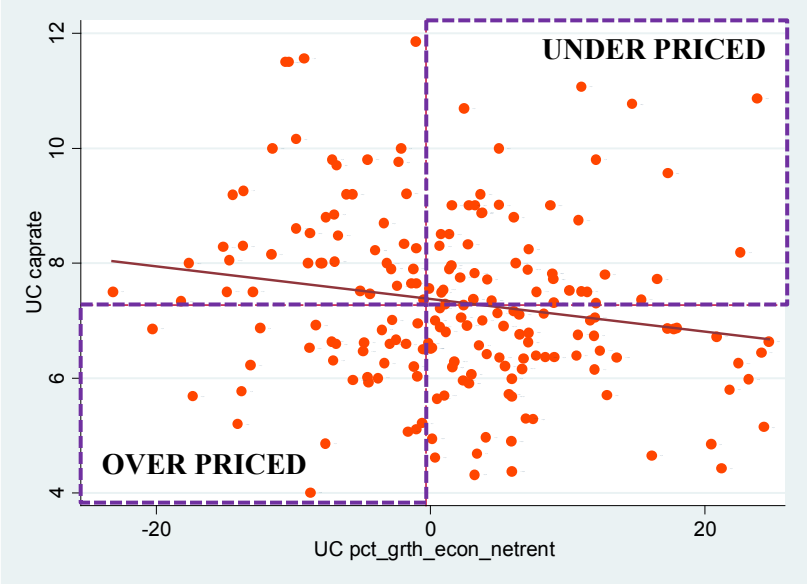
As discussed the relation between office gross rents and cap rates of UC in previous section, the scatter diagram between the UC gross rental change and cap rate levels displays the negative relation between the two parameters' changes. In other words, if an office in UC gets higher gross rents than previous term, the price of the property would be raised while the cap rate would move lower. However, considering the scattered plots that located further from the fitted line, the data set implies both the market specific effects

and time effects. More importantly, there are a considerable number of markets where their properties mispriced, the UCs locating in either 1st quadrant or 3rd quadrant. The UC markets in 1st quadrant are underpriced because their cap rate lever is greater than the average cross markets even though their economic rental growth outperforms that of other markets. In addition, the downtowns of 3rd quadrant experienced the overpricing since their cap rate levels are lower than the mean value of entire markets in spite of the decrease in the gross rental growth rates.

[Figure 44] Scatter Diagram of Economic Gross Rents and Cap Rate Levels of UC

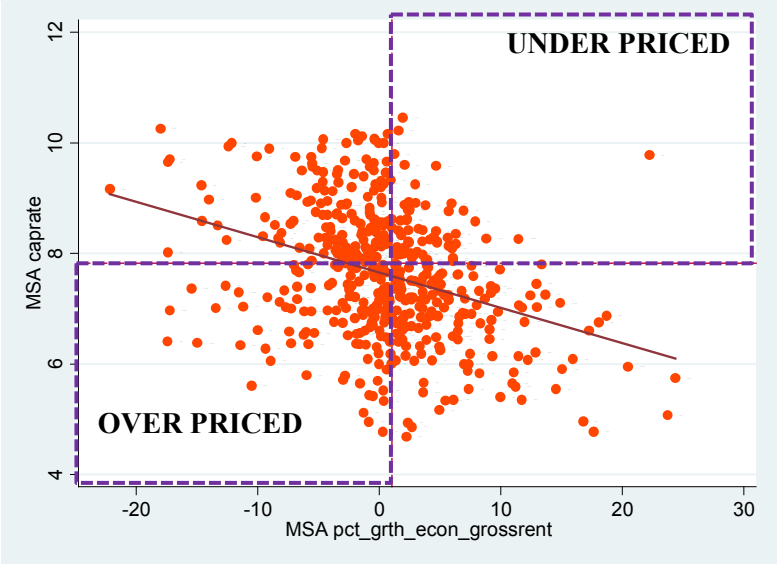


[Figure 45] Scatter Diagram of Economic Net Rents and Cap Rate Levels of UC

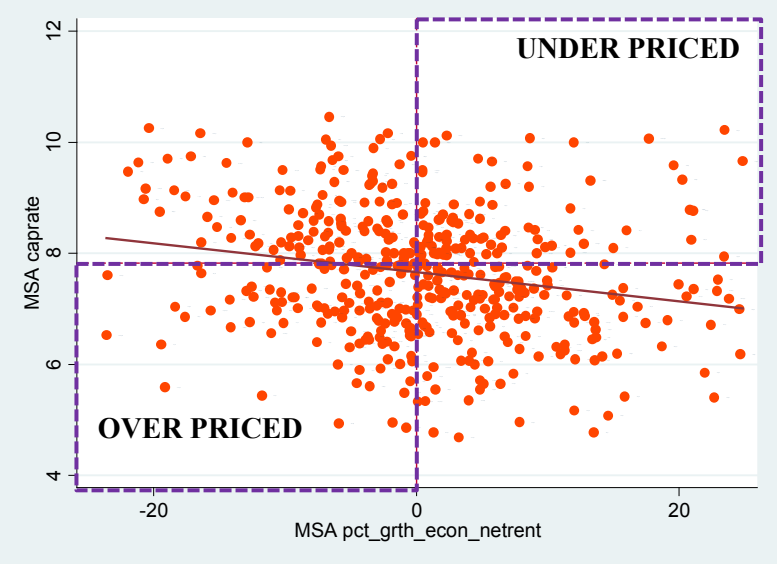


Compared to the scatter plot of UC, the diagram of MSA clearly illustrates the correlation between the growth of gross rental rates and the level of cap rates. This result also corresponds with the panel regression model discussed earlier. Despite the closer correlation between the indicators, there are also mispriced markets shown in 1st and 3rd quadrants. As can be seen from Figure 46, there are more number of overpriced MSAs with the negative growth in gross rental rates rather than underpriced places where the gross rental rates grow faster than the average of the US office markets. While the MSA gross rental rates range around from -23% to 25%, the level of cap rates in the metropolitan area varies approximately from 4.7% to 10.5%, presenting less variation in the pricing in contrary to the UC cap rates. The possible reason might be the cap rate levels of MSA market is less volatile to the change in yearly rental growth.

[Figure 46] Scatter Diagram of Economic Gross Rents and Cap Rate Levels of MSA



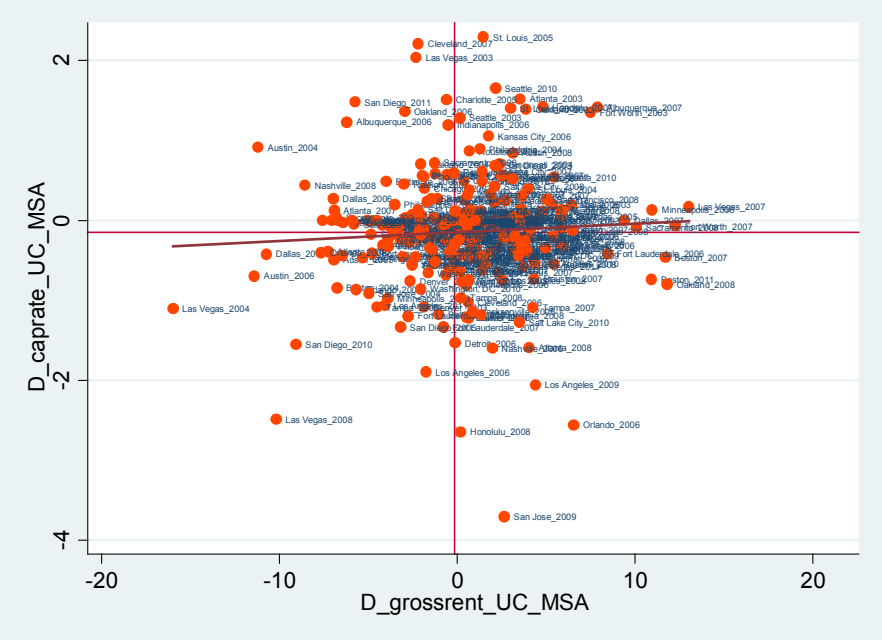
[Figure 47] Scatter Diagram of Economic Net Rents and Cap Rate Levels of MSA



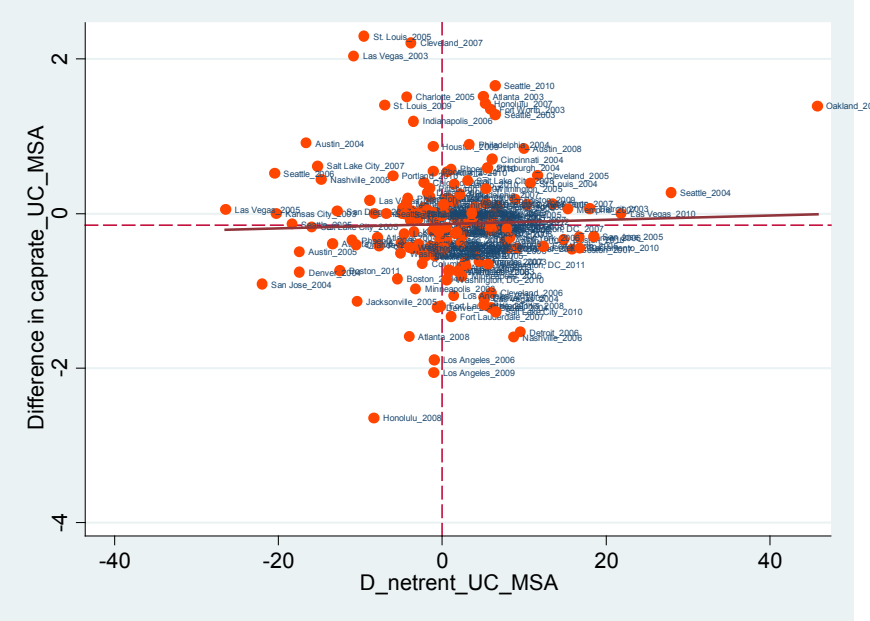
- *Differences in Cap Rates and Economic Rent Growth Rates between UC and MSA*

In order to explain the dissimilarity of empirical investment returns, this study also compares the differences in yearly gross rental growth rates between UC and MSA with the changes in cap rate levels between UC and MSA. It is important to note that the difference in cap rate levels between UC and MSA is not likely to be explained by areas where a zone outperforms the other zone. To be specific, not only the correlation between two parameters is weak, but also the result reveals the positive relation. According to the observations, if the economic rental growth rate is higher in UC than in MSA, the cap rate level of UC would be slightly higher than that of MSA, which is the opposite perception to the "rational" pricing. In short, it hardly indicates that the disparity between the market-specific cap rates within a metropolitan area incorporates the changes in rental growth rates between UC and MSA.

[Figure 48] Scatter Diagram of Differences in Cap Rates and Gross Rental Growth Rates between UC and MSA



[Figure 49] Scatter Diagram of Differences in Cap Rates and Net Rental Growth Rates between UC and MSA

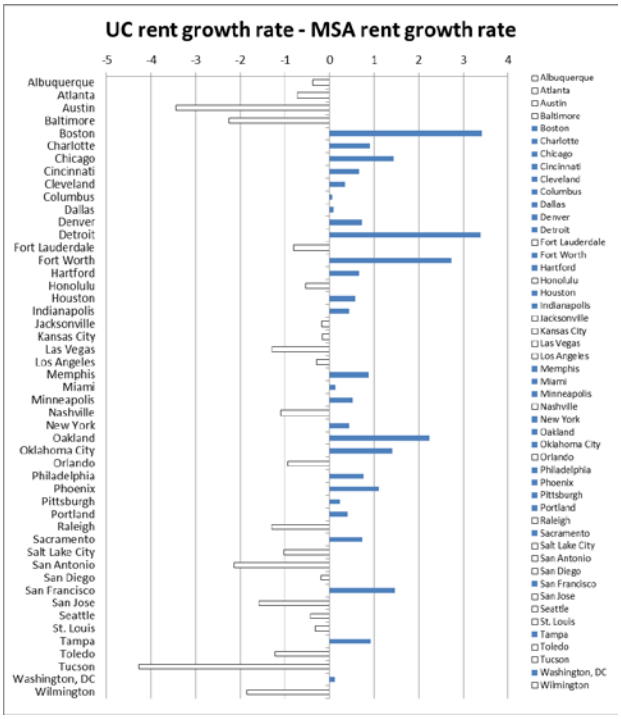


As a further evidence of the market mispricing, the tornado diagram[59] is provided in order to compare the changes in average rental rates between UC and MSA with the difference in the level of cap rates between the two areas. The chart clearly suggests that the market where the investment returns of the downtown outperform those of the broader city is not always the place that the rental growth rate of the city core is higher than that of the entire city. For example, San Jose shows 100 basis-point of the difference in cap rate levels between UC and MSA although the UC rental growth rate is 1.6% less than MSA rate in average. In addition, since 2003 UC of Los Angeles also enjoyed the 80 basis-point lower level of cap rates than MSA but the UC average rental rates actually grew slower than MSA rental rates. Fort Lauderdale is the same case. Likewise, in Fort Worth, even though the UC's average rental growth rate was higher than MSA's, the result in the cap rate difference between UC and MSA presents that the average level of cap rates of UC was higher.

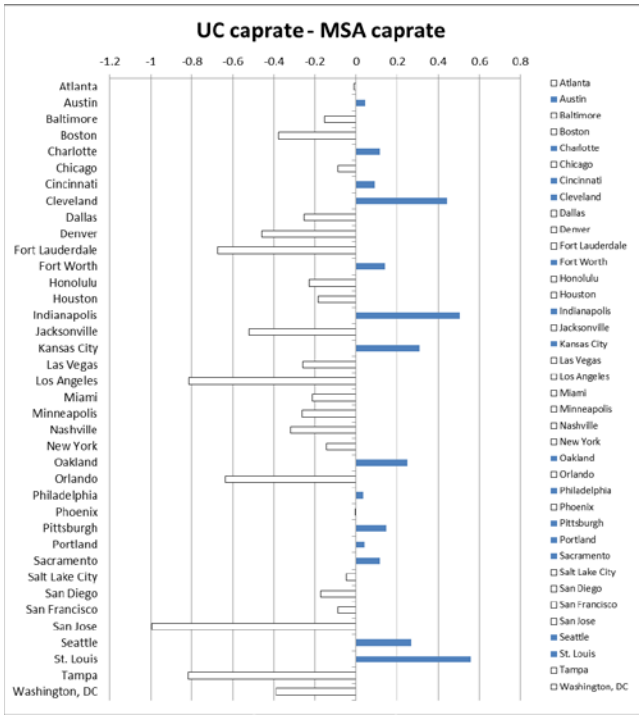
In terms of the movements in net rental growth rates with pricing, there are also identical cases that depict the mismatch between the net growth rates and cap rate levels. For Oakland, its UC net rental growth rate is superior to the rate of MSA net rental increase but the office properties in UC were less valued than those in MSA. On the other hand, although St. Louise encountered the similar rental growth rates between downtowns and suburbs, the price of offices in MSA was higher than those in UC, resulting in around 55 basis points lower in the average level of cap rates of MSA.

[59] See 'Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances' for the detail.

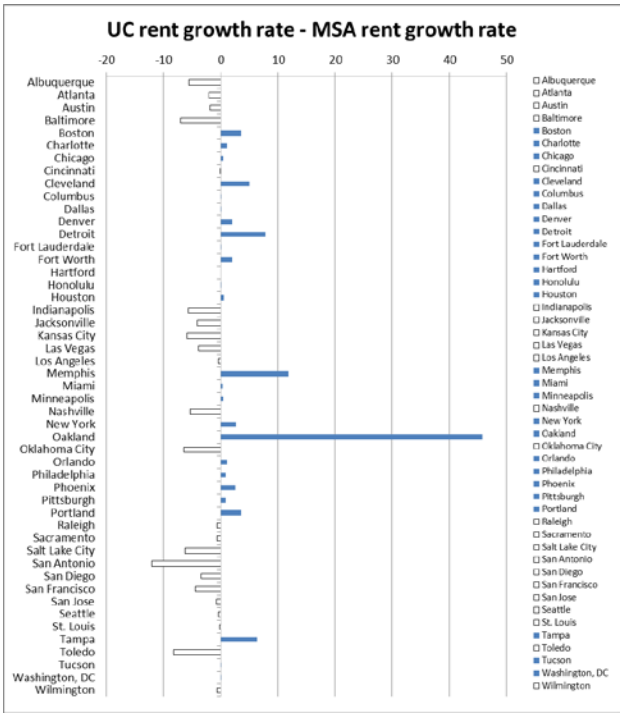
[Figure 50] Difference in Gross Rental Growth Rates between UC and MSA (average from 2003 to 2012)



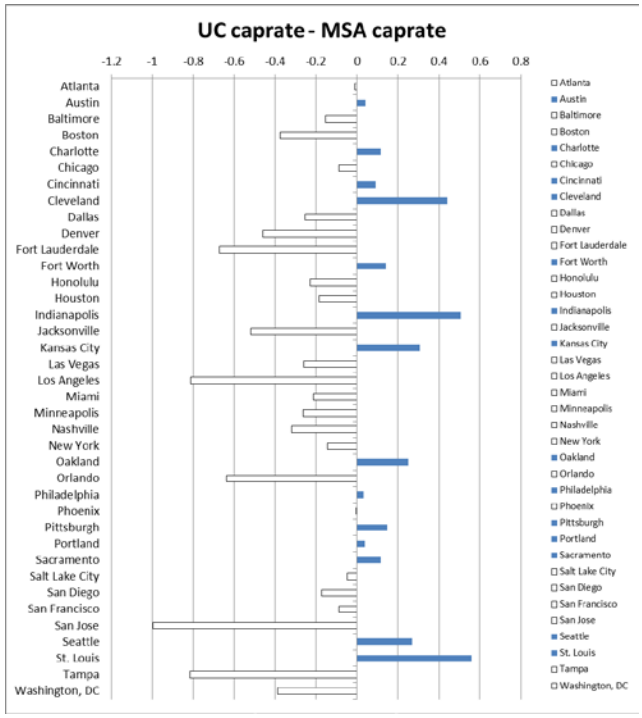
[Figure 51] Difference in Cap Rates between UC and MSA (average from 2003 to 2012)



[Figure 52] Difference in Net Rental Growth Rates between UC and MSA(average from 2003 to 2012)



[Figure 53] Difference in Cap Rates between UC and MSA (average from 2003 to 2012)



- ***Panel Model of Relationship between Economic Rents and Cap Rates of UC and MSA***

  - Economic Gross Rents and Cap Rates of UC

In order to explain the correlation between offices' economic performance and their pricing in UC markets, it employs the panel regression model with fixed effect dummies, shown in equation (12). The weighted average of a specific zone level is regressed against the value of gross rental measurements of the broader area.

$$WACR\ of\ UC_{(jt)} = 6.387251 + 0.0044934 * ER\ GR\ of\ UC_{(jt)} + FE_{(j)} + FE_{(t)} \quad (12)$$

In the panel, *j* is cross-section market (city) and *t* is time. The variables are as follows:
WACR of UC*(jt)*: Weighted Average Cap Rate measured from cap rate levels weighted by square foot for a given Urban Core in a given year
ER GR of UC*(jt)*: Economic Rent Growth Rate measured as a change of gross rental data for a given UC in a given year
FE*(j)*: Fixed market-specific effects in connection with each city
FE*(t)*: Fixed time effects in connection with each year

[Table 19] List of Regression Model Variables

Variables	Abbreviations	Description
Dependent Variables		
Cap rate	CaprateUC	Total average cap rate of UC in a given year
	caprateMSA	Total average cap rate of MSA in a given year
Independent Variables		
Growth rate of economic rents	pct_grth_econ_grossrentUC	Total average growth rate of gross rents of UC in a given year
	pct_grth_econ_grossrentMSA	Total average growth rate of gross rents of UC in a given year
	pct_grth_econ_netrentUC	Total average growth rate of net rents of UC in a given year
	pct_grth_econ_netrentMSA	Total average growth rate of net rents of UC in a given year
	pct_grth_econ_rentUC	Total average growth rate of rents of UC in a given year
	pct_grth_econ_rentMSA	Total average growth rate of rents of UC in a given year

Both equation (12) and Table 20 describe that the level of investment performance in downtowns is not likely to be explained by the properties' economic indication such as rental growth rates. According to the result, the growth in office rental leads to increase the level of cap rates of offices in UC even though the magnitude of the effect is simply little. Not only the coefficient is very low but also P-value shows a very low level of significance, indicating that the parameter does not give statistically significant impact on the level of cap rates in a given area. Meanwhile, the R square reveals that 61% of the weighted average cap rates in UC are explained by the change of gross rental rates of offices in UC. In terms of the fixed

effects[60], the market specific effects extensively vary from -1.77(New York) to 2.15(Cleveland) according to the geographical region and 16 of 45 cities illustrate the statistically significant impact on their properties' cap rate level. In addition, the time dummies present the positive effects on the cap rates except for 2007 and especially the years of 2003, 2004, 2009, 2010, and 2011 show their statistical significance in the model.

[Table 20] Panel Model of Economic Gross Rents and Cap Rates of UC

```
Linear regression                                       Number of obs =     269
                                                        F( 51,   213) =       .
                                                        Prob > F      =       .
                                                        R-squared     =  0.6137
                                                        Root MSE      =  1.0407
                          |               Robust
               caprateUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------------+----------------------------------------------------------------
pct_grth_econ_grossrentUC |  .0044934   .0130115     0.35   0.730    -.0211544   .0301413
                    _cons |  6.387251   .4115184    15.52   0.000     5.576081   7.198422
Fixed Effects of MSA
Fixed Effects of Year
```

- Gross Rents and Cap Rates of MSA

Following the approach described above, the model for MSA is also developed. It is formulated to gauge the effect of gross rental values of the office market to the market pricing in MSA.

$$WACR\ of\ MSA_{(jt)} = 8.014089 + (-0.0258789) * ER\ GR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \qquad (13)$$

Unlike the result of UC, this equation and summary disclose that, with the statistical significance, there is a certain amount of correlation between the gross rental increase of offices in MSA and the investment returns. That is, there are a high level of significance, described by 0.006 of P-value, between the economic rental changes in the metropolitan area and the level of cap rates and the negative correlation between the two measurements, providing the coefficient around -0.0259. Except for the year of 2004, the most of time effects are significant, giving the negative impact of rental growth on cap rate levels. The cross section effects widely vary from -1.66(New York) to 2.15(Dayton, Ohio), showing that 26 of 62 cities have significant impact of market specific characteristics.

[60] See 'Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances' for the detail.

[Table 21] Panel Model of Economic Gross Rents and Cap Rates of MSA

```
Linear regression                               Number of obs =     499
                                                F( 71,   424) =       .
                                                Prob > F      =       .
                                                R-squared     =  0.6118
                                                Root MSE      =  .78268
                          |               Robust
               caprateMSA |      Coef.  Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------------+--------------------------------------------------------------
pct_grth_econ_grossrentMSA |  -.0258789   .0094063    -2.75   0.006    -.0443678   -.0073901
                     _cons |   8.014089   .2849854    28.12   0.000     7.453929    8.574249
Fixed Effects of MSA
Fixed Effects of Year
```

- Net Rents and Cap Rates of UC

In order to gauge the plausible correlation, this section also applies the net rental rates into the analysis on relation between rental growth rate and cap rate levels in UC and MSA respectively. This is to be comparable with the previous result based on the gross rental rates. The development of the model is followed the same approach.

$$WACR\ of\ UC_{(jt)} = 8.053977 + 0.0046409 * ER\ NR\ of\ UC_{(jt)} + FE_{(j)} + FE_{(t)} \quad (14)$$

ER NR of UC*(jt)*: Economic Rent Growth Rate measured as a change of net rental data for a given UC in a given year

Comparing this result with the interpretation discussed in the previous section, it is noted that the level of cap rates of downtowns is more likely to be explained by the properties' net rental growth rates than by the gross rental changes. The net rental growth of UC offices involves the decrease in the level of cap rates of the properties while 1 in the magnitude change of economic rent would affect the cap rate level by 2.5 basis points. Although the coefficient indicates the negative effect of net rental changes to the pricing, its P-value shows a very low level of significance. Just like the value of the gross rental model, the R square shows that 61% of net rental data is explainable by this model in for to figure out the correlation to cap rates. As expected, the market specific effects vary by the location and 22 of 42 cities illustrate the statistically significant impact on their properties' cap rate level. Interestingly, the time dummies present the positive effects on the cap rates except for 2006 and especially the years of 2003, 2004, 2009, and 2010 show their statistical significance in the model.[61]

[61] See 'Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances' for the detail.

[Table 22] Panel Model of Economic Net Rents and Cap Rates of UC

```
Linear regression                               Number of obs =     195
                                                F( 46,   142) =       .
                                                Prob > F      =       .
                                                R-squared     =  0.6106
                                                Root MSE      =  1.1174
                        |               Robust
             caprateUC |      Coef.  Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
pct_grth_econ_netrentUC |   .0046409   .0111117     0.42   0.677    -.0173248    .0266066
                  _cons |   8.053977   .6100397    13.20   0.000     6.848044    9.25991
Fixed Effects of MSA
Fixed Effects of Year
```

- Net Rents and Cap Rates in MSA

The panel model for the net rental growth and cap rate levels of MSA is identical to that developed above. This result elucidates that there is a certain amount of correlation between the net rental increase of offices in MSA and the properties' price. With 0.054 of P-value, the variable of the economic rental changes in the metropolitan area gives the level of cap rates the negative effect, denoting it by around -0.0095 of its coefficient. Except for the year of 2004, the most of time effects are significant, giving the negative impact of rental growth on cap rate levels. The cross section effects widely vary from -3.56(New York) to -0.24(Toledo), showing the statistical significance that 53 of 63 cities have significant impact of market specific characteristics.[62]

$$WACR\ of\ MSA_{(jt)} = 10.01026 + (-0.0094628) * ER\ NR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \qquad (15)$$

[Table 23] Panel Model of Economic Net Rents and Cap Rates of MSA

```
Linear regression                               Number of obs =     455
                                                F( 70,   381) =       .
                                                Prob > F      =       .
                                                R-squared     =  0.6077
                                                Root MSE      =  .78829
                        |               Robust
           caprateMSA |      Coef.  Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------------+------------------------------------------------------------------
pct_grth_econ_netrentMSA |  -.0094628   .0048895    -1.94   0.054    -.0190767    .000151
                  _cons |   10.01026   .2363454    42.35   0.000     9.545557    10.47497
Fixed Effects of MSA
Fixed Effects of Year
```

[62] See 'Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances' for the detail.

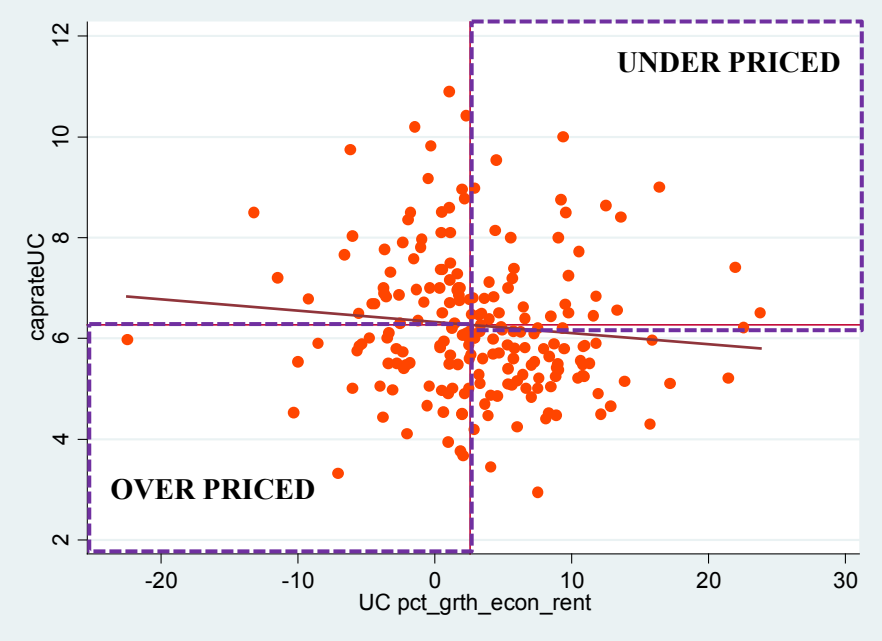
7.4.2 Multifamily Housing Markets

This section is designed to focus on the multifamily housing market, analyzing the sensitivity of the level of cap rates to the growth in rental rates. Using the panel regression, scatter plots, and tornado diagrams, this study examines the effect of the rental income indicator to pricing of properties by defined zone and the correlation of economic and investment performances between the two particular zones.

- ***Comparison between Cap Rates and Economic Rent Growth Rates of UC and MSA***

Using the scatter diagram, this section aims to capture the correlation between the changes in economic performances of income growth and the level of investment returns by the newly defined zones within the metropolitan area. The fitted line in Figure 54 indicates that the cap rate level of UC negatively correlates with the increase in the economic rental rates of multi-housing properties. While the line displays with negative slope in the chart, the plots are located further from the line, implying a weak relationship between two indicators. Interestingly, a number of mispriced markets are easily noted by the diagram, the observations that locate at either 1st quadrant, the underpriced region, or 3rd quadrant, the overpriced area.

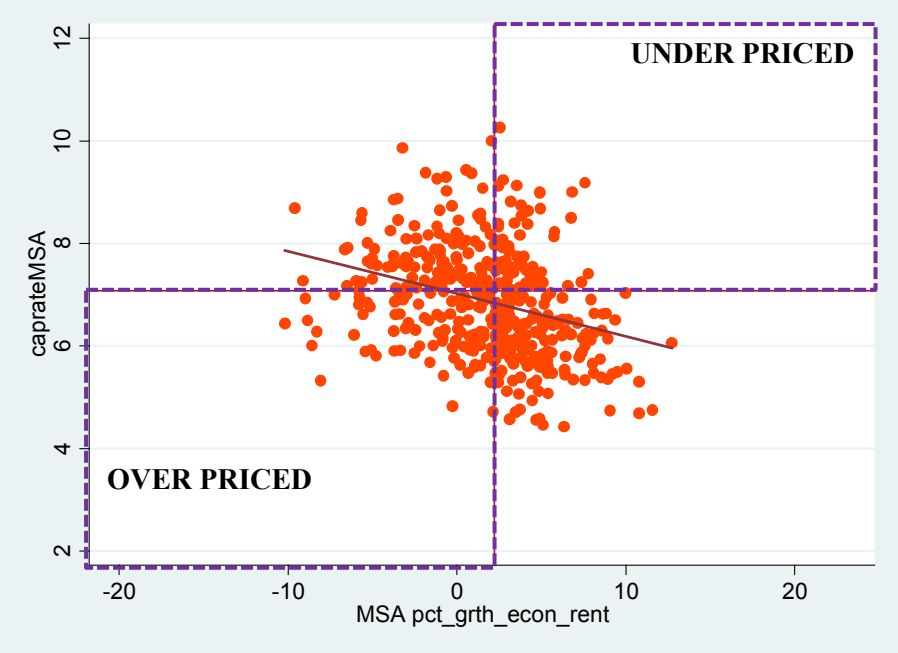
[Figure 54] Scatter Diagram of Economic Rents and Cap Rates of UC



In contrast to the diagram of UC markets, the output of MSA markets describes a relatively stronger correlation between the income growth rates and investment returns. With the narrower range of the parameter, the economic rental growth rates incorporate the less variation of cap rate levels. Nevertheless,

the market mispricing is also observed in MSA markets, demonstrating the plots in both 1st and 3rd quadrants. Compared to other markets such as 2nd and 4th quadrants, the MSAs in 1st quadrant possess the undervalued properties without the effect of rental growth, and the regions in 3rd quadrant are built with the overvalued properties despite the decrease in their rental rates.

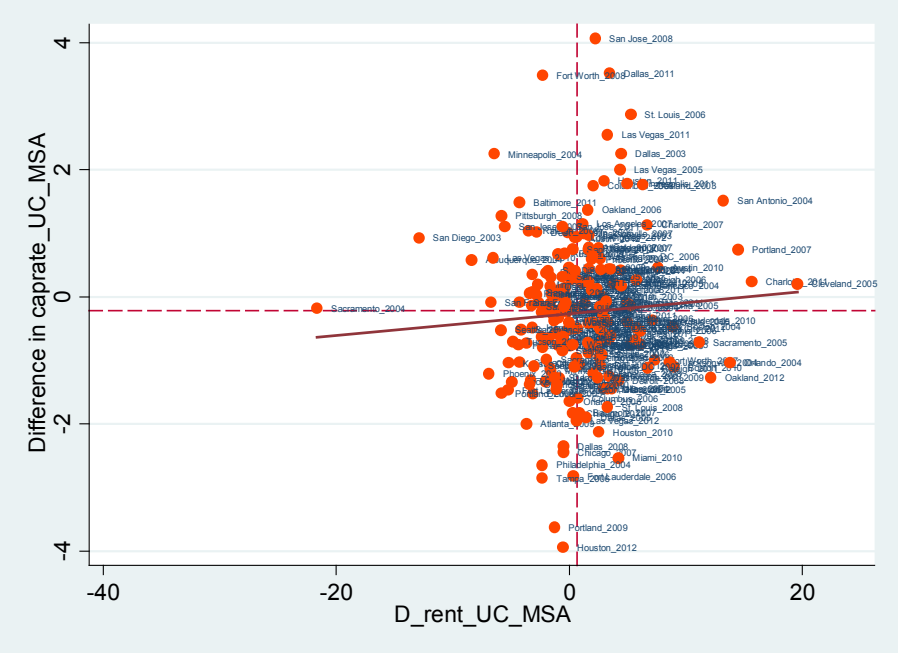
[Figure 55] Scatter Diagram of Economic Rents and Cap Rates of UC



- ***Differences in Cap Rates in accordance with Economic Rent Growth Rates of UC and MSA***

Questioning about the difference in pricing of UC and MSA, this part examines the effect of the differences in yearly rental growth rates between the two areas to the changes in cap rate levels. The result suggests that the difference in rental growth rates between UC and MSA leads to increase the differences in cap rate levels between the areas, the response which is the opposite direction of the movement in cap rates in "rational" markets. As shown in Figure 56, the observations describe the positive correlation between the two indicators even though the relation appears weak on the chart. For example, if the economic rental growth rate is higher in UC than MSA, the cap rate level of UC would be slightly higher than that of MSA, meaning that the price of multifamily properties in UC is lower than that of properties in MSA. If the "rational" pricing is assumed, this result doesn't match with the perception that the disparity between the market-specific cap rates within a metropolitan area incorporates the changes in rental growth rates between UC and MSA.

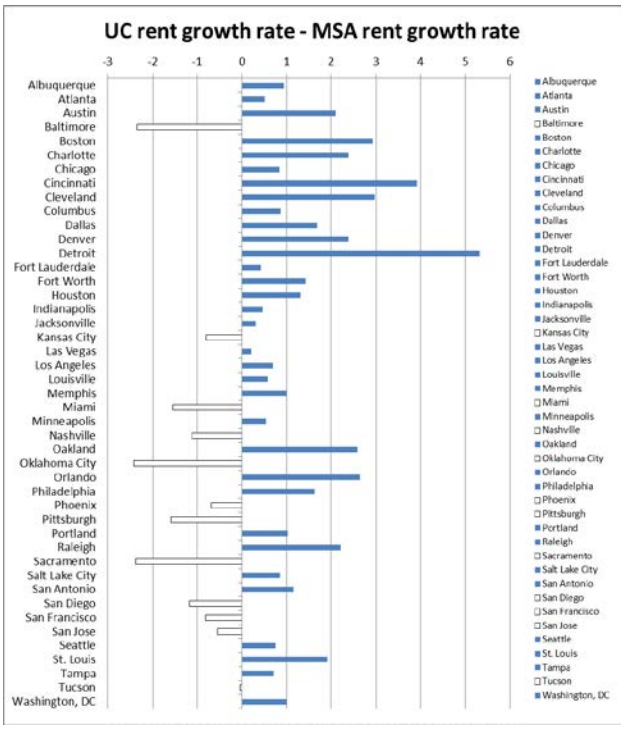
[Figure 56] Differences in Cap Rate Levels and Rental Rates between UC and MSA



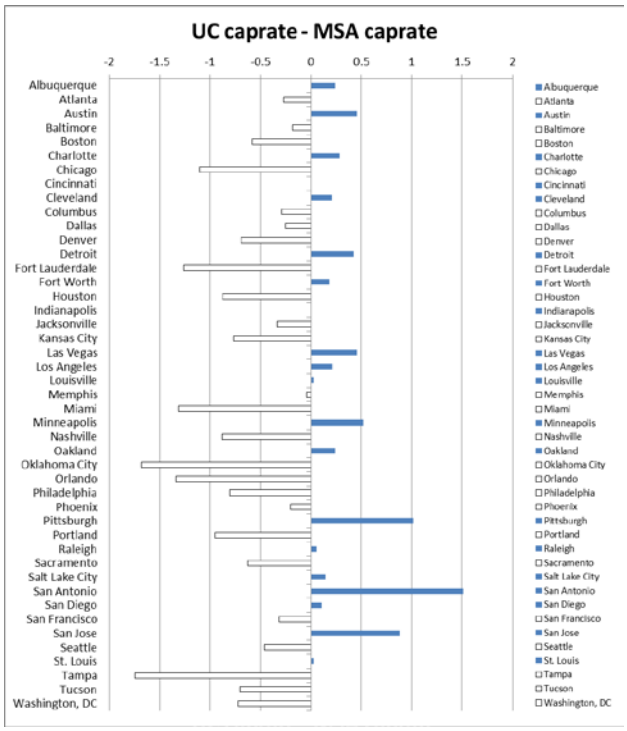
In order to verify the movement in the market pricing of multifamily, the tornado diagram is also employed in the analysis to compare the changes in average rental rates between UC and MSA with the difference in the level of cap rates between the two areas. Figure 57 and 58 illustrate that the market where the investment returns of the downtown outperform those of the broader city is not always the place that the rental growth rate of the city core is higher than that of the entire city. For instance, Detroit was the place where the UC rental growth rate was greater than that of MSA, showing around 5.3% of the difference in the rental increase between UC and MSA. However, its cap rate level of UC was higher than that of MSA, presenting the positive value of UC cap rates minus MSA rates. In addition, Oklahoma City shows one of the greatest differences in cap rate levels between UC and MSA, indicating that since 2003 the average cap rates of UC was higher than that of MSA. Despite the negative rate of UC cap rates subtracted from MSA cap rates, the average rental rate less increased in UC than MSA. Miami presents the identical case to Oklahoma City. San Antonio is another example that even though the UC's average rental growth rate was higher than MSA's, the average level of cap rates of UC was the higher.[63]

[63] See 'Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances' for the detail.

[Figure 57] Difference in Rental Growth Rates between UC and MSA (average from 2003 to 2012)



[Figure 58] Difference in Cap Rates between UC and MSA (average from 2003 to 2012)



- *Panel Model of Cap Rates and Economic Rent Growth Rates*

With identically defined variables, the model is identical to the panel model for office markets.

- Economic Rents and Cap Rates of UC

$$WACR\ of\ UC_{(jt)} = 6.471439 + 0.0103688 * ER\ GR\ of\ UC_{(jt)} + FE_{(j)} + FE_{(t)} \qquad (16)$$

According to the regression result, in UC, the level of cap rates positively moves to the changes in rental growth rates. With 1% increase in yearly rental changes, the annual cap rates would be raised by 0.01 of the level. However, the P-value of the variable demonstrates that the rental growth rates are statistically insignificant in explaining the effect on cap rate levels of UC. Through the R square, the model is told that around 55% of the investment returns of UC are explained by the growth rate of economic rents. In terms of the fixed effects[64], the cross section effects extensively vary around from -1.27(Orlando) to 2.38(San Antonio) according to the geographical region, and 15 of 42 cities indicates their statistically

[64] See 'Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances' for the detail.

significant impact on the properties' cap rate level. In addition, except for 2003, the time dummies present the negative effects, from -0.02 to -1.04, on the cap rates and especially the years of 2003, 2005 and 2006 show their statistical significance in the model. The result is show in Table 24.

[Table 24] Panel Model of Cap Rates and Economic Rent Growth Rates of UC

```
Linear regression                               Number of obs =     207
                                                F( 46,   154) =       .
                                                Prob > F      =       .
                                                R-squared     =  0.5552
                                                Root MSE      =  1.0857
                     |               Robust
           caprateUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+------------------------------------------------------------------
pct_grth_econ_rentUC |   .0103688   .0160807     0.64   0.520    -.0213984    .0421361
               _cons |   6.471439   .4102502    15.77   0.000     5.660995    7.281884
Fixed Effects of MSA
Fixed Effects of Year
```

- Economic Rents and Cap Rates of MSA

The model is identical to the one used earlier, with the identical variables.

$$WACR\ of\ MSA_{(jt)} = 7.748567 + (-0.0212972) * ER\ GR\ of\ MSA_{(jt)} + FE_{(j)} + FE_{(t)} \qquad (17)$$

Compared to the result shown in the previous section, the MSA model reveals the slightly different outcome, indicating the negative correlation between two variables. The analysis suggests that the level of cap rate of MSA is explainable by the effect of changes in rental growth rates in the region. A 1% of increase in the yearly growth rate of apartments' rental levels lowers the cap rate level by 2 basis points. However, the variable of economic rental growth rate is not significant in explaining the impact on movements in the capitalization rate of multifamily housing market in MSA. While the 23 MSAs of 44 in total have significant effects of market characteristics, the fixed effects[65] vary from -1.91(San Francisco) to 1.45(Oklahoma City). Unlike the cross section effect, the time effects only indicate negative impacts on the cap rates since 2003. The coefficient ranges approximately from -1.00 to -0.08 but the years of 2003, 2010, and 2012 are insignificant in the model.

[65] See 'Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances' for the detail.

[Table 25] Panel Model of Cap Rates and Economic Rent Growth Rates of MSA

```
Linear regression                               Number of obs =     443

                                                F( 54,   388) =   23.61
                                                Prob > F      =  0.0000
                                                R-squared     =  0.6649
                                                Root MSE      =  .65001
                     |               Robust
          caprateMSA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+------------------------------------------------------------------
pct_grth_econ_rentMSA |  -.0212972   .0115626    -1.84   0.066    -.0440303     .001436
               _cons |   7.748567   .1844487    42.01   0.000     7.385923    8.111211
Fixed Effects of MSA
Fixed Effects of Year
```

7.5 Summary

This section provides the integrated outcomes, revealing interesting findings on the pricing behaviors in the identified markets within a metropolitan area. First, the effects of population and employment on the real estate market enable the research to understand the current pricing behaviors. The results of office and apartment markets illustrate: the difference in the population level between UC and MSA explains the disparity in investment performances of two areas; the dissimilar growth rate of employment between UC and MSA addresses the difference in properties' value between the two distinct markets.

In terms of the office market, however, the effect of UC rental growth rates on the cap rate doesn't match with the "rational" pricing, indicating that the rental growth rate of UC empirically leads to increases in the cap rate of the area. On the other hand, the MSA rental growth explains the movements in the cap rate of MSA in accordance with the "rational" pricing. The multifamily housing market describes the identical movement as well. The nature of these outcomes offers that particular markets such as the UC area are not explicable by the "rational" pricing model. The result also indicates that the difference in rental growth rates reveals the positive relation with the gap in the cap rate levels, which is complete opposite to the "rational" investors' behavior.

CHAPTER 8 DETERMINANTS OF THE PERFORMANCE DIFFERENCES BETWEEN UC AND MSA

Throughout the previous chapters, this study obtained the various range of differences in economic and investment performances between UC and MSA. This chapter experiments what explains the performance differences between UC and MSA. Incorporating the market performances with the market characteristics enables this study to explore the question of what factors are explicable in generating the disparities within a same geographical market. The goal of this part is to develop the convincing model and to characterize which variable drives the influence on performance differences.

8.1 Data and Methodology

8.1.1 Data

In order to identify the factors that affect the economic performance in a specific market, this section uses the demographic features such as market sizes, market growth rates, the share of entire market accounted for the market core. The market size is determined by the most recent employment level. The market growth rate is calculated by last 10 year employment changes. The share of a market is defined two parameters. One parameter is the employment share which is determined by the ratio of 2009 UC employment level to the MSA employment level. The other is the population share which is calculated by 2010 UC population over the MSA population. These data are drawn from the results obtained in the previous chapters.

8.1.2 Methodology: Multivariate Regression Model

The research uses the multivariate regression model in order to explore determinants which are able to explain the different performance between Urban Cores and MSAs. The regression model with multiple independent variables is formulated as below.

$$Y_{jt} = \beta_1 + \beta_2 * X_{2jt} + \beta_3 * X_{3jt} + \beta_4 * X_{4jt} + \beta_5 * X_{5jt} \quad (18)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The equation shows the effect of each explanatory variable X*ijt* on Y*jt*, indicating that a unit of change in X*ijt* leads to gain the β_i amount of effect in Y*jt*. The variables used in the model consist of the difference in performance between UC and MSA and the characteristics of MSA. By analyzing the statistical significance of variables, this study identifies the determinants that drive the dissimilarity in economic performances between a core and the broader area within a metropolitan market.

[Table 26] List of Regression Model Variables

Variables	Abbreviations	Description
Dependent Variables		
Difference in economic rents	d_grossrent_uc_msa d_netrent_uc_msa d_rent_uc_msa	Difference in economic gross rent between UC and MSA Difference in economic net rent between UC and MSA Difference in economic rent between UC and MSA
Difference in population growth	d_pop_uc_msa	Difference in population between UC and MSA
Difference in employment growth	d_emp_uc_msa	Difference in employment between UC and MSA
Independent Variables		
MSA size	emp_2009_msa pop2010_msa	2009 employment level of MSA 2010 population level of MSA
MSA growth rate	emp_grth_rate pop_grth_rate	10 year employment growth rate 10 year population growth rate
Ratio of UC to MSA	emp_uctomsa pop_uctomsa	2009 UC employment/MSA employment 2010 UC population/MSA population

8.2 Determinants of the Performance Differences of UC and MSA

This section experiments what explains the performance differences between UC and MSA. Using the regression model allows the research to gauge the link between the differentials in performances and characteristics of the regions within a metropolitan area. In order to explore effects in associated with the multiple numbers of the probable factors this study uses the multivariate regression model with previously described parameters.

8.2.1 Determinants of Differences in Economic Performances

- ***Office Markets***

  - Gross rental rates

In order to understand the differences in economic performances of offices between UC and MSA, this study measures the influence of the market size, market growth rates, and the share of MSA accounted for UC. The equation is formulated with the variables as below.

$$D\_ER\ GR_{(jt)} = \beta_1 + \beta_2 * m\ Size_{(jt)} + \beta_3 * m\ GR_{(jt)} + \beta_4 * e\_Share_{(jt)} \quad (19)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The variables are as follows:
D_ER GR*(jt)*: Differences in Economic Rent Growth Rate between a given Urban Core and the MSA in a given year

m Size*(jt)*: MSA size measured by 2009 employment level of MSA[66]

m GR*(jt)*: MSA Growth Rate measured by 10 year employment growth rate for a given MSA from 2000 to 2009[67]

e_Share*(jt)*: Employment share of MSA accounted for UC measured by the ratio of UC employment to the MSA employment in 2009

The equation presents the effect of three explanatory variables such as MSA size, MSA growth rate, the share of MSA jobs to UC jobs on difference in economic performance of office properties between UC and MSA. The each coefficient indicates that a unit of change in independent variable, X*(ijt)* drives the β_i amount of changes in the dependent variable. By analyzing the statistical significance of variables, this study identifies the determinants that drive the dissimilarity in office markets between a core and the broader area within a metropolitan market.

According to the regression result, the market size and the share of MSA taken up UC give influences on different performance of economic gross rental rate changes, with statistical significance. The market size represents the MSA employment level in 2009, shown as 'emp_2009_msa' in Table 27; the share of MSA taken up UC denotes the ratio of 2009 UC employment to MSA employment, indicated as 'emp_uc to msa' in the model. This outcome suggests: as the job market of MSA is expanding the difference in offices' economic performances is the greater, which means the UC rental rate grows faster than MSA office rents; however, if the ratio of UC to MSA becomes greater, the rental growth difference between the two areas turns into slighter but negative, implying that the UC rental growth rate is slightly less than MSA rental growth rate.

[Table 27] Regression Model of Determinants of Gross Rental Growth Rates

```
. regress  d_grossrent_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  3,    43) =    2.28
       Model |  7.65272677     3  2.55090892           Prob > F      =  0.0924
    Residual |  48.0215162    43  1.11677945           R-squared     =  0.1375
-------------+------------------------------           Adj R-squared =  0.0773
       Total |  55.6742429    46  1.21030963           Root MSE      =  1.0568
------------------------------------------------------------------------------
d_grossrent~a |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   3.70e-07   1.85e-07     2.00   0.051    -2.44e-09    7.42e-07
emp_grth_rate |   .0059941   .0156935     0.38   0.704    -.0256549    .0376431
  emp_uctomsa |  -.0535207   .0229837    -2.33   0.025    -.0998717   -.0071697
        _cons |   .5648014   .3271891     1.73   0.091    -.0950383    1.224641
```

[66] For office markets, the level of employment is assumed as the MSA size. In addition, since the most recent employment data comes from 2009, this study uses 2009 employment level as an indicator.

[67] For office markets, the MSA growth rate represents the changes in employment.

By adding another explanatory variable in the model, this study also examines whether the variables in addition to the population share of MSA accounted for UC explain the different performance between UC and MSA. The revised model is formulated as below.

$$D\_ER\ GR_{(jt)} = \beta_1 + \beta_2 * m\ size_{(jt)} + \beta_3 * m\ GR_{(jt)} + \beta_4 * e\_Share_{(jt)} + \beta_5 * p\_Share_{(jt)} \quad (20)$$

p_Share*(jt)*: Population share of MSA accounted for UC measured by the ratio of UC population to the MSA population in 2009

Regression with the additional variable presents insignificant results, with low values of t-stat. However, the result also shows: the MSA size has a positive relation with the growth difference; the share of MSA employment to UC has a negative but inversely proportional correlation. The share of MSA population to UC has leads to decrease the difference in rental growth rate while the greater share causes the UC rental rate to grow slower.[68]

- Net rental rates

In terms of the link between differences in net rental growth and the market characteristics, the MSA growth rate only shows significant statistic result, indicating inversely negative relation. That is, if MSA grows faster, the difference between two areas becomes less while the UC growth rate of economic rents turns into lower. Both multivariate regression analyses present almost identical results.[69]

- *Multifamily Housing Markets*

For multifamily housing markets, this study applies the identical model with the one for office markets. Despite the similarity of formation, the independent variables are different since the market has distinct demand parameters. Therefore, this section uses the MSA population level as the market size, the 10 year population growth rate of MSA as the market growth rate, and the population ratio of UC to MSA as the share of MSA accounted for UC. The equation is formulated with the variables as below.

$$D\_ER\ GR_{(jt)} = \beta_1 + \beta_2 * m\ Size_{(jt)} + \beta_3 * m\ GR_{(jt)} + \beta_4 * p\_Share_{(jt)} \quad (21)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The variables are as follows:
D_ER GR*(jt)*: Differences in Economic Rent Growth Rate between a given Urban Core and the MSA in a given year

[68] See 'Appendix _ Chapter 8: Determinants of the Performance Differences between UC and MSA' for the detail.
[69] See 'Appendix _ Chapter 8: Determinants of the Performance Differences between UC and MSA' for the detail.

m Size*(jt)*: MSA size measured by 2010 population level of MSA[70]
m GR*(jt)*: MSA Growth Rate measured by 10 year population growth rate for a given MSA from 2001 to 2010[71]
p_Share*(jt)*: Population share of MSA accounted for UC measured by the ratio of UC Population to the MSA population in 2010

By analyzing the statistical significance of variables, this model identifies the determinants that drive the dissimilarity in apartment markets between a core and the broader area within a metropolitan market.

The variables of three market characteristics reveal statistically insignificant influence on the performance dissimilarity between zones, with high P-values. Also the model with addition variable of the employment share of UC to MSA presents same results with the original model. Interestingly, the result indicates: the population level (market size) has a proportionally positive effect on the difference; the population growth rate (market growth rate) and the ratio of UC employment to MSA (the share of employment level) inversely and negatively affects creating variance; the ratio of UC population to MSA (the share of population level) provides inverse effect on the discrepancy in market performances.[72] Since this statistic results with 4 variables cannot explain what parameters affect the dissimilarity in multifamily housing performances between UC and MSA, the further study is required of identifying other factors and developing the applicable model.

8.2.2 Determinants of Differences in Population Growth

In order to understand the differences in regional growth of offices between UC and MSA, this section also analyzes the link between the demographic growth difference and market characteristics such as the market size, market growth rates, and the share of MSA accounted for UC. The equation is formulated with the variables as below.

$$D\_P\ GR_{(jt)} = \beta_1 + \beta_2 * m\ Size_{(jt)} + \beta_3 * m\ GR_{(jt)} + \beta_4 * e\_Share_{(jt)} \quad (22)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The variables are as follows:
D_P GR*(jt)*: Differences in Population Growth Rate between a given Urban Core and the MSA in a given year

[70] For multifamily housing markets, the level of population is assumed as the MSA size. In addition, since the most recent population data comes from 2010, this study uses 2010 population level as an indicator.
[71] For multi-housing markets, the MSA growth rate represents the changes in population.
[72] See 'Appendix _ Chapter 8: Determinants of the Performance Differences between UC and MSA' for the detail.

m Size*(jt)*: MSA size measured by 2009 employment level of MSA[73]

m GR*(jt)*: MSA Growth Rate measured by 10 year employment growth rate for a given MSA from 2000 to 2009

e_Share*(jt)*: Employment share of MSA accounted for UC measured by the ratio of UC Population to the MSA population in 2010

The regression result suggests that the market growth rate and the share of MSA accounted for UC have a close link with the difference in population changes, with statistical significance. The market growth rate, shown as 'emp_grth_rate in Table 28, has an inversely negative impact on the difference in population growth, implying that if MSA job markets grow faster the difference in population between two area becomes less while UC population grows slower; the employment share of MSA accounted for UC, indicated as 'emp_uc to msa' has an inverse correlation with the dependent variable, meaning that when a unit of the ratio of UC to MSA leads to decrease the difference by almost half. Although the variable of market size shows a statistical insignificance in the model, it implies that when MSA is greater the gap in population growth between the two markets is wider.

[Table 28] Regression Model of Determinants of Population Growth Rates

```
. regress  d_pop_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  3,    43) =    6.44
       Model |  2326.45403     3  775.484677            Prob > F      =  0.0011
    Residual |  5180.36293    43  120.473556            R-squared     =  0.3099
-------------+------------------------------           Adj R-squared =  0.2618
       Total |  7506.81696    46  163.191673            Root MSE      =  10.976

------------------------------------------------------------------------------
 d_pop_uc_msa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   1.68e-06   1.92e-06     0.88   0.384    -2.18e-06    5.55e-06
emp_grth_rate |  -.5894346    .162998    -3.62   0.001    -.9181515   -.2607177
  emp_uctomsa |   .5316911   .2387161     2.23   0.031     .0502742    1.013108
        _cons |  -29.81215   3.398295    -8.77   0.000    -36.66546   -22.95884
------------------------------------------------------------------------------
```

With the additional variable of the share of MSA population, the regression provides the different result from the original one. Adding the variable makes the share of MSA employment insignificant while the new variable gives effects on the population growth difference, with the high value of t-stat. According to the result, while the influence of the market growth rate is almost unchanged from the previous model, the

[73] For analysis of population differences, the level of employment is assumed as the MSA size.

ratio of UC to MSA population indicates that if population concentrates more in UC than in MSA, the difference in population growth rates are greater. The equation is established as below.

$$D\_P\ GR_{(jt)} = \beta_1 + \beta_2 * m\ Size_{(jt)} + \beta_3 * m\ GR_{(jt)} + \beta_4 * e\_Share_{(jt)} + \beta_5 * p\_Share_{(jt)} \quad (23)$$

p_Share*(jt)*: Population share of MSA accounted for UC measured by the ratio of UC population to the MSA population in 2009

[Table 29] Regression Model of Determinants of Population Growth Rates with an Additional Variable

```
. regress  d_pop_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa pop_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  4,    42) =    6.14
       Model |  2769.26589     4  692.316473            Prob > F      =  0.0006
    Residual |  4737.55107    42  112.798835            R-squared     =  0.3689
-------------+------------------------------           Adj R-squared =  0.3088
       Total |  7506.81696    46  163.191673            Root MSE      =  10.621

------------------------------------------------------------------------------
 d_pop_uc_msa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   2.37e-06   1.89e-06     1.25   0.216    -1.44e-06    6.17e-06
emp_grth_rate |   -.507426   .1630614    -3.11   0.003    -.8364972   -.1783548
  emp_uctomsa |  -.1127634   .3989378    -0.28   0.779    -.9178524    .6923256
  pop_uctomsa |   1.888114   .9529518     1.98   0.054    -.0350204    3.811249
        _cons |  -30.62597   3.313824    -9.24   0.000    -37.31354    -23.9384
------------------------------------------------------------------------------
```

8.2.3 Determinants of Differences in Employment Growth

The identical analysis with the regression model of population growth and market characteristics is applied to identify the determinants of the difference in job market growth. The model has same explanatory variables such as the market size, market growth rates, and the share of MSA accounted for UC. The equation is formulated with the variables as below.

$$D\_E\ GR_{(jt)} = \beta_1 + \beta_2 * m\ Size_{(jt)} + \beta_3 * m\ GR_{(jt)} + \beta_4 * e\_Share_{(jt)} \quad (24)$$

where *j* stands for the *j*th metropolitan market and *t* for the *t*th time period. The variables are as follows:

D_E GR*(jt)*: Differences in Employment Growth Rate between a given Urban Core and the MSA in a given year

m Size*(jt)*: MSA size measured by 2009 employment level of MSA

m GR*(jt)*: MSA Growth Rate measured by 10 year employment growth rate for a given MSA from 2000 to 2009

e_Share*(jt)*: Employment share of MSA accounted for UC measured by the ratio of UC employment to the MSA employment in 2009

The result offers that the three characteristics of a market are not able to statistically explain the difference in job growth rate between the two areas. The market size is statistically quite meaningful in the model, indicating that the larger MSA experiences the greater dissimilarity in the job market growth between the core and the MSA. Regression including the share of MSA population accounted for UC population improves the significance of the variable of the market size. The level of its effect slightly increases, describing that the level of employment in MSA causes the UC job market grows faster than the entire job markets of the MSA.

[Table 30] Regression Model of Determinants of Employment Growth Rates

```
. regress  d_emp_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa pop_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  4,    42) =    2.86
       Model |  656.144023     4  164.036006           Prob > F      =  0.0350
    Residual |  2410.94868    42  57.4035399           R-squared     =  0.2139
-------------+------------------------------           Adj R-squared =  0.1391
       Total |   3067.0927    46  66.6759282           Root MSE      =  7.5765

------------------------------------------------------------------------------
 d_emp_uc_msa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   2.75e-06   1.35e-06     2.04   0.047     3.31e-08    5.47e-06
emp_grth_rate |  -.1201714   .1163237    -1.03   0.307    -.3549221    .1145794
  emp_uctomsa |   .0538682   .2845917     0.19   0.851     -.520461    .6281974
  pop_uctomsa |   .5486492   .6798106     0.81   0.424    -.8232641    1.920563
        _cons |  -11.28465   2.363995    -4.77   0.000    -16.05538   -6.513913
------------------------------------------------------------------------------
```

8.3 Summary

Finding the differences in economic and investment performances between UC and MSA motivates to explore the determinants of the relationship. Using multivariate regression model allows the study to experiment the effects of manifold market characteristics on the difference in performance. The results present important points about the determinants even though the applied models are not fully explicable to the disparity in market performances. Analyzing the relation with the ratio of UC to MSA, a critical variable, allows the experiment to obtain a few significant results. The effect of the share of MSA accounted for UC on the dissimilarities in economic performances and population growth is clearly observed. However, the explanatory variables used in the model do not fully explain the inequality between two specific markets so that the further study is required.

CHAPTER 9 CONCLUSION

9.1 Research Results

The findings of this thesis provide answers to the major questions on the "back to the city" movement and its influence on real estate markets. The answer is summarized as five major conclusions on economic and investment performances within a metropolitan area.

First, the result of is study clearly points out that there is the "back to the city" movement although the change has happened only in the Urban Cores not the entire MSA. In terms of population, the average growth rate of UC population is still lower than that of MSA population, but UC growth rate has been increased by around 7.28% while MSA growth rate has been decreased by around 3.18% last decade. With regard to employment, the movement is more obvious, indicating that the employment of UC has grown faster than that of MSA. For last 10 years, the UCs lost fewer employees (-3.27% of the decrease in jobs) while the job market in MSA dramatically shrank by around -18% of the decrease in employment.

Second, the economic performances between UC and MSA maintain a close link with each other. Concerning the office market, the gross rental growth rate of MSA greatly affects the rental changes of UC so that the two parameters move with a nearly identical pattern, implying that the volatility of both sub-markets is almost the same. The scatter diagram of these two indicators also reveals the close correlation between them. In addition, the net rental change of MSA also leads the movement in net rental rate of UC, with statistical significance. Compared to the relation between the two regional rates of gross rents, however, the association illustrates that the range of UC net rental changes is relatively narrower than the movement of MSA net rental rates, indicating that the economic net rental growth rate of UC is much less volatile than that of MSA. Regarding the multifamily housing market, the economic rental growth of MSA exerts the effect on the change in economic rental rates of UC. While the movement in UC renal growth rate is relatively less volatile than the change of MSA rental growth, the two variables closely relates with each other.

Third, the investment performances in MSA closely relates with the capitalization rate of UC. The scatter plot of office cap rates indicates the close correlation between the MSA cap rate level and the UC cap rate level. Furthermore, the regression analysis of office markets addresses the MSA investment returns are relatively more stable than UC returns since the UC cap rates are more volatile than MSA cap rates. The individual result on the fixed effect of geographic markets shows the significant statistics for estimating the level of cap rates across US cities, indicating in what markets the UC outperforms the MSA in terms

of the properties pricing. In addition, the time coefficient yields negative values except for 2007, illustrating that all years except for 2007 causes the lower level of cap rates in UC than MSA. The outcome of the multifamily housing market also presents the connection between UC cap rates and MSA cap rates. The correlation between the UC cap rate and the MSA cap rate is observable in the scatter diagram. However, the variation in prices of UC properties is comparatively slighter than the changes in values of MSA properties because the magnitude of the effect of the MSA cap rate implies that the UC cap rate level is much less volatile than MSA level. The individual result on the fixed effect of geographic markets shows the statistical significance, indicating the places where the UC cap rate is different from the MSA cap rate. In addition, the individual time coefficients are statistically significant, yielding the result in which each year affects the UC cap rate level to be lower than the MSA level.

Fourth, the effects of population and employment on the real estate market enable the research to understand the current pricing behaviors. The results of office and apartment markets illustrate: the difference in the population level between UC and MSA explains the disparity in investment performances of two areas; the dissimilar growth rate of employment between UC and MSA addresses the difference in properties' value between the two distinct markets. In terms of the office market, however, the effect of UC rental growth rates on the cap rate doesn't match with the rational pricing, indicating that the rental growth rate of UC empirically leads increases in the cap rate of the area. On the other hand, the MSA rental growth explains the movements in the cap rate of MSA in accordance with the rational pricing. The multifamily housing market describes the identical movement as well. The nature of these outcomes offers that the UC market is not explicable by the rational pricing model. The result also indicates that the difference in rental growth rates reveals the positive relation with the gap in the cap rate levels, which is complete opposite to the rational investors' behavior.

Lastly, finding the differences in economic and investment performances between UC and MSA motivates to explore the determinants of the relationship. Using multivariate regression model allows the study to experiment the effects of manifold market characteristics on the difference in performance. The results present important points about the determinants even though the applied models are not fully explicable to the disparity in market performances. Analyzing the relation with the ratio of UC to MSA, a critical variable, allows the experiment to obtain a few significant results. The effect of the share of MSA accounted for UC on the dissimilarities in economic performances and population growth is clearly observed. However, the explanatory variables used in the model do not fully explain the inequality between two specific markets. Therefore, it is required to study further the determinants of the market characteristics.

9.2 Research Contributions

This thesis is the first to explore the questions on the "back to the city" movement in associated with the performances of real estate markets. Answering the question requires critical identifications on geographical markets and explanatory indicators for measuring performances of real estate properties. The main contribution of this study includes three aspects.

First, re-defining zones at ZIP code level enables this thesis to analyze manifold performances with connected to the "back to the city" movement at the market-specific level within a metropolitan area. Exploring the performances based on the distinctly identified market lead to provide a compelling answer on the movement.

Second, using RCA data drawn from the empirical transaction database allows the research to conduct a convincing analysis, providing actual movements in cap rates over time. Moreover, compared to NCREIF, "RCA data is derived from a broader sample of properties including institutional transactions".[74] Therefore, the data used in the model is enriched so that the study is able to approach to comprehensive observations.

Third, applying the panel data regression allows the analysis to be enhanced and to yield robust statistical results. (Sivitanides et al, 2001) The addition of fixed effects of market-specific characteristics and time even better helps the model to capture the specific effects and dynamics of changes. (Gujarati, 2004)

Fourth, interestingly and importantly, examining concurrently the demographic, economic, and investment performance leads to address the pricing behaviors as well as relationship with two fold perspectives: between the specific markets such as UC and MSA, and between parameters. The experiments reveal the inequality between distinctive local markets within a metropolitan area.

Finally, attempt to explain the determinants of difference in economic performance at the local level leads to find a critical variable which is the share of MSA accounted for UC. Even though the determinants are clearly unanswered, the analysis opens the chance to question various measurements for explaining the disparity in real estate performances.

[74] Jim Clayton et al

9.3 Further Research

The future study should pursue in examining the characteristics and features of a metropolitan area which are explicable in terms of the differences in economic and investment performances between the specific markets. With the explanatory variables, the new model could be developed so as to answer the questions of dissimilarity in properties' performances across submarkets within the same metropolitan area. What would be able to explain the disparity between Urban Cores and MSAs?

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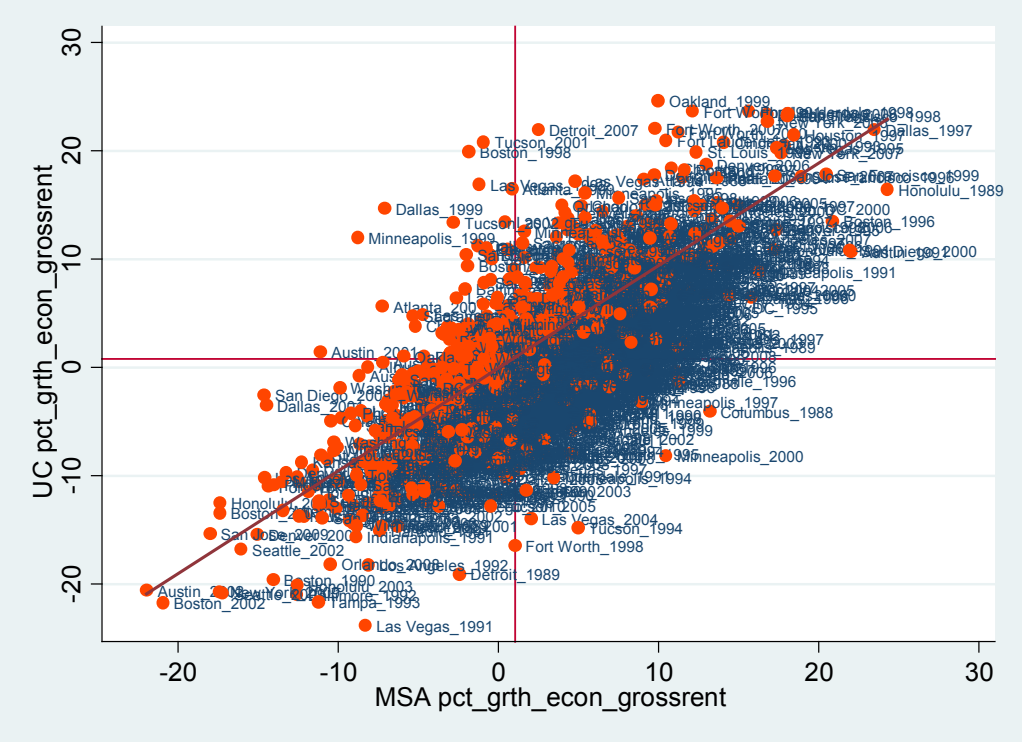
APPENDIX

Appendix _ Chapter 5: List of Metropolitan Areas

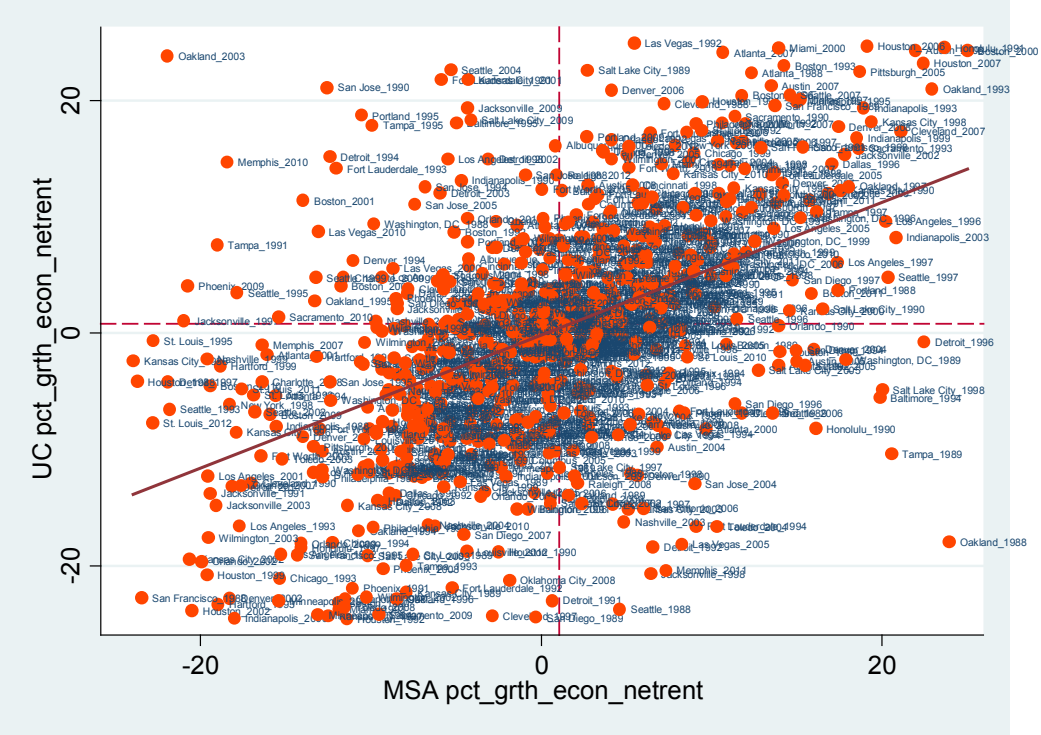
No	Metro Area Name	Metro Area ID	No	Metro Area Name	Metro Area ID
1	Akron	74	36	New York	111
2	Albany	1	37	Norfolk	42
3	Albuquerque	2	38	Northern New Jersey	43
4	Ann Arbor	113	39	Oakland	44
5	Atlanta	3	40	Oklahoma City	45
6	Austin	4	41	Orange County	47
7	Baltimore	6	42	Orlando	48
8	Boston	8	43	Philadelphia	49
9	Charlotte	9	44	Phoenix	50
10	Chicago	10	45	Pittsburgh	51
11	Cincinnati	11	46	Port Saint Lucie	163
12	Cleveland	12	47	Portland	52
13	Columbus	14	48	Providence	99
14	Dallas	15	49	Raleigh	53
15	Dayton	16	50	Richmond	54
16	Denver	17	51	Riverside	55
17	Detroit	18	52	Sacramento	56
18	Fort Lauderdale	20	53	Salt Lake City	57
19	Fort Worth	21	54	San Antonio	58
20	Hartford	25	55	San Diego	59
21	Honolulu	26	56	San Francisco	60
22	Houston	27	57	San Jose	61
23	Indianapolis	28	58	Santa Barbara	170
24	Jacksonville	29	59	Seattle	62
25	Kansas City	30	60	St. Louis	63
26	Kingsport-Bristol	149	61	Stamford	64
27	Lakeland	90	62	Tampa	65
28	Las Vegas	31	63	Toledo	66
29	Long Island	32	64	Trenton	112
30	Los Angeles	33	65	Tucson	67
31	Louisville	34	66	Ventura	69
32	Memphis	35	67	Washington, DC	70
33	Miami	36	68	West Palm Beach	71
34	Minneapolis	38	69	Wilmington	73
35	Nashville	39			

Appendix _ Chapter 5: Economic Performances of Properties

1. Relation of the Growth Rate of Gross Rents between UC and MSA : Office



2. Relation of the Growth Rate of Gross Rents between UC and MSA : Office



3. Panel Model of Economic Gross Rental Growth Rates between UC and MSA: Office

```
. xi: regress  pct_grth_econ_grossrentUC  pct_grth_econ_grossrentMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-170   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1987-2012    (naturally coded; _Iyear_1987 omitted)

Linear regression                                 Number of obs =    1095
                                                  F( 75,  1019) =   24.53
                                                  Prob > F      =  0.0000
                                                  R-squared     =  0.6411
                                                  Root MSE      =  4.7147

------------------------------------------------------------------------------
                             |               Robust
  pct_grth_econ_grossrentUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------------------+-------------------------------------------------------------------
pct_grth_econ_grossrentMSA |   .9400895   .0340214    27.63   0.000     .8733295    1.006849
              _Imetroarea_2 |   .4328138   1.597343     0.27   0.786    -2.701644    3.567272
              _Imetroarea_3 |   .7329149   1.752853     0.42   0.676    -2.706699    4.172529
              _Imetroarea_4 |  -.8932883   1.882314    -0.47   0.635    -4.586942    2.800366
              _Imetroarea_6 |  -.5351981   1.612204    -0.33   0.740    -3.698818    2.628422
              _Imetroarea_8 |    3.05607   1.934388     1.58   0.114    -.7397702     6.85191
              _Imetroarea_9 |   .7839692   1.609548     0.49   0.626    -2.374438    3.942377
             _Imetroarea_10 |   1.126941   1.479996     0.76   0.447    -1.777248    4.031131
             _Imetroarea_11 |   .4727449   1.585409     0.30   0.766    -2.638296    3.583785
             _Imetroarea_12 |   .1256775   1.473782     0.09   0.932    -2.766316    3.017671
             _Imetroarea_14 |   .3109682   1.768437     0.18   0.860    -3.159227    3.781163
             _Imetroarea_15 |    .424883   1.984936     0.21   0.831    -3.470147    4.319913
             _Imetroarea_16 |          0  (omitted)
             _Imetroarea_17 |    1.58661   1.510235     1.05   0.294    -1.376916    4.550137
             _Imetroarea_18 |   .3152625   1.988445     0.16   0.874    -3.586653    4.217178
             _Imetroarea_20 |  -.0723055   1.752971    -0.04   0.967    -3.512151     3.36754
             _Imetroarea_21 |   1.082822   2.010658     0.54   0.590    -2.862681    5.028325
             _Imetroarea_25 |  -.4754621   1.608261    -0.30   0.768    -3.631345    2.680421
             _Imetroarea_26 |   .0479036   1.599489     0.03   0.976    -3.090765    3.186572
             _Imetroarea_27 |   .5033755   1.466564     0.34   0.731    -2.374455    3.381206
             _Imetroarea_28 |    .095524   1.499448     0.06   0.949    -2.846836    3.037884
             _Imetroarea_29 |  -.1027719   1.461702    -0.07   0.944    -2.971063    2.765519
             _Imetroarea_30 |   .2235349   1.558141     0.14   0.886    -2.833996    3.281066
             _Imetroarea_31 |   .2887046   2.371795     0.12   0.903    -4.365456    4.942865
             _Imetroarea_32 |          0  (omitted)
             _Imetroarea_33 |  -.3702639   1.671817    -0.22   0.825    -3.650862    2.910334
             _Imetroarea_34 |  -.0033087    1.81573    -0.00   0.999    -3.566306    3.559688
             _Imetroarea_35 |   .6450264   1.628333     0.40   0.692    -2.550242    3.840295
             _Imetroarea_36 |   .3311837   1.506288     0.22   0.826    -2.624597    3.286965
             _Imetroarea_38 |  -.4811914   2.400314    -0.20   0.841    -5.191315    4.228932
             _Imetroarea_39 |  -.1128551   1.578648    -0.07   0.943    -3.210628    2.984918
             _Imetroarea_42 |          0  (omitted)
             _Imetroarea_43 |          0  (omitted)
             _Imetroarea_44 |   .4422068   1.848315     0.24   0.811    -3.184733    4.069146
             _Imetroarea_45 |   1.341395    2.25202     0.60   0.552    -3.077732    5.760522
             _Imetroarea_47 |          0  (omitted)
```

_Imetroarea_48	.0741119	1.60465	0.05	0.963	-3.074684	3.222908
_Imetroarea_49	-.1125898	1.483804	-0.08	0.940	-3.024251	2.799071
_Imetroarea_50	.8027704	1.535236	0.52	0.601	-2.209815	3.815355
_Imetroarea_51	.5183511	1.425689	0.36	0.716	-2.279271	3.315973
_Imetroarea_52	1.011498	1.501895	0.67	0.501	-1.935664	3.958659
_Imetroarea_53	-.4445953	1.723269	-0.26	0.796	-3.826157	2.936966
_Imetroarea_54	0	(omitted)				
_Imetroarea_55	0	(omitted)				
_Imetroarea_56	1.07088	1.632876	0.66	0.512	-2.133303	4.275063
_Imetroarea_57	.6253317	1.585178	0.39	0.693	-2.485255	3.735918
_Imetroarea_58	-1.967813	1.807898	-1.09	0.277	-5.515441	1.579815
_Imetroarea_59	-.1925065	1.769342	-0.11	0.913	-3.664477	3.279464
_Imetroarea_60	1.399983	1.555571	0.90	0.368	-1.652505	4.452472
_Imetroarea_61	.274996	1.659833	0.17	0.868	-2.982086	3.532078
_Imetroarea_62	.9916081	1.492019	0.66	0.506	-1.936173	3.919389
_Imetroarea_63	-.2228037	1.685699	-0.13	0.895	-3.530643	3.085035
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	.0891885	1.593155	0.06	0.955	-3.037052	3.215429
_Imetroarea_66	.1070566	1.584463	0.07	0.946	-3.002127	3.21624
_Imetroarea_67	-.6079595	2.20177	-0.28	0.783	-4.92848	3.712561
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	1.016347	1.507766	0.67	0.500	-1.942333	3.975028
_Imetroarea_71	0	(omitted)				
_Imetroarea_73	.2295602	1.581964	0.15	0.885	-2.87472	3.333841
_Imetroarea_74	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_99	0	(omitted)				
_Imetroarea_111	.3662343	1.585166	0.23	0.817	-2.744328	3.476797
_Imetroarea_112	0	(omitted)				
_Imetroarea_113	0	(omitted)				
_Imetroarea_149	0	(omitted)				
_Imetroarea_163	0	(omitted)				
_Imetroarea_170	0	(omitted)				
_Iyear_1988	-.7498401	1.347294	-0.56	0.578	-3.393628	1.893948
_Iyear_1989	-1.906419	1.316394	-1.45	0.148	-4.489572	.6767345
_Iyear_1990	-2.205979	1.283972	-1.72	0.086	-4.725512	.313553
_Iyear_1991	-2.046552	1.34014	-1.53	0.127	-4.676302	.583198
_Iyear_1992	-2.670727	1.363605	-1.96	0.050	-5.346521	.0050676
_Iyear_1993	-2.448052	1.296888	-1.89	0.059	-4.992929	.0968257
_Iyear_1994	-2.739872	1.342545	-2.04	0.042	-5.374341	-.1054031
_Iyear_1995	-1.740917	1.246373	-1.40	0.163	-4.186667	.7048344
_Iyear_1996	-2.89614	1.230894	-2.35	0.019	-5.311518	-.4807624
_Iyear_1997	-2.036337	1.207287	-1.69	0.092	-4.405391	.3327164
_Iyear_1998	0	(omitted)				
_Iyear_1999	2.198806	1.514776	1.45	0.147	-.7736305	5.171243
_Iyear_2000	.975304	1.36182	0.72	0.474	-1.696987	3.647595
_Iyear_2001	1.77342	1.492952	1.19	0.235	-1.156192	4.703032
_Iyear_2002	-1.207003	1.36928	-0.88	0.378	-3.893934	1.479928
_Iyear_2003	-2.166612	1.258376	-1.72	0.085	-4.635915	.3026922
_Iyear_2004	-2.205025	1.227264	-1.80	0.073	-4.613278	.2032284
_Iyear_2005	-3.022596	1.177535	-2.57	0.010	-5.333267	-.7119259
_Iyear_2006	-.6912798	1.220937	-0.57	0.571	-3.087118	1.704558

_Iyear_2007	1.776665	1.276368	1.39	0.164	-.7279458	4.281276
_Iyear_2008	.1300063	1.298492	0.10	0.920	-2.418018	2.678031
_Iyear_2009	-.7902732	1.349728	-0.59	0.558	-3.438836	1.85829
_Iyear_2010	-.6999692	1.22752	-0.57	0.569	-3.108725	1.708786
_Iyear_2011	-.9980375	1.197637	-0.83	0.405	-3.348154	1.352079
_Iyear_2012	-1.097751	1.119107	-0.98	0.327	-3.293769	1.098267
_cons	.6588872	1.775395	0.37	0.711	-2.824961	4.142735

4. Panel Model of Economic Net Rental Growth Rates between UC and MSA: Office

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. xi: regress   pct_grth_econ_netrentUC   pct_grth_econ_netrentMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-170   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1987-2012    (naturally coded; _Iyear_1987 omitted)

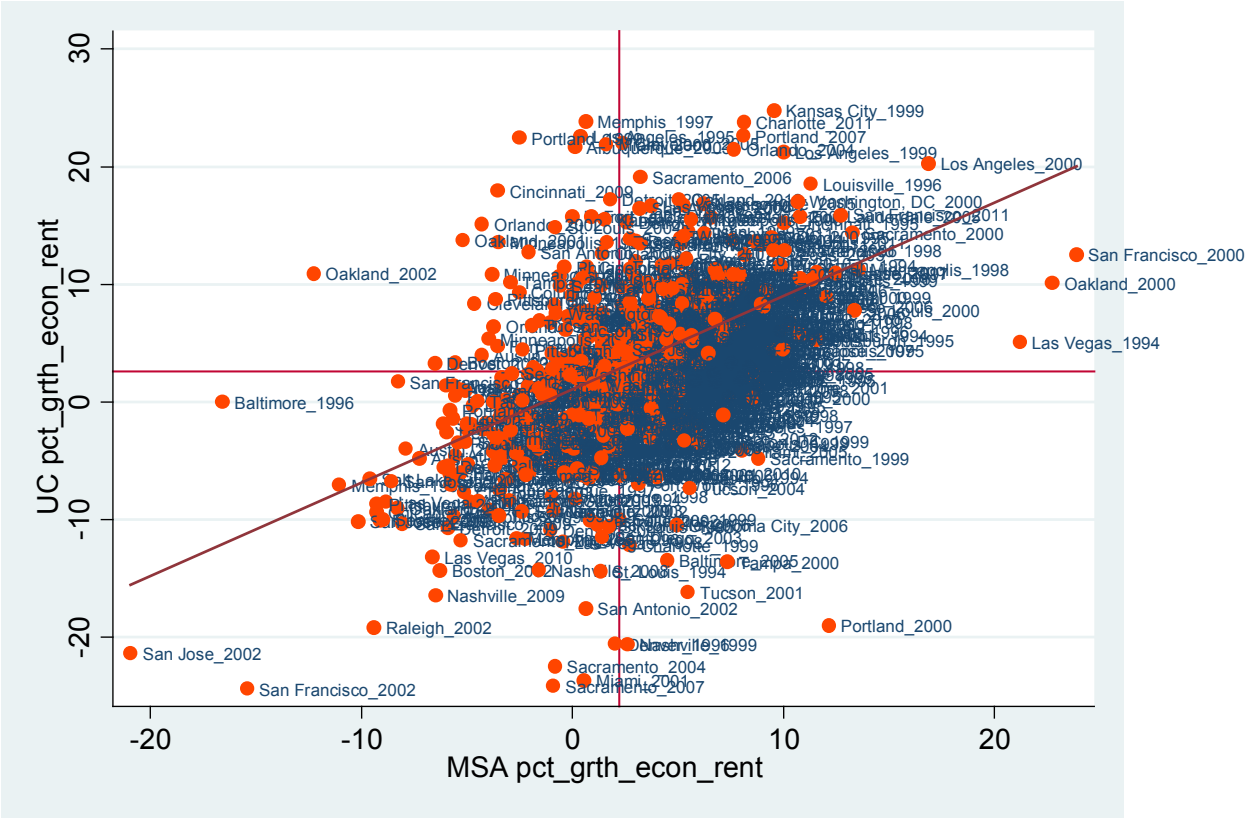
Linear regression                                 Number of obs =     768
                                                  F( 75,   692) =    4.46
                                                  Prob > F      =  0.0000
                                                  R-squared     =  0.3253
                                                  Root MSE      =  8.8563

------------------------------------------------------------------------------
                           |               Robust
 pct_grth_econ_netrentUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------------------+----------------------------------------------------------------
pct_grth_econ_netrentMSA |   .5649599   .0467774    12.08   0.000     .4731173    .6568026
          _Imetroarea_2 |   6.740515   5.177893     1.30   0.193    -3.425751    16.90678
          _Imetroarea_3 |   3.256947   3.277244     0.99   0.321    -3.177588    9.691483
          _Imetroarea_4 |   6.037841    3.13684     1.92   0.055    -.1210249    12.19671
          _Imetroarea_6 |   6.087552   4.707819     1.29   0.196    -3.155771    15.33087
          _Imetroarea_8 |   6.969202   3.807781     1.83   0.068    -.5069868    14.44539
          _Imetroarea_9 |   5.265299   3.265025     1.61   0.107    -1.145246    11.67584
         _Imetroarea_10 |   4.241579    2.93922     1.44   0.149    -1.529279    10.01244
         _Imetroarea_11 |   4.797437   3.012915     1.59   0.112    -1.118114    10.71299
         _Imetroarea_12 |   4.865818   3.483382     1.40   0.163    -1.973447    11.70508
         _Imetroarea_14 |   4.491302   2.951778     1.52   0.129    -1.304212    10.28682
         _Imetroarea_15 |   5.164251   2.975485     1.74   0.083    -.6778112    11.00631
         _Imetroarea_16 |          0  (omitted)
         _Imetroarea_17 |   7.590141   3.633572     2.09   0.037     .4559929    14.72429
         _Imetroarea_18 |   5.970902   4.038392     1.48   0.140     -1.95807    13.89987
         _Imetroarea_20 |   6.741947   3.611299     1.87   0.062    -.3484703    13.83236
         _Imetroarea_21 |   6.093225   2.920234     2.09   0.037     .3596444    11.82681
         _Imetroarea_25 |   3.827068   3.103015     1.23   0.218    -2.265386    9.919521
         _Imetroarea_26 |    4.34029   3.049566     1.42   0.155    -1.647221     10.3278
         _Imetroarea_27 |   2.629136   3.626109     0.73   0.469    -4.490359     9.74863
         _Imetroarea_28 |   3.230009   3.352805     0.96   0.336    -3.352882      9.8129
         _Imetroarea_29 |   4.192813   3.421435     1.23   0.221    -2.524826    10.91045
         _Imetroarea_30 |   3.206646   3.676625     0.87   0.383    -4.012032    10.42533
         _Imetroarea_31 |   4.528253   3.610808     1.25   0.210      -2.5612    11.61771
         _Imetroarea_32 |          0  (omitted)
         _Imetroarea_33 |   4.099853   3.044842     1.35   0.179    -1.878383    10.07809
         _Imetroarea_34 |   1.159857   4.602399     0.25   0.801    -7.876484     10.1962
         _Imetroarea_35 |   5.180228   7.087953     0.73   0.465    -8.736245     19.0967
         _Imetroarea_36 |   7.266258   3.610373     2.01   0.045     .1776592    14.35486
```

_Imetroarea_38	4.725953	2.940887	1.61	0.109	-1.048179	10.50009
_Imetroarea_39	4.289436	3.967116	1.08	0.280	-3.499592	12.07846
_Imetroarea_42	0	(omitted)				
_Imetroarea_43	0	(omitted)				
_Imetroarea_44	3.574475	6.960533	0.51	0.608	-10.09182	17.24077
_Imetroarea_45	3.962253	5.197871	0.76	0.446	-6.243238	14.16774
_Imetroarea_47	0	(omitted)				
_Imetroarea_48	3.158599	3.37236	0.94	0.349	-3.462687	9.779885
_Imetroarea_49	4.640598	2.89631	1.60	0.110	-1.04601	10.32721
_Imetroarea_50	2.389186	3.783031	0.63	0.528	-5.038409	9.816781
_Imetroarea_51	6.576477	3.21457	2.05	0.041	.2649974	12.88796
_Imetroarea_52	6.517204	3.54929	1.84	0.067	-.4514655	13.48587
_Imetroarea_53	4.598392	6.993148	0.66	0.511	-9.13194	18.32872
_Imetroarea_54	0	(omitted)				
_Imetroarea_55	0	(omitted)				
_Imetroarea_56	7.186262	4.395922	1.63	0.103	-1.444682	15.81721
_Imetroarea_57	3.288816	3.83286	0.86	0.391	-4.236615	10.81425
_Imetroarea_58	-8.100451	4.245517	-1.91	0.057	-16.43609	.2351887
_Imetroarea_59	-.1858631	3.588642	-0.05	0.959	-7.231796	6.860069
_Imetroarea_60	5.322418	3.665279	1.45	0.147	-1.873983	12.51882
_Imetroarea_61	11.54742	4.793483	2.41	0.016	2.135904	20.95894
_Imetroarea_62	5.180614	3.656038	1.42	0.157	-1.997643	12.35887
_Imetroarea_63	3.600801	3.201495	1.12	0.261	-2.685008	9.886611
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	7.564104	4.455927	1.70	0.090	-1.184654	16.31286
_Imetroarea_66	-.426838	4.385039	-0.10	0.922	-9.036415	8.182739
_Imetroarea_67	-.6415695	5.813533	-0.11	0.912	-12.05585	10.77271
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	5.862838	2.889532	2.03	0.043	.1895366	11.53614
_Imetroarea_71	0	(omitted)				
_Imetroarea_73	5.534086	3.367383	1.64	0.101	-1.077427	12.1456
_Imetroarea_74	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_99	0	(omitted)				
_Imetroarea_111	4.76394	3.293824	1.45	0.149	-1.703147	11.23103
_Imetroarea_112	0	(omitted)				
_Imetroarea_113	0	(omitted)				
_Imetroarea_149	0	(omitted)				
_Imetroarea_163	0	(omitted)				
_Imetroarea_170	0	(omitted)				
_Iyear_1988	-3.066897	3.008096	-1.02	0.308	-8.972987	2.839193
_Iyear_1989	-6.099382	2.722461	-2.24	0.025	-11.44466	-.7541075
_Iyear_1990	-4.522276	2.369494	-1.91	0.057	-9.174535	.1299835
_Iyear_1991	-3.058367	2.430756	-1.26	0.209	-7.830909	1.714175
_Iyear_1992	-4.223129	2.50955	-1.68	0.093	-9.150375	.7041167
_Iyear_1993	-4.968097	2.388804	-2.08	0.038	-9.658269	-.2779243
_Iyear_1994	-6.805698	2.409617	-2.82	0.005	-11.53674	-2.074661
_Iyear_1995	1.347089	2.403316	0.56	0.575	-3.371578	6.065755
_Iyear_1996	-4.389881	2.241907	-1.96	0.051	-8.791637	.0118749
_Iyear_1997	-3.284195	2.624472	-1.25	0.211	-8.437078	1.868688
_Iyear_1998	-2.272038	2.615884	-0.87	0.385	-7.40806	2.863985
_Iyear_1999	.139266	2.204215	0.06	0.950	-4.188485	4.467017
_Iyear_2000	-.7485972	2.533239	-0.30	0.768	-5.722353	4.225158
_Iyear_2001	0	(omitted)				

_Iyear_2002	-6.025071	2.359895	-2.55	0.011	-10.65848	-1.391657
_Iyear_2003	-4.368163	2.717572	-1.61	0.108	-9.703838	.9675118
_Iyear_2004	-3.631956	2.691031	-1.35	0.178	-8.915521	1.651608
_Iyear_2005	-4.211551	2.402936	-1.75	0.080	-8.92947	.5063679
_Iyear_2006	-1.445994	2.341165	-0.62	0.537	-6.042633	3.150645
_Iyear_2007	.9066943	2.287663	0.40	0.692	-3.584899	5.398288
_Iyear_2008	-4.102973	2.246152	-1.83	0.068	-8.513063	.3071167
_Iyear_2009	-2.082993	2.464635	-0.85	0.398	-6.922053	2.756067
_Iyear_2010	-1.087508	2.077495	-0.52	0.601	-5.166457	2.991441
_Iyear_2011	-2.478735	2.032894	-1.22	0.223	-6.470116	1.512646
_Iyear_2012	-2.925002	1.99313	-1.47	0.143	-6.83831	.9883068
_cons	-1.949367	3.234661	-0.60	0.547	-8.300294	4.401559

5. Relation of the Growth Rate of Rents between UC and MSA : Multifamily



6. Panel Model of Economic Net Rental Growth Rates between UC and MSA : Multifamily

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. xi: regress  pct_grth_econ_rentUC  pct_grth_econ_rentMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_2-111   (naturally coded; _Imetroarea_2 omitted)
i.year            _Iyear_1992-2012    (naturally coded; _Iyear_1992 omitted)

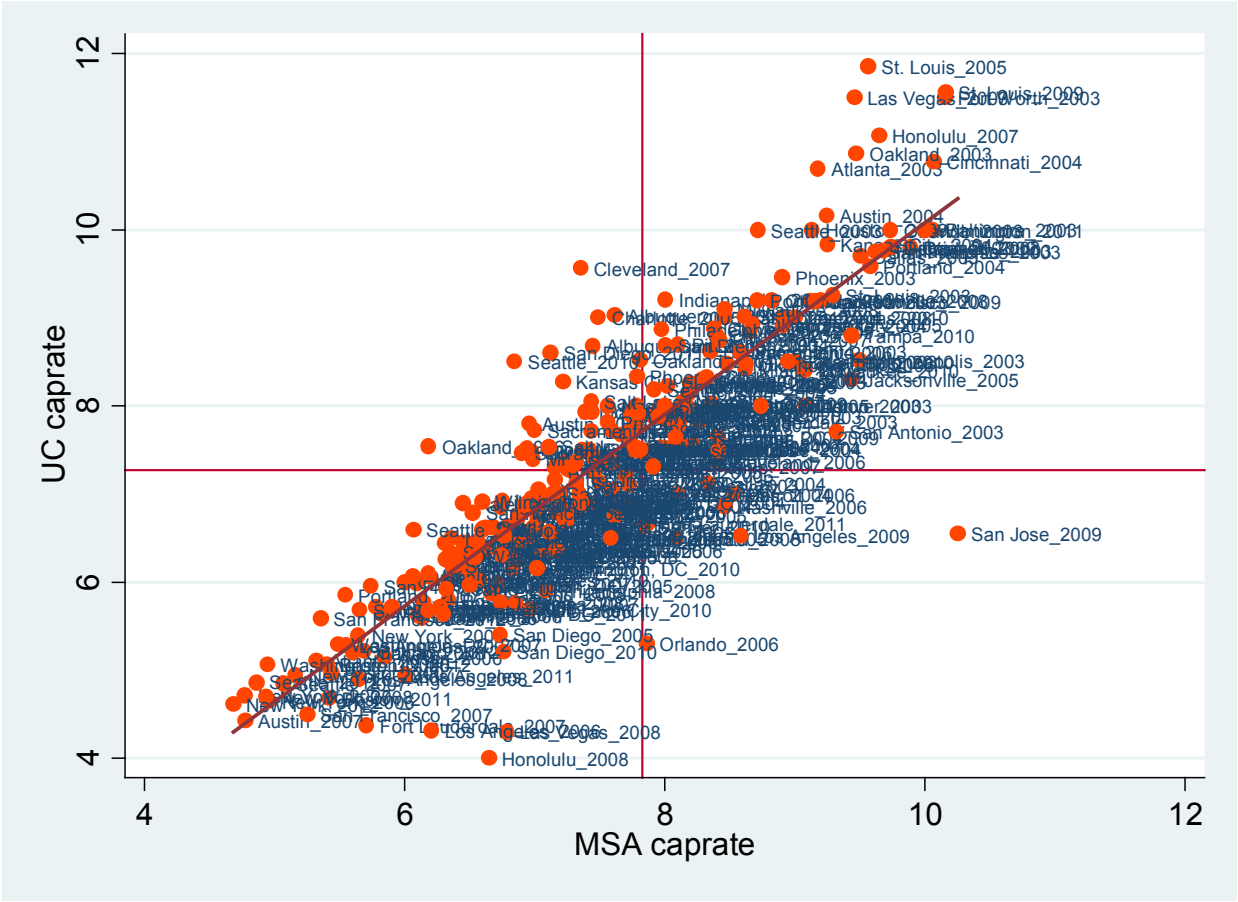
Linear regression                                      Number of obs =     692
                                                       F( 64,   627) =    5.81
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.3077
                                                       Root MSE      =  6.4371

------------------------------------------------------------------------------
                     |               Robust
 pct_grth_econ_rentUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+--------------------------------------------------------------------
pct_grth_econ_rentMSA |   .7010768   .0865429     8.10   0.000     .5311278    .8710258
        _Imetroarea_3 |   .4670557   2.069535     0.23   0.822    -3.597003    4.531115
        _Imetroarea_4 |   .9315729   2.212028     0.42   0.674    -3.412307    5.275452
        _Imetroarea_6 |  -1.929054   2.906551    -0.66   0.507    -7.636807      3.7787
        _Imetroarea_8 |   .1894686   2.426727     0.08   0.938    -4.576028    4.954966
        _Imetroarea_9 |   1.200991   2.411475     0.50   0.619    -3.534554    5.936536
       _Imetroarea_10 |  -.8725991   2.063853    -0.42   0.673    -4.925499    3.180301
       _Imetroarea_11 |   1.867304   2.556684     0.73   0.465    -3.153397    6.888006
       _Imetroarea_12 |   3.539241   3.353168     1.06   0.292    -3.045558    10.12404
       _Imetroarea_14 |  -.8370472   2.234455    -0.37   0.708     -5.22497    3.550875
       _Imetroarea_15 |   1.129124   1.941425     0.58   0.561    -2.683358    4.941606
       _Imetroarea_17 |  -.6247808   2.649883    -0.24   0.814    -5.828501    4.578939
       _Imetroarea_18 |   2.574972   3.020133     0.85   0.394    -3.355828    8.505772
       _Imetroarea_20 |   2.568307   2.457822     1.04   0.296    -2.258252    7.394866
       _Imetroarea_21 |  -.0245935   2.180385    -0.01   0.991    -4.306335    4.257148
       _Imetroarea_27 |   .3051435   2.121645     0.14   0.886    -3.861247    4.471534
       _Imetroarea_28 |   -.575667    2.15151    -0.27   0.789    -4.800704     3.64937
       _Imetroarea_29 |   .7062939   2.476399     0.29   0.776    -4.156745    5.569333
       _Imetroarea_30 |   1.221768   2.638097     0.46   0.643    -3.958808    6.402343
       _Imetroarea_31 |  -2.235267    2.49138    -0.90   0.370    -7.127726    2.657192
       _Imetroarea_33 |   1.638806   2.533363     0.65   0.518    -3.336097    6.613709
       _Imetroarea_34 |   .2433559   2.148368     0.11   0.910    -3.975512    4.462224
       _Imetroarea_35 |  -.8382962   2.456749    -0.34   0.733    -5.662749    3.986156
       _Imetroarea_36 |  -1.495591    3.17179    -0.47   0.637    -7.724208    4.733026
       _Imetroarea_38 |    .863387   2.422595     0.36   0.722    -3.893995    5.620769
       _Imetroarea_39 |  -3.650556   3.195243    -1.14   0.254    -9.925228    2.624117
       _Imetroarea_44 |    3.73292    2.90005     1.29   0.199    -1.962066    9.427907
       _Imetroarea_45 |  -2.477894   5.168925    -0.48   0.632    -12.62839    7.672607
       _Imetroarea_48 |   3.444122   2.963912     1.16   0.246    -2.376274    9.264519
       _Imetroarea_49 |   1.265636   2.368628     0.53   0.593    -3.385769     5.91704
       _Imetroarea_50 |    .087344    2.10653     0.04   0.967    -4.049364    4.224052
       _Imetroarea_51 |  -.0886495   2.257224    -0.04   0.969    -4.521284    4.343985
       _Imetroarea_52 |   .6568341   3.211942     0.20   0.838    -5.650632    6.964301
       _Imetroarea_53 |   .1656288   2.337271     0.07   0.944    -4.424199    4.755456
       _Imetroarea_56 |   -2.32045   4.482702    -0.52   0.605    -11.12338    6.482478
       _Imetroarea_57 |  -2.693059   2.470859    -1.09   0.276    -7.545221    2.159102
       _Imetroarea_58 |  -1.035371   2.536546    -0.41   0.683    -6.016525    3.945783
       _Imetroarea_59 |  -1.317839   2.345002    -0.56   0.574    -5.922847    3.287169
       _Imetroarea_60 |  -.8742885   2.388424    -0.37   0.714    -5.564567     3.81599
       _Imetroarea_61 |  -1.396798   2.069761    -0.67   0.500      -5.4613    2.667705
       _Imetroarea_62 |     1.4991   2.220863     0.68   0.500     -2.86213     5.86033
       _Imetroarea_63 |  -1.574104   2.483483    -0.63   0.526    -6.451056    3.302849
       _Imetroarea_65 |  -.8603804   2.565562    -0.34   0.737    -5.898515    4.177754
```

_Imetroarea_67	-2.046972	2.566558	-0.80	0.425	-7.087062	2.993118
_Imetroarea_70	1.521952	2.159395	0.70	0.481	-2.718571	5.762474
_Imetroarea_111	0	(omitted)				
_Iyear_1993	2.180006	1.854094	1.18	0.240	-1.460979	5.820992
_Iyear_1994	0	(omitted)				
_Iyear_1995	-.2091188	1.823594	-0.11	0.909	-3.790209	3.371972
_Iyear_1996	-.1768948	2.126163	-0.08	0.934	-4.352157	3.998368
_Iyear_1997	1.763346	1.879168	0.94	0.348	-1.92688	5.453571
_Iyear_1998	-.23394	1.715926	-0.14	0.892	-3.603598	3.135718
_Iyear_1999	-.8939082	2.37919	-0.38	0.707	-5.566055	3.778238
_Iyear_2000	-.0992612	2.37597	-0.04	0.967	-4.765083	4.566561
_Iyear_2001	-.4628381	2.046019	-0.23	0.821	-4.480718	3.555042
_Iyear_2002	-1.552107	1.887949	-0.82	0.411	-5.259575	2.155361
_Iyear_2003	.6353969	1.958634	0.32	0.746	-3.21088	4.481673
_Iyear_2004	.4928936	1.889954	0.26	0.794	-3.218512	4.204299
_Iyear_2005	.7867755	1.748513	0.45	0.653	-2.646874	4.220425
_Iyear_2006	-.1165376	1.676762	-0.07	0.945	-3.409286	3.176211
_Iyear_2007	-.4037716	1.688304	-0.24	0.811	-3.719187	2.911644
_Iyear_2008	-1.33024	1.641313	-0.81	0.418	-4.553377	1.892896
_Iyear_2009	-2.375517	1.857414	-1.28	0.201	-6.023022	1.271987
_Iyear_2010	-.5018999	1.652496	-0.30	0.761	-3.746997	2.743197
_Iyear_2011	2.132791	1.586125	1.34	0.179	-.981969	5.247551
_Iyear_2012	-.495533	1.579256	-0.31	0.754	-3.596804	2.605738
_cons	1.325962	2.423946	0.55	0.585	-3.434072	6.085997

Appendix _ Chapter 6: Investment Performances of Properties

1. Relation of the Cap Rates between UC and MSA : Office



2. Panel Model of Cap Rates between UC and MSA : Office

```
. xi: regress   caprateUC  caprateMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-184   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1987-2012    (naturally coded; _Iyear_1987 omitted)

Linear regression                                      Number of obs =     289
                                                       F( 55,   229) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.8325
                                                       Root MSE      =  .67756

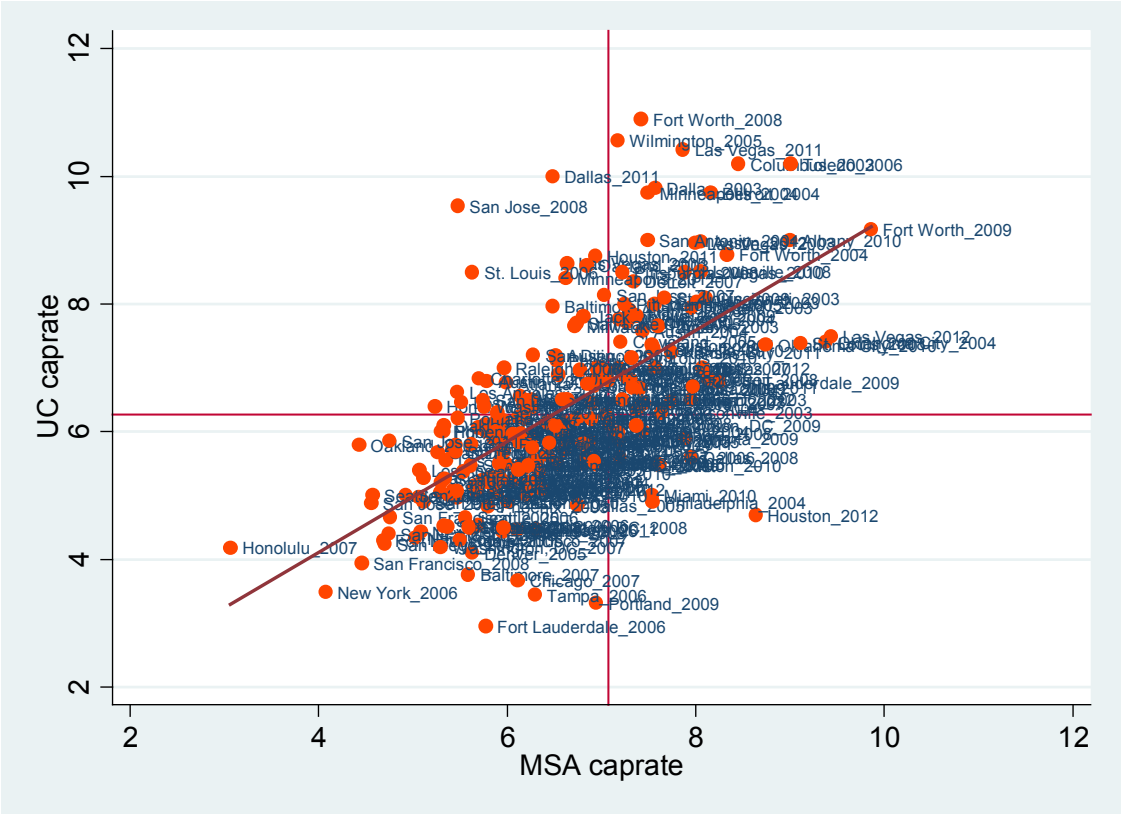
------------------------------------------------------------------------------
             |               Robust
  caprateUC  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  caprateMSA |   1.122697   .0722628    15.54   0.000     .9803124    1.265082
_Imetroarea_2 |   .4914976   .3563738     1.38   0.169    -.2106932    1.193688
_Imetroarea_3 |  -.1463097   .2636521    -0.55   0.579    -.6658039    .3731845
_Imetroarea_4 |  -.0259518   .3408562    -0.08   0.939    -.6975672    .6456636
_Imetroarea_5 |           0  (omitted)
_Imetroarea_6 |  -.4057548   .3111831    -1.30   0.194    -1.018903    .2073934
```

_Imetroarea_7	0	(omitted)				
_Imetroarea_8	-.4074849	.1570947	-2.59	0.010	-.7170206	-.0979492
_Imetroarea_9	-.0493246	.3007744	-0.16	0.870	-.6419636	.5433144
_Imetroarea_10	-.1608175	.134178	-1.20	0.232	-.4251988	.1035639
_Imetroarea_11	-.2885732	.2855008	-1.01	0.313	-.8511174	.273971
_Imetroarea_12	.217117	.6669461	0.33	0.745	-1.097019	1.531252
_Imetroarea_13	0	(omitted)				
_Imetroarea_14	-.8647847	.2190356	-3.95	0.000	-1.296368	-.4332019
_Imetroarea_15	-.4532708	.2497936	-1.81	0.071	-.9454583	.0389168
_Imetroarea_16	0	(omitted)				
_Imetroarea_17	-.5934724	.2426084	-2.45	0.015	-1.071503	-.1154423
_Imetroarea_18	-1.138436	.5367087	-2.12	0.035	-2.195954	-.0809172
_Imetroarea_19	0	(omitted)				
_Imetroarea_20	-.8054004	.198882	-4.05	0.000	-1.197273	-.4135279
_Imetroarea_21	-.0987579	.2428125	-0.41	0.685	-.57719	.3796743
_Imetroarea_22	0	(omitted)				
_Imetroarea_23	0	(omitted)				
_Imetroarea_24	0	(omitted)				
_Imetroarea_25	-.1855371	.1356724	-1.37	0.173	-.4528629	.0817888
_Imetroarea_26	-.3992564	.4790417	-0.83	0.405	-1.343149	.5446364
_Imetroarea_27	-.333542	.1978238	-1.69	0.093	-.7233296	.0562456
_Imetroarea_28	.3060208	.3693059	0.83	0.408	-.4216512	1.033693
_Imetroarea_29	-.7560141	.3003691	-2.52	0.013	-1.347855	-.1641737
_Imetroarea_30	.0858646	.2799271	0.31	0.759	-.4656974	.6374265
_Imetroarea_31	-.4278485	.4207187	-1.02	0.310	-1.256823	.4011261
_Imetroarea_32	0	(omitted)				
_Imetroarea_33	-.8440253	.252916	-3.34	0.001	-1.342365	-.3456854
_Imetroarea_34	-.5525549	.1921262	-2.88	0.004	-.931116	-.1739937
_Imetroarea_35	-.3833212	.1959972	-1.96	0.052	-.7695097	.0028673
_Imetroarea_36	-.2692753	.1727475	-1.56	0.120	-.609653	.0711024
_Imetroarea_37	-.1108505	.3218431	-0.34	0.731	-.7450028	.5233018
_Imetroarea_38	-.4515106	.2470938	-1.83	0.069	-.9383787	.0353575
_Imetroarea_39	-.5093837	.5092231	-1.00	0.318	-1.512745	.4939779
_Imetroarea_40	0	(omitted)				
_Imetroarea_42	0	(omitted)				
_Imetroarea_43	0	(omitted)				
_Imetroarea_44	.1213269	.3496673	0.35	0.729	-.5676496	.8103033
_Imetroarea_45	-.1999286	.2403223	-0.83	0.406	-.6734543	.273597
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	0	(omitted)				
_Imetroarea_48	-.8193949	.4703408	-1.74	0.083	-1.746144	.107354
_Imetroarea_49	-.1501395	.2403547	-0.62	0.533	-.6237289	.32345
_Imetroarea_50	-.1390149	.1898877	-0.73	0.465	-.5131653	.2351356
_Imetroarea_51	-.0194215	.1558965	-0.12	0.901	-.3265965	.2877535
_Imetroarea_52	-.0878776	.1499552	-0.59	0.558	-.383346	.2075908
_Imetroarea_53	.22525	.1420224	1.59	0.114	-.0545877	.5050876
_Imetroarea_54	0	(omitted)				
_Imetroarea_55	0	(omitted)				
_Imetroarea_56	-.0478936	.2119505	-0.23	0.821	-.465516	.3697288
_Imetroarea_57	-.1818137	.2911201	-0.62	0.533	-.7554301	.3918027
_Imetroarea_58	-1.563973	.4686135	-3.34	0.001	-2.487319	-.6406277
_Imetroarea_59	-.2518122	.3227149	-0.78	0.436	-.8876823	.3840579
_Imetroarea_60	-.1398051	.1774763	-0.79	0.432	-.4895003	.2098902
_Imetroarea_61	-1.166158	.673932	-1.73	0.085	-2.494058	.1617425
_Imetroarea_62	.2200387	.258819	0.85	0.396	-.2899325	.7300099
_Imetroarea_63	.2973657	.4472324	0.66	0.507	-.5838508	1.178582
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	-.9130034	.250647	-3.64	0.000	-1.406873	-.4191342
_Imetroarea_66	0	(omitted)				
_Imetroarea_67	0	(omitted)				
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	0	(omitted)				

_Imetroarea_70	-.4121716	.1512125	-2.73	0.007	-.7101172	-.1142259
_Imetroarea_71	0	(omitted)				
_Imetroarea_73	-.4100467	.441364	-0.93	0.354	-1.2797	.459607
_Imetroarea_74	0	(omitted)				
_Imetroarea_75	0	(omitted)				
_Imetroarea_77	0	(omitted)				
_Imetroarea_78	0	(omitted)				
_Imetroarea_79	0	(omitted)				
_Imetroarea_80	0	(omitted)				
_Imetroarea_81	0	(omitted)				
_Imetroarea_82	0	(omitted)				
_Imetroarea_83	0	(omitted)				
_Imetroarea_84	0	(omitted)				
_Imetroarea_85	0	(omitted)				
_Imetroarea_86	0	(omitted)				
_Imetroarea_87	0	(omitted)				
_Imetroarea_88	0	(omitted)				
_Imetroarea_89	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_92	0	(omitted)				
_Imetroarea_93	0	(omitted)				
_Imetroarea_94	0	(omitted)				
_Imetroarea_95	0	(omitted)				
_Imetroarea_96	0	(omitted)				
_Imetroarea_97	0	(omitted)				
_Imetroarea_99	0	(omitted)				
_Imetroarea_100	0	(omitted)				
_Imetroarea_101	0	(omitted)				
_Imetroarea_102	0	(omitted)				
_Imetroarea_103	0	(omitted)				
_Imetroarea_104	0	(omitted)				
_Imetroarea_105	0	(omitted)				
_Imetroarea_106	0	(omitted)				
_Imetroarea_107	0	(omitted)				
_Imetroarea_108	0	(omitted)				
_Imetroarea_111	-.0526333	.1655184	-0.32	0.751	-.3787669	.2735004
_Imetroarea_112	0	(omitted)				
_Imetroarea_113	0	(omitted)				
_Imetroarea_114	0	(omitted)				
_Imetroarea_115	0	(omitted)				
_Imetroarea_116	0	(omitted)				
_Imetroarea_117	0	(omitted)				
_Imetroarea_119	0	(omitted)				
_Imetroarea_121	0	(omitted)				
_Imetroarea_123	0	(omitted)				
_Imetroarea_125	0	(omitted)				
_Imetroarea_126	0	(omitted)				
_Imetroarea_127	0	(omitted)				
_Imetroarea_129	0	(omitted)				
_Imetroarea_130	0	(omitted)				
_Imetroarea_131	0	(omitted)				
_Imetroarea_132	0	(omitted)				
_Imetroarea_135	0	(omitted)				
_Imetroarea_136	0	(omitted)				
_Imetroarea_137	0	(omitted)				
_Imetroarea_141	0	(omitted)				
_Imetroarea_144	0	(omitted)				
_Imetroarea_146	0	(omitted)				
_Imetroarea_149	0	(omitted)				
_Imetroarea_150	0	(omitted)				
_Imetroarea_151	0	(omitted)				
_Imetroarea_153	0	(omitted)				

_Imetroarea_154	0	(omitted)				
_Imetroarea_155	0	(omitted)				
_Imetroarea_156	0	(omitted)				
_Imetroarea_158	0	(omitted)				
_Imetroarea_160	0	(omitted)				
_Imetroarea_161	0	(omitted)				
_Imetroarea_162	0	(omitted)				
_Imetroarea_163	0	(omitted)				
_Imetroarea_164	0	(omitted)				
_Imetroarea_166	0	(omitted)				
_Imetroarea_167	0	(omitted)				
_Imetroarea_168	0	(omitted)				
_Imetroarea_169	0	(omitted)				
_Imetroarea_170	0	(omitted)				
_Imetroarea_171	0	(omitted)				
_Imetroarea_172	0	(omitted)				
_Imetroarea_175	0	(omitted)				
_Imetroarea_176	0	(omitted)				
_Imetroarea_178	0	(omitted)				
_Imetroarea_179	0	(omitted)				
_Imetroarea_180	0	(omitted)				
_Imetroarea_182	0	(omitted)				
_Imetroarea_183	0	(omitted)				
_Imetroarea_184	0	(omitted)				
_Iyear_1988	0	(omitted)				
_Iyear_1989	0	(omitted)				
_Iyear_1990	0	(omitted)				
_Iyear_1991	0	(omitted)				
_Iyear_1992	0	(omitted)				
_Iyear_1993	0	(omitted)				
_Iyear_1994	0	(omitted)				
_Iyear_1995	0	(omitted)				
_Iyear_1996	0	(omitted)				
_Iyear_1997	0	(omitted)				
_Iyear_1998	0	(omitted)				
_Iyear_1999	0	(omitted)				
_Iyear_2000	0	(omitted)				
_Iyear_2001	0	(omitted)				
_Iyear_2002	0	(omitted)				
_Iyear_2003	-.0183619	.2526956	-0.07	0.942	-.5162676	.4795439
_Iyear_2004	-.1657318	.1989744	-0.83	0.406	-.5577864	.2263228
_Iyear_2005	-.2178749	.1739769	-1.25	0.212	-.560675	.1249253
_Iyear_2006	-.1635419	.1708063	-0.96	0.339	-.5000948	.173011
_Iyear_2007	.0621062	.1607396	0.39	0.700	-.2546115	.3788239
_Iyear_2008	-.3227232	.2093558	-1.54	0.125	-.7352332	.0897867
_Iyear_2009	-.4324946	.3738341	-1.16	0.249	-1.169089	.3040996
_Iyear_2010	-.1774088	.21814	-0.81	0.417	-.6072269	.2524094
_Iyear_2011	-.1847387	.1811902	-1.02	0.309	-.5417517	.1722744
_Iyear_2012	0	(omitted)				
_cons	-.627856	.4891322	-1.28	0.201	-1.591631	.3359189

3. Relation of the Cap Rates between UC and MSA : Multifamily



4. Panel Model of Cap Rates between UC and MSA : Multifamily

```
. xi: regress   caprateUC   caprateMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-185   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1990-2012    (naturally coded; _Iyear_1990 omitted)

Linear regression                                 Number of obs =     236
                                                  F( 52,   175) =       .
                                                  Prob > F      =       .
                                                  R-squared     =  0.6292
                                                  Root MSE      =   1.032

------------------------------------------------------------------------------
             |               Robust
     caprateUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------+--------------------------------------------------------------
    caprateMSA |   .5343859   .1370543     3.90   0.000     .2638939     .804878
  _Imetroarea_2 |  -1.011766   .5006135    -2.02   0.045    -1.999783   -.0237488
  _Imetroarea_3 |  -1.368806   .4200897    -3.26   0.001    -2.197901   -.5397119
  _Imetroarea_4 |  -.6154575   .3983137    -1.55   0.124    -1.401574    .1706593
  _Imetroarea_5 |          0  (omitted)
  _Imetroarea_6 |  -1.584802   .9710275    -1.63   0.104    -3.501234    .3316303
  _Imetroarea_7 |          0  (omitted)
```

_Imetroarea_8	-2.141514	.5601579	-3.82	0.000	-3.247048	-1.035979
_Imetroarea_9	-1.327204	.664834	-2.00	0.047	-2.639328	-.015079
_Imetroarea_10	-2.485732	.4511465	-5.51	0.000	-3.37612	-1.595344
_Imetroarea_11	-1.485739	.3596582	-4.13	0.000	-2.195565	-.7759129
_Imetroarea_12	-.5280381	.3081891	-1.71	0.088	-1.136284	.0802077
_Imetroarea_13	0	(omitted)				
_Imetroarea_14	-1.154221	.6440826	-1.79	0.075	-2.42539	.1169487
_Imetroarea_15	-1.207944	.6611388	-1.83	0.069	-2.512775	.0968881
_Imetroarea_16	0	(omitted)				
_Imetroarea_17	-1.975344	.4469348	-4.42	0.000	-2.85742	-1.093268
_Imetroarea_18	-.1542154	.7662966	-0.20	0.841	-1.666588	1.358157
_Imetroarea_19	0	(omitted)				
_Imetroarea_20	-2.516559	.7043877	-3.57	0.000	-3.906747	-1.12637
_Imetroarea_21	-.3268442	.899404	-0.36	0.717	-2.101919	1.448231
_Imetroarea_22	0	(omitted)				
_Imetroarea_23	0	(omitted)				
_Imetroarea_24	0	(omitted)				
_Imetroarea_25	-1.560177	.3707966	-4.21	0.000	-2.291986	-.8283684
_Imetroarea_26	-1.384149	.6376708	-2.17	0.031	-2.642664	-.1256342
_Imetroarea_27	-1.770031	.4958294	-3.57	0.000	-2.748606	-.7914555
_Imetroarea_28	0	(omitted)				
_Imetroarea_29	-1.695077	.7762435	-2.18	0.030	-3.227081	-.1630736
_Imetroarea_30	-1.734429	.3359821	-5.16	0.000	-2.397527	-1.07133
_Imetroarea_31	-.530276	.5266903	-1.01	0.315	-1.569758	.5092065
_Imetroarea_32	0	(omitted)				
_Imetroarea_33	-1.465542	.5237312	-2.80	0.006	-2.499184	-.4318993
_Imetroarea_34	-.6268336	.4056246	-1.55	0.124	-1.427379	.1737121
_Imetroarea_35	-.8004825	.6241369	-1.28	0.201	-2.032287	.4313219
_Imetroarea_36	-2.506141	.5319555	-4.71	0.000	-3.556015	-1.456267
_Imetroarea_37	-.5777633	.4909701	-1.18	0.241	-1.546748	.3912215
_Imetroarea_38	-.6067384	.6207357	-0.98	0.330	-1.83183	.6183533
_Imetroarea_39	-1.924108	.3471903	-5.54	0.000	-2.609327	-1.238889
_Imetroarea_40	0	(omitted)				
_Imetroarea_42	0	(omitted)				
_Imetroarea_43	0	(omitted)				
_Imetroarea_44	-1.408407	.559111	-2.52	0.013	-2.511876	-.3049389
_Imetroarea_45	-1.81423	.2871475	-6.32	0.000	-2.380948	-1.247512
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	0	(omitted)				
_Imetroarea_48	-2.765264	.427109	-6.47	0.000	-3.608212	-1.922316
_Imetroarea_49	-1.904565	.5246577	-3.63	0.000	-2.940036	-.8690937
_Imetroarea_50	-1.703828	.4696866	-3.63	0.000	-2.630807	-.7768484
_Imetroarea_51	.2682203	.3615768	0.74	0.459	-.4453923	.9818328
_Imetroarea_52	-2.327218	.5724937	-4.07	0.000	-3.457098	-1.197337
_Imetroarea_53	-1.471836	.9057904	-1.62	0.106	-3.259515	.3158436
_Imetroarea_54	0	(omitted)				
_Imetroarea_55	0	(omitted)				
_Imetroarea_56	-2.128489	.437686	-4.86	0.000	-2.992311	-1.264666
_Imetroarea_57	-.8705403	.5513765	-1.58	0.116	-1.958744	.2176632
_Imetroarea_58	.4837113	.3313985	1.46	0.146	-.170341	1.137764
_Imetroarea_59	-1.758583	.523111	-3.36	0.001	-2.791002	-.7261648
_Imetroarea_60	-2.186017	.5492328	-3.98	0.000	-3.26999	-1.102044

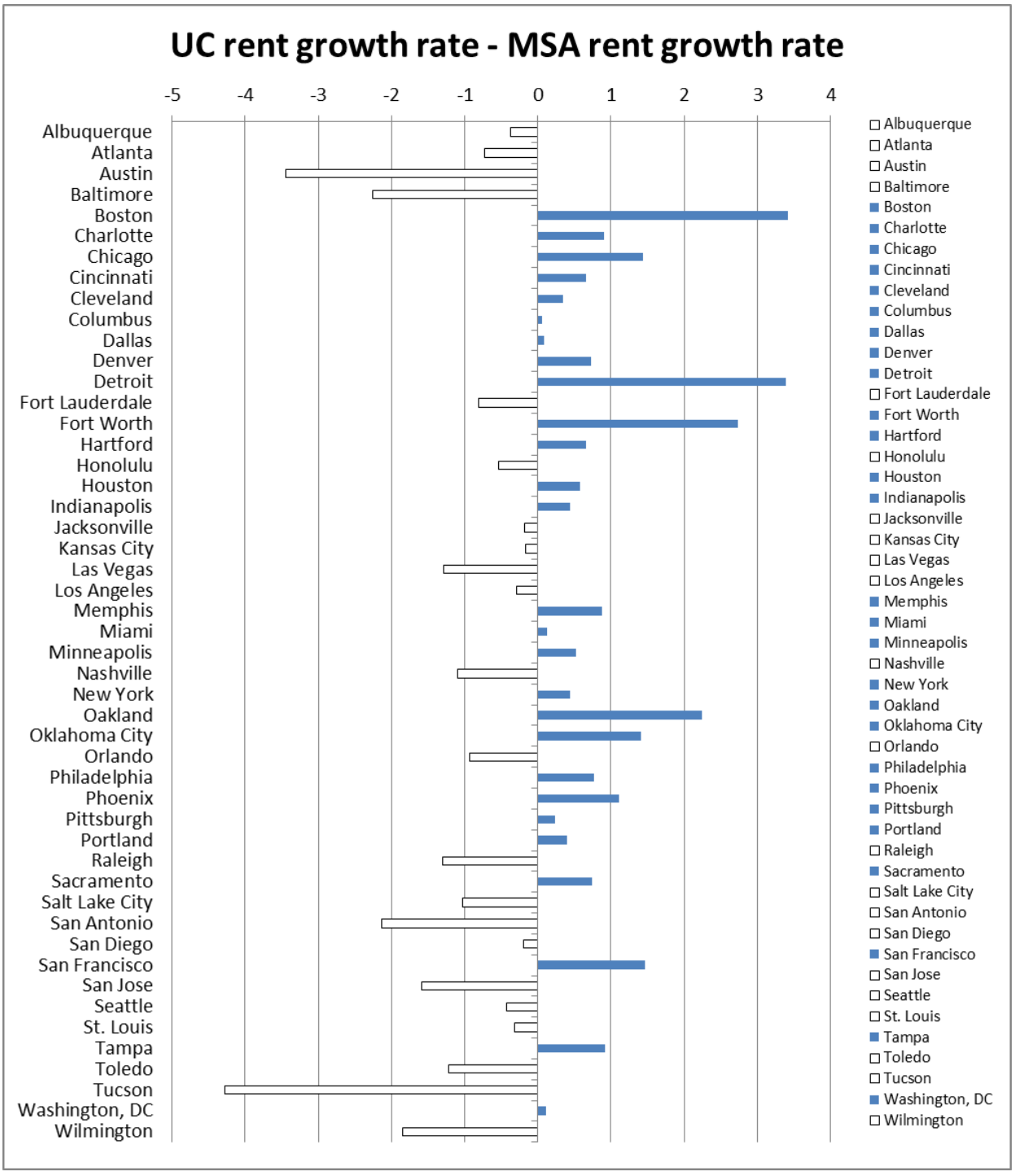
_Imetroarea_61	-.8144468	.8256921	-0.99	0.325	-2.444043	.8151493
_Imetroarea_62	-2.054589	.5051579	-4.07	0.000	-3.051575	-1.057604
_Imetroarea_63	-.7293358	.6377369	-1.14	0.254	-1.987981	.5293098
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	-2.861521	1.008057	-2.84	0.005	-4.851034	-.8720078
_Imetroarea_66	1.302149	.2729892	4.77	0.000	.7633745	1.840924
_Imetroarea_67	-1.946145	.4027281	-4.83	0.000	-2.740974	-1.151316
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	-2.229829	.5019031	-4.44	0.000	-3.220391	-1.239267
_Imetroarea_71	0	(omitted)				
_Imetroarea_73	.7482823	1.587534	0.47	0.638	-2.384894	3.881459
_Imetroarea_74	0	(omitted)				
_Imetroarea_75	0	(omitted)				
_Imetroarea_76	0	(omitted)				
_Imetroarea_77	0	(omitted)				
_Imetroarea_78	0	(omitted)				
_Imetroarea_79	0	(omitted)				
_Imetroarea_80	0	(omitted)				
_Imetroarea_81	0	(omitted)				
_Imetroarea_82	0	(omitted)				
_Imetroarea_83	0	(omitted)				
_Imetroarea_84	0	(omitted)				
_Imetroarea_85	0	(omitted)				
_Imetroarea_86	0	(omitted)				
_Imetroarea_87	0	(omitted)				
_Imetroarea_88	0	(omitted)				
_Imetroarea_89	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_91	0	(omitted)				
_Imetroarea_92	0	(omitted)				
_Imetroarea_93	0	(omitted)				
_Imetroarea_94	0	(omitted)				
_Imetroarea_95	0	(omitted)				
_Imetroarea_96	0	(omitted)				
_Imetroarea_97	0	(omitted)				
_Imetroarea_99	0	(omitted)				
_Imetroarea_100	0	(omitted)				
_Imetroarea_101	0	(omitted)				
_Imetroarea_102	0	(omitted)				
_Imetroarea_103	0	(omitted)				
_Imetroarea_104	0	(omitted)				
_Imetroarea_105	0	(omitted)				
_Imetroarea_106	0	(omitted)				
_Imetroarea_107	0	(omitted)				
_Imetroarea_108	0	(omitted)				
_Imetroarea_111	-2.354639	.4994958	-4.71	0.000	-3.34045	-1.368828
_Imetroarea_112	0	(omitted)				
_Imetroarea_113	0	(omitted)				
_Imetroarea_114	0	(omitted)				
_Imetroarea_115	0	(omitted)				
_Imetroarea_116	0	(omitted)				

_Imetroarea_117	0	(omitted)
_Imetroarea_119	0	(omitted)
_Imetroarea_121	0	(omitted)
_Imetroarea_122	0	(omitted)
_Imetroarea_123	0	(omitted)
_Imetroarea_125	0	(omitted)
_Imetroarea_126	0	(omitted)
_Imetroarea_127	0	(omitted)
_Imetroarea_128	0	(omitted)
_Imetroarea_130	0	(omitted)
_Imetroarea_131	0	(omitted)
_Imetroarea_132	0	(omitted)
_Imetroarea_135	0	(omitted)
_Imetroarea_136	0	(omitted)
_Imetroarea_137	0	(omitted)
_Imetroarea_138	0	(omitted)
_Imetroarea_139	0	(omitted)
_Imetroarea_141	0	(omitted)
_Imetroarea_143	0	(omitted)
_Imetroarea_144	0	(omitted)
_Imetroarea_145	0	(omitted)
_Imetroarea_146	0	(omitted)
_Imetroarea_147	0	(omitted)
_Imetroarea_148	0	(omitted)
_Imetroarea_150	0	(omitted)
_Imetroarea_152	0	(omitted)
_Imetroarea_153	0	(omitted)
_Imetroarea_154	0	(omitted)
_Imetroarea_155	0	(omitted)
_Imetroarea_156	0	(omitted)
_Imetroarea_157	0	(omitted)
_Imetroarea_158	0	(omitted)
_Imetroarea_159	0	(omitted)
_Imetroarea_160	0	(omitted)
_Imetroarea_161	0	(omitted)
_Imetroarea_162	0	(omitted)
_Imetroarea_163	0	(omitted)
_Imetroarea_164	0	(omitted)
_Imetroarea_166	0	(omitted)
_Imetroarea_167	0	(omitted)
_Imetroarea_168	0	(omitted)
_Imetroarea_169	0	(omitted)
_Imetroarea_170	0	(omitted)
_Imetroarea_171	0	(omitted)
_Imetroarea_172	0	(omitted)
_Imetroarea_173	0	(omitted)
_Imetroarea_175	0	(omitted)
_Imetroarea_176	0	(omitted)
_Imetroarea_178	0	(omitted)
_Imetroarea_179	0	(omitted)
_Imetroarea_180	0	(omitted)
_Imetroarea_181	0	(omitted)

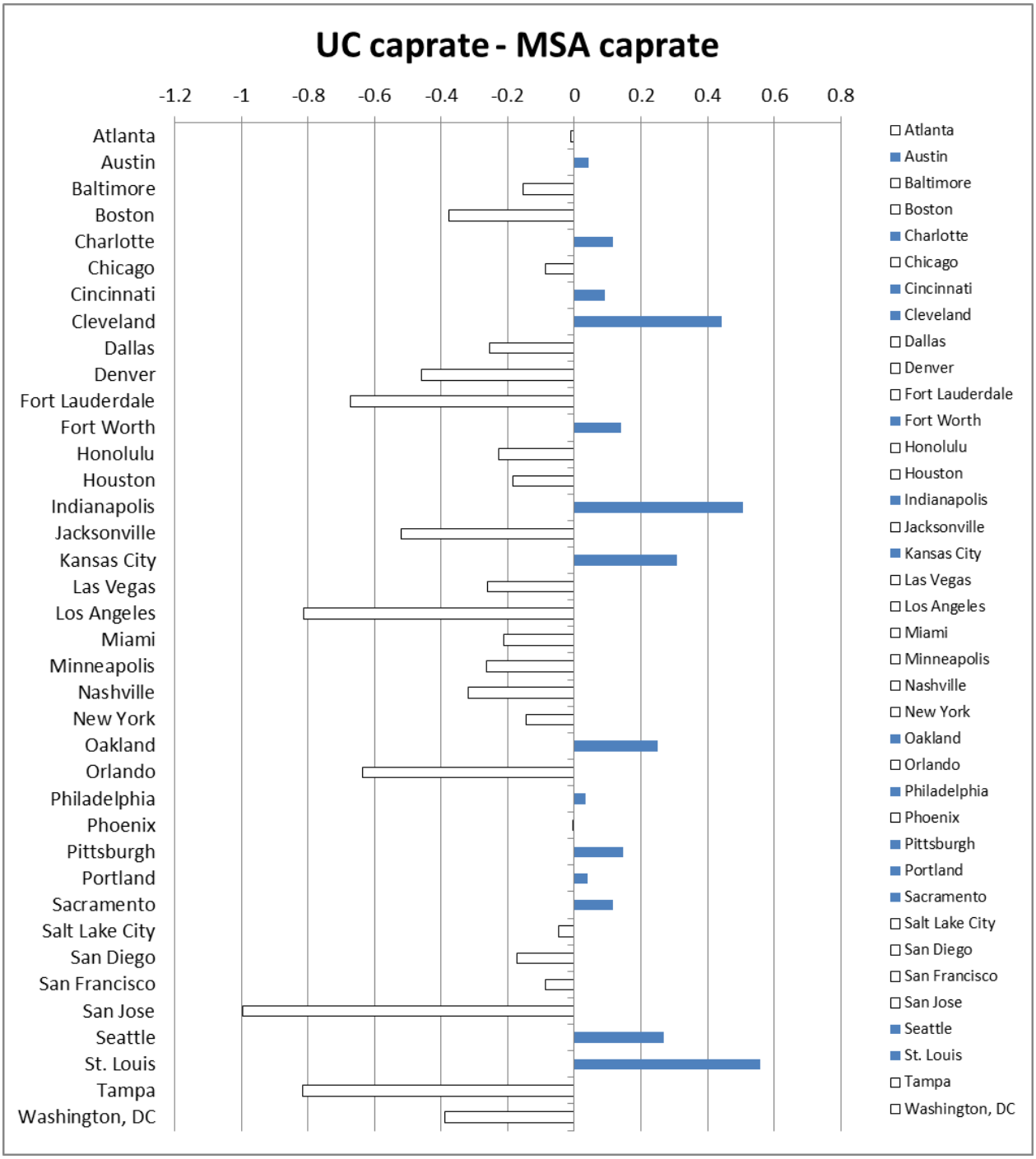
_Imetroarea_183	0	(omitted)				
_Imetroarea_184	0	(omitted)				
_Imetroarea_185	0	(omitted)				
_Iyear_1992	0	(omitted)				
_Iyear_1993	0	(omitted)				
_Iyear_1994	0	(omitted)				
_Iyear_1995	0	(omitted)				
_Iyear_1996	0	(omitted)				
_Iyear_1997	0	(omitted)				
_Iyear_1998	0	(omitted)				
_Iyear_1999	0	(omitted)				
_Iyear_2000	0	(omitted)				
_Iyear_2001	0	(omitted)				
_Iyear_2002	0	(omitted)				
_Iyear_2003	0	(omitted)				
_Iyear_2004	-.7432077	.3467084	-2.14	0.033	-1.427476	-.0589396
_Iyear_2005	-1.169907	.3814233	-3.07	0.003	-1.922689	-.417125
_Iyear_2006	-1.173218	.362183	-3.24	0.001	-1.888027	-.4584088
_Iyear_2007	-1.148503	.3763555	-3.05	0.003	-1.891282	-.4057227
_Iyear_2008	-1.133325	.3614511	-3.14	0.002	-1.84669	-.4199609
_Iyear_2009	-.9751136	.3473587	-2.81	0.006	-1.660665	-.2895621
_Iyear_2010	-1.066686	.3085031	-3.46	0.001	-1.675552	-.4578208
_Iyear_2011	-.5988649	.4050871	-1.48	0.141	-1.39835	.20062
_Iyear_2012	-1.2007	.4096124	-2.93	0.004	-2.009116	-.3922839
_cons	5.257213	1.343993	3.91	0.000	2.604691	7.909735

Appendix _ Chapter 7: Relationship between Demographic and Economic Changes and Investment Performances

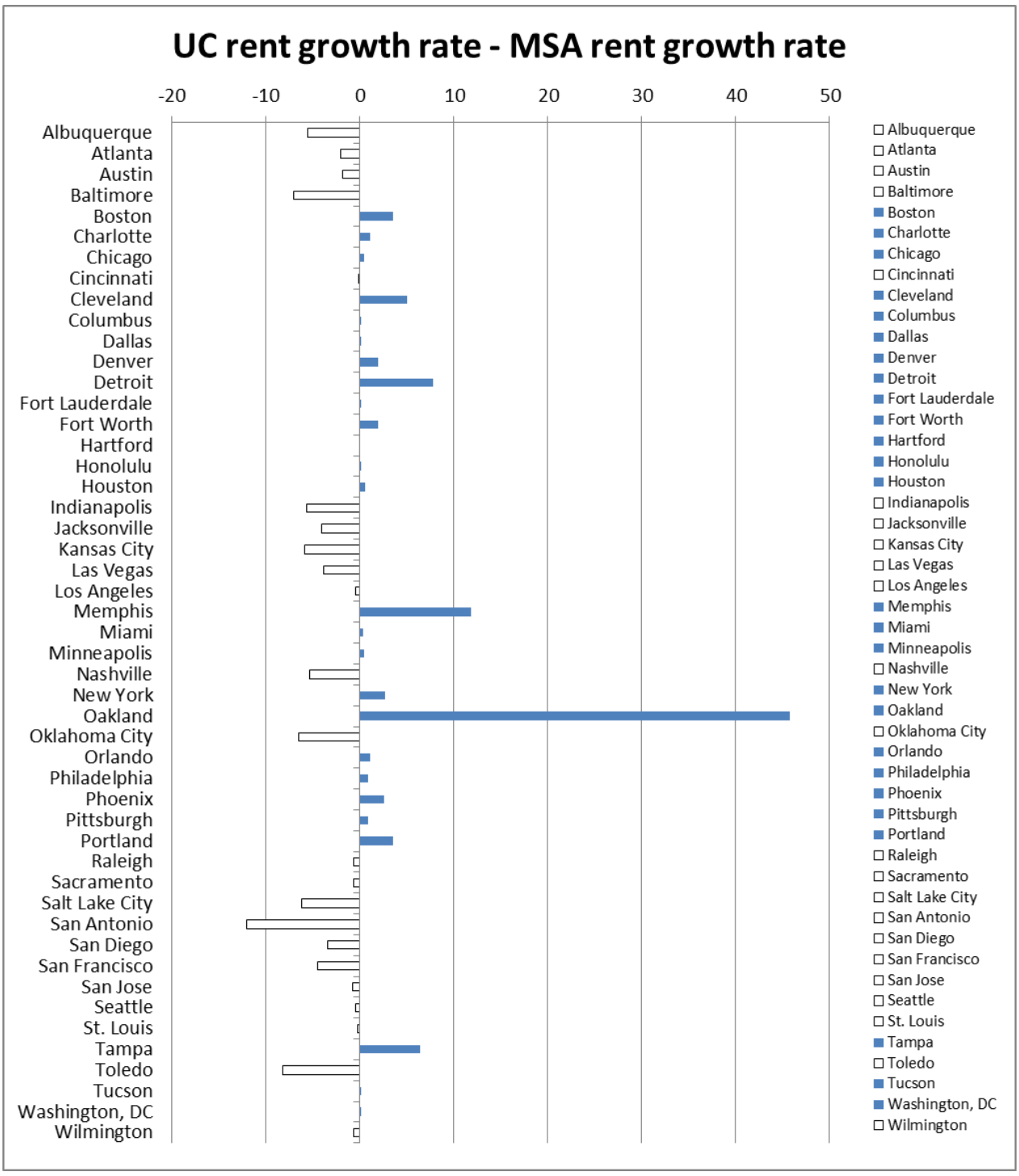
1. Difference in Gross Rental Growth Rates between UC and MSA (average from 2003 to 2012): Office



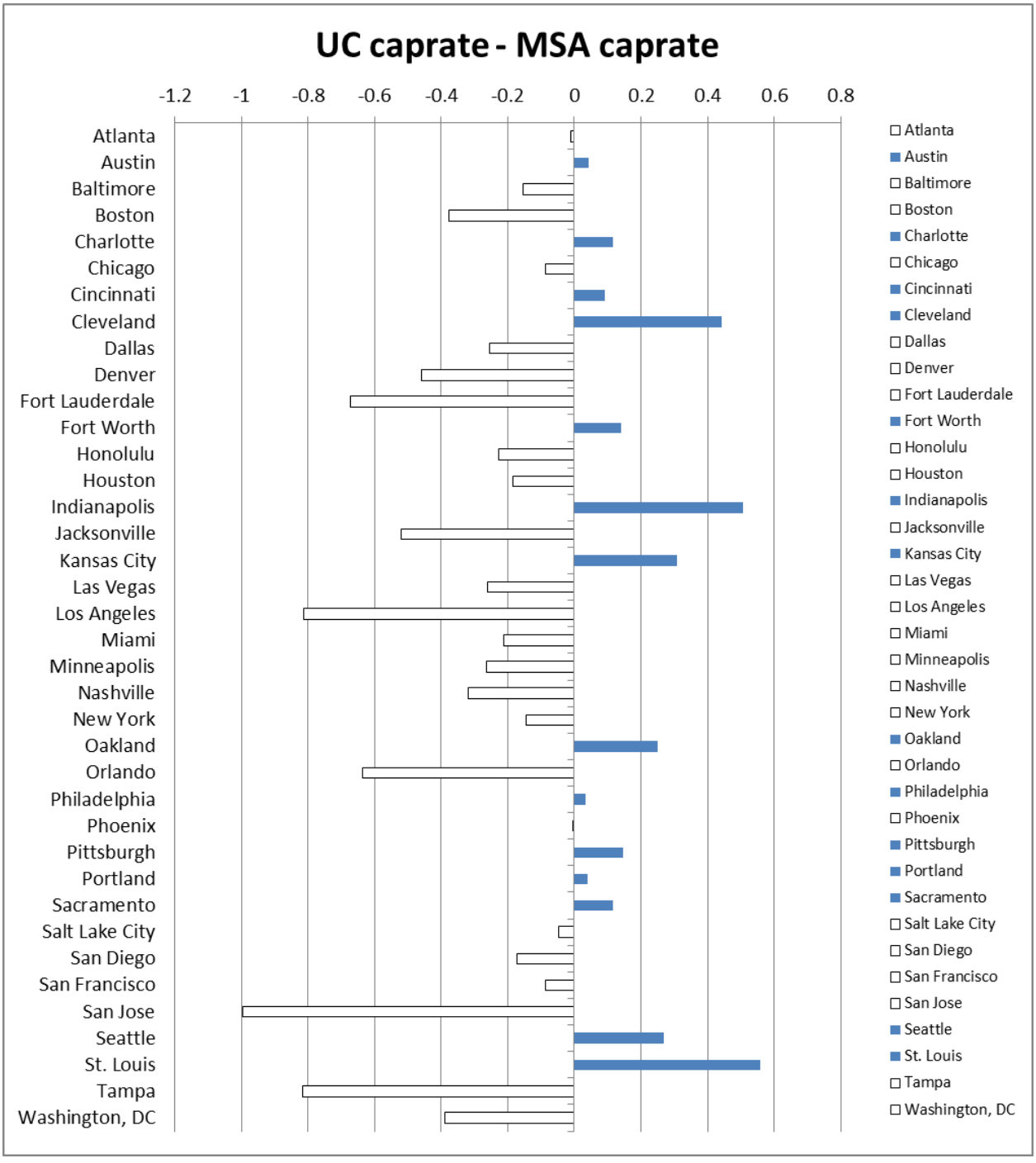
2. Difference in Cap Rates between UC and MSA (average from 2003 to 2012) : Office



3. Difference in Net Rental Growth Rates between UC and MSA(average from 2003 to 2012) : Office



4. Difference in Cap Rates between UC and MSA (average from 2003 to 2012) : Office



5. Panel Model of Economic Gross Rents and Cap Rates of UC : Office

```
. xi: regress caprateUC pct_grth_econ_grossrentUC i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-184   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1987-2012    (naturally coded; _Iyear_1987 omitted)

Linear regression                                 Number of obs =     269
                                                  F( 51,   213) =       .
                                                  Prob > F      =       .
                                                  R-squared     =  0.6137
                                                  Root MSE      =  1.0407

------------------------------------------------------------------------------
                             |               Robust
                  caprateUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------------------+------------------------------------------------------------------
pct_grth_econ_grossrentUC |   .0044934   .0130115     0.35   0.730    -.0211544    .0301413
            _Imetroarea_2 |   1.905056   .3518983     5.41   0.000     1.211407    2.598706
            _Imetroarea_3 |   .1502145    .408854     0.37   0.714    -.6557038    .9561328
            _Imetroarea_4 |   .1898848   .8203332     0.23   0.817    -1.427126    1.806896
            _Imetroarea_5 |           0  (omitted)
            _Imetroarea_6 |   .4596124    .378749     1.21   0.226    -.2869639    1.206189
            _Imetroarea_7 |           0  (omitted)
            _Imetroarea_8 |   -1.11519   .3003077    -3.71   0.000    -1.707145    -.523234
            _Imetroarea_9 |   .2316056   .4394361     0.53   0.599     -.634595    1.097806
           _Imetroarea_10 |  -.3321807   .3027016    -1.10   0.274    -.9288552    .2644939
           _Imetroarea_11 |   1.416944   .6527462     2.17   0.031     .1302744    2.703614
           _Imetroarea_12 |   2.152766   .5091772     4.23   0.000     1.149095    3.156438
           _Imetroarea_13 |           0  (omitted)
           _Imetroarea_14 |   .7650615   .3874207     1.97   0.050     .0013917    1.528731
           _Imetroarea_15 |   .0901422   .3804695     0.24   0.813    -.6598255       .84011
           _Imetroarea_16 |           0  (omitted)
           _Imetroarea_17 |  -.1721537   .3133821    -0.55   0.583    -.7898812    .4455738
           _Imetroarea_18 |   .6480438   .2071919     3.13   0.002     .2396345    1.056453
           _Imetroarea_19 |           0  (omitted)
           _Imetroarea_20 |   -.825378   .2971638    -2.78   0.006    -1.411136   -.2396195
           _Imetroarea_21 |   .8366494   .4979243     1.68   0.094    -.1448411     1.81814
           _Imetroarea_22 |           0  (omitted)
           _Imetroarea_23 |           0  (omitted)
           _Imetroarea_24 |           0  (omitted)
           _Imetroarea_25 |           0  (omitted)
           _Imetroarea_26 |   .3324229   1.216888     0.27   0.785    -2.066263    2.731109
           _Imetroarea_27 |   .1639797   .2564523     0.64   0.523    -.3415298    .6694892
           _Imetroarea_28 |   1.531096   .6820218     2.24   0.026     .1867189    2.875472
           _Imetroarea_29 |   1.278762   .5502239     2.32   0.021     .1941808    2.363344
           _Imetroarea_30 |   .9634791   .5066941     1.90   0.059    -.0352979    1.962256
           _Imetroarea_31 |   .1742207   .6152212     0.28   0.777    -1.038481    1.386923
           _Imetroarea_32 |           0  (omitted)
           _Imetroarea_33 |  -1.417285    .323715    -4.38   0.000    -2.055381   -.7791901
           _Imetroarea_34 |           0  (omitted)
           _Imetroarea_35 |   1.879803   .2269683     8.28   0.000     1.432411    2.327195
           _Imetroarea_36 |   -.687108   .3094437    -2.22   0.027    -1.297072   -.0771438
           _Imetroarea_37 |           0  (omitted)
           _Imetroarea_38 |   .2852402   .2774329     1.03   0.305    -.2616255    .8321058
           _Imetroarea_39 |   1.107739   .3502641     3.16   0.002     .4173111    1.798167
```

_Imetroarea_40	0	(omitted)				
_Imetroarea_42	0	(omitted)				
_Imetroarea_43	0	(omitted)				
_Imetroarea_44	.371139	.3573707	1.04	0.300	-.3332972	1.075575
_Imetroarea_45	0	(omitted)				
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	0	(omitted)				
_Imetroarea_48	-.0128322	.5118061	-0.03	0.980	-1.021686	.9960215
_Imetroarea_49	.6239762	.3222262	1.94	0.054	-.0111845	1.259137
_Imetroarea_50	.1803643	.2538318	0.71	0.478	-.3199797	.6807083
_Imetroarea_51	1.073547	.4846541	2.22	0.028	.1182145	2.02888
_Imetroarea_52	.2865023	.4844086	0.59	0.555	-.6683465	1.241351
_Imetroarea_53	.5252257	.2272826	2.31	0.022	.0772145	.9732369
_Imetroarea_54	0	(omitted)				
_Imetroarea_55	0	(omitted)				
_Imetroarea_56	.4732722	.3033332	1.56	0.120	-.1246473	1.071192
_Imetroarea_57	.7220843	.5548919	1.30	0.195	-.3716985	1.815867
_Imetroarea_58	.9373617	.2280074	4.11	0.000	.4879218	1.386802
_Imetroarea_59	-.4770284	.4100552	-1.16	0.246	-1.285314	.3312577
_Imetroarea_60	-.5913885	.390071	-1.52	0.131	-1.360282	.1775054
_Imetroarea_61	-.2787489	.4703952	-0.59	0.554	-1.205975	.6484771
_Imetroarea_62	-.1472553	.3682781	-0.40	0.690	-.8731918	.5786813
_Imetroarea_63	1.500797	.8325551	1.80	0.073	-.1403056	3.1419
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	-.3126424	.4722537	-0.66	0.509	-1.243532	.618247
_Imetroarea_66	0	(omitted)				
_Imetroarea_67	0	(omitted)				
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	-1.051984	.2178051	-4.83	0.000	-1.481313	-.6226542
_Imetroarea_71	0	(omitted)				
_Imetroarea_73	.603127	1.113154	0.54	0.589	-1.591083	2.797337
_Imetroarea_74	0	(omitted)				
_Imetroarea_75	0	(omitted)				
_Imetroarea_77	0	(omitted)				
_Imetroarea_78	0	(omitted)				
_Imetroarea_79	0	(omitted)				
_Imetroarea_80	0	(omitted)				
_Imetroarea_81	0	(omitted)				
_Imetroarea_82	0	(omitted)				
_Imetroarea_83	0	(omitted)				
_Imetroarea_84	0	(omitted)				
_Imetroarea_85	0	(omitted)				
_Imetroarea_86	0	(omitted)				
_Imetroarea_87	0	(omitted)				
_Imetroarea_88	0	(omitted)				
_Imetroarea_89	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_92	0	(omitted)				
_Imetroarea_93	0	(omitted)				
_Imetroarea_94	0	(omitted)				
_Imetroarea_95	0	(omitted)				
_Imetroarea_96	0	(omitted)				
_Imetroarea_97	0	(omitted)				
_Imetroarea_99	0	(omitted)				
_Imetroarea_100	0	(omitted)				

_Imetroarea_101	0	(omitted)				
_Imetroarea_102	0	(omitted)				
_Imetroarea_103	0	(omitted)				
_Imetroarea_104	0	(omitted)				
_Imetroarea_105	0	(omitted)				
_Imetroarea_106	0	(omitted)				
_Imetroarea_107	0	(omitted)				
_Imetroarea_108	0	(omitted)				
_Imetroarea_111	-1.768241	.2336152	-7.57	0.000	-2.228735	-1.307748
_Iyear_2002	0	(omitted)				
_Iyear_2003	2.713283	.431209	6.29	0.000	1.8633	3.563267
_Iyear_2004	1.614554	.4044857	3.99	0.000	.817247	2.411862
_Iyear_2005	.5712291	.4184039	1.37	0.174	-.2535136	1.395972
_Iyear_2006	.0577382	.4134809	0.14	0.889	-.7573004	.8727769
_Iyear_2007	-.0398041	.4486016	-0.09	0.929	-.9240712	.8444631
_Iyear_2008	.0537437	.4275808	0.13	0.900	-.7890881	.8965755
_Iyear_2009	2.270212	.553309	4.10	0.000	1.179549	3.360875
_Iyear_2010	1.092322	.4559587	2.40	0.017	.1935522	1.991091
_Iyear_2011	.7225168	.4433	1.63	0.105	-.1513001	1.596334
_Iyear_2012	0	(omitted)				
_cons	6.387251	.4115184	15.52	0.000	5.576081	7.198422

6. Panel Model of Economic Gross Rents and Cap Rates of MSA : Office

```
. xi: regress caprateMSA pct_grth_econ_grossrentMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-184   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1987-2012    (naturally coded; _Iyear_1987 omitted)

Linear regression                                 Number of obs =     499
                                                  F( 71,   424) =       .
                                                  Prob > F      =       .
                                                  R-squared     =  0.6118
                                                  Root MSE      =  .78268

------------------------------------------------------------------------------
                             |               Robust
                  caprateMSA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------------------------+------------------------------------------------------------------
pct_grth_econ_grossrentMSA |  -.0258789   .0094063    -2.75   0.006    -.0443678   -.0073901
              _Imetroarea_2 |   .5872122   .3156057     1.86   0.063    -.0331343    1.207559
              _Imetroarea_3 |  -.1218039   .3392826    -0.36   0.720    -.7886893    .5450814
              _Imetroarea_4 |   .1994597   .4325201     0.46   0.645     -.650691     1.04961
              _Imetroarea_5 |          0  (omitted)
              _Imetroarea_6 |   .6775821   .2572989     2.63   0.009     .1718419    1.183322
              _Imetroarea_7 |          0  (omitted)
              _Imetroarea_8 |  -.7789852   .2732422    -2.85   0.005    -1.316063   -.2419072
              _Imetroarea_9 |   .1503268   .2745387     0.55   0.584    -.3892995    .6899531
             _Imetroarea_10 |  -.3740498   .2723261    -1.37   0.170    -.9093271    .1612274
             _Imetroarea_11 |   .8467844    .263608     3.21   0.001     .3286433    1.364926
             _Imetroarea_12 |   1.147285   .4242037     2.70   0.007     .3134812    1.981089
             _Imetroarea_13 |          0  (omitted)
             _Imetroarea_14 |   .4448967   .3363253     1.32   0.187    -.2161758    1.105969
             _Imetroarea_15 |   .2288911    .229643     1.00   0.319    -.2224894    .6802717
```

_Imetroarea_16	2.158012	.7255597	2.97	0.003	.7318705	3.584154
_Imetroarea_17	.3046035	.2579319	1.18	0.238	-.2023809	.8115879
_Imetroarea_18	1.367434	.2361277	5.79	0.000	.9033078	1.831561
_Imetroarea_19	0	(omitted)				
_Imetroarea_20	.3919825	.3732025	1.05	0.294	-.341575	1.12554
_Imetroarea_21	.9673562	.3204445	3.02	0.003	.3374985	1.597214
_Imetroarea_22	0	(omitted)				
_Imetroarea_23	0	(omitted)				
_Imetroarea_24	0	(omitted)				
_Imetroarea_25	1.251022	.5121806	2.44	0.015	.2442929	2.257751
_Imetroarea_26	-.0626041	.4818047	-0.13	0.897	-1.009627	.884419
_Imetroarea_27	.2348912	.2062349	1.14	0.255	-.170479	.6402614
_Imetroarea_28	.9470861	.3391885	2.79	0.005	.2803857	1.613787
_Imetroarea_29	1.395859	.3359552	4.15	0.000	.7355144	2.056205
_Imetroarea_30	.8794773	.4543355	1.94	0.054	-.0135531	1.772508
_Imetroarea_31	.1471422	.2977508	0.49	0.621	-.4381093	.7323937
_Imetroarea_32	-.0678605	.330527	-0.21	0.837	-.717536	.5818151
_Imetroarea_33	-.6952796	.2580878	-2.69	0.007	-1.20257	-.1879887
_Imetroarea_34	-.2483923	.2413933	-1.03	0.304	-.7228688	.2260842
_Imetroarea_35	1.176011	.2597921	4.53	0.000	.6653703	1.686652
_Imetroarea_36	-.5414791	.2570818	-2.11	0.036	-1.046792	-.0361657
_Imetroarea_37	0	(omitted)				
_Imetroarea_38	.5540533	.2247918	2.46	0.014	.1122081	.9958984
_Imetroarea_39	.8873598	.2922732	3.04	0.003	.3128749	1.461845
_Imetroarea_40	0	(omitted)				
_Imetroarea_42	.9056937	.3308951	2.74	0.006	.2552946	1.556093
_Imetroarea_43	-.0305006	.2613322	-0.12	0.907	-.5441686	.4831675
_Imetroarea_44	.0803562	.2429802	0.33	0.741	-.3972396	.5579519
_Imetroarea_45	.5151354	.2628145	1.96	0.051	-.0014462	1.031717
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	-.549364	.2528206	-2.17	0.030	-1.046302	-.0524262
_Imetroarea_48	.2506081	.4299795	0.58	0.560	-.5945487	1.095765
_Imetroarea_49	.6166048	.2832447	2.18	0.030	.0598661	1.173343
_Imetroarea_50	.207972	.2113885	0.98	0.326	-.2075279	.6234719
_Imetroarea_51	.6014075	.3864058	1.56	0.120	-.1581018	1.360917
_Imetroarea_52	-.0253035	.3430036	-0.07	0.941	-.6995026	.6488956
_Imetroarea_53	.5697357	.3259908	1.75	0.081	-.0710236	1.210495
_Imetroarea_54	1.383519	.3619001	3.82	0.000	.6721775	2.094861
_Imetroarea_55	-.0241886	.3100275	-0.08	0.938	-.6335707	.5851936
_Imetroarea_56	.3148066	.2606044	1.21	0.228	-.1974308	.827044
_Imetroarea_57	.6070693	.2674775	2.27	0.024	.0813224	1.132816
_Imetroarea_58	.5468577	.4150475	1.32	0.188	-.2689492	1.362665
_Imetroarea_59	-.3686462	.2412475	-1.53	0.127	-.8428362	.1055437
_Imetroarea_60	-.464637	.3692393	-1.26	0.209	-1.190404	.2611304
_Imetroarea_61	-.0166095	.3859541	-0.04	0.966	-.7752312	.7420122
_Imetroarea_62	-.4939777	.3472198	-1.42	0.156	-1.176464	.1885088
_Imetroarea_63	1.076599	.3299252	3.26	0.001	.4281063	1.725091
_Imetroarea_64	-.1747312	.3304868	-0.53	0.597	-.8243277	.4748653
_Imetroarea_65	.5258086	.2928114	1.80	0.073	-.0497341	1.101351
_Imetroarea_66	1.548609	.3228432	4.80	0.000	.9140369	2.183182
_Imetroarea_67	.2839257	.292906	0.97	0.333	-.291803	.8596543
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	-.5782648	.2971224	-1.95	0.052	-1.162281	.0057515
_Imetroarea_70	-.7394444	.2616892	-2.83	0.005	-1.253814	-.2250747
_Imetroarea_71	.5028857	.4322362	1.16	0.245	-.3467068	1.352478
_Imetroarea_73	.7255797	.7103758	1.02	0.308	-.670717	2.121876

_Imetroarea_74	0	(omitted)				
_Imetroarea_75	0	(omitted)				
_Imetroarea_77	0	(omitted)				
_Imetroarea_78	0	(omitted)				
_Imetroarea_79	0	(omitted)				
_Imetroarea_80	0	(omitted)				
_Imetroarea_81	0	(omitted)				
_Imetroarea_82	0	(omitted)				
_Imetroarea_83	0	(omitted)				
_Imetroarea_84	0	(omitted)				
_Imetroarea_85	0	(omitted)				
_Imetroarea_86	0	(omitted)				
_Imetroarea_87	0	(omitted)				
_Imetroarea_88	0	(omitted)				
_Imetroarea_89	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_92	0	(omitted)				
_Imetroarea_93	0	(omitted)				
_Imetroarea_94	0	(omitted)				
_Imetroarea_95	0	(omitted)				
_Imetroarea_96	0	(omitted)				
_Imetroarea_97	0	(omitted)				
_Imetroarea_99	.3660544	.3641373	1.01	0.315	-.3496848	1.081793
_Imetroarea_100	0	(omitted)				
_Imetroarea_101	0	(omitted)				
_Imetroarea_102	0	(omitted)				
_Imetroarea_103	0	(omitted)				
_Imetroarea_104	0	(omitted)				
_Imetroarea_105	0	(omitted)				
_Imetroarea_106	0	(omitted)				
_Imetroarea_107	0	(omitted)				
_Imetroarea_108	0	(omitted)				
_Imetroarea_111	-1.662055	.242358	-6.86	0.000	-2.138428	-1.185682
_Imetroarea_112	.188121	.3571613	0.53	0.599	-.5139062	.8901481
_Imetroarea_113	1.49423	.2489024	6.00	0.000	1.004994	1.983467
_Imetroarea_114	0	(omitted)				
_Imetroarea_115	0	(omitted)				
_Imetroarea_116	0	(omitted)				
_Imetroarea_117	0	(omitted)				
_Imetroarea_119	0	(omitted)				
_Imetroarea_121	0	(omitted)				
_Imetroarea_123	0	(omitted)				
_Imetroarea_125	0	(omitted)				
_Imetroarea_126	0	(omitted)				
_Imetroarea_127	0	(omitted)				
_Imetroarea_129	0	(omitted)				
_Imetroarea_130	0	(omitted)				
_Imetroarea_131	0	(omitted)				
_Imetroarea_132	0	(omitted)				
_Imetroarea_135	0	(omitted)				
_Imetroarea_136	0	(omitted)				
_Imetroarea_137	0	(omitted)				
_Imetroarea_141	0	(omitted)				
_Imetroarea_144	0	(omitted)				
_Imetroarea_146	0	(omitted)				
_Imetroarea_149	0	(omitted)				

_Imetroarea_150	0	(omitted)				
_Imetroarea_151	0	(omitted)				
_Imetroarea_153	0	(omitted)				
_Imetroarea_154	0	(omitted)				
_Imetroarea_155	0	(omitted)				
_Imetroarea_156	0	(omitted)				
_Imetroarea_158	0	(omitted)				
_Imetroarea_160	0	(omitted)				
_Imetroarea_161	0	(omitted)				
_Imetroarea_162	0	(omitted)				
_Imetroarea_163	0	(omitted)				
_Imetroarea_164	0	(omitted)				
_Imetroarea_166	0	(omitted)				
_Imetroarea_167	0	(omitted)				
_Imetroarea_168	0	(omitted)				
_Imetroarea_169	0	(omitted)				
_Imetroarea_170	.0262748	.2445404	0.11	0.914	-.4543876	.5069372
_Imetroarea_171	0	(omitted)				
_Imetroarea_172	0	(omitted)				
_Imetroarea_175	0	(omitted)				
_Imetroarea_176	0	(omitted)				
_Imetroarea_178	0	(omitted)				
_Imetroarea_179	0	(omitted)				
_Imetroarea_180	0	(omitted)				
_Imetroarea_182	0	(omitted)				
_Imetroarea_183	0	(omitted)				
_Imetroarea_184	0	(omitted)				
_Iyear_2002	0	(omitted)				
_Iyear_2003	.5798299	.2002709	2.90	0.004	.1861825	.9734773
_Iyear_2004	-.0370252	.2196482	-0.17	0.866	-.4687601	.3947097
_Iyear_2005	-.6606076	.2266902	-2.91	0.004	-1.106184	-.2150311
_Iyear_2006	-1.121394	.2247576	-4.99	0.000	-1.563172	-.6796164
_Iyear_2007	-1.492977	.24321	-6.14	0.000	-1.971024	-1.014929
_Iyear_2008	-1.049832	.2077926	-5.05	0.000	-1.458263	-.6413998
_Iyear_2009	0	(omitted)				
_Iyear_2010	-.5184947	.2112783	-2.45	0.015	-.933778	-.1032114
_Iyear_2011	-.6806801	.212833	-3.20	0.001	-1.099019	-.262341
_Iyear_2012	-.8903634	.2442462	-3.65	0.000	-1.370448	-.4102792
_cons	8.014089	.2849854	28.12	0.000	7.453929	8.574249

7. Panel Model of Economic Net Rents and Cap Rates of UC : Office

```
. xi: regress caprateUC pct_grth_econ_netrentUC i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-184   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1987-2012    (naturally coded; _Iyear_1987 omitted)

Linear regression                               Number of obs =     195
                                                F( 46,   142) =       .
                                                Prob > F      =       .
                                                R-squared     =  0.6106
                                                Root MSE      =  1.1174
```

caprateUC	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
pct_grth_econ_netrentUC	.0046409	.0111117	0.42	0.677	-.0173248	.0266066
_Imetroarea_2	-.4350557	.5048366	-0.86	0.390	-1.433022	.5629109
_Imetroarea_3	-1.600304	.5807279	-2.76	0.007	-2.748293	-.4523144
_Imetroarea_4	-1.642359	.9080803	-1.81	0.073	-3.437462	.1527443
_Imetroarea_5	0	(omitted)				
_Imetroarea_6	0	(omitted)				
_Imetroarea_7	0	(omitted)				
_Imetroarea_8	-2.737767	.5041126	-5.43	0.000	-3.734302	-1.741232
_Imetroarea_9	-1.384974	.6777701	-2.04	0.043	-2.724798	-.0451511
_Imetroarea_10	-2.125336	.4612852	-4.61	0.000	-3.03721	-1.213463
_Imetroarea_11	-.2091383	.7278623	-0.29	0.774	-1.647984	1.229708
_Imetroarea_12	.2846053	.6047932	0.47	0.639	-.9109566	1.480167
_Imetroarea_13	0	(omitted)				
_Imetroarea_14	-.9148561	.5520461	-1.66	0.100	-2.006147	.1764347
_Imetroarea_15	-1.639928	.540809	-3.03	0.003	-2.709005	-.5708504
_Imetroarea_16	0	(omitted)				
_Imetroarea_17	-1.996708	.4133484	-4.83	0.000	-2.81382	-1.179596
_Imetroarea_18	-1.029059	.2758426	-3.73	0.000	-1.574348	-.4837705
_Imetroarea_19	0	(omitted)				
_Imetroarea_20	-2.564858	.4477021	-5.73	0.000	-3.44988	-1.679835
_Imetroarea_21	-.9133609	.6962869	-1.31	0.192	-2.289788	.4630667
_Imetroarea_22	0	(omitted)				
_Imetroarea_23	0	(omitted)				
_Imetroarea_24	0	(omitted)				
_Imetroarea_25	0	(omitted)				
_Imetroarea_26	-1.77847	1.077184	-1.65	0.101	-3.907859	.3509197
_Imetroarea_27	-1.649094	.4325301	-3.81	0.000	-2.504124	-.7940637
_Imetroarea_28	1.180656	.496984	2.38	0.019	.1982121	2.163099
_Imetroarea_29	-.5511439	.6763058	-0.81	0.416	-1.888073	.7857848
_Imetroarea_30	-1.385864	.6867661	-2.02	0.045	-2.74347	-.0282568
_Imetroarea_31	-.9763883	.8099817	-1.21	0.230	-2.577569	.6247925
_Imetroarea_32	0	(omitted)				
_Imetroarea_33	-3.2212	.4707566	-6.84	0.000	-4.151797	-2.290603
_Imetroarea_34	0	(omitted)				
_Imetroarea_35	.1072876	.5541745	0.19	0.847	-.9882107	1.202786
_Imetroarea_36	-2.212593	.8186233	-2.70	0.008	-3.830857	-.5943295
_Imetroarea_37	0	(omitted)				
_Imetroarea_38	-1.476391	.432227	-3.42	0.001	-2.330823	-.6219604
_Imetroarea_39	-.9767824	.4748087	-2.06	0.041	-1.91539	-.0381753
_Imetroarea_40	0	(omitted)				
_Imetroarea_42	0	(omitted)				
_Imetroarea_43	0	(omitted)				
_Imetroarea_44	0	(omitted)				
_Imetroarea_45	0	(omitted)				
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	0	(omitted)				
_Imetroarea_48	-1.690956	1.052702	-1.61	0.110	-3.77195	.390037
_Imetroarea_49	-1.12522	.4929353	-2.28	0.024	-2.09966	-.1507798
_Imetroarea_50	-1.220478	.6547498	-1.86	0.064	-2.514795	.0738382
_Imetroarea_51	-.7108518	.7342735	-0.97	0.335	-2.162372	.7406682
_Imetroarea_52	-1.322261	.7730769	-1.71	0.089	-2.850488	.2059661
_Imetroarea_53	0	(omitted)				
_Imetroarea_54	0	(omitted)				

_Imetroarea_55	0	(omitted)				
_Imetroarea_56	-.7881961	.4543404	-1.73	0.085	-1.686341	.109949
_Imetroarea_57	-1.255883	.7867286	-1.60	0.113	-2.811096	.2993313
_Imetroarea_58	-.8848723	.4863773	-1.82	0.071	-1.846348	.0766037
_Imetroarea_59	-2.309257	.5800746	-3.98	0.000	-3.455955	-1.162559
_Imetroarea_60	-2.91286	.4042329	-7.21	0.000	-3.711952	-2.113768
_Imetroarea_61	-1.75553	.4954091	-3.54	0.001	-2.73486	-.7761995
_Imetroarea_62	-2.055376	.5523553	-3.72	0.000	-3.147278	-.9634735
_Imetroarea_63	-.2848018	.8771592	-0.32	0.746	-2.01878	1.449176
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	-1.888817	1.241097	-1.52	0.130	-4.342232	.5645968
_Imetroarea_66	0	(omitted)				
_Imetroarea_67	0	(omitted)				
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	-2.851156	.3935107	-7.25	0.000	-3.629053	-2.07326
_Imetroarea_71	0	(omitted)				
_Imetroarea_73	-1.177443	1.204134	-0.98	0.330	-3.557789	1.202904
_Imetroarea_74	0	(omitted)				
_Imetroarea_75	0	(omitted)				
_Imetroarea_77	0	(omitted)				
_Imetroarea_78	0	(omitted)				
_Imetroarea_79	0	(omitted)				
_Imetroarea_80	0	(omitted)				
_Imetroarea_81	0	(omitted)				
_Imetroarea_82	0	(omitted)				
_Imetroarea_83	0	(omitted)				
_Imetroarea_84	0	(omitted)				
_Imetroarea_85	0	(omitted)				
_Imetroarea_86	0	(omitted)				
_Imetroarea_87	0	(omitted)				
_Imetroarea_88	0	(omitted)				
_Imetroarea_89	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_92	0	(omitted)				
_Imetroarea_93	0	(omitted)				
_Imetroarea_94	0	(omitted)				
_Imetroarea_95	0	(omitted)				
_Imetroarea_96	0	(omitted)				
_Imetroarea_97	0	(omitted)				
_Imetroarea_99	0	(omitted)				
_Imetroarea_100	0	(omitted)				
_Imetroarea_101	0	(omitted)				
_Imetroarea_102	0	(omitted)				
_Imetroarea_103	0	(omitted)				
_Imetroarea_104	0	(omitted)				
_Imetroarea_105	0	(omitted)				
_Imetroarea_106	0	(omitted)				
_Imetroarea_107	0	(omitted)				
_Imetroarea_108	0	(omitted)				
_Imetroarea_111	-3.452691	.4362943	-7.91	0.000	-4.315163	-2.59022
_Iyear_2002	0	(omitted)				
_Iyear_2003	2.698774	.5478042	4.93	0.000	1.615869	3.78168
_Iyear_2004	1.530084	.5250477	2.91	0.004	.4921644	2.568004
_Iyear_2005	.8922822	.5311009	1.68	0.095	-.1576039	1.942168
_Iyear_2006	-.0222719	.5038807	-0.04	0.965	-1.018349	.9738051

_Iyear_2007	.0992146	.554946	0.18	0.858	-.9978087	1.196238
_Iyear_2008	.3623323	.5456619	0.66	0.508	-.7163381	1.441003
_Iyear_2009	2.821202	.6145846	4.59	0.000	1.606285	4.03612
_Iyear_2010	1.22787	.5434597	2.26	0.025	.1535524	2.302187
_Iyear_2011	.741978	.5259099	1.41	0.160	-.2976466	1.781603
_Iyear_2012	0	(omitted)				
_cons	8.053977	.6100397	13.20	0.000	6.848044	9.25991

8. Panel Model of Economic Net Rents and Cap Rates of MSA : Office

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. xi: regress caprateMSA pct_grth_econ_netrentMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-184   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1987-2012    (naturally coded; _Iyear_1987 omitted)

Linear regression                                 Number of obs =     455
                                                  F( 70,   381) =       .
                                                  Prob > F      =       .
                                                  R-squared     =  0.6077
                                                  Root MSE      =  .78829
```

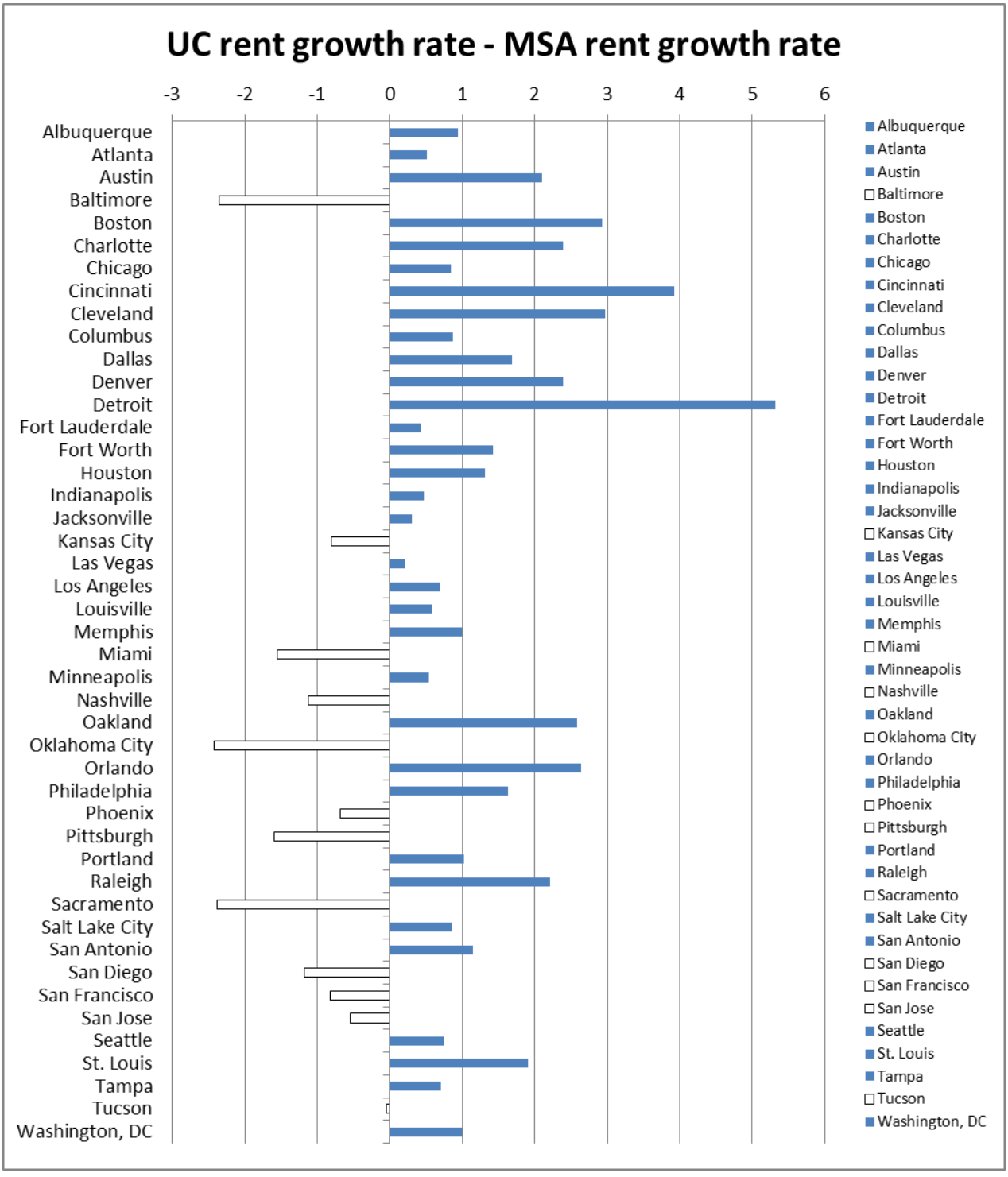
caprateMSA	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
pct_grth_econ_netrentMSA	-.0094628	.0048895	-1.94	0.054	-.0190767	.000151
_Imetroarea_2	-1.35045	.3237166	-4.17	0.000	-1.986945	-.7139555
_Imetroarea_3	-1.893875	.3433614	-5.52	0.000	-2.568996	-1.218754
_Imetroarea_4	-1.53367	.4243565	-3.61	0.000	-2.368044	-.6992962
_Imetroarea_5	0	(omitted)				
_Imetroarea_6	-1.107942	.2396989	-4.62	0.000	-1.579241	-.6366441
_Imetroarea_7	0	(omitted)				
_Imetroarea_8	-2.54329	.3053795	-8.33	0.000	-3.14373	-1.942849
_Imetroarea_9	-1.690138	.3000049	-5.63	0.000	-2.280011	-1.100266
_Imetroarea_10	-2.15459	.2662973	-8.09	0.000	-2.678186	-1.630993
_Imetroarea_11	-.8691454	.3064093	-2.84	0.005	-1.47161	-.2666804
_Imetroarea_12	-.6270114	.406497	-1.54	0.124	-1.42627	.1722471
_Imetroarea_13	0	(omitted)				
_Imetroarea_14	-1.349521	.377465	-3.58	0.000	-2.091696	-.6073455
_Imetroarea_15	-1.515537	.23708	-6.39	0.000	-1.981686	-1.049388
_Imetroarea_16	-.9546112	.2000306	-4.77	0.000	-1.347913	-.5613091
_Imetroarea_17	-1.491055	.2446832	-6.09	0.000	-1.972153	-1.009956
_Imetroarea_18	-.3639434	.2856663	-1.27	0.203	-.9256234	.1977365
_Imetroarea_19	0	(omitted)				
_Imetroarea_20	-1.391341	.3772519	-3.69	0.000	-2.133097	-.6495842
_Imetroarea_21	-.7705083	.3182781	-2.42	0.016	-1.39631	-.1447067
_Imetroarea_22	0	(omitted)				
_Imetroarea_23	0	(omitted)				
_Imetroarea_24	0	(omitted)				
_Imetroarea_25	0	(omitted)				
_Imetroarea_26	-1.785902	.4752303	-3.76	0.000	-2.720304	-.8514992
_Imetroarea_27	-1.521442	.1858824	-8.18	0.000	-1.886926	-1.155958
_Imetroarea_28	-.7989444	.3489096	-2.29	0.023	-1.484974	-.1129149

_Imetroarea_29	-.3549632	.378157	-0.94	0.348	-1.098499	.3885728
_Imetroarea_30	-.8788605	.5162643	-1.70	0.090	-1.893945	.1362235
_Imetroarea_31	-1.649367	.2997547	-5.50	0.000	-2.238748	-1.059986
_Imetroarea_32	-1.62282	.3159958	-5.14	0.000	-2.244134	-1.001506
_Imetroarea_33	-2.485178	.2293031	-10.84	0.000	-2.936036	-2.03432
_Imetroarea_34	-2.192313	.2242471	-9.78	0.000	-2.63323	-1.751396
_Imetroarea_35	-.642183	.293866	-2.19	0.029	-1.219985	-.0643808
_Imetroarea_36	-2.353644	.2461506	-9.56	0.000	-2.837628	-1.869661
_Imetroarea_37	0	(omitted)				
_Imetroarea_38	-1.284058	.2231766	-5.75	0.000	-1.72287	-.8452456
_Imetroarea_39	-.8611924	.2969959	-2.90	0.004	-1.445149	-.2772361
_Imetroarea_40	0	(omitted)				
_Imetroarea_42	-.8578434	.3599178	-2.38	0.018	-1.565517	-.1501694
_Imetroarea_43	-1.787573	.2801886	-6.38	0.000	-2.338482	-1.236663
_Imetroarea_44	-1.626981	.2311181	-7.04	0.000	-2.081408	-1.172555
_Imetroarea_45	-1.305853	.3019444	-4.32	0.000	-1.899539	-.7121672
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	-2.395615	.2680416	-8.94	0.000	-2.922641	-1.868589
_Imetroarea_48	-1.810621	.4544166	-3.98	0.000	-2.7041	-.9171427
_Imetroarea_49	-1.169986	.2886613	-4.05	0.000	-1.737554	-.6024169
_Imetroarea_50	-1.565148	.2061889	-7.59	0.000	-1.970559	-1.159738
_Imetroarea_51	-1.16921	.4026101	-2.90	0.004	-1.960826	-.3775943
_Imetroarea_52	-1.577952	.3910097	-4.04	0.000	-2.346759	-.8091446
_Imetroarea_53	-1.24798	.3317363	-3.76	0.000	-1.900243	-.5957171
_Imetroarea_54	-.3883175	.4464894	-0.87	0.385	-1.266209	.4895744
_Imetroarea_55	-1.662115	.2622561	-6.34	0.000	-2.177766	-1.146465
_Imetroarea_56	-1.44447	.2586634	-5.58	0.000	-1.953057	-.9358836
_Imetroarea_57	-1.180565	.2537664	-4.65	0.000	-1.679523	-.6816065
_Imetroarea_58	-1.671996	.460895	-3.63	0.000	-2.578212	-.7657797
_Imetroarea_59	-2.155765	.2646071	-8.15	0.000	-2.676038	-1.635492
_Imetroarea_60	-2.095452	.4113026	-5.09	0.000	-2.90416	-1.286745
_Imetroarea_61	-1.794965	.4466699	-4.02	0.000	-2.673212	-.9167184
_Imetroarea_62	-2.306659	.3276286	-7.04	0.000	-2.950845	-1.662472
_Imetroarea_63	-.5910222	.4026537	-1.47	0.143	-1.382724	.2006794
_Imetroarea_64	-2.052376	.3993586	-5.14	0.000	-2.837599	-1.267153
_Imetroarea_65	-1.310833	.3095673	-4.23	0.000	-1.919507	-.7021582
_Imetroarea_66	-.2460953	.3565333	-0.69	0.490	-.9471146	.4549239
_Imetroarea_67	-1.525614	.3051572	-5.00	0.000	-2.125617	-.9256108
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	-2.562211	.2696335	-9.50	0.000	-3.092367	-2.032055
_Imetroarea_71	-1.277096	.4640355	-2.75	0.006	-2.189487	-.3647047
_Imetroarea_73	-1.09362	.7416305	-1.47	0.141	-2.551822	.364581
_Imetroarea_74	0	(omitted)				
_Imetroarea_75	0	(omitted)				
_Imetroarea_77	0	(omitted)				
_Imetroarea_78	0	(omitted)				
_Imetroarea_79	0	(omitted)				
_Imetroarea_80	0	(omitted)				
_Imetroarea_81	0	(omitted)				
_Imetroarea_82	0	(omitted)				
_Imetroarea_83	0	(omitted)				
_Imetroarea_84	0	(omitted)				
_Imetroarea_85	0	(omitted)				
_Imetroarea_86	0	(omitted)				

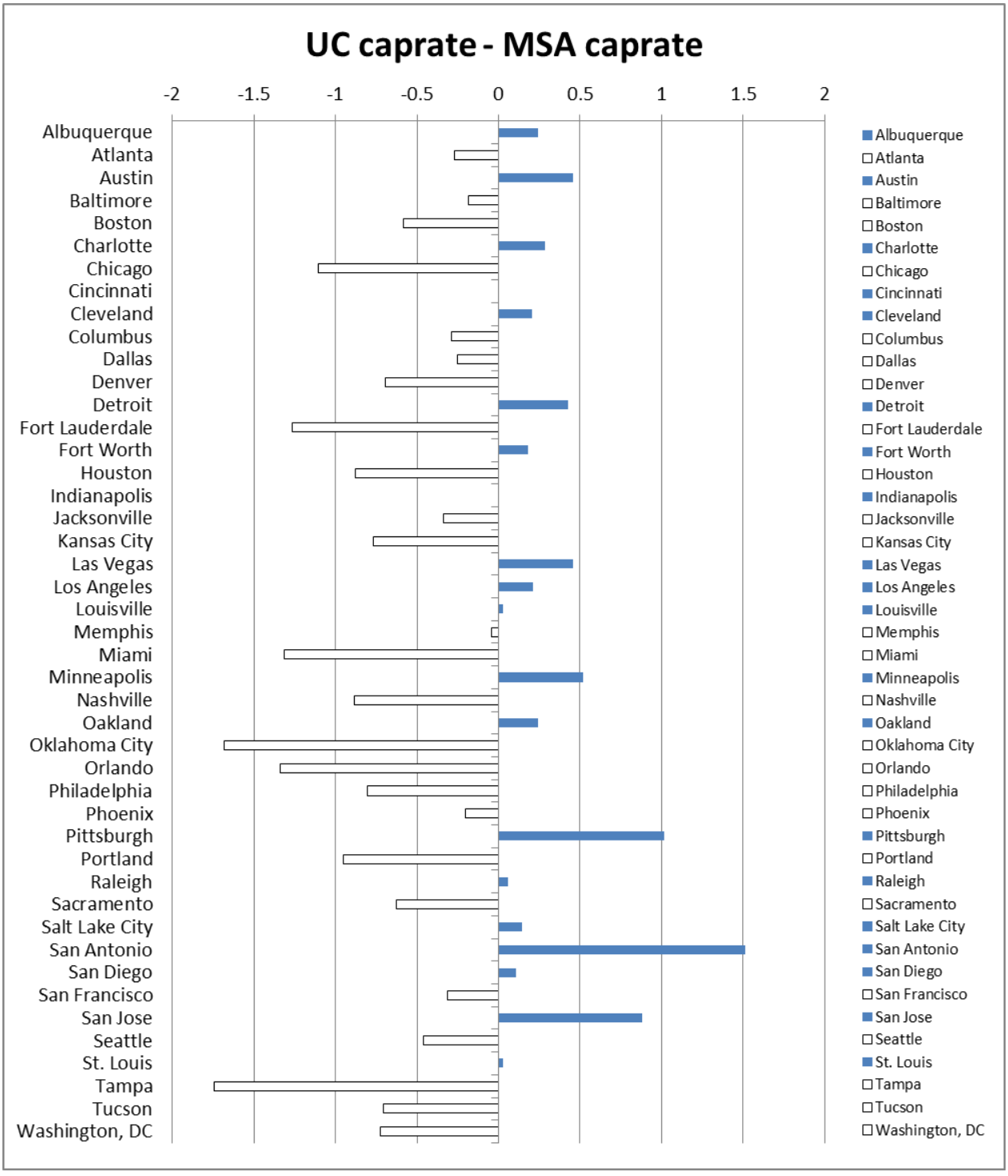
_Imetroarea_87	0	(omitted)				
_Imetroarea_88	0	(omitted)				
_Imetroarea_89	0	(omitted)				
_Imetroarea_90	0	(omitted)				
_Imetroarea_92	0	(omitted)				
_Imetroarea_93	0	(omitted)				
_Imetroarea_94	0	(omitted)				
_Imetroarea_95	0	(omitted)				
_Imetroarea_96	0	(omitted)				
_Imetroarea_97	0	(omitted)				
_Imetroarea_99	-.9763126	.2237416	-4.36	0.000	-1.416236	-.5363897
_Imetroarea_100	0	(omitted)				
_Imetroarea_101	0	(omitted)				
_Imetroarea_102	0	(omitted)				
_Imetroarea_103	0	(omitted)				
_Imetroarea_104	0	(omitted)				
_Imetroarea_105	0	(omitted)				
_Imetroarea_106	0	(omitted)				
_Imetroarea_107	0	(omitted)				
_Imetroarea_108	0	(omitted)				
_Imetroarea_111	-3.562863	.2206633	-16.15	0.000	-3.996733	-3.128993
_Imetroarea_112	-1.675328	.3527601	-4.75	0.000	-2.368929	-.9817282
_Imetroarea_113	-.203099	.2559746	-0.79	0.428	-.7063988	.3002007
_Imetroarea_114	0	(omitted)				
_Imetroarea_115	0	(omitted)				
_Imetroarea_116	0	(omitted)				
_Imetroarea_117	0	(omitted)				
_Imetroarea_119	0	(omitted)				
_Imetroarea_121	0	(omitted)				
_Imetroarea_123	0	(omitted)				
_Imetroarea_125	0	(omitted)				
_Imetroarea_126	0	(omitted)				
_Imetroarea_127	0	(omitted)				
_Imetroarea_129	0	(omitted)				
_Imetroarea_130	0	(omitted)				
_Imetroarea_131	0	(omitted)				
_Imetroarea_132	0	(omitted)				
_Imetroarea_135	0	(omitted)				
_Imetroarea_136	0	(omitted)				
_Imetroarea_137	0	(omitted)				
_Imetroarea_141	0	(omitted)				
_Imetroarea_144	0	(omitted)				
_Imetroarea_146	0	(omitted)				
_Imetroarea_149	0	(omitted)				
_Imetroarea_150	0	(omitted)				
_Imetroarea_151	0	(omitted)				
_Imetroarea_153	0	(omitted)				
_Imetroarea_154	0	(omitted)				
_Imetroarea_155	0	(omitted)				
_Imetroarea_156	0	(omitted)				
_Imetroarea_158	0	(omitted)				
_Imetroarea_160	0	(omitted)				
_Imetroarea_161	0	(omitted)				
_Imetroarea_162	0	(omitted)				
_Imetroarea_163	-1.26481	.1698327	-7.45	0.000	-1.598737	-.9308837

_Imetroarea_164	0	(omitted)				
_Imetroarea_166	0	(omitted)				
_Imetroarea_167	0	(omitted)				
_Imetroarea_168	0	(omitted)				
_Imetroarea_169	0	(omitted)				
_Imetroarea_170	-1.697846	.8869768	-1.91	0.056	-3.441829	.0461361
_Imetroarea_171	0	(omitted)				
_Imetroarea_172	0	(omitted)				
_Imetroarea_175	0	(omitted)				
_Imetroarea_176	0	(omitted)				
_Imetroarea_178	0	(omitted)				
_Imetroarea_179	0	(omitted)				
_Imetroarea_180	0	(omitted)				
_Imetroarea_182	0	(omitted)				
_Imetroarea_183	0	(omitted)				
_Imetroarea_184	0	(omitted)				
_Iyear_2002	0	(omitted)				
_Iyear_2003	.4343695	.2013551	2.16	0.032	.0384632	.8302759
_Iyear_2004	-.3371649	.2059746	-1.64	0.102	-.7421541	.0678244
_Iyear_2005	-.9090804	.2078827	-4.37	0.000	-1.317821	-.5003394
_Iyear_2006	-1.383516	.2059118	-6.72	0.000	-1.788382	-.9786506
_Iyear_2007	-1.770944	.2090244	-8.47	0.000	-2.18193	-1.359958
_Iyear_2008	-1.306003	.2003047	-6.52	0.000	-1.699844	-.9121622
_Iyear_2009	0	(omitted)				
_Iyear_2010	-.7071126	.206366	-3.43	0.001	-1.112872	-.3013537
_Iyear_2011	-.9069435	.2068343	-4.38	0.000	-1.313623	-.5002638
_Iyear_2012	-1.121757	.2447761	-4.58	0.000	-1.603038	-.6404758
_cons	10.01026	.2363454	42.35	0.000	9.545557	10.47497

9. Difference in Rental Growth Rates between UC and MSA (average from 2003 to 2012): Multifamily



10. Difference in Cap Rates between UC and MSA (average from 2003 to 2012): Multifamily



11. Panel Model of Economic Rents and Cap Rates of UC : Multifamily

```
. xi: regress caprateUC  pct_grth_econ_rentUC i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-185   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1992-2012    (naturally coded; _Iyear_1992 omitted)

Linear regression                                      Number of obs =     207
                                                       F( 46,   154) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5552
                                                       Root MSE      =  1.0857

------------------------------------------------------------------------------
                     |               Robust
          caprateUC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+--------------------------------------------------------------
pct_grth_econ_rentUC |   .0103688   .0160807     0.64   0.520    -.0213984    .0421361
       _Imetroarea_2 |    .735368   .5996081     1.23   0.222    -.4491506    1.919887
       _Imetroarea_3 |   .5041145   .3255472     1.55   0.124    -.1390001    1.147229
       _Imetroarea_4 |   1.228329   .4320122     2.84   0.005     .3748938    2.081764
       _Imetroarea_5 |          0  (omitted)
       _Imetroarea_6 |  -.0514452   1.046361    -0.05   0.961    -2.118519    2.015629
       _Imetroarea_7 |          0  (omitted)
       _Imetroarea_8 |  -.7740138   .5290572    -1.46   0.146     -1.81916    .2711323
       _Imetroarea_9 |  -.0759002    .695362    -0.11   0.913     -1.44958    1.297779
      _Imetroarea_10 |   -.856959   .4213177    -2.03   0.044    -1.689267   -.0246508
      _Imetroarea_11 |    .538178   .4232915     1.27   0.205    -.2980294    1.374385
      _Imetroarea_12 |     1.7488   .3895787     4.49   0.000     .9791918    2.518408
      _Imetroarea_13 |          0  (omitted)
      _Imetroarea_14 |   1.057805   .6610382     1.60   0.112    -.2480682    2.363678
      _Imetroarea_15 |   .8344101   .6348611     1.31   0.191    -.4197505    2.088571
      _Imetroarea_16 |          0  (omitted)
      _Imetroarea_17 |  -.3704634   .4042477    -0.92   0.361     -1.16905     .428123
      _Imetroarea_18 |   1.661633    .873521     1.90   0.059    -.0639971    3.387264
      _Imetroarea_19 |          0  (omitted)
      _Imetroarea_20 |  -.9406769   .7252008    -1.30   0.197    -2.373302    .4919485
      _Imetroarea_21 |   2.097892   .9502177     2.21   0.029     .2207483    3.975036
      _Imetroarea_22 |          0  (omitted)
      _Imetroarea_23 |          0  (omitted)
      _Imetroarea_24 |          0  (omitted)
      _Imetroarea_25 |          0  (omitted)
      _Imetroarea_26 |          0  (omitted)
      _Imetroarea_27 |   .3215603   .4398236     0.73   0.466     -.547306    1.190427
      _Imetroarea_28 |          0  (omitted)
      _Imetroarea_29 |  -.0118536   .8539323    -0.01   0.989    -1.698787    1.675079
      _Imetroarea_30 |   .6084921   .2278049     2.67   0.008     .1584663    1.058518
      _Imetroarea_31 |   1.516729   .6000624     2.53   0.012     .3313132    2.702145
      _Imetroarea_32 |          0  (omitted)
      _Imetroarea_33 |  -.2807419   .3641104    -0.77   0.442    -1.000038    .4385537
      _Imetroarea_34 |   1.552713   .5226272     2.97   0.003     .5202696    2.585157
      _Imetroarea_35 |   1.573077   .8027804     1.96   0.052    -.0128063     3.15896
      _Imetroarea_36 |  -.7587519   .6726989    -1.13   0.261     -2.08766    .5701568
      _Imetroarea_37 |          0  (omitted)
      _Imetroarea_38 |   1.179647   .6973143     1.69   0.093    -.1978895    2.557183
      _Imetroarea_39 |  -.0693245   .3965046    -0.17   0.861    -.8526146    .7139656
```

_Imetroarea_40	0	(omitted)				
_Imetroarea_42	0	(omitted)				
_Imetroarea_43	0	(omitted)				
_Imetroarea_44	-.1688224	.4526095	-0.37	0.710	-1.062947	.7253024
_Imetroarea_45	1.338784	.3266945	4.10	0.000	.6934025	1.984165
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	0	(omitted)				
_Imetroarea_48	-1.27385	.4604976	-2.77	0.006	-2.183558	-.3641428
_Imetroarea_49	-.0409346	.4635188	-0.09	0.930	-.9566104	.8747412
_Imetroarea_50	-.2483106	.3250875	-0.76	0.446	-.8905171	.3938959
_Imetroarea_51	2.301077	.3796351	6.06	0.000	1.551112	3.051041
_Imetroarea_52	-.9069706	.503779	-1.80	0.074	-1.90218	.0882387
_Imetroarea_53	-.0732527	.9711121	-0.08	0.940	-1.991673	1.845168
_Imetroarea_54	0	(omitted)				
_Imetroarea_55	0	(omitted)				
_Imetroarea_56	-.4245617	.2198075	-1.93	0.055	-.8587888	.0096654
_Imetroarea_57	0	(omitted)				
_Imetroarea_58	2.376873	.5511451	4.31	0.000	1.288092	3.465654
_Imetroarea_59	-.6576073	.3617734	-1.82	0.071	-1.372286	.0570717
_Imetroarea_60	-1.184453	.3586274	-3.30	0.001	-1.892917	-.475989
_Imetroarea_61	.2893356	.7523955	0.38	0.701	-1.197013	1.775684
_Imetroarea_62	-.8438218	.3607794	-2.34	0.021	-1.556537	-.1311064
_Imetroarea_63	1.434561	.5512826	2.60	0.010	.3455087	2.523613
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	-.8912908	1.011944	-0.88	0.380	-2.890373	1.107791
_Imetroarea_66	0	(omitted)				
_Imetroarea_67	0	(omitted)				
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	-.8294001	.4821595	-1.72	0.087	-1.7819	.1231003
_Iyear_2002	0	(omitted)				
_Iyear_2003	1.085579	.3713217	2.92	0.004	.3520374	1.819121
_Iyear_2004	-.0186109	.3592135	-0.05	0.959	-.728233	.6910111
_Iyear_2005	-1.038086	.3919331	-2.65	0.009	-1.812346	-.2638272
_Iyear_2006	-.9756041	.3691509	-2.64	0.009	-1.704857	-.246351
_Iyear_2007	-.7408663	.3853022	-1.92	0.056	-1.502026	.0202936
_Iyear_2008	-.3796243	.3728925	-1.02	0.310	-1.116269	.3570204
_Iyear_2009	0	(omitted)				
_Iyear_2010	-.4545748	.32727	-1.39	0.167	-1.101093	.1919432
_Iyear_2011	-.0759081	.45654	-0.17	0.868	-.9777975	.8259813
_Iyear_2012	-.4506059	.4129602	-1.09	0.277	-1.266404	.3651921
_cons	6.471439	.4102502	15.77	0.000	5.660995	7.281884

12. Panel Model of Economic Rents and Cap Rates of MSA : Multifamily

```
. xi: regress caprateMSA  pct_grth_econ_rentMSA i.metroareaid i.year, robust
i.metroareaid     _Imetroarea_1-185   (naturally coded; _Imetroarea_1 omitted)
i.year            _Iyear_1992-2012    (naturally coded; _Iyear_1992 omitted)

Linear regression                                      Number of obs =     443
                                                       F( 54,   388) =   23.61
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.6649
                                                       Root MSE      =  .65001

------------------------------------------------------------------------------
                     |               Robust
          caprateMSA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+--------------------------------------------------------------
pct_grth_econ_rentMSA |  -.0212972   .0115626    -1.84   0.066    -.0440303     .001436
        _Imetroarea_2 |  -.4715794    .327405    -1.44   0.151    -1.115289    .1721305
        _Imetroarea_3 |  -.1375572   .2613479    -0.53   0.599    -.6513926    .3762782
        _Imetroarea_4 |  -.3889368   .2146321    -1.81   0.071    -.8109243    .0330508
        _Imetroarea_5 |          0  (omitted)
        _Imetroarea_6 |  -.7289776    .221994    -3.28   0.001    -1.165439    -.292516
        _Imetroarea_7 |          0  (omitted)
        _Imetroarea_8 |  -1.138424   .2041053    -5.58   0.000    -1.539714   -.7371328
        _Imetroarea_9 |  -.7658869   .3275156    -2.34   0.020    -1.409814   -.1219596
       _Imetroarea_10 |  -.5713878   .2416369    -2.36   0.019    -1.046469   -.0963063
       _Imetroarea_11 |   .7909001   .3311945     2.39   0.017     .1397396    1.442061
       _Imetroarea_12 |   .8066784   .3049798     2.65   0.009     .2070585    1.406298
       _Imetroarea_13 |          0  (omitted)
       _Imetroarea_14 |   .5098202   .2383979     2.14   0.033     .0411069    .9785336
       _Imetroarea_15 |   .0845681   .2126447     0.40   0.691    -.3335119    .5026482
       _Imetroarea_16 |          0  (omitted)
       _Imetroarea_17 |  -.7520138   .2560276    -2.94   0.004    -1.255389   -.2486387
       _Imetroarea_18 |    1.01716   .3147585     3.23   0.001     .3983139    1.636005
       _Imetroarea_19 |          0  (omitted)
       _Imetroarea_20 |  -.5936485   .3130911    -1.90   0.059    -1.209216    .0219188
       _Imetroarea_21 |   .5385626   .2878422     1.87   0.062    -.0273631    1.104488
       _Imetroarea_22 |          0  (omitted)
       _Imetroarea_23 |          0  (omitted)
       _Imetroarea_24 |          0  (omitted)
       _Imetroarea_25 |          0  (omitted)
       _Imetroarea_26 |          0  (omitted)
       _Imetroarea_27 |   .1561917     .20368     0.77   0.444    -.2442629    .5566464
       _Imetroarea_28 |   .5078227   .1742205     2.91   0.004     .1652884     .850357
       _Imetroarea_29 |   .0253366   .3658384     0.07   0.945    -.6939372    .7446104
       _Imetroarea_30 |    .494718   .2481703     1.99   0.047     .0067911    .9826449
       _Imetroarea_31 |  -.1400837   .3542406    -0.40   0.693    -.8365549    .5563876
       _Imetroarea_32 |          0  (omitted)
       _Imetroarea_33 |  -1.505131   .1784421    -8.43   0.000    -1.855965   -1.154297
       _Imetroarea_34 |   .3162017   .2538316     1.25   0.214    -.1828558    .8152593
       _Imetroarea_35 |   .2042829    .349863     0.58   0.560    -.4835817    .8921475
       _Imetroarea_36 |  -.5416982   .3818064    -1.42   0.157    -1.292367    .2089702
       _Imetroarea_37 |          0  (omitted)
       _Imetroarea_38 |  -.4927935   .1968306    -2.50   0.013    -.8797815   -.1058055
       _Imetroarea_39 |   .0295498   .2438975     0.12   0.904    -.4499762    .5090759
```

_Imetroarea_40	0	(omitted)				
_Imetroarea_42	0	(omitted)				
_Imetroarea_43	0	(omitted)				
_Imetroarea_44	-1.258418	.2455362	-5.13	0.000	-1.741166	-.7756699
_Imetroarea_45	1.453924	.2369961	6.13	0.000	.9879665	1.919881
_Imetroarea_46	0	(omitted)				
_Imetroarea_47	0	(omitted)				
_Imetroarea_48	-.6001777	.2666245	-2.25	0.025	-1.124387	-.0759681
_Imetroarea_49	-.6096028	.2580896	-2.36	0.019	-1.117032	-.1021738
_Imetroarea_50	-1.041137	.2415476	-4.31	0.000	-1.516043	-.5662309
_Imetroarea_51	0	(omitted)				
_Imetroarea_52	-.9525126	.1748863	-5.45	0.000	-1.296356	-.6086692
_Imetroarea_53	-.9012216	.2149391	-4.19	0.000	-1.323813	-.4786306
_Imetroarea_54	0	(omitted)				
_Imetroarea_55	0	(omitted)				
_Imetroarea_56	-.7186415	.1915869	-3.75	0.000	-1.09532	-.3419631
_Imetroarea_57	-.1514782	.2351935	-0.64	0.520	-.6138913	.310935
_Imetroarea_58	.1047468	.235289	0.45	0.656	-.3578541	.5673478
_Imetroarea_59	-1.645095	.1903523	-8.64	0.000	-2.019346	-1.270844
_Imetroarea_60	-1.912267	.2373023	-8.06	0.000	-2.378826	-1.445707
_Imetroarea_61	-1.664124	.3090571	-5.38	0.000	-2.27176	-1.056488
_Imetroarea_62	-1.462326	.2503212	-5.84	0.000	-1.954481	-.9701698
_Imetroarea_63	.1913743	.3065803	0.62	0.533	-.4113922	.7941408
_Imetroarea_64	0	(omitted)				
_Imetroarea_65	-.4413797	.2107777	-2.09	0.037	-.8557891	-.0269704
_Imetroarea_66	0	(omitted)				
_Imetroarea_67	-.50541	.2562233	-1.97	0.049	-1.00917	-.0016501
_Imetroarea_68	0	(omitted)				
_Imetroarea_69	0	(omitted)				
_Imetroarea_70	-.926226	.211997	-4.37	0.000	-1.343033	-.5094194
_Iyear_2002	0	(omitted)				
_Iyear_2003	-.0864091	.134132	-0.64	0.520	-.3501255	.1773073
_Iyear_2004	-.3916965	.1441904	-2.72	0.007	-.6751888	-.1082042
_Iyear_2005	-.9441692	.155753	-6.06	0.000	-1.250395	-.6379438
_Iyear_2006	-1.001823	.1630403	-6.14	0.000	-1.322376	-.6812697
_Iyear_2007	-.8774939	.1492058	-5.88	0.000	-1.170847	-.5841408
_Iyear_2008	-.6517702	.1666306	-3.91	0.000	-.9793822	-.3241583
_Iyear_2009	0	(omitted)				
_Iyear_2010	-.2281689	.1553261	-1.47	0.143	-.5335551	.0772172
_Iyear_2011	-.4731956	.1890727	-2.50	0.013	-.8449309	-.1014604
_Iyear_2012	-.080235	.2014201	-0.40	0.691	-.4762464	.3157763
_cons	7.748567	.1844487	42.01	0.000	7.385923	8.111211

Appendix _ Chapter 8: Determinants of the Performance Differences between UC and MSA

1. Regression Model of Determinants of Gross Rental Growth Rates

```
. regress  d_grossrent_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  3,    43) =    2.28
       Model |  7.65272677     3  2.55090892            Prob > F      =  0.0924
    Residual |  48.0215162    43  1.11677945            R-squared     =  0.1375
-------------+------------------------------           Adj R-squared =  0.0773
       Total |  55.6742429    46  1.21030963            Root MSE      =  1.0568

------------------------------------------------------------------------------
d_grossrent~a |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   3.70e-07   1.85e-07     2.00   0.051    -2.44e-09    7.42e-07
emp_grth_rate |   .0059941   .0156935     0.38   0.704    -.0256549    .0376431
  emp_uctomsa |  -.0535207   .0229837    -2.33   0.025    -.0998717   -.0071697
        _cons |   .5648014   .3271891     1.73   0.091    -.0950383    1.224641
------------------------------------------------------------------------------
```

2. Regression Model of Determinants of Gross Rental Growth Rates with an Additional Variable

```
. regress  d_grossrent_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa pop_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  4,    42) =    1.96
       Model |   8.7396562     4  2.18491405            Prob > F      =  0.1191
    Residual |  46.9345867    42  1.11749016            R-squared     =  0.1570
-------------+------------------------------           Adj R-squared =  0.0767
       Total |  55.6742429    46  1.21030963            Root MSE      =  1.0571
------------------------------------------------------------------------------
d_grossrent~a |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   3.36e-07   1.88e-07     1.79   0.081    -4.30e-08    7.15e-07
emp_grth_rate |   .0019311   .0162301     0.12   0.906    -.0308226    .0346847
  emp_uctomsa |  -.0215918   .0397077    -0.54   0.589    -.1017252    .0585415
  pop_uctomsa |  -.0935447   .0948507    -0.99   0.330    -.2849611    .0978717
        _cons |   .6051214   .3298367     1.83   0.074    -.0605161    1.270759
------------------------------------------------------------------------------
```

3. Regression Model of Determinants of Net Rental Growth Rates

```
. regress  d_netrent_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  3,    43) =    2.19
       Model |  473.247543     3  157.749181            Prob > F      =  0.1025
    Residual |   3090.9852    43  71.8833766            R-squared     =  0.1328
-------------+------------------------------           Adj R-squared =  0.0723
       Total |  3564.23274    46  77.4833204            Root MSE      =  8.4784
------------------------------------------------------------------------------
d_netrent_u~a |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   5.63e-07   1.48e-06     0.38   0.706    -2.42e-06    3.55e-06
emp_grth_rate |  -.3032197   .1259073    -2.41   0.020    -.5571359   -.0493035
  emp_uctomsa |   .1462569   .1843954     0.79   0.432     -.225612    .5181257
        _cons |  -.5095254   2.625001    -0.19   0.847    -5.803344    4.784293
------------------------------------------------------------------------------
```

4. Regression Model of Determinants of Net Rental Growth Rates with an Additional Variable

```
. regress  d_netrent_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa pop_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  4,    42) =    1.63
       Model |  478.516636     4  119.629159            Prob > F      =  0.1850
    Residual |   3085.7161    42   73.469431            R-squared     =  0.1343
-------------+------------------------------           Adj R-squared =  0.0518
       Total |  3564.23274    46  77.4833204            Root MSE      =  8.5714
------------------------------------------------------------------------------
d_netrent_u~a |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   4.88e-07   1.52e-06     0.32   0.750    -2.58e-06    3.56e-06
emp_grth_rate |  -.3121655   .1315989    -2.37   0.022    -.5777428   -.0465882
  emp_uctomsa |   .2165561   .3219632     0.67   0.505    -.4331919    .8663041
  pop_uctomsa |  -.2059617   .7690808    -0.27   0.790     -1.75803    1.346106
        _cons |  -.4207511   2.674425    -0.16   0.876     -5.81796    4.976458
------------------------------------------------------------------------------
```

5. Regression Model of Determinants of Employment Growth Rates

```
. regress  d_emp_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  3,    43) =    3.62
       Model |  618.754292     3  206.251431            Prob > F      =  0.0204
    Residual |  2448.33841    43  56.9381025            R-squared     =  0.2017
-------------+------------------------------           Adj R-squared =  0.1460
       Total |   3067.0927    46  66.6759282            Root MSE      =  7.5457

------------------------------------------------------------------------------
 d_emp_uc_msa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   2.55e-06   1.32e-06     1.94   0.060    -1.07e-07    5.21e-06
emp_grth_rate |  -.1440015   .1120568    -1.29   0.206    -.3699854    .0819825
  emp_uctomsa |   .2411342   .1641109     1.47   0.149     -.089827    .5720953
        _cons |  -11.04817   2.336236    -4.73   0.000    -15.75964   -6.336698
------------------------------------------------------------------------------
```

6. Regression Model of Determinants of Employment Growth Rates with an Additional Variable

```
. regress  d_emp_uc_msa emp_2009_msa emp_grth_rate emp_uctomsa pop_uctomsa

      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  4,    42) =    2.86
       Model |  656.144023     4  164.036006            Prob > F      =  0.0350
    Residual |  2410.94868    42  57.4035399            R-squared     =  0.2139
-------------+------------------------------           Adj R-squared =  0.1391
       Total |   3067.0927    46  66.6759282            Root MSE      =  7.5765

------------------------------------------------------------------------------
 d_emp_uc_msa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
 emp_2009_msa |   2.75e-06   1.35e-06     2.04   0.047     3.31e-08    5.47e-06
emp_grth_rate |  -.1201714   .1163237    -1.03   0.307    -.3549221    .1145794
  emp_uctomsa |   .0538682   .2845917     0.19   0.851     -.520461    .6281974
  pop_uctomsa |   .5486492   .6798106     0.81   0.424    -.8232641    1.920563
        _cons |  -11.28465   2.363995    -4.77   0.000    -16.05538   -6.513913
------------------------------------------------------------------------------
```