

Is there Seasonality in Home Prices – Evidence from CBSAs

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Abstract

This study attempts to detect seasonality in home prices at the Core Base Statistical Area (CBSA) level. Using a unique database of home sales from 138 CBSAs from February 2000 to April 2011, we study if monthly home prices vary significantly during the year. Using a hedonic pricing model to account for housing characteristics and the standard HP-filter system to extract the trend and the cyclical/seasonality component of the prices, our findings indicate significant price variations during the year for most months around the country. At the aggregate level, the monthly price changes vary from an average of -2.78% on the downside to 1.93% on the upside. This study finds two factors affecting price changes: one if the CBSA is a tourist destination or not; the other the geographic region.

Key words: Seasonality, home prices, price changes, appraisal.

I. Introduction

Sales of homes in the United States take place all around the year although at vastly different volumes. Sellers wait for the best offer on their houses, and when an offer meets their reservation price, they enter into a contract with the buyer. However, the decision as to when to attempt a sale is more often a need or consumption-driven decision rather than an investment-maximizing decision. Sellers may surmise that the price fetched by their property is independent of the time of year it is offered. This is not true and it appears that both consumers and appraisers have largely ignored seasonal price effects. There is already evidence of inefficiency in the housing market with respect to the volume of single-family homes.¹ Sales of homes peak at different times of the year across the country. While it is a common knowledge among real estate agents, Goodman (1993) established the pattern of home sales peaking during the Spring-Summer season. With respect to new homes, the author explains that sales peak earlier because of recording differences as most new homes are sold before they are ready for occupancy. Having seen inefficiency with respect to home volumes, it is reasonable to question the existence of informational inefficiency with respect to seasonality in home prices.

Studies in the past have looked at pricing changes over years. Case and Shiller (1989, 1990) find that the single homes market is inefficient across years. Using data from 1970 to 1986 for Atlanta, Chicago, Dallas and San Francisco, the study finds that price changes in one year tend to continue for more than one year in the same direction. In another study, Kuo (1996) tests for seasonality in home prices. The study uses quarterly data of single family homes of the same set of four cities as used by Case and Shiller (1987, 1989, 1990). The author uses both real and

¹ See Goodman (1993) and Figure 1.

nominal prices to test for seasonality. The study finds no significance for the real price index for any city but strong significance for Chicago and San Francisco for the first three quarters, when nominal index is used.

In a recent study of home prices, Kaplanski and Levy (2009) find a significant and persistent seasonality effect. Their study examines price changes within each year during the period of 1987 to 2007. They use two indices, the Case-Shiller Index and the House Price Index, to find evidence of price seasonality. Specifically, the study finds that the real rates of return on real estate are very low and even negative during the fall and early winter and positive and relatively high during the spring and early summer. Depending on the real estate price index employed, the prices are higher, on average, in the summer by 0.86% to 3.75%. However, the study uses indices to proxy for residential real estate prices. By using the Case-Shiller index, the study is restricted to only 20 major metropolitan statistical areas, a small set of major markets. (The other index used in the study is the House Price Index which is restricted to 9 divisions)

This study adds to the current literature on seasonality in home prices. It makes two major contributions to the current work in this area. Firstly, our data set is very large and representative. Our sample consists of home prices from 138 Core Base Statistical Area (CBSAs) over the last 10 years (135 seasonal months in total). Collectively, this is the most comprehensive data sample amongst all the studies done in this area. Secondly, we use a methodology that is different from previous studies to test for seasonality. Specifically, the HP filter used in this study allows it to extract seasonality effects for each month of the year, allowing it to vary throughout the sample period. Our results indicate significant price variation over the months across all years for all CBSAs analyzed in this study, providing further evidence of significant market frictions based on households' mobility needs. If homeowners wished to

maximize investment gains, they would certainly sell during the peak months and purchase during the troughs. Unfortunately for most homeowners, the decision to move often creates the need for both selling and buying, lest the homeowners decide to temporarily rent and move twice, adding significant transactions costs to the move and negating much of the benefits from timing the purchase and sale. To the extent these moving costs are significant, the variations in price observed here over the course of the year is rational and explainable. Still, it does allow for some exploitation by first-time buyers or last-time sellers as well as speculators in the housing market.

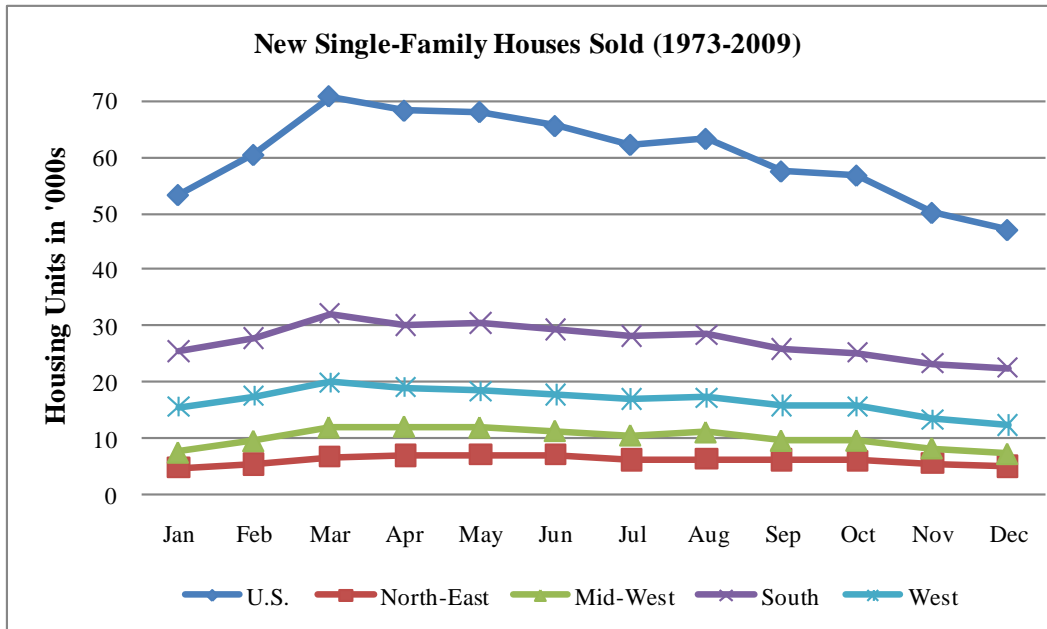
II. Literature Review

Previous studies have addressed the topic of inefficiencies in the housing market in various forms. With regard to knowledge of local markets, Lambson, McQueen and Slade (2004) detect the presence of a home bias amongst buyers of property in Phoenix. In a study of homes bought by out-of-state buyers and in-state buyers in Phoenix, the study finds that out-of-state buyers pay an average 5% higher price than in-state buyers.² The authors argue that this premium is a compensation for the information disadvantage that these out-of-state buyers have over their in-state counterparts.

When it comes to inefficiencies due to seasonal pattern in housing prices, there have been quite a few studies that have looked at seasonality. However, none of them have been targeted specifically at the topic. Most of the studies have touched upon this area, without focusing on it.

² A similar but smaller effect is found in, "The Effects of Housing Transaction Phenomena on the Housing Market", Norman G. Miller dissertation, Ohio State University, 1977.

Figure 1



Source: census.gov

Harris (1989) in a study analyzing the effect of real interest rates on housing prices uses a model of house sales price, which incorporates several variables including seasonality. He finds house prices to be seasonal with the prices peaking in the second quarter, while being the lowest in the fourth quarter. The effect of this seasonality in home prices can be seen in volumes of home sales. Figure 1 shows the average monthly pattern in new home sales in the United States for a period of 37 years (1973-2009). As seen in Figure 1, the months March to June lead the volume tally for home sales. This is consistent at the regional level as well.

On similar lines, Reichert (1990) using quarterly data to study the impact of interest rates, income and employment upon regional housing prices finds support for seasonality in home prices. The author finds that housing prices are generally 2.2 percent higher during the second quarter in comparison to the first quarter. In a study to understand the mobility patterns of people around the country, Goodman (1993) finds evidence of transaction volume seasonality. Using data from the American Housing Survey, the study finds that moves are two times as likely to

occur during the summer months than during the winter months. The study also finds that this effect is similar for all the reasons that people move and not necessarily because of summer weddings and school calendars (they are part but not all of the factors driving seasonal volume). Also the seasonality is similar for all regions and climate zones. The author explains that new home developers take advantage of this seasonality in order to shorten their marketing period and secure higher premiums from consumers. With respect to the pricing of homes, Case and Shiller (1989, 1990) find that the market for single-family homes is not efficient. Using quarterly data of single-family homes for four cities, they find momentum in price changes in one direction for over a year. However, the Case Shiller studies did not look at monthly seasonality effects in home prices.

In a recent study by Ngai and Tenreyro (2009), the authors analyze hot and cold seasons in the US and UK housing markets from 1991 to 2007. For the UK markets, their results indicate nominal price increases at an average 5 percent in the winters in all regions except for Northern Ireland, while in the summers the increase is 12 percent for all regions except for Northern Ireland, East Anglia and the North East. For the US markets, the study finds an average 3% difference in annualized percentage changes in house prices between winter (Q4 and Q1) and summer seasons (Q2 and Q3).

In another recent study, Kaplanski and Levy (2009) try to explain seasonality in home prices by two local factors: the monthly change in the number of daylight hours and the latitude, which should capture most of the climate impact. Using the Case-Shiller Index for 20 MSAs in the United States and the House Price Index for nine divisions, their study finds evidence of inefficiency in monthly home prices during the year. Specifically, the study finds that the real rates of return on real estate are very low and even negative during the fall and early winter and

are positive and relatively high during the spring and early summer. The prices are higher, on average, in the summer by 0.86% to 3.75%, depending on the real estate price index employed. The authors attribute this seasonality to Seasonal Affective Disorder (SAD).

III. Data and Methodology

The data for this study is from Collateral Analytics. All types of information on home sales, including home characteristics such as the area of the living room, the number of bedrooms, bathrooms and age is obtained for 138 CBSAs from February 2000 to April 2011. This data is one of the most comprehensive sets of home sales data available. Housing prices are explained by a hedonic pricing model, which account for housing size and quality characteristics. The pricing model includes the following variables; number of living rooms, lot size, number of bedrooms, number of bathrooms and age of the house.

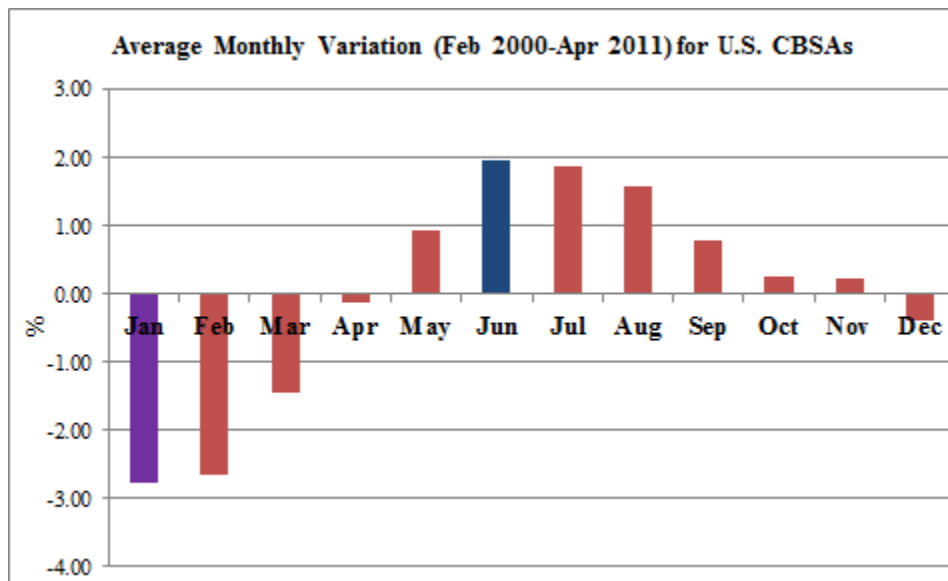
Then we have the trend and the cyclical/seasonality component of the prices. They are so-called nested variables, i.e. the 12 months are “nested” in one year, but any month in a particular year is different from the same month in another year. For this reason we use, standard HP-filter system (Hodrick and Prescott (1980)) as used by McGough and Tsolacos (1995) but with a $\lambda = 100$. This is a value used for annual data. The HP-filter is a linear filter that decomposes a time series, P_t , into a cyclical component (seasonality), P_t^c , and a growth component, P_t^g .

Since our data runs from February 2000 to April 2011, we have 12 coefficients (percentage premium/discount over the average price of the house during the year) for the each of months of February, March and April. For the remaining each nine months, we have 11 coefficients for the sample period. Thus our methodology allows us to extract a total of 135 seasonal coefficients for our sample period.

IV. Results

As mentioned in the previous section, this study helps us extract a total of 135 seasonal effects. Figure 2 shows the average price variation over the year for the country³. Please note that the seasonality effects (premium/discount %) for any month is relative to the average home price during the year⁴. As seen in the figure, prices are higher during summer months (Q2-Q3), peaking in June, while lowest during winter months (Q4-Q1), with the lowest in January. After June. The prices are low in January through May, after which they start to rise. The price variation is sizable with the lowest being -2.78%, and the highest being 1.93%. Note, that the results shown here are based on closing months as opposed to contract months. As such, the contracts were typically signed 30 to 60 days prior to closing. One should keep this in mind when analyzing the results.

Figure 2



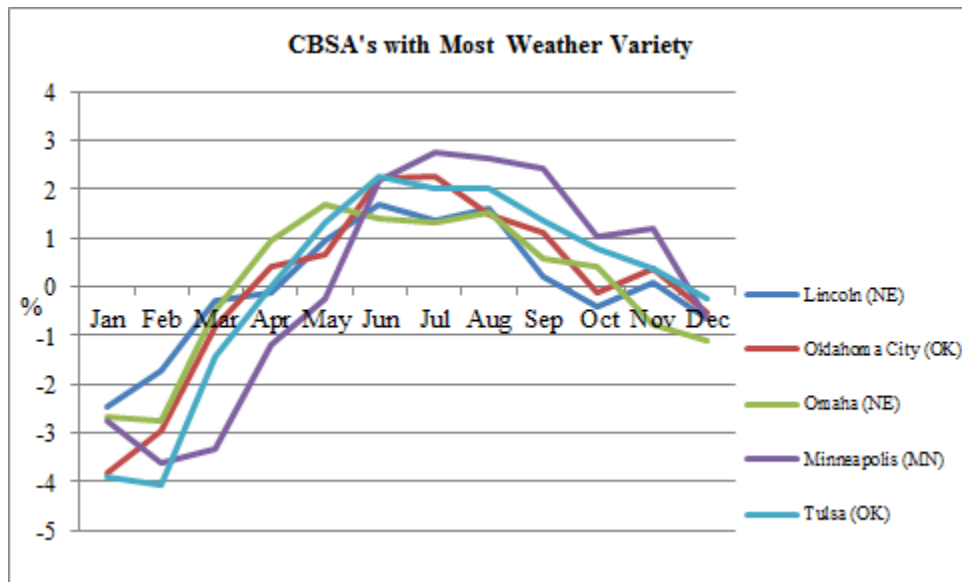
³ By calculating the average of each month over the sample period across all CBSAs

⁴ The average of the seasonality affects for all months for any year is therefore zero for any CBSA

Next, we plot graphs to see if there exists any commonality amongst various CBSAs. We graph cities on various parameters. We plot cities with the least weather variety, the most weather variety, the maximum discount in a year, the most premium in a year, and cities with the least and most price variation (as measured by the range) during a year. The premium/discount of a month for any CBSA is the average of the month over the entire sample period. Thus we will have 11 observations each for the months May through January and 12 observations each for the months February through April. Last, we look at seasonality effects for the country during summer and winter months.

Figure 3 and Figure 4 show the monthly variation in prices for CBSAs with the most and least weather variety in the nation respectively.

Figure 3



As seen from Figures 3 and 4, cities with the least weather variety are more consistent in pattern than cities with the most intense weather variety.

Figure 4

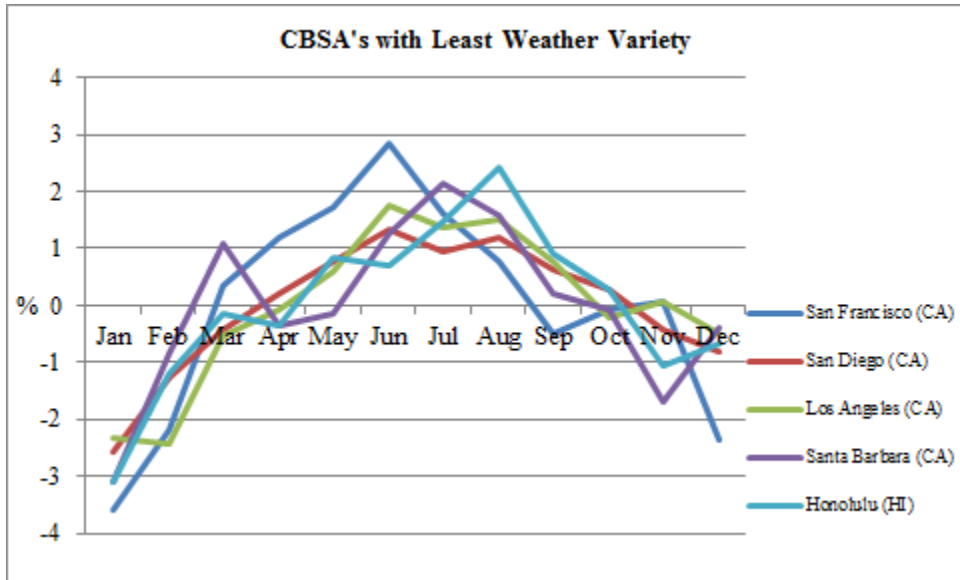
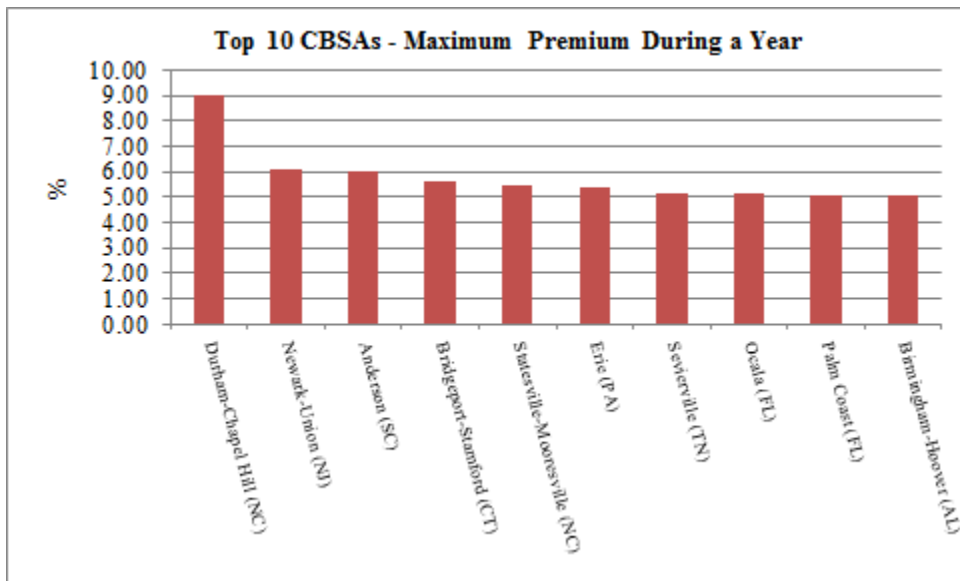


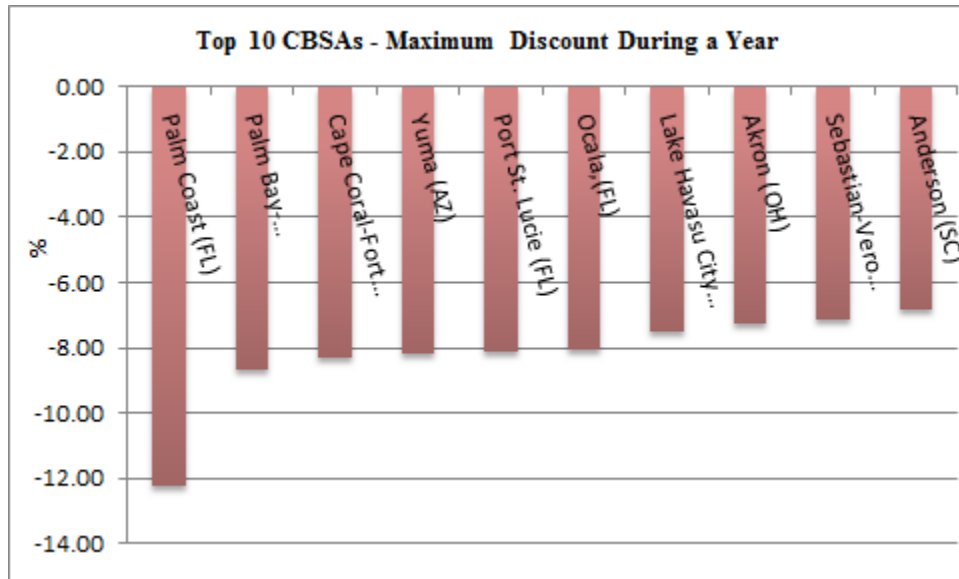
Figure 5 and Figure 6 show the CBSAs with the maximum premium and maximum discount during the year respectively.

Figure 5



What can be observed from Figure 5 and 6 is that the most CBSAs with the extreme values belong to the Eastern and South Eastern region. Weather could be likely dominating these general regional observed price effects.

Figure 6



Next we look at CBSAs with the least and most price variation during the year as measured by range⁵. Figure 7 and Figure 8 show this difference in terms of the minimum and maximum annual price variation. Most of the CBSAs with least seasonality are from the western region. And the ones that are not from the west are from Florida, and are major tourist destinations. Looking at these graphs, we may be able to somewhat confirm our belief that CBSAs with the most price variation during the year tend to be the ones that experience different seasons throughout the year. As we can see from Figure 8, all but one of the CBSAs with the most price variation are from the south and eastern region of the country.

⁵ The results don't change much if we use standard deviation as a measure

Figure 7

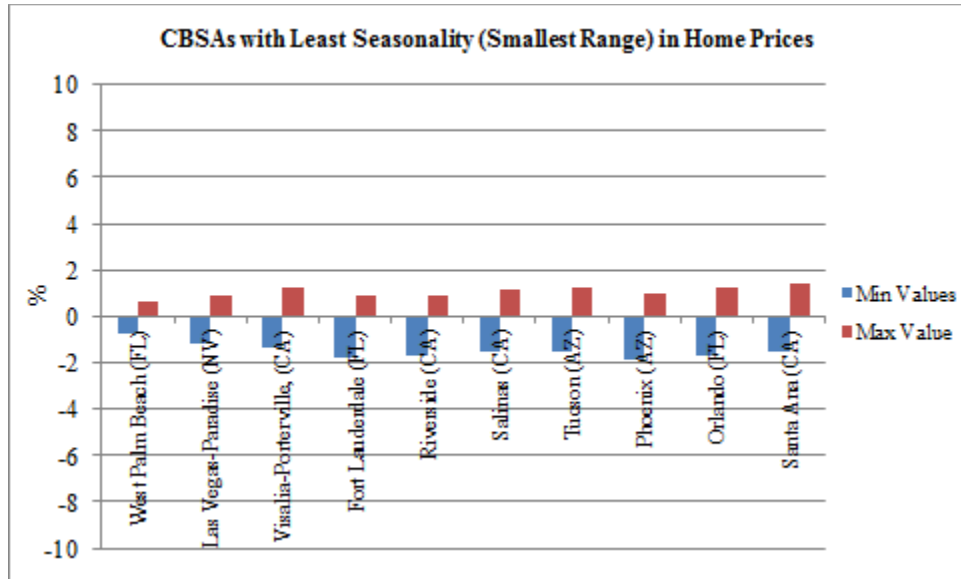
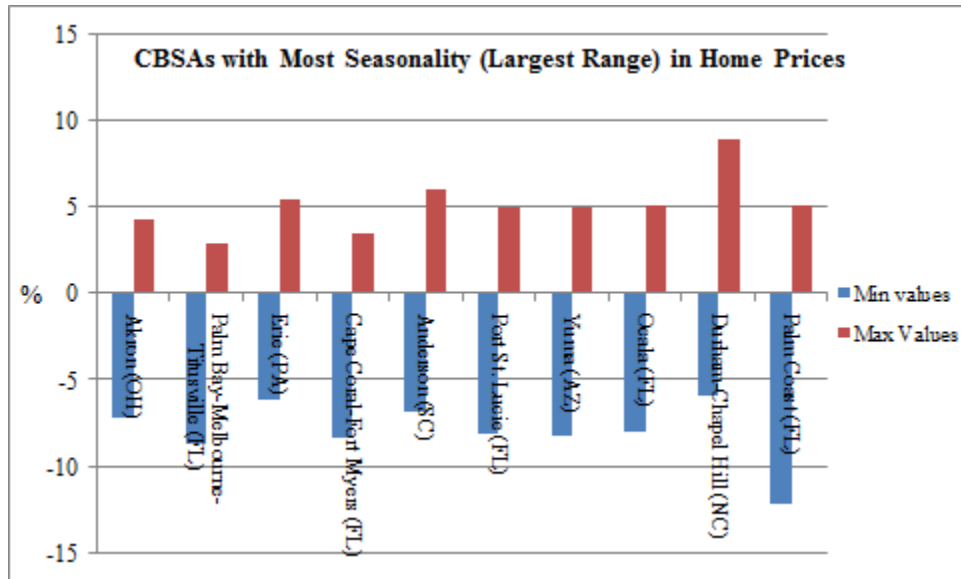


Figure 8



IV. i. Statistical Tests

Once we get the price variations for all the CBSAs, we need to confirm that seasonality is significant statistically. For that, we aggregate the seasonality coefficients for each month. This is done by calculating the average across all CBSA's for each month for the entire sample period. This way we can test whether each month's (average) coefficient is statistically significant or not. Because of our sample period, we get 12 data points for the months of February, March and April, while the rest of the months have 11 data points each.

| Table 1: Seasonality coefficients during sample period Feb 2000- April 2011 averaged across all CBSAs | | | | | | | | | | | | |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| 2001 | -2.10 | -1.16 | -1.25 | -0.22 | 1.08 | 1.47 | 1.38 | 1.15 | 0.10 | -0.38 | 0.21 | -0.69 |
| 2002 | -2.00 | -2.51 | -1.14 | 0.47 | 0.81 | 1.77 | 2.03 | 1.70 | 0.35 | -0.18 | 0.07 | -0.45 |
| 2003 | -2.04 | -2.61 | -1.43 | -0.60 | 0.82 | 1.62 | 1.43 | 1.63 | 0.56 | -0.11 | 0.25 | -0.30 |
| 2004 | -2.22 | -1.63 | -1.00 | -0.33 | 0.76 | 1.49 | 1.53 | 1.88 | 1.27 | -0.37 | -0.88 | -1.48 |
| 2005 | -1.39 | -1.86 | -1.11 | -0.31 | 1.28 | 2.28 | 1.43 | 1.11 | 0.46 | -0.64 | -1.19 | -1.30 |
| 2006 | -2.65 | -2.14 | -1.23 | -0.09 | 0.24 | 1.38 | 1.59 | 1.55 | 1.48 | 0.56 | 0.00 | 0.01 |
| 2007 | -3.09 | -2.03 | -0.60 | 0.16 | 0.85 | 1.67 | 1.70 | 1.16 | 0.35 | -0.08 | -0.41 | -0.72 |
| 2008 | -3.51 | -2.48 | -1.23 | 0.28 | 1.22 | 2.14 | 2.39 | 1.99 | 0.71 | 0.31 | 0.25 | 0.02 |
| 2009 | -5.78 | -3.27 | -1.58 | -0.77 | 1.17 | 2.50 | 2.81 | 2.41 | 1.69 | 2.06 | 0.64 | -0.67 |
| 2010 | -3.14 | -4.90 | -4.22 | -3.02 | -0.71 | 1.30 | 2.89 | 1.91 | 1.66 | 1.63 | 2.29 | 0.26 |
| 2011 | -2.64 | -3.97 | -1.52 | 0.54 | 2.76 | 3.63 | 1.14 | 0.83 | -0.20 | -0.09 | 1.03 | 0.81 |
| 2012 | | -3.46 | -1.04 | 2.37 | | | | | | | | |
| Average | -2.78 | -2.67 | -1.45 | -0.13 | 0.93 | 1.93 | 1.85 | 1.57 | 0.77 | 0.25 | 0.21 | -0.41 |
| p value | 0.00* | 0.00* | 0.00* | 0.58 | 0.00* | 0.00* | 0.00* | 0.00* | 0.00* | 0.92* | 0.42* | 0.11* |

**Significance at 1% level. A Wilcoxon Signed Rank non-parametric test is run for statistical significance
All numbers are in percentage price variation over the average sale price during the year*

Because of the limited data points for each month, we run the Wilcoxon Signed Rank non-parametric test for significance. Table 1 shows each month's seasonality coefficient for the nation and the significance level. All but four months show high significance. The results prove that seasonality exists in home prices and it is significant for most of the months during the year. Some studies in the past (Ngai and Tenreyro (2009), Reichert (1990) and Harris (1989) have shown that prices peak in summers and are lowest in winters. Figure 9 and Figure 10 show the price variations

in the U.S. during the winter and summer season respectively. We can see that most winter months across the sample period have negative price changes, while most summer months have positive price variations. This is consistent with previous studies in the literature.

Figure 9

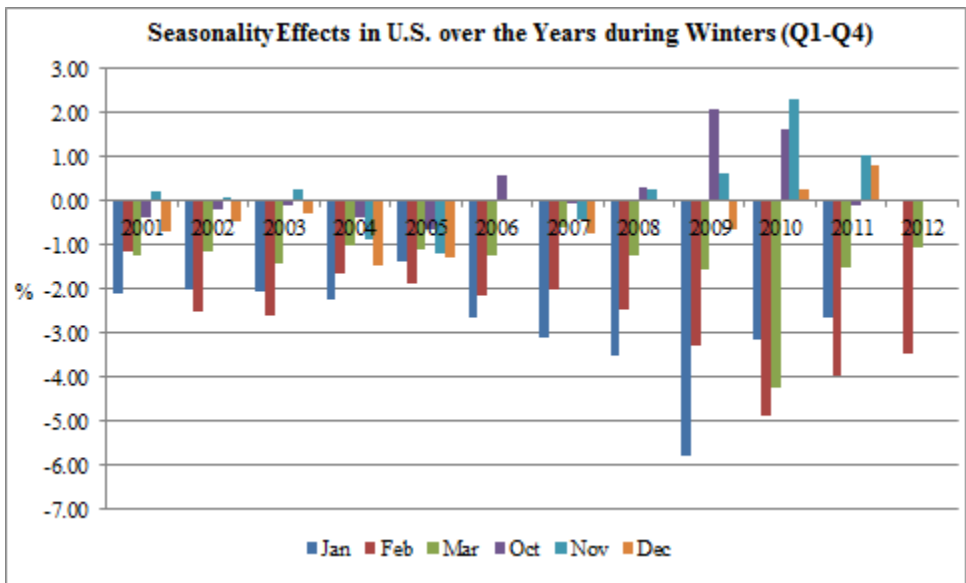
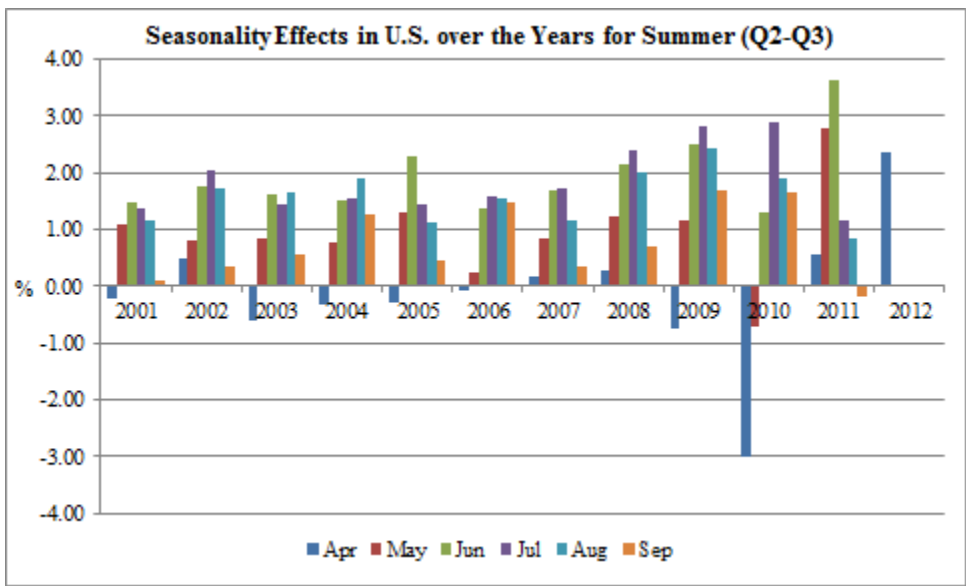
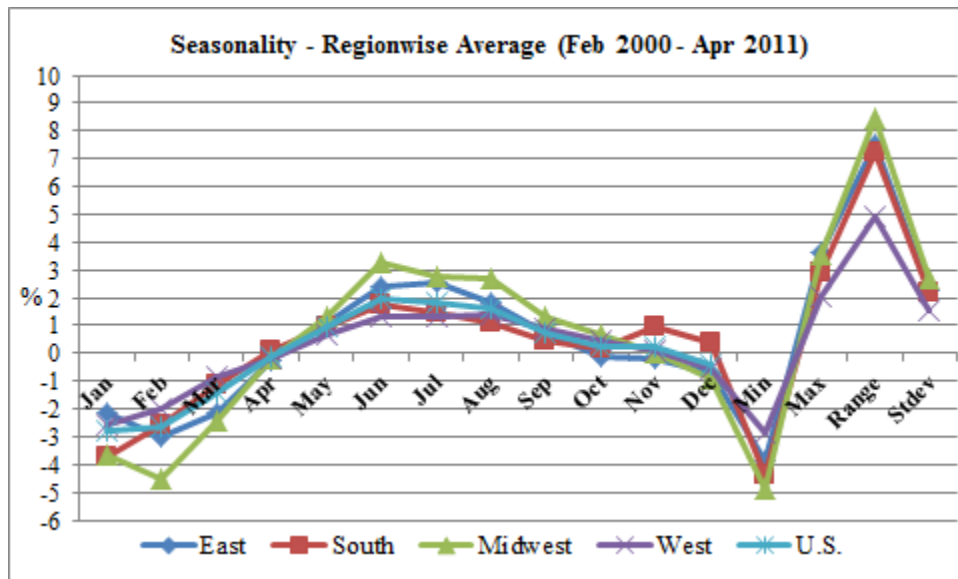


Figure 10



A t-test of difference between the two seasons (Q2-Q3 vs Q1-Q4) shows high significance (p val of 0.00), with the average variation in the winters being -1.16%, while for the summers is 1.13%. Finally, we look at the regional wise price variation in home prices. Figure 11 shows the seasonality affects for the four regions as categorized by the U.S. Census Bureau. As seen from Figure 11, the Midwest region dominates both on minimum and maximum price variation during the year.

Figure 10



Note: Each of the month's value is the average of the month's coefficient during the sample period for a CBSA. The CBSAs are then grouped according to their region and a regional average calculated for each month.

IV. ii. Exploratory Analysis

As an additional analysis, we test for some factors that may help explain seasonality. Although, there is no clear literature on such explanatory factors, geographic region, tourism, ethnicity and weather variation may seem to be some intuitive factors. We run a regression to

test these factors, with the dependent variable being the variation in seasonality in the CBSA as measure by standard deviation.

$$MStd_i = \alpha + \gamma_1 W_i + \gamma_2 O_i + \gamma_3 D_{iTour} + \gamma_4 D_{iRegn} + \gamma_5 Tem_Range + \mu_i \dots\dots\dots(1)$$

where;

$MStd_i$ is the standard deviation of the seasonality factor across all the months (premium or discount %) for the i^{th} CBSA

W_i is the percent population of White Americans in that CBSA for the most recent data (2010) from the Bureau of Labor Statistics

D_{iTour} is a dummy if the CBSA is a tourist city or not

D_{iRegn} is a regional dummy (West, Midwest, South and East) as classified by the U.S. Census Bureau

Tem_Range is the variable for the temperature and is measured as the difference between the average summer temperature minus the average winter temperature of the CBSA

μ_i is the error term, which is assumed to be normally distributed.

Table 2 summarizes the results for the regression analysis. We find the dummy for two regions and tourist city to be significant. The base category for the regional dummy is the eastern region. G1, G2 and G3 are the dummies for the West, Midwest and South regions respectively. The Western region and the Midwestern region variables are significant at the 1% and 5% levels respectively, while the dummy for the Southern region is not significant. The coefficients for the regional dummies suggest that the Western regions have 37% less variability in prices during the year than the Eastern region, while CBSAs in the Mid-Western region have 18% more price variation during the year than the Eastern region. This result can also be seen graphically to some

extent in Figure 11. The significance on the tourism dummy suggests that CBSAs that are tourist attractions have 15% less seasonality during the year than those that are not tourist hubs. What may be surprising is that the temperature variable is not significant. One may argue that there should exist some relationship between seasonality and weather. However, our results prove otherwise. Further exploration in this area could be a topic of future research.

Table 2

| | Standardized coefficients | P value |
|-------------------------|----------------------------------|----------------|
| Others | 0.03 | 0.65 |
| D_{iTou} | -0.15 | 0.05** |
| G1 | -0.37 | 0.00* |
| G2 | 0.18 | 0.03** |
| G3 | -0.02 | 0.75 |
| Tem_Range | -0.04 | 0.61 |
| R square | 0.22 | |

**Significant at the 1% levels*

*** Significant at the 5% levels*

Dependent variable: Standard deviation in prices during the year for a CBSA

V. Implications and Conclusions

This study explores seasonality in home prices at the Core Base Statistical Area (CBSA) level. Using a unique database of home sales from 138 CBSAs over the period from February 2000 to April 2011, we study monthly home prices variations during the year. Using a hedonic pricing model to account for housing characteristics, we use the standard HP-filter system (Hodrick and Prescott (1980)) to extract the trend and the cyclical/seasonality component of the prices. Our findings indicate significant price variations during the year for most months. At the aggregate level, monthly price changes vary significantly from an average of -2.78% on the downside for the month of January, to 1.93% on the upside for month of June. Our results indicate, in general during a year, the summer months (Q2 to Q3) at an average have higher prices than winter

months (Q4 to Q1). Additionally, this study finds two factors affecting price changes: One is if the CBSA is a tourist destination or not; the other being the geographic region it is located in. Our data is based on closings and since it typically takes 30 to 60 days to close a transaction, the negotiated contracts occurred prior to the peaks and troughs shown here. Summer time peaks are generally based on mid to late spring time contracting. January closings, when the market is slower typically are generated from late November and December contracting.

The results from this study have significant implications for consumers, appraisers, lenders and policymakers. Appraisers could easily be off of true values by several percent when ignoring seasonal price effects. Because appraisers use historical transactions, often from sales up to 12 months ago in attempts to find good comps, existence of significant seasonal variations in home prices within local markets should require adjustments to the comparable property data. One exception would be if the comparable property entered into contract exactly one year before it is being used to value a subject property⁶. Then, the appraiser need only consider the longer-term price trend. Because seasonality exists in markets, incorporating these effects while valuing properties is essential to reduce appraisal errors that otherwise appear to be noise, but are not. The valuation errors will depend upon both the time of year and the magnitude of price changes within that local market. Markets that have higher price seasonality will obviously have more appraisal error when price seasonality is not factored into adjustments.

From a tax assessment point of view in counties, the timing of property valuation could have a significant financial impact on a county's revenues. The timing of appraisal by the assessor's office may either increase or decrease revenues. If the appraisal is conducted in months in which prices are higher, it will lead to higher property values and, hence, increased property taxes. This may well benefit the given county. On the other hand, from the property

⁶ This means the sale probably closed about 10 to 10.5 months before the date of the appraisal.

owner's perspective, appraisal appeals based on comparable properties selected from months of lower prices will benefit the owner. So we do see the possibility for the strategic use of the seasonal price effects found here. Finally, from an investor's perspective, our results show that if one can buy in the down seasons, one can significantly benefit from the seasonal price variations. There is clearly an arbitrage opportunity in the housing market for time-flexible buyers and sellers.

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