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# Macroeconomic Uncertainty and the Comovement in Buying versus Renting in the USA

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# Abstract

This paper characterizes the sources of the comovement in the U.S metropolitan buy-rent growth rate. The analysis is based on quarterly buy-rent indices from 1982:Q1 to 2016:Q4. To this end, we used the dynamic factor model to decompose the index into national and local factors. The national component contributed more to the variation in the buy-rent indices relative to the local component with variance decomposition values of 72% and 27% respectively albeit this varied across the cities. We further examined the sensitivity of the national buy-rent factor to macroeconomic uncertainty. Our full sample results show that uncertainty has a significant negative effect on the buy-rent behavior thus favouring buying a home as a wealth accumulation channel and hence a hedge relative to renting a similar home and investing in other financial assets. The results from the recursive estimation further confirmed a dominant negative relationship with fewer periods of positive relationship. The implications of these findings are drawn.



**Keywords**: Buy-rent choice, consumer behavior, dynamic latent factor model, development, economic uncertainty.

**JEL**: C32, C38, E21, E30, R31.

# 1. Introduction

The housing market plays a crucial role in determining the future growth potential of an economy. This is because housing accounts for a substantial share of many household's assets and net worth. For instance, in 2017Q4, the Federal Reserve Bank (2018) data shows that real estate forms 72.1% of total household non-financial assets, 24.8% of total household net worth and 21.4% of household total asset. Therefore, any declines in housing wealth presents a channel through which housing bust can weaken aggregate demand. This was evident in the 2007-2008 global economic and financial crisis which originated from the U.S. housing market bubble when very attractive house prices, low mortgage interest rates and low standards for mortgage loans resulted into large subprime debt.

The impact of the crisis loomed even years after. According to Statista (2018a), the number of new houses sold in the United States in 2011 (306 thousand houses) decreased by about 76% compared to the value in 2005 (1.3 million houses). The housing market is beginning to recover as there were roughly 614 thousand new housing units sold in 2017. Also the S&P/Case Shiller home price index which fell from 180.1 in 2005 to a low of 135.2 in 2011 rose to 196.2 as at 2017 (Statista, 2018a). However, the rate of home-ownership has been declining with the figure standing at 64.2% in 2017 compared to approximately 68% between 2007-2008 (Statista, 2018a; U.S. Census Bureau, 2018).

An important financial decision by households and firms is the decision as to whether to buy or rent a home. Both buying and renting a home are conceived as wealth accumulation (Beracha and Johnson, 2012) though both may have both advantages and disadvantages. With buying, wealth creation could be possible through imputed rents (rents avoided by ownership) which often exceed interest on mortgage and savings motivated by the downpayment requirement (Mnasri, 2015). With renting, wealth creation could be possible if the individuals are fiscally disciplined and reinvest all gains from renting into a risk free asset, or a risk equivalent portfolio (Hennessey, 2003; Lin and Vandell, 2007; Beracha and Johnson, 2012).

The decision to buy or rent a house may be influenced by complex but interrelated factors such as high geographic mobility, idiosyncratic earnings uncertainty, downpayment constraints,

large loan debts, mortgage distress, uncertainty about the adequacy of social security, high cost of education, high rates of job loss, soft wage growth, depleted financial reserves and uncertainty over the future housing finance system, rising home prices coupled with declining household income amongst others (Mnasri, 2015; Dynan, 2012; Statistica, 2018b). Therefore, understanding the drivers of the buy or rent decision is important for households, firms, portfolio managers, policy makers and researchers.

Against this backdrop, this study aims at examining the impact of macroeconomic uncertainty on buy-rent behaviour of agents in the housing market in the U.S. This is particularly important given that the aftermath of the recent recession has been characterized by increased volatility in housing prices, unemployment rate and uncertainty in the United States (Strobel *et al*., 2018). The theoretical channel through which uncertainty may affect the buy-rent decision could be explained in terms of real options effect and irreversibility of investment (McDonald and Siegel, 1985, 1986; Pindyck, 1991). It is well known in classical economics that a risk-neutral firm will choose to invest if the net present value of an investment is positive.

However, if there is uncertainty about future coupled with durable and illiquid investment, then pursuing a different investment or refusal to invest at all in the future has economic value (real option). Cunningham (2006) explained that a real option permits one to make an investment in the future, conditional on new information. Firms wishing to make such an investment need high expected net return as a motivation for giving up the real option in favour of current-period investment. Consequently, real options should raise the value of some assets and delay investment. Ceteris paribus, uncertainty about future housing prices or returns, should reduce the probability of current-period investment, even for risk-neutral investors. It tends to hold demand for housing, thereby affecting housing returns (Hirata *et al*., 2013; Burnside *et al*., 2016).

Uncertainty may reduce the likelihood of buying in favour of renting a house. This is because buying involves making an irreversible investment. Transaction costs and liquidity risk render buying riskier and costlier relative to renting (Mnasri, 2015).[1]. In the presence of uncertainty often characterized by high interest and unemployment rates, people may therefore tend be

[1] Sinai (2011) however argued that though it is often assumed that renting is less risky than homeownership, this is not always the case as which option is riskier depends on the risk source and household characteristics.

more cautions in buying houses. Hence it may pay to delay buying plans. According to a report by the Trafalgar Property Group (2016), high interest rates make it more difficult for potential buyers to secure home loans especially if they are first-timers since large cash may need to be saved to pay deposit and transfer costs. The report further noted that rental demand is likely to be heightened by those who decide to postpone buying a home because of economic and employment uncertainties, and homeowners who decide to sell their properties due to financial pressure and rent instead.

If the future cash flows are surrounded with uncertainty, renting may be a better alternative since it allows the flexibility of moving to a location with cheaper rental. According to Wang (2018) owning a house is risky due to house price volatility whose effect on the owner's wealth could be substantial whereas renting provides a hedge against housing price uncertainty by offering a put option on the house value. It is also possible that one finds more preference for buying a home during uncertain times to renting especially if the interest or mortgage rate is low at such uncertain periods. More importantly, uncertainty can generate financial pressure and make home owners feel their house value may drop thus putting their loans in negative equity (Inglis, 2017).

Although there is a recent interest among researchers in examining the link between uncertainty and the housing market as evidenced in the literature section, we are not aware of any empirical studies on macroeconomic uncertainty and buy-rent decision. Therefore, for the first time, we contribute to the literature by investigating whether macroeconomic uncertainty affects the buy-rent behaviour in the United States. We also contribute by first decomposing the buy-rent index into three components: national, regional and city-specific factors to determine which of these actually drives the major comovement in the buy-rent index. We then subsequently analysed the sensitivity of the major component to economic uncertainty.

Uncertainty is not observable and hence needs to be measured. There are several measures of uncertainty that have been proposed in the literature (Jurado *et al*., 2015; Fernandez-Villaverde *et al*., 2015; Shoag and Veuger, 2016; Baker *et al*., 2016; Rossi *et al*., 2016; Azzimonti, 2018) We use Rossi et al. (2016) macroeconomic uncertainty in this study although robustness check was performed with other measures of uncertainty. The advantage of the Rossi *et al*. (2016) uncertainty measure is that it not only captures aggregate macroeconomic uncertainty but goes further to decompose uncertainty into different components. In addition, we used Rossi and

Sekhposyan (2015) macroeconomic uncertainty indices that is based on nowcast and forecast error distributions which in addition allows for asymmetry by distinguishing between upside and downside uncertainty.

The rest of the paper is structured as follows: section 2 presents the literature review. Section 3 is on the empirical model while data are presented in section 4. Results are discussed in section 5 and section 6 concludes.

## 2. Literature Review

Although research in the housing market has grown over the years, only few studies have investigated the drivers of buying versus renting behavior. For instance, Mnasri, (2015) examined housing tenure decision in the U.S. in a dynamic general equilibrium life cycle model with uninsurable individual income risk and found that the decision to own a house is mainly determined by youth's high geographic mobility while downpayment constraints have minor role except for retired households. The findings also show that income inequality has a significant impact on ownership rates especially among the middle-aged households.

Boehm and Schlottmann (2014) examined the likelihood and timing of housing tenure choice dynamics in the U.S. and Germany using continuous time and logit models. Data on house price appreciation and the relative cost of owning to renting as well as household characteristics were used as drivers of tenure decision. The results show that appreciation and the relative cost of owning to renting a house play significant role in housing transitions in both economies.

Halket and Vasudev (2014) found that while some households rent due to borrowing constraints. However, risky house values and transactions costs, which affects propensity to save and move are important determinants of the ownership rate in the U.S. Halket and di Custoza (2015), show that in the U.S. rent-to-price ratios are low and scarce rentals contribute to high homeownership rates and that long-duration households sort into scarce rental markets. Tabner (2016) found that increases in holding periods, inflation and the spread between imputed rent and the opportunity cost of household savings favour house ownership thus supporting the notion that inflation transfers wealth from renters and mortgage providers to

owners, whereas deflation reverses the flow until rising default levels establish a new equilibrium.

For 23 U.S. metropolitan areas, the four Census regions, and the nation, Campbell et al. (2009) split the rent–price ratio into three components: the expected present discounted values of rent growth, real interest rates, and a housing premium. They showed that housing premia are variable, can be predicted and contribute significantly to rent–price ratio volatility at the national and local levels. They also showed that the rent–price ratios fluctuations are dampened by the covariances among the three components. Schulz *et al*. (2014) using household panel data analyzed the importance of human capital for the tenure mode choice of German households. They show that the probability of renting increases with mobility requirements while the potential to diversify net income risk did not affect the choice between buying or renting a house in Germany.

Fisher and Gervais (2010) found that while heightened income risk and delayed marriage are the main driving forces lowering home ownership among the youths, higher productivity has a substantial positive impact on home ownership. Lowering the downpayment constraints and lowering household formation also had positive but small impact on home ownership. Also Kiyotaki *et al*. (2011) argue that the relaxation of downpayment requirements was quantitatively small and had only modest implications for the housing market in the U.S. However, Chambers *et al*. (2009) and Iacoviello and Pavan (2013) found that low ownership rates among young households in the U.S. could be substantially explained by the borrowing constraints.

Aside these studies which have typically examined the drivers of housing tenure decision in terms of fundamentals, Wang *et al*. (2018) used the property and rental market data from Hong Kong and mainland China's cities, to model the renter's decision to buy a house and the landlord's decision to sell as real options of waiting. Thus, they examined real options effects on rental demand, supply and thus, the rental rate. They demonstrated in theory that housing price uncertainty can have a significant impact on the property investments of individual households, leading to fluctuations in the rental market. Empirically, they show that rent is not just driven by fundamentals; the housing price shock and its variance also play important roles in rental adjustments.

Other strands of literature (Sum and Brown, 2012; Ajmi *et al*., 2014; Dorofeenko *et al*., 2014; Antonakakis *et al*., 2015; Su *et al*., 2016; El Montasser *et al*., 2016; Akinsomi *et al*., 2016; Antonanakis *et al*., 2016; Christou *et al*., 2017; Andre *et al*., 2017; Chow *et al*., 2017; Aye, 2018; Strobel *et al*., 2018; Aye *et al*., forthcoming) have focused on the impact of economic uncertainty on the housing or real estate investment trusts markets. Typically they have looked at the impact of economic policy uncertainty on housing returns and its volatility but not on the decision to buy or rent a house. Therefore, the current study fills the gap in the literature by examining the impact of macroeconomic uncertainty on the decision to buy or rent a house in the US and its metropolitan cities whereby we first decompose the buy-rent index growth rate to its various sources.

## 3. Empirical Model

We follow two steps in implementing the method. In the first step, we estimate a dynamic latent factor model (DFM) for the U.S. metropolitan areas buy-rent index (from Beracha *et al*., 2012) growth rates which includes the national, regional and area (city) specific factors. In the second step we analyse the effect of economic uncertainty on the national factors. Following Neely and Rapach (2011) the DFM is specified as:

$$BHJ_{i,t} = \beta_i^n f_t^n + \beta_i^r f_{j,t}^r + \varepsilon_{i,t} \quad (1)$$

where $BHJ_{i,t}^{US}$ is the demeaned growth rate of BHJ buy-rent index for the U.S. metropolitan area $i$ $(i = 1,...,N)$ from year $t-1$ to $t$ $(t = 1,...,T)$. $f_t^n$ is the national factor and is common to all the $N = 23$ metropolitan buy-rent growth rates we study. The regional factors, $f_{j,t}^r$ $(j = 1,...,J)$ are common to all the metropolitan cities in each of the $J = 4$ U.S. regions (Northeast, Midwest, South and West).[2] The loadings, $\beta_i^n$ and $\beta_i^r$, capture the responses of an individual metropolitan's buy-rent growth rate to changes in the national and regional factors, respectively. For instance, a higher $\beta_i^n$, implies that metropolitan i's buy-rent growth

[2] The regions are classified based on the U.S. Census Bureau. The 23 metropolitan areas and their regions are: Boston, New York City, Philadelphia and Pittsburgh (Northeast); Chicago, Cincinnati, Cleveland, Detroit, Kansas City, Milwaukee, Minneapolis and St. Louis (Midwest), Altanta, Dallas, Houston and Miami (South); Denver, Honolulu, Los Angeles, Portland, San Diego, San Francisco and Seattle (West).

rate responds more strongly to the national factor. Therefore, a metropolitan area with $\beta_i^n = \beta_i^r = 0$ will have a buy-rent growth that is totally idiosyncratic, showing no movement with other metropolitan city's buy-rent growth. $\varepsilon_{i,t}$ reflects the city-specific or idiosyncratic component of metropolitan $i's$ buy-rent growth rate. It is assumed that the national and regional as well as the idiosyncratic factors are mutually independent and follow AR (q) and AR (p) processes, respectively[3]:

$$f_t^n = \phi_1^n f_{t-1}^n + ... + \phi_q^n f_{t-q}^n + u_t^n \tag{2}$$

$$f_{j,t}^r = \phi_{j,1}^r f_{j,t-1}^r + ... + \phi_{j,q}^r f_{j,t-q}^r + u_{j,t}^r (j = 1,...J) \tag{3}$$

$$\varepsilon_{i,t} = \phi_{i,1}\varepsilon_{i,t-1} + ... + \phi_{i,p}\varepsilon_{i,t-p} + u_{i,t} \tag{4}$$

where

$u_t^n \sim N(0,\sigma_n^2)$, $u_{j,t}^r \sim N(0,\sigma_{j,r}^2)$, $u_{i,t} \sim N(0,\sigma_i^2)$ and $E(u_t^n u_{t-s}^n) = E(u_{j,t}^r u_{t-s}^r) = E(u_{i,t}u_{i,t-s}) = 0$ for $s \neq 0$.

As the shocks in (2) to (4) are assumed to be uncorrelated contemporaneously at all leads and lags, the national, regional, and area-specific factors are orthogonal. Although the results are not sensitive to the lag order, we set the orders of the AR processes to two when estimating the DFM in the empirical section.

Neither the signs nor the scales of factors and factor loadings are separately identified in (1). Hence, to normalize the scales, each of the factor shock variances is assumed to be equal to one. Also following Kose *et al*. (2003), we normalize the signs by restricting the national factor loadings for the first metropolitan city in the entire list (Boston) and the regional loadings for

[3] This feature makes equation (1) to be regarded as a dynamic latent factor model (Neely and Rapach, 2011).

the first city in each region (Boston, Chicago, Altanta and Denver) to be positive. The choice is done arbitrarily. It should however be noted that these normalisations do not have any economic implications as for instance the variance decompositions, the main tool of analysis here, are not sensitive to these normalisations. Moreover, the sign normalizations only help in making interpretation convenient since they ensure that the means of the loading posterior distributions are mostly positive.[4]

Due to the latent nature of the factors in (1), we cannot use common regression methods for estimating the DFM, rather we estimate the model with Bayesian techniques with data augmentation following Neely and Rapach (2011). Moreover, the efficiency of the Bayesian techniques in cross-sectional data and factor analysis in dynamic factor models has been noted by Kose *et al*. (2003). We simulate draws from the complete posterior distribution for the model parameters and factors by successively drawing from a series of conditional distributions using a Markov chain Monte Carlo (MCMC) procedure based on 10000 replications after 1000 burn-in replications. We use conjugate priors for the national and regional shocks, diffuse prior for the idiosyncratic shock. As this prior information relies on stationary AR processes, we use the growth rate of the buy-rent index to account for stationarity. [5]

As earlier stated, the variance decomposition is the main tool of analysis used here. This measures the extent to which each national factor contributes to the variation in the metropolitan buy-rent index growth rate. Assuming orthogonal factors, the variance decomposition is computed as follows:

$$\theta_i^n = (\beta_i^w)^2 \, \mathrm{var}(f_t^n) / \mathrm{var}(BHJ_{i,t})(i = 1,...N) \qquad (5)$$

where

[4] The results show that all the 23 metropolitan cities have positive national factor loadings while 14 out of 23 metros have positive regional loadings.

[5] For more technical details on the Bayesian techniques including prior selection and definition and estimation procedure employed, please refer to Neely and Rapach, (2011), Simo-Kengne *et al.* (2014), Otrok and Whiteman (1998) and Kose *et al.* (2003).

$$\text{var}(BHJ_{i,t}) = (\beta_i^n)^2 \text{ var}(f_t^n) + (\beta_i^r)^2 \text{ var}(f_{j,t}^r) + \text{var}(\varepsilon_{i,t})(i = 1,...N) \quad (6)$$

and $\theta_i^n$ is the fraction of the total variability in metropolitan city $i's$ buy-rent growth rate accounted for by the national factor. The factor loadings and relative buy-rent volatility in cities $i$ and $j$ both determine the relative sizes of $\theta_i^n$ and $\theta_j^n$. The proportion of the total variability in city $i's$ buy-rent growth accounted for by the regional factor ($\theta_i^r$) and city specific factor ($\theta_i^c$) are similarly defined. As $\theta_i^n$, $\theta_i^r$, and $\theta_i^c$ are functions of the model parameters and data, the MCMC algorithm draws from the respective posterior distributions on each statistic for each replication for each metropolitan city.

Once the national factor is separated from the local component in the buy-rent index fluctuations, we proceed to answer an important question: does economic uncertainty drive the national buy-rent factor? To address this, the proportion of buy-rent variance explained by the national factor is regressed on U.S. economic uncertainty variables. We also analysed the role of economic uncertainty for the aggregate US buy-rent growth rate. The bivariate regression model is given by

$$\theta_i^{-n} = \alpha_0 + \alpha_1 X_i + e_i^n \quad (9)$$

where $\theta_i^{-n}$ is the point estimate (given by the posterior mean) of the fraction of the variance of metropolitan city $i$ ($i = 1,...,23$) that the national factor explains and $X_i$ is the value for U.S. economic uncertainty. We estimate (9) using OLS.[6] We also present the recursive estimates to indicate the exact nature of the relationship at each time period.

## 4. Data

[6] Robustness checks with quantile regression and probit model (with the dummy taking one when renting and zero when buying) produced qualitatively similar results, which in turn, are available upon request from the authors.

We used quarterly data on economic uncertainty and buy-rent index covering from 1982:Q1 to 2016:Q4. The starting and ending date are purely determined by the economic uncertainty data. Although various uncertainty proxies have been proposed in the literature we used Rossi *et al*.'s (2016) decomposed macroeconomic uncertainty in this study. The index is based on forecast densities for output growth which are used to construct a measure of uncertainty that reflect business cycle uncertainty. This uncertainty is decomposed into different sources of uncertainty such as Knightian uncertainty and realized risk, disagreement and aggregate uncertainty, ex-ante and ex-post uncertainty among others.

Risk relates to situations where agents know the probability distribution of the stochastic events while Knightian uncertainty refers to a situation in which agents cannot reasonably contemplate all the possible states of nature or correctly characterize their probability distributions. There is also a distinction between aggregate uncertainty and disagreement by Rossi *et al*. (2016). Aggregate uncertainty captures the aggregate probability distribution, measured with a simple average of the individual probability distributions.

Disagreement measures dispersion among forecasters on the probability distribution of future outcomes and is a special case of Knightian uncertainty since it implies that at least one of the probability distributions is not correctly specified. Their measure of uncertainty were constructed using realizations of the data, therefore, they distinguished between an ex-ante component that does not include the realizations and an ex-post component which does. The ex-ante component arises from the average distance of random draws from a given predictive distribution.

We also used the macroeconomic uncertainty indices of Rossi and Sekhposyan (2015) that is based on nowcast and forecast error distributions. The index was based on comparing the realized forecast error of a macroeconomic variable (specifically real GDP growth) with the historical forecast error distribution of that variable. The interesting feature of this uncertainty measure is that it conveys some information about asymmetry in uncertainty by distinguishing between upside and downside uncertainty. A realized value much higher than the expected value (values close to 1) measures a positive "shock" and hence captures the upside uncertainty. On the hand, a very small value of the index (close to zero) indicates that the realized value

was much smaller than its expected value, i.e., a negative, unexpected "shock" and this captures the downside uncertainty [7]

For buy versus rent decision, we used the Beracha, Hardin and Johnson (BHJ) Buy vs. Rent Index (Beracha *et al*., 2012). To construct the index value for each location and each point in time, a "horse race" comparison is made between an individual that is buying a home and an individual that rents a similar quality home and reinvests all monies otherwise invested in homeownership. The index value ranges between -1 and 1 with a value that approaches -1 strongly favouring buying in order to create greater wealth while an index value that approaches 1 strongly favors renting in terms of wealth creation. Index values close to 0 suggest a "toss-up" between ownership and renting.

The index is available for 23 major U.S. metropolitan housing markets (Boston, New York City, Philadelphia, Pittsburgh, Chicago, Cincinnati, Cleveland, Detroit, Kansas City, Milwaukee, Minneapolis, St. Louis, Altanta, Dallas, Houston, Miami, Denver, Honolulu, Los Angeles, Portland, San Diego, San Francisco and Seattle) and the U.S. real estate market as a whole.

## 5. Results

To understand the comovement in the buy-rent growth rates, the metropolitan buy-rent indices are plotted alongside with the national and local factors obtained from the dynamic factor model. Panel A which plots the actual data on buy-rent ratios shows that the values have fluctuated between buying and renting over the sample period. However, there is one noticeable period of high volatility across all cities. This occurred between 2005 and 2009, a period which largely coincides with the recent global economic and financial crisis which originated from the U.S. subprime mortgage crisis. Increasing values of the buy-rent indices imply that more households would choose renting over buying.

[7] We also used the factor-model based uncertainty indices of Jurado *et al*., (2015) at various forecasting horizons, news-based indices of uncertainty as developed by Baker *et al*., (2016). These indices are available at monthly frequency, and we converted them into quarterly data by taking three month averages. Our results, however, were qualitatively similar, and are available upon request from the authors. We decided to go with the indices of Rossi and Sekhposyan (2015) and Rossi *et al*., (2016), as they provide information on various types of uncertainties and also upside and downside values of the same. Also, aggregating uncertainty from higher to lower frequency could be a concern due to loss of information, as suggested by Balcilar *et al*., (2016).

Although both national and local factors (regional and city-specific) factors in Panels B and C respectively show much volatility over the period, the impact of the Great Recession is obvious in Panel B. Comparing Panels B and C., it appears that the heterogeneity in the buy-rent ratios across the provinces seems to be more pronounced in Panel C than Panel B. This is in line with the observation of the former Fed Chairman Alan Greenspan, that the U.S. housing market did not experience national housing bubble prior to 2007 but mainly local bubbles (Greenspan 2005; 2007). Figure 2 displays the U.S. aggregate buy-rent index growth rate and the national factor. There appears to be some correlations but this is not very distinct.

The variance decomposition which shows the relative contribution of each factor to changes in the buy-rent indices per period is shown in Figure 2. This is an important tool in understanding the strength of national comovement in metropolitan buy-rent indices. Here we present the mean of the posterior distribution for the common or national component as well as the local component. National variance decomposition indicates the contribution of the national factor in buy-rent movement while the local variance decomposition shows the joint contribution of regional and city-specific factors in driving buy-rent movement in the U.S.

Figure 2 shows that national and the local factors have played different roles over the years in the buy-rent behaviour in the U.S. Although the national factor has greater impact on the buy-rent movement, we observe some heterogeneity across the cities. For instance, while in Chicago, the national factor accounts for 92% of the variation in the metropolitan buy-rent index, in Boston the difference between the contribution of the national factor (0.53) and local factor (0.47) is not that great. On average the national factor accounts for about 72% while the local factor accounts for about 28% of the buy-rent volatility.

Having established that the national factor plays a substantial role in the variation in the buy-rent index, we turn to analyse the impact of economic uncertainty on the national factor. The bivariate full sample regression results between the national factor and the macroeconomic uncertainty measures used in this paper are presented in Table 1. We found significant negative relationship between uncertainty and the national buy-rent factor. This implies that uncertainty tends to favour buying as a form of wealth creation relative to renting. This could be explained by the reason that individuals consider housing as hedging against risk such that they would rather buy a house when uncertainty increases instead of renting and investing in other assets.

Also if the monetary authority decides to lower interest rates in order to give the economy enough liquidity to fuel growth in the wake of higher uncertainty, this may again favour buying a home. In general, housing seems to be considered as a safe-haven by economic agents. Our results are in line with Aye *et al*. (forthcoming) on economic uncertainty and the housing market cycle. Table 2 shows the regression estimates for the relationship between macroeconomic uncertainty and U.S. aggregate buy-rent growth. The result here is essentially mostly insignificant, the only exception being the upside uncertainty and realized risk.

To see whether the negative relationship we have observed in the full sample estimation is constant over the entire sample period, we also presented in Figure 4 the results from the recursive estimation. The coefficients are presented alongside with their corresponding p-values. We plot the figures for uncertainty and realized risk since these have larger explanatory power relative to other measures. Clearly the figure shows that the relationship is changing over time. Both the sign and magnitude of the effect of uncertainty on the national buy-rent factor are not constant.

Within the first two years of the sample the effect is positive thus favoring renting behavior. However, for the greater part of the sample, the effect is negative and significant as evidenced by the p-values falling below the 10% critical value (the red horizontal line on the RHS panel). This shows that uncertainty favoured buying behaviour for most of the times including the well-known Asian financial crisis of 1997 and the recent Great Recession of 2007-2009.

## 6. Conclusion

Firms, households and individuals often make decision whether to buy or rent their accommodation. This tenure decision has long-term consequence for the financial welfare of these agents and has implications for macroeconomic development and stability. In this paper, we attempted to decompose the U.S metropolitan buy-rent index growth rate into national and local (joint regional and city-specific) factors. Our results show that the local factors are mainly responsible for the historical heterogeneity in the buy-rent indices.

However, in terms of the magnitude of impact, the national component accounts for about 72% of the changes in the buy-rent indices while the local component accounts for 27%. Since the

national factor plays a greater role in the comovement of the buy-rent index, we further investigated the effect of macroeconomic uncertainty on the national buy-rent factor. Our full sample results show that the relationship between uncertainty and the buy-rent behavior is in general negative and significant.

Further results based on a recursive estimation further confirmed a dominant negative relationship though this was positive at the beginning of the sample. In addition, the magnitude of impact varied over time. Overall, the results suggest that macroeconomic uncertainty favour buying a home instead of renting a home and reinvesting all the gains from not owning a home to other assets. It can be inferred that buying a home is considered as a hedge against uncertainty by individuals. Buying a home may have been viewed as less risky than renting and reinvesting in other assets such as stocks in a period of uncertainty.

Moreover, as pointed out by Sinai (2011), buying may not always be riskier as widely assumed since the riskiness of buying versus renting may depend on the source of risk and household characteristics. Buying may have also been preferred to renting if uncertainty shocks gave rise to expansionary monetary policy. These results have important implications. From the policy and practical perspective, the findings are important in developing social security reforms and other welfare packages and development programs aimed at promoting home ownership even in the presence of uncertainty. This however, does not suggest that policy makers and other stakeholders should care less about economic uncertainty.

From the academic perspective, it is important that a precise analysis and assessment be obtained to inform better policy decisions. As it is evident that the main driver of the comovement in the buy-rent growth is the national factor, it is needful that such decompositions should be made prior to further analysis and forecasting of tenure choice.

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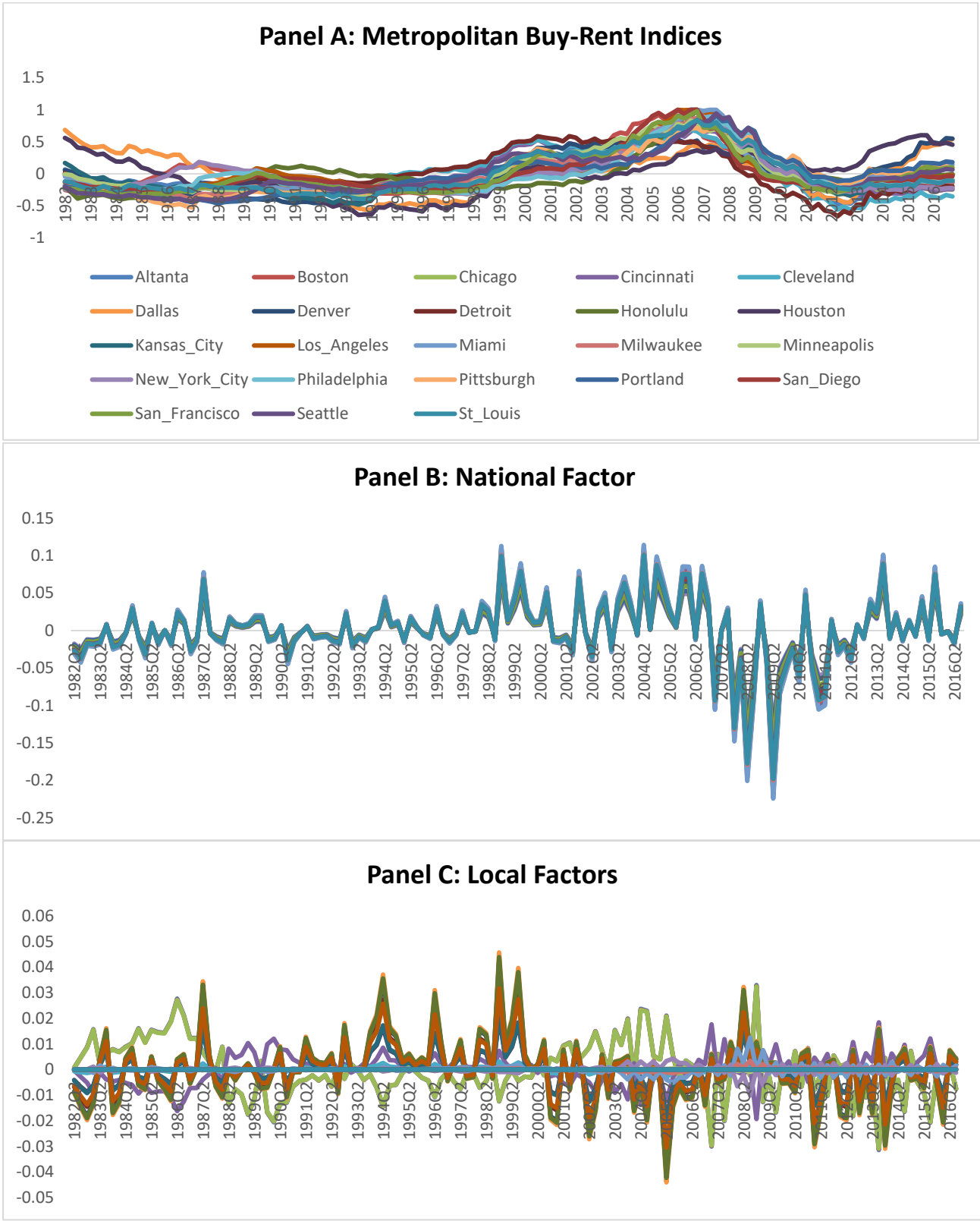
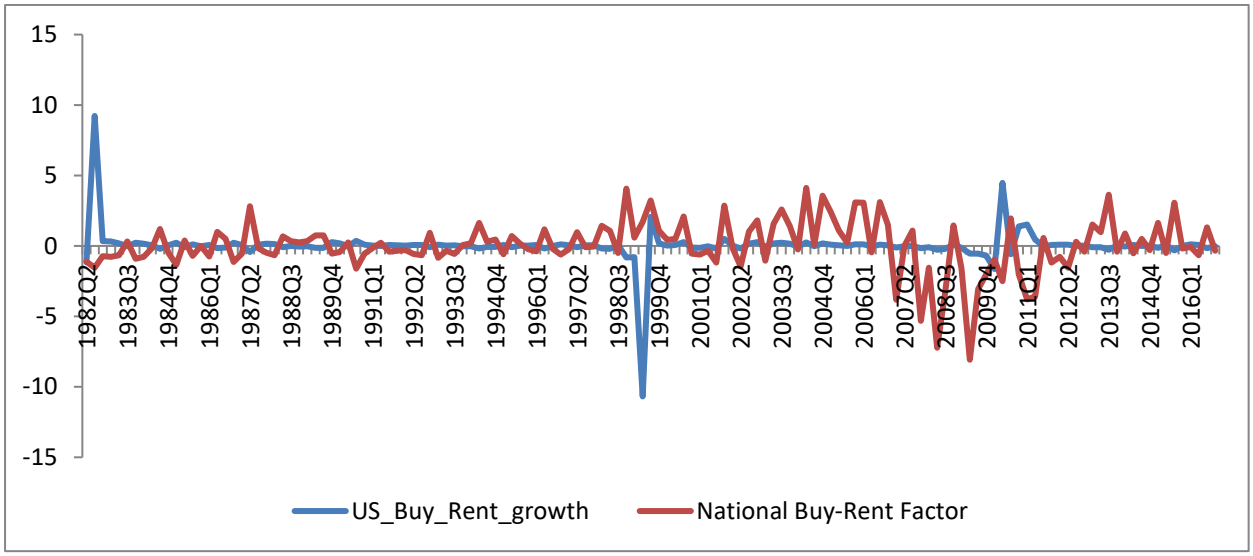
# Figure 1

**The buy-rent indices and the role of the national and local factor across metropolitan cities**



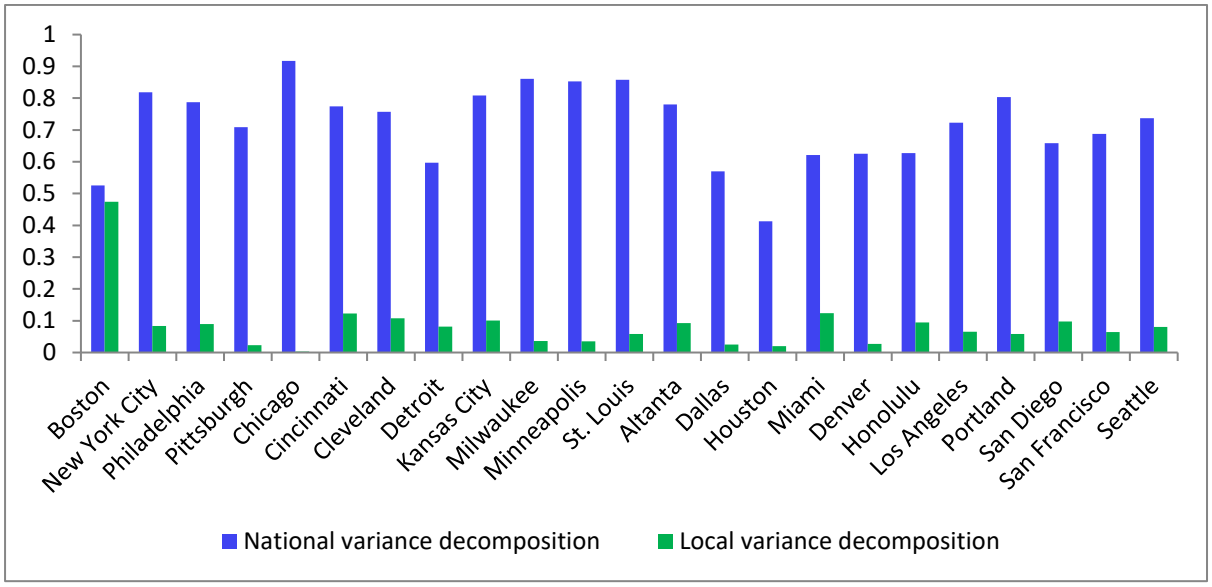
# Figure 2

**The national buy-rent factor and the U.S. aggregate buy-rent index growth**



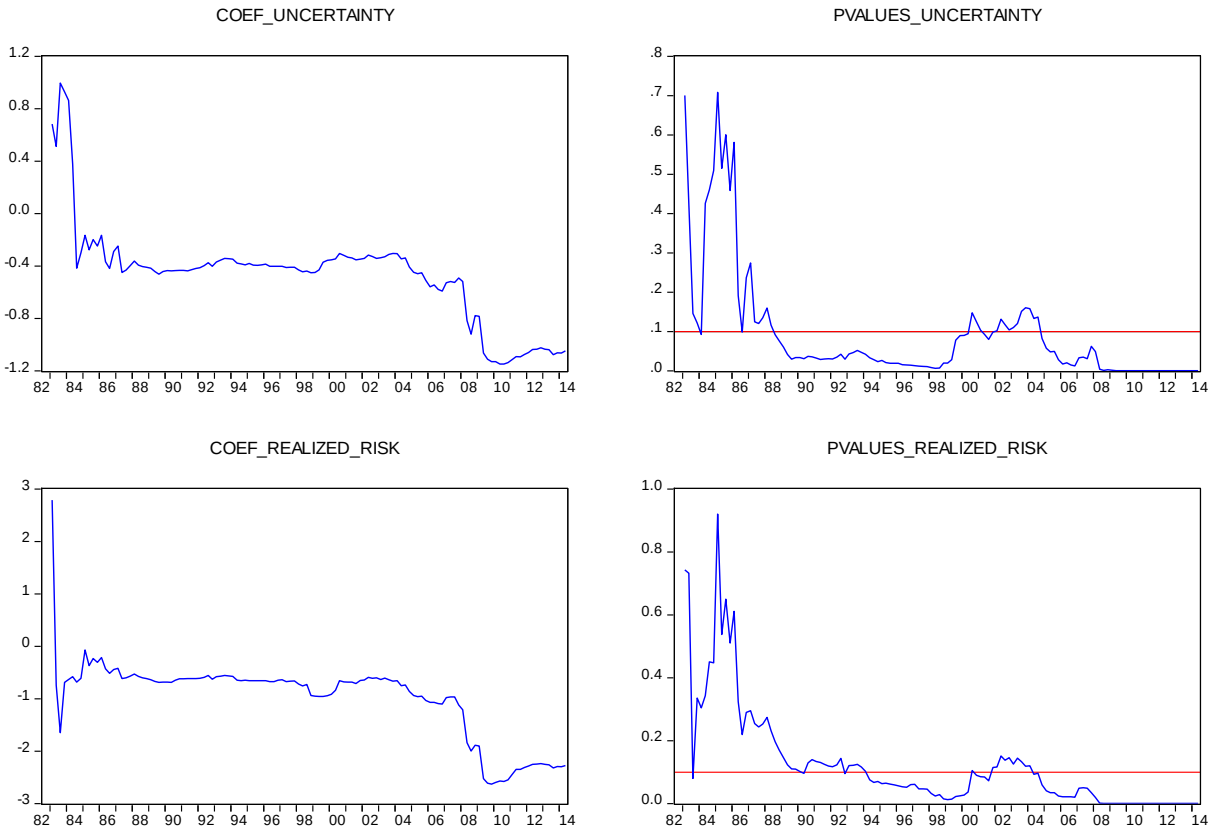
# Figure 3

## Variance decompositions for metropolitan buy-rent ratios



# Figure 4

## Recursive estimates and p-values of the impact of uncertainty on the national factor



# Table 1

**Bivariate regression between the national factor and macroeconomic uncertainty**

| Uncertainty measure | Coefficient | T-statistic | $R^2$ |
|---|---|---|---|
| SPFU0 | -0.8852 | -0.6853 | 0.0038 |
| SPFU0_UP | 1.3993 | 1.1952 | 0.0114 |
| SPFU0_DOWN | -2.1561* | -1.8457 | 0.0267 |
| SPFU4 | -3.3003*** | -2.7995 | 0.0613 |
| SPFU4_UP | 0.8231 | 0.7424 | 0.0046 |
| SPFU4_DOWN | -4.5719*** | -3.8574 | 0.1103 |
| UNCERTAINTY | -1.0482*** | -4.6112 | 0.1444 |
| AGGREGATE_UNCERTAINTY | -1.0696*** | -4.6101 | 0.1443 |
| DISAGREEMENT | -7.8679* | -1.7178 | 0.0229 |
| KNIGHTIAN | -0.7999** | -2.1335 | 0.0349 |
| REALIZED_RISK | -2.2752*** | -4.6301 | 0.1454 |

*, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

# Table 2

**Bivariate regression between the US aggregate buy-rent growth and macroeconomic uncertainty**

| Uncertainty measure | Coefficient | T-statistic | $R^2$ |
|---|---|---|---|
| SPFU0 | -0.0049 | -0.0065 | 0.0000 |
| SPFU0_UP | 0.0963 | 0.1395 | 0.0002 |
| SPFU0_DOWN | -0.1014 | -0.1462 | 0.0002 |
| SPFU4 | -0.9944 | -1.3902 | 0.0159 |
| SPFU4_UP | -1.6466** | -2.5681 | 0.0521 |
| SPFU4_DOWN | 1.0445 | 1.4144 | 0.0164 |
| UNCERTAINTY | 0.0231 | 0.1268 | 0.0001 |
| AGGREGATE_UNCERTAINTY | 0.0021 | 0.0112 | 0.0000 |
| DISAGREEMENT | 5.0935 | 1.4965 | 0.0175 |
| KNIGHTIAN | -0.2248 | -0.7968 | 0.0050 |
| REALIZED_RISK | 0.6542* | 1.6792 | 0.0219 |

*, and ** indicate significance at 10% and 5% levels, respectively.