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RENTAL PRICE CONVERGENCE IN A DEVELOPING ECONOMY: NEW EVIDENCE FROM NONLINEAR PANEL UNIT ROOT TEST

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ABSTRACT. We examine the hypothesis of nonlinear rental price convergence using relative rental price index of three major cities of Turkey namely, Istanbul, Izmir, and Ankara span from the period from January 1994 to February 2010. Our results indicate that all cities exhibit rental price convergence towards its national mean level for the period of January 1994 to December 2004. In contrast, none of the cities show evidence of convergence from January 2005 to February 2010. The evidence clearly shows rental price divergence in Turkish property market.

KEYWORDS: Turkey; Housing industry; Major cities of Turkey; Panel unit root test; Rental price movement

1. INTRODUCTION

The world had experienced a house price boom starting from the mid-1990s. During this period, house prices rose by 120% on average in OECD countries. However, the crises in US sub-prime mortgage market in 2007 which has pushed the world into an economic recession, has ended the expansion. The housing markets outside the US have also been affected dramatically from the crisis (Andre, 2010). The problems in the housing markets have spread and adversely affected other industries which are directly or indirectly related.

The housing industry in Turkey has moved directly related with the general economic conditions of Turkey. The macroeconomic problems in late 1990s, the Russian Crisis in 1998, the earthquake of 17 August 1999¹, economic and political instabilities, and finally

¹ Turkey had a serious earthquake on August 17, 1999, which was a 7.6 magnitude earthquake that struck all northwestern of Turkey including Istanbul and many other cities. Izmit, another big city of Turkey, was very badly damaged and the earthquake killing around 17 thousand people and leaving approximately half a million people homeless.

the financial crisis in 2001 created serious problems in housing industry in Turkey (Turhan, 2008). However, the structural reforms in the banking industry and the political stability have helped to stimulate the economy and so the housing industry to recover in the following years. The growth rate of construction industry in GDP declined dramatically by 17.4% in 2001, however after the crisis an average yearly growth rate of 11% was achieved in the period of 2002-2007 (TurkStat, 2009). The property prices and rents also increased quickly during this period.

Nevertheless, the decreasing demand in housing market result a decline of 3.3% in the first quarter of 2008 and afterwards the decline has continued. The construction industry shrank by 19.9% in the first half of 2009 (Republic of Turkey Ministry of Finance, 2009). The housing loans which valued 1.4 billion TL (0.85 billion dollar) in 2002 rose to 12.4 billion TL (9.18 billion dollar) in 2005 and 37.5 billion TL (24.67 billion dollar) in 2008². The ratio of housing loans to GDP which was less than 1% before 2004, reached to 4% in 2008. New housing loans had shown a decrease starting from the last quarter of 2008 as a result of rising interest rates; however the market has started to recover in the second half of 2009 (ISPAT, 2010).

Turkey is one of the fastest urbanizing countries in the world (Standard and Poors, 2007). Besides, decreasing interest rates, introduction of mortgage market, increasing GDP per capita, the need for renewing the houses and rising population of Turkey has been the major forces of the expansion in housing market in Turkey during 2000s. Nevertheless, housing loans to GDP ratio is still below the level of the Central and Eastern Europe

member states and the average in the Euro Area. Although the unmet demand decreased from 74.1% in 2002 to 27.8% in 2008, the supply in housing industry still yet does not able to meet the demand in Turkey (ISPAT, 2010). There exists a great potential in housing sector in Turkey. Although the housing industry is expanding and getting more important for the economy, a mature literature on the industry does not exist yet in Turkey. Onder et al. (2004), Ozus et al. (2007), and Keskin (2008) focus on the determinants of house prices in Istanbul, whereas Selim (2008) analyzes the house price determinants in Turkey. Moreover, Akin (2008) makes a comprehensive look at the housing market characteristics in Turkey. The lack of house-price/rent index for Turkey has been the major obstacle in the literature development on house and rent prices specifically on the convergence³.

This paper tests whether there exist a convergence or divergence of rent price movements in three major cities of Turkey, namely Istanbul, Ankara and Izmir. The rest of the paper is organized as follows. The next section gives a literature review. The section 3 reports the data and methodology. The section 4 shows and discusses the findings of the study. The final section contains the summary and concludes.

2. LITERATURE REVIEW

The behavior of house prices and rents has gained interest in the literature especially in the last two decades. The focus has been mostly on the test of the existence of convergence between house prices across countries and

² USD values are calculated by using year-end exchange rates.

³ Reidin.com has developed INDEX focus on house prices and rents in Turkey covering seven major cities since 2007 and Turkish Statistical Institute is now working on establishment of house price index for Turkey.

across regions/states in a country⁴. The tests for regional house price convergence are performed mostly for the US and the UK. Klyuev (2008) and Vansteenkiste (2007) find evidence in favor of house price convergence across the US. However, Clark and Coggin (2009) find mixed evidence for regional convergence in the US. The literature on house price movements in the UK is well-developed. The findings for the UK show that house price changes start in the South East and later spread to other regions. This phenomenon is named as “the ripple effect”. Over the long-run, the house prices in regions move together. Cook (2003) with asymmetric unit root tests and Cook (2005) with jointly applying DF-GLS test and KPSS stationarity test find supportive evidence for ripple effect in the UK. Likewise, Holmes and Grimes (2005) and Holmes (2007) also indicate the regional house price convergence in the UK. Moreover, MacDonald and Taylor (1993) show many cointegrating relationships for 11 regions in the UK for the period of 1969-1987 and find weak support for ripple effect. Similarly, Alexander and Barrow (1994) report evidence for the ripple effect and cointegration of house prices. Cook and Thomas (2003) find evidence in favor of ripple effect by using non-parametric testing and business cycle dating techniques. Conversely, Ashworth and Parker (1997) cast doubt on the ripple effect hypothesis. The findings of Drake (1995) indicate the existence of regional differences in the pattern of the UK house price movements. The empirical results mostly support existing regional house price convergence in the UK based on findings of long-run equilibrium relationships (Chien, 2010).

The literature on house price convergence in other countries has also developed in the last decade. Berg (2002) finds that Stockholm area leads price changes in the housing market of six other areas which means the ripple effect for the period from January 1981 to July 1997. Larraz-Iribas and Alfaro-Navarro (2008) focus on regional asymmetries of house prices in Spain and find that Spanish regions groups cointegrate over time. Chien and Lee (2006) find evidence for house price convergence in some regions of Taiwan. Chien (2010) with two-break LM unit test, supports the existence of ripple effects for each city in Taiwan except Taipei City. Burger and Rensburg (2008) find that large and possibly medium middle-segment house prices in these areas converge in South Africa. Luo et al. (2007) indicate the existence of convergence between pairs of housing markets in the eight capital cities of Australia. Likewise, Liu et al. (2008) also find house price diffusion within Australia’s state capital cities by indicating the cities Canberra and Hobart as the key engines. Stevenson (2004) finds the house price diffusion from Dublin to the other regions which is similar and consistent with the UK ripple effect.

Contrary to the vast literature on house price movement, the literature lacks studies about rents. Rents are mostly investigated in term of their effects on house prices. Hargreaves (2008) investigates whether the changes in rents affect the changes in New Zealand house prices. The author finds that rents lead prices by 6 months lag. Carrerasi-Solanas et al. (2004) indicate that rents are important in determining house prices. Likewise, Gallin (2008) finds evidence for the long-run relationship between house prices and rents. House prices and rents tend to correct back to each other over 4 year time period in the US. Klyuev (2008) reports a co-integrating relationship between home prices and rents. As the literature exhibits, the test of convergence of rents in three biggest cities of Turkey

⁴ We skip the literature on cross-country investigation. Please see, Andre (2010), Gros (2007), Otrók and Terrones (2005), Vansteenkiste and Hiebert (2009), Ferrara and Koopman (2009), Tvaronavičienė et al. (2009), and Bilgin et al. (2010) for cross-country investigation.

will be helpful in inferring information about the house-price convergence which can not be tested due to lack of data.

In fact, the research about house prices and rent convergence does not exist due to lack of data in Turkey. However, the price convergence on broader terms has been studied. Ozcicek (2007) analyzes the price convergence for 19 Turkish provinces from 1994 to 2003 and finds no evidence of price convergence. Unlikely, Tunay and Silpagar (2007) report the existence of a serious inflation convergence among different geographical regions for the period of 1994-2004. More recently, Akkoyunlu and Siliverstovs (2010) find the existence of a long-run relationship between inflation in two biggest cities of Turkey namely Istanbul and Ankara over the time period of 1922-1998. Yilmazkuday (2009) studies the CPI convergence for different sectors by taking into account the monetary policy. He tests the convergence for housing and rent CPI inflation rates for monthly data for 7 regions of Turkey over the 1994-2004 by using Augmented Dickey-Fuller test. The results indicate that at least 14% of the region pairs have converged to each other in terms of housing and rent CPI inflation rents. However, the portion of this convergence is very low compared to convergence portions in Clothing and Footwear, Food, Beverage and Tobacco CPI Inflation Rates. The author put forward two explanations for the reasoning of the difference between convergence portions. The non-tradability of the sector makes it harder for prices and inflation rate to converge to each other. And secondly, the process of migration which is regarded as arbitrage decreasing activity especially for housing industry, will take a longer time period to work. Moreover, he indicates that more regions have converged to each other in terms of housing and rent CPI inflation rates in the inflation-targeting period (after January 2002)

compared to the pre-inflation-targeting period. In this study, we focus specifically on the convergence of rent CPI inflation rates by doing the analysis on city level instead of regional level. As suggested by Yilmazkuday (2009), we aim to shed more light on rent price movement across three major cities of Turkey namely Istanbul, Ankara, and Izmir.

3. EMPIRICAL ANALYSIS

3.1. Data and methodology

The data is collected from the website of the Turkish Statistical Institute (TurkStat). We use the monthly data on rent price index CPI span from January 1994 to February 2010. In this study, we include 3 major cities in Turkey; they are Istanbul, Ankara, and Izmir. These cities are the leading cities of Turkey in many aspects. According to the 2009 population census results of Address Based Population Registration System, Istanbul, Ankara, and Izmir with the population of 12.9 million, 4.6 million and 3.8 million respectively took the first three places in Turkey. Moreover, these three cities are in the first five in terms of export values in 2009. The proportions of these cities in GDP sum up to 36.4% of Turkey according to 2001 data.

The methodology of unit root test is widely adopted in the economics literature as an econometrics tool to validate the conceptual hypothesis of convergence⁵, and it indicates the convergence hypothesis holds once the

⁵ For example, Taylor and Taylor (2004) and Lau (2009) among others use the unit root test to test against purchasing power parity. Pedroni and Yao (2006) and Lau (2010) adopt the methodology of linear and nonlinear unit root test to examine the issue of income convergence in China. Bektas (2007) investigates the hypothesis of corporate profit persistence in the Turkish banking system.

time series in interest is found to be stationary. In the following sections we will discuss the methodology of unit root test in more details. One needs to take note that TurkStat changed its definition of CPI for the regions from which price data are collected for time period after year 2004. However, this will not affect our analysis because the variable that we are interested in is the relative price series, as long as the definition of CPI and its calculation method are the same across regions the analysis and hence the empirical results will not be affected by the change of CPI definition.

3.2. Univariate augmented Dickey–Fuller (ADF) test

We first employ monthly rent price index of three major Turkish cities, Istanbul, Izmir, and Ankara, to construct relative price series towards the average of Turkish rent index, such that the series of interest for city i is, at time t , is $P_{i,t}$, we have:

$$y_{i,t} = \ln\left(\frac{g_{i,t}}{\bar{g}_t}\right) \quad t = 1, \dots, T \tag{1}$$

where: $y_{i,t}$ is the relative price series; $g_{i,t}$ is the price index; \bar{g}_t is the Turkish rent index.

We can see from Figure 1 and 2 that the relative price differential series becomes widening through time. This result implies price divergence and the observation is obvious for Ankara after year 2001. In order to have a more rigorous assessment about the evidence on Turkish rent price convergence or divergence, we employ univariate unit root test, linear panel unit root test, and non-linear panel unit root test in the following sections.

Consider a series at time t ,

$$\Delta y_{1,t} = \alpha_1 + \beta_1 y_{1,t-1} + \sum_{j=1}^{K_1} \delta_{1,j} \Delta y_{1,t-j} + \mu_{1,t} \tag{2}$$

where: Δy_t is the series of interested items in first difference; Δy_{t-1} is the augmenting term; u_t is the IID error term, i.e. $u_t \sim id(0, \sigma^2)$.

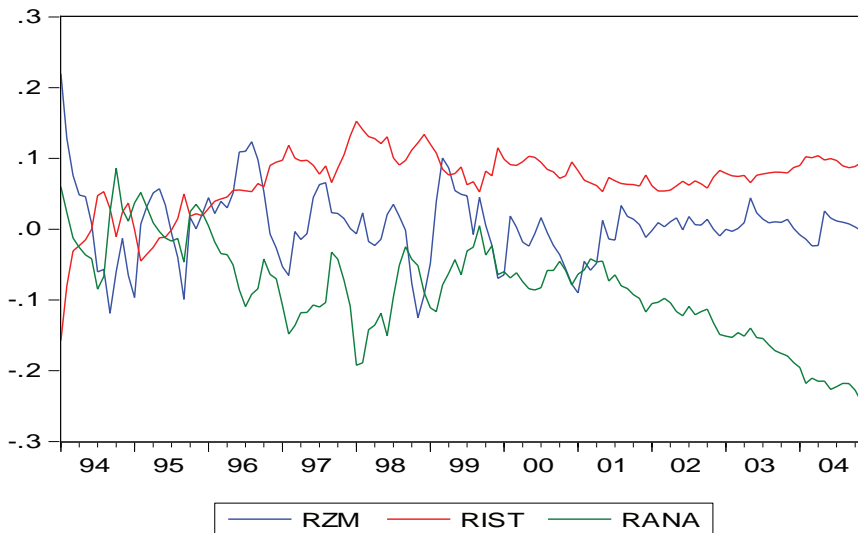


Figure 1. Relative price difference (January 1994 - December 2004)

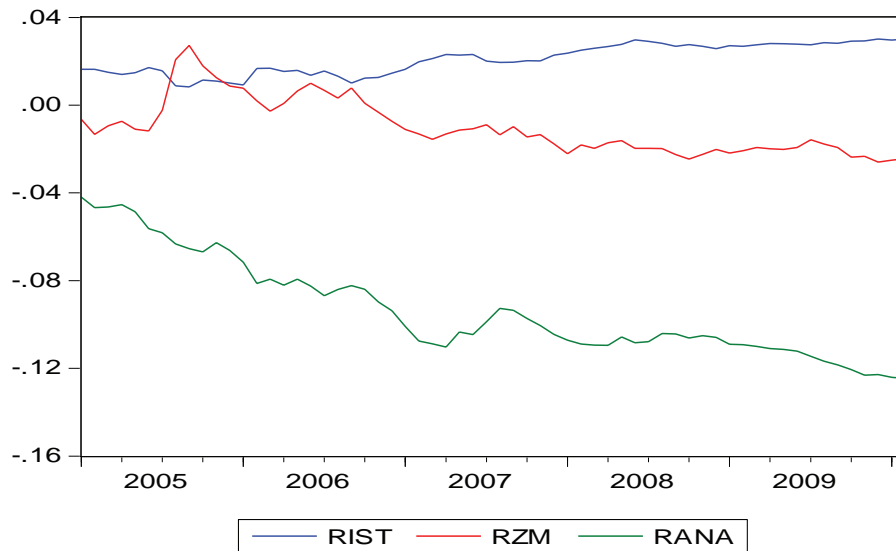


Figure 2. Relative price difference (January 2005 - February 2010)

Equation (2) is estimated by ordinary least square (OLS) and the unit root null hypothesis is rejected when the ADF statistic is found to be significant for the null $b = 0$ against the alternative $b < 0$. The number of augmenting terms is determined using the Akaike information criteria (AIC). Table 1 indicates that the null hypothesis of having a unit root is rejected for Izmir, and hence we can conclude that the hypothesis of price convergence is accepted for Izmir only during year 1994 to 2004. In contrast Table 2 shows that the unit-root null hypothesis of price convergence is rejected for all three major cities during year 2005 to 2010.

Table 1. Univariate augmented Dickey-Fuller test (House rental index: 1994-2004)

City	β_i	Test Stat. (p-value#)	Lag
Istanbul	-0.1078	-2.6392*	0
Ankara	-0.056	-2.0183	0
Izmir	-0.1439	-3.420***	1

MacKinnon approximate p-value is used. Note: * and *** denotes 10% and 1% significance level respectively.

Table 2. Univariate augmented Dickey-Fuller test (House rental index: 2005-2010)

City	β_i	Test Stat. (p-value#)	Lag
Istanbul	-0.0118	-0.3755	7
Ankara	-0.0327	-1.7191	1
Izmir	-0.0658	-1.8562	10

MacKinnon approximate p-value is used. Note: * and *** denotes 10% and 1% significance level respectively.

Next, we proceed to examine the traditional panel unit root tests and their potential weaknesses when applying to empirical studies.

3.3. Im et al. (2003) linear panel unit root test

However, it is well documented in the literature that the ADF test has low power against the stationary alternative. Maddala and Kim (1998) among others criticize univariate unit root tests for having low power against the stationary alternative. This problem even becomes severe when the sample sizes used are relatively small. Two solutions have been

exchange rate adjustment follows a non-linear path due to the existence of “bands of inaction” in the exchange rate adjustment process. Within the bands, arbitrage of tradable good is not profitable because transaction cost (i.e. the sum of transportation cost, cost of trade barriers, and distribution cost) is greater than the price difference. The existence of “bands of inaction” may come from market frictions raised from trade protectionism or transaction costs (i.e. any costs not directly related to the production of goods and services).

In our study of Turkish property market, we propose that the convergence mechanism, if there are any, should follow nonlinear dynamic process. The rationale behind it is that the sum of transaction cost involved in property market includes among others, agent commission, legal fees, and property tax, and other investment opportunities forgone. Property price and rental price difference will be continuously observed if the profit margin earned from arbitrage activity across cities is not substantial enough to cover the amount of transaction cost.

Therefore, we use the Exponential Smooth Transition Autoregressive (ESTAR) model to specify the price evolution dynamics across cities. Cerrato et al. (2009) developed a new non-linear panel ADF test under cross-sectional dependence, which is based on the following ESTAR specification, and the model is applied to the de-meaned data series of interest in our study: in its general form, we have:

$$\bar{y}_{it} = \xi_i \bar{y}_{i,t-1} + \xi_i^* \bar{y}_{i,t-1} Z(\theta_i; \bar{y}_{i,t-d}) + \mu_{it} \quad (6)$$

$t = 1, \dots, T \quad i = 1, \dots, N,$

where:

$$Z(\theta_i; \bar{y}_{i,t-d}) = 1 - \exp[-\theta_i (\bar{y}_{i,t-d} - c)^2] \quad (7)$$

where: θ_i is a positive coefficient; c is the equilibrium value of price difference between region i and the mean difference across cities

due to heterogeneous factors between region i and the mean value in Turkey rental market.

The initial value, y_{i0} , is given, and the error term, μ_{it} , has the one-factor structure:

$$\begin{aligned} \mu_{it} &= \gamma_i f_t + \varepsilon_{it}, \\ (\varepsilon_{it})_t &\sim i.i.d.(0, \sigma_i^2) \end{aligned} \quad (8)$$

in which f_t is the unobserved common factor, and ε_{it} is the individual-specific (idiosyncratic) error. Following the existing literature, the delay parameter d is set to be equal to one so that equation (6) may be rewritten in first difference form in general as:

$$\begin{aligned} \Delta \bar{y}_{i,t} &= \alpha_i + \xi_i \bar{y}_{i,t-1} + \sum_{h=1}^{h-1} \delta_{ijh} \Delta \bar{y}_{ij,t-h} + \\ (\bar{\alpha}_i^* + \xi_i^* \bar{y}_{i,t-1} + \sum_{h=1}^{h-1} \delta_{ih}^* \Delta \bar{y}_{i,t-h}) &* Z(\theta_i; \bar{y}_{i,t-d}) + \\ \gamma_i f_t + \varepsilon_{it} & \end{aligned} \quad (9)$$

notice that when $\bar{y}_{i,t-d} = c$, $Z(\cdot) = 0$ and equation (9) is equivalent to a standard linear ADF model of equation (2). However, when the magnitude of income divergence between $\bar{y}_{i,t-d}$ and c becomes too large, $Z(\cdot) \approx 1$ will generate a new linear ADF model with parameter $\beta_i = \xi_i + \xi_i^*$. In contrast, when income divergence is negligible, ξ_i^* affects the flow of the income differential in this case. However, when the income divergence becomes more serious, ξ_i^* plays a more important role in governing the adjustment process. We should take note that $\xi_i + \xi_i^* < 0$ is the necessary condition for “global stability” to hold. Once the condition of $\xi_i + \xi_i^* < 0$ is fulfilled, it is legitimate to have $\xi_i \geq 0$; if this occurs, the implication is that the income divergence follows a non-stationary growth path (e.g. a random walk or an explosive innovation within the “band of inaction” of c) and eventually it converges back to its equilibrium once the magnitude of income divergence is outside the “band”. If we assume that $\bar{y}_{i,t}$ follows a unit root process in

the middle regime, then $\xi_i = 0$ and equation (9) can be rewritten as:

$$\Delta \bar{y}_{i,t} = \xi_i^* \bar{y}_{i,t-1} [1 - \exp(-\theta_i \bar{y}_{i,t-1}^2)] + \gamma_i f_t + \varepsilon_{i,t} \quad (10)$$

The null hypothesis of non-stationarity is $H_0 : \theta_i = 0 \forall i$, against the alternative of : $H_1 : \theta_i > 0$ for $i = 1, 2, \dots, N_1$ and $\theta_i = 0$ for $i = N_1 + 1, \dots, N$.

Because ξ_i^* in equation (10) is not identified under the null, it is not feasible to test the null hypothesis directly. Thus, Cerrato et al. (2009) reparameterize equation (10) by using a first-order Taylor series approximation and obtain the auxiliary regression

$$\Delta \bar{y}_{i,t} = a_i + \delta \bar{y}_{i,t-1}^3 + \gamma_i f_t + \varepsilon_{i,t} \quad (11)$$

For a more general case where the errors are serially correlated, equation (11) is extended to:

$$\Delta \bar{y}_{i,t} = a_i + \delta \bar{y}_{i,t-1}^3 + \sum_{h=1}^{h-1} \vartheta_{ih} \Delta y_{i,t-h} + \gamma_i f_t + \varepsilon_{i,t} \quad (12)$$

Cerrato et al. (2009) further prove that the common factor f_t can be approximated by

$$f_t \approx \frac{1}{\bar{\gamma}} \Delta \bar{y}_t - \frac{\bar{b}}{\bar{\gamma}} \bar{y}_{t-1}^3 \quad (13)$$

where: \bar{y}_t is the mean of y_t ; $\bar{b} = \frac{1}{N} \sum_{i=1}^N b_i$.

Therefore, it follows that equation (12) can be written as the following non-linear cross-sectionally augmented DF (NCADF) regression:

$$\Delta \bar{y}_{i,t} = a_i + b_i \bar{y}_{i,t-1}^3 + c_i \Delta \bar{y}_t + d_i \Delta \bar{y}_{t-1}^3 + \varepsilon_{i,t} \quad (14)$$

Given the framework above, the authors develop a unit root test in the heterogeneous panel model based on equation (14). Extending the idea of Kapetanios et al. (2003), the authors derive t-statistics on \hat{b}_i , which are denoted by:

$$t_{iNL}(N, T) = \frac{\hat{b}_i}{s.e.(\hat{b}_i)}, \quad (15)$$

where: \hat{b}_i is the OLS estimate of b_i ; $s.e.(\hat{b}_i)$ is its associated standard error.

Following Pesaran (2007), the t-statistic in equation (15) can be used to construct a panel unit root test by averaging the individual test statistics:

$$\bar{t}_{iNL}(N, T) = \frac{1}{N} \sum_{i=1}^N t_{iNL}(N, T) \quad (16)$$

This is a non-linear cross-sectionally augmented version of the IPS test (NCIPS). Consequently, Pesaran (2007) calculates critical values of both individual and panel NCADF tests for varying cross section and time dimensions.

Table 4. Test of rental price convergence - individual NCADF

January 1994 – December 2004		January 2005 – February 2010	
City	t-stat	City	t-stat
Istanbul	-6.059 ***	Istanbul	-1.980
Ankara	-3.227 ***	Ankara	-0.645
Izmir	-3.5081 ***	Izmir	-1.453
Critical values (N = 3, T = 132):			
1%	-3.71		
5%	-3.12		
10%	-2.80		

Note : *** denote 1%.

Source: Cerrato et al. (Table 11, pp. 25, 2009)

Table 5. Panel test of rental price convergence

January 1994 – December 2004		January 2005 – February 2010	
	t-stat		t-stat
NCADF	-4.265***	NCADF	-1.359
Critical values (N = 3, T = 132):			
1%	-2.42		
5%	-2.22		
10%	-2.11		

Note: *** denote 1% critical value.

Source: Cerrato et al. (Table 11, pp. 25, 2009)

Furthermore, Table 4 reports the CADF test results as proposed by Cerrato's NCADF test. The results indicate that all cities exhibit rental price convergence towards the Turkish mean level at the 1% significance level from January 1994 to December 2004. In contrast, none of the cities show evidence of convergence from January 2005 to February 2010. The evidence clearly shows rental price divergence in Turkish property market. The result of nonlinear panel unit root test in Table 5 also provides the same conclusion as Table 4.

4. CONCLUSION AND FURTHER RESEARCH

In this paper, we investigate the rent convergence hypothesis by using monthly CPI inflation rates for Rent data in Turkey. After the recession in the early 2000s, Turkish housing market has grown on average yearly 11% in the period of 2002-2007. The property prices and rents also increased quickly during this period. However, the global economic crisis and some domestic factors have pushed the Turkish housing market into a recession at the late of 2000s.

We examine the hypothesis of nonlinear rental price convergence using relative rental price index of three major cities namely, Istanbul, Izmir, and Ankara span from the period from January, 1994 to February, 2010. Using a new non-linear panel ADF test under cross-sectional dependence, which is based on the Exponential Smooth Transition Autoregressive (ESTAR) model as advocated by Cerrato et al. (2009) the hypothesis of rental price convergence towards its national average rental index for three major cities in Turkey rental market is investigated.

Our results indicate that all cities exhibit rental price convergence towards its national mean level for the period of January 1994 to December 2004. In contrast, none of the cities

show evidence of convergence from January 2005 to February 2010. The evidence clearly shows rental price divergence in Turkish property market.

The empirical result indicates that evidence of both linear and nonlinear convergence is lacking in the era of globalization in the period of January 2005 to February 2010. Lau (2010) finds evidence of provincial income divergence using Cerrato's NCADF test for the period 1952-2005. His finding for Chinese provincial growth dynamics suggests further study on conditional convergence, whereas heterogeneous factor difference may hinder beta convergence across provinces. Those factors may include inflation rate, infrastructure, human capital, degree of openness, and use of foreign capital among provinces. The findings support the implication of the proposition suggested by Young (2000) that there is increasing local protectionism in China. Along this strand of study we suggests further research on the rent convergence in Turkish property market should investigate heterogeneous factor difference in those three Turkish cities, that may hinder rent convergence dynamics in the era of globalization. Those factors may include prime loan rate, inflation rate, degree of market openness in terms of regulations and rules, agency commissions, legal fees, and property tax across cities.

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SANTRAUKA

RENTOS KAINŲ KONVERGENCIJA BESIVYSTANČIOJE EKONOMIKOJE

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Darbe tikrinama trijų pagrindinių Turkijos miestų – Stambulo, Izmiro ir Ankaros – netiesinės rentos kainų konvergencijos hipotezė nuo 1994 m. sausio mėn. iki 2010 m. vasario mėn., taikant santykinį rentos kainų indeksą. Tyrimų rezultatai rodo, kad nuo 1994 m. sausio mėn. iki 2004 m. gruodžio mėn. visuose miestuose rentos kainos artėjo prie vidutinio nacionalinio lygio. Priešingai, tokios konvergencijos įrodymų negauta nė vieno miesto atžvilgiu nuo 2005 m. sausio mėn. iki 2010 m. vasario mėn. Faktai aiškiai rodo Turkijos nekilnojamojo turto rinkos rentos kainų divergenciją.