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CONNECTICUT REAL ESTATE MARKET 2007 TO 2020: A TREND AND REGRESSION ANALYSIS

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Abstract

This study investigates certain aspects of the real estate market in Connecticut state in the United States of America for the period 2007 to 2020. The methodology implements trend analysis and performs a regression analysis via the Generalized Method of Moments (GMM) estimator. Heterogeneous cluster analysis was also performed by comparing the statistical GMM results of the different Connecticut clusters comprising the Fairfield, Hartford, New Haven and Windham counties. In particular, we find that the population growth rate parameters of big population high density city counties such as Hartford and New Haven are either not significantly related or positively related to changes in the median home price. In contrast, we find that the population growth rate parameters of the smaller population low density cities, such as Fairfield and Windham are significantly positively related to changes in the median home price. Our contribution is that we find that even though the unemployment rate worsened to above 8 percent in 2020 and there was only a slight increase in the state's GDP Growth rate to 3.4 percent, average home prices increased by

8.7 percent. A plausible explanation for this observed anomaly is that Connecticut home sales heating up may be due to the influx of residents from high density cities to low density suburbs in recent years which has been exacerbated by the Covid-19 pandemic. There is evidence to suggest that wealthier home buyers prefer to live in more exclusive smaller less densely populated suburbs characterized by declining population growth that is positively related to changes in median home prices.

Keywords: home values, mortgage interest rates, home sales, unemployment, gross domestic product, COVID-19 pandemic

INTRODUCTION

The housing market in Connecticut state took a large hit during the financial crisis and economic recession and even experienced a slower recovery than most of the other states in the United States of America. (Chukwuogor and Foster, 2019). The situation changed in 2020. An examination of some real estate statistics such as the historical average home prices, home sales, and 30-year mortgage interest rates, reveals that there is evidence to suggest that even though the unemployment rate worsened to above 8 percent in 2020 and there was only a slight increase in the state's GDP growth rate to 3.4 percent, average home prices increased by 8.7 percent. See Figures 1, 2 and 3 for the Connecticut Average Home Prices; the U.S. 30-Year Mortgage Interest rates; and the Connecticut Unemployment Rate and Economic GDP rate for the period for the period 2010 to 2020 respectively. A median home sold in Fairfield County was up 24 percent from the equivalent home sold in November 2019, (Soule, 2019). This noted anomaly presents a research problem that requires further investigation. It is against this backdrop that the present study uses the GMM system estimator to explore Connecticut's real estate market with particular focus on the impact of the COVID-19 pandemic.

Figure 1: Average Home Sales (USD), 2010 to 2020

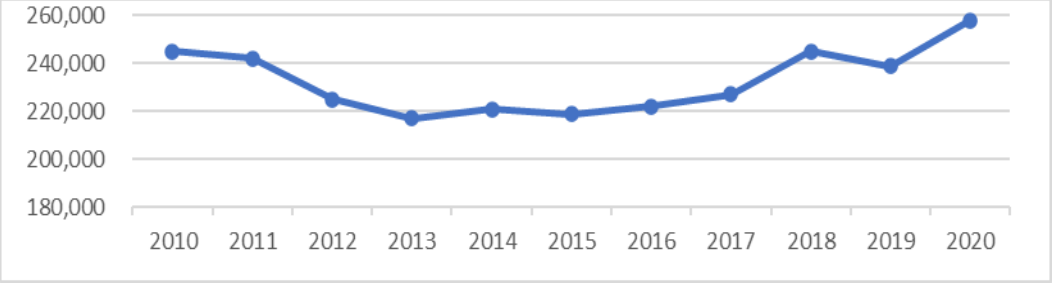


Figure 2. Average 30-year Fixed Mortgage Interest Rate, 2010 to 2020

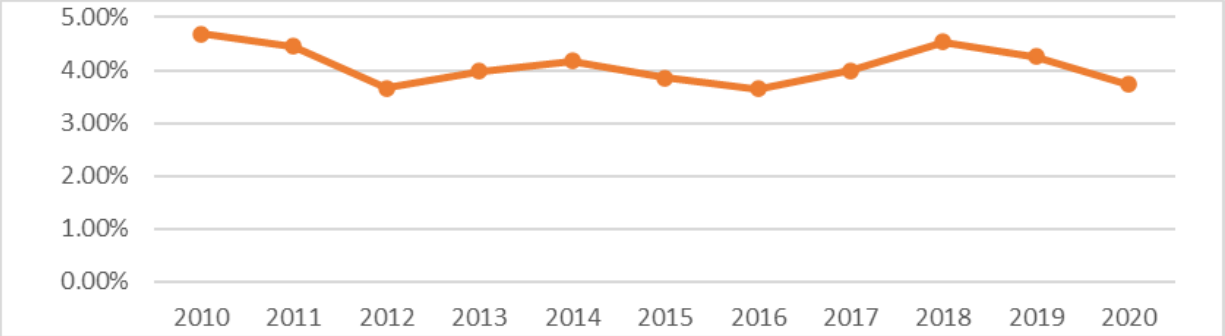
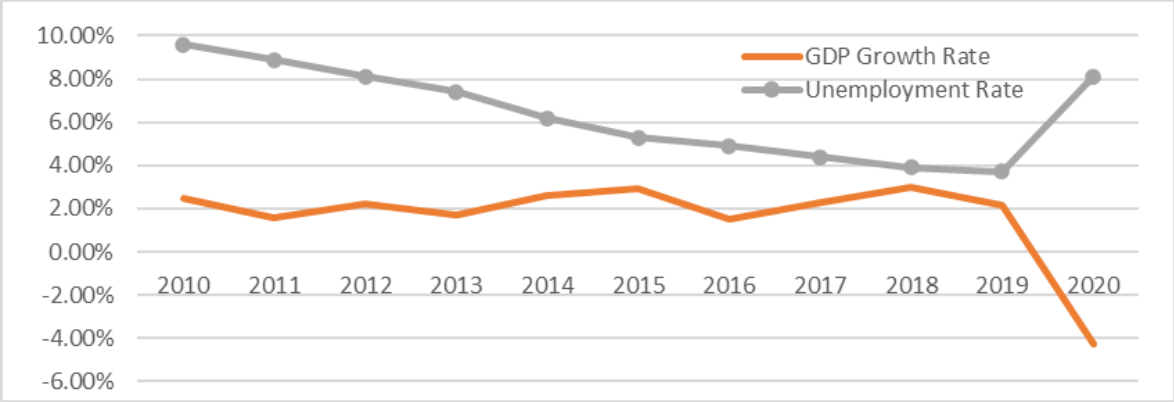


Figure 3. Connecticut Unemployment Rate and Economic GDP Growth Rate, 2010 to 2020



LITERATURE REVIEW

This paper draws inferences that relate the COVID-19 pandemic and the real estate market. A number of papers study this subject such as D'Lima et al. (2021); Gupta et al. (2021); Liu and Su (2021). D'Lima et al. (2021) use microlevel data on US residential property transactions to examine effects of pricing in housing markets as a result of the shutdown responses undertaken by the government in response to the Covid-19 pandemic. The authors find that post Covid-19 shutdown pricing effects are not only impacted by population density but also by the structural density and size attributes of residential properties. They find that on average, three-bedroom residential property prices declined in densely populated downtown locations but rose in low-density suburb locations where shutdowns occurred. The effects are found to be more drastic for properties that have fewer bedrooms. They also infer a drastic fall in market sales under a Covid-19 shutdown.

Gupta et al. (2021) examine the impact of the Covid-19 pandemic on real estate markets in the US. The authors find considerable changes in rent and price gradients that provide evidence urban residents are fleeing city centers for the suburbs. They conclude that limits

placed on city amenities in conjunction with increasing opportunities to work from home have reduced the premium on urban living.

Liu and Su (2021) explore the impact of the Covid-19 pandemic on the location demand for housing. The authors document that the pandemic has resulted in a shift in housing demand away from high population density neighborhoods. They infer that the reduced demand for density is caused in part by the reduced need to live reside near to telework-compatible jobs and the diminishing value of access to consumption amenities. Neighborhoods with high pre-Covid-19 home values also experience a bigger drop in housing demand. In addition, they find a considerable shift in housing demand away from large cities, though the magnitude is smaller.

Consequently, a gap is identified in the literature on the study of the impact of the Covid-19 pandemic on real estate in regard to empirical analysis involving such variables as home prices for the dependent variable and volume of home sales, unemployment rates, gross domestic product growth rates, and mortgage interest rates as independent macroeconomic variables. This is especially important because, in 2018, excluding debt instruments, US real estate was estimated to be worth $49.3 trillion, $33.3 trillion in residential and $16 trillion in commercial, while total equity capitalization in the US stock market was $30.4 trillion. According to the Gallup poll (Jones, 2019), real estate has been the most favored long-term investment of Americans for eight consecutive years. Despite the booming stock market in 2019, with the major U.S. stock indices establishing or nearing record highs in April and early May 2019, more Americans, comprising about 35 percent continue to believe real estate is a superior long-term investment to stocks, and 27 percent believe real estate is a better long-term investment compared to other investment options.

Earlier studies on the effect of changes in economic variables such as population, employment, and income on home prices stimulated significant attention, justifiably so. For example, Mankiw and Wei (1989), examined the impact of significant demographic changes in the United States housing market. They found that the expansion of the Baby Boom generation into its home purchasing years was the main reason for the hike in real housing prices during the 1970s. Since the Baby Bust generation is now moving into its house-buying years, it was expected that there will be slower growth in housing demand during the 1990s in comparison to the past forty years. The continuation of the historical relation between housing demand and housing prices meant real housing prices will decrease considerably during the next two decades. This prediction coincided with the financial crisis, ignited by the real estate sector.

DiPasquale and Somerville, (1995), observed that price series based on transaction prices and owner-reported values exhibit reasonably related time-series patterns, although they

can be different at near market turning points. However, there are distinct differences between the two series in terms of price levels. Owner estimates of value are persistently greater than reported transaction prices. Even though scholarly research did not make this connection, it is possible that the decline in demand for at the period led real estate mortgage operators to introduce immoral, sometimes illegal procedures, in an effort to generate increased demand as the demand for baby boomers declined.

Clapp and Carmelo, (1994) explored the relationship between methods used to assess house price indices and the economic factors determining house prices at the local level. The authors implemented two methods for the measurement of house price changes consisting of the repeat sales method and the assessed value (AV) method. They found that the results for Hartford in Connecticut, showed a strong correlation of around 0.8 between the annual rates of change in these two price indices. However, the percentage changes in the two price indices were observed to differ markedly for the observed period spanning the 2nd to 10th quarters. Notwithstanding, the two price indices are found to relate to economic variables, including similar changes in local employment and unemployment. The results reveal an important role for expected inflation and unemployment variables. Additionally, these variables have significant forecasting ability which appears to contradict to the theory of the efficient market hypothesis.

RESEARCH METHODOLOGY

Data was sourced from the Federal Housing Financing Agency, Quarterly Data: Purchase-Only Indexes, Federal Reserve Bank of St. Louis: Homeownership Rate for the United States and Connecticut, Zillow Home Value Index, Core Logic and S&P/Case-Shiller U.S. National Home Price Index and Connecticut Department of Labor, Labor Information.

The empirical analysis combines trend analysis, correlation, and regression analysis of such variables as average home prices for dependent variable and volume of home sales, unemployment rates, economic gross domestic product growth rates, and mortgage interest rates as independent variables. The sample spans the time period running from 2007 through 2022. The selection of this time period was based on the availability of consistent data on the aforementioned variables used in the empirical analysis. The empirical analysis further combines the median home price as the dependent variable and the volume of home sales, unemployment rates, economic gross domestic product (GDP) growth rates, and mortgage interest rates as independent variables. The study implements the Modified Dickey-Fuller unit root test for the determination of the time series characteristics of the variables in the model.

There exists evidence in the literature that the DF-GLS technique exhibits more explanatory power than the standard Dickey-Fuller test (Elliot et al., 1996). The regression equation (1) sets out the DF-GLS unit root test as follows:

$$\Delta Y_t^k = \alpha_0 Y_{t-1}^k + \sum_{j=1}^{m} \alpha_j \Delta Y_{t-j}^k + \mu_t \qquad (1)$$

In equation (1), the variable of interest is represented by Y; m stands for the maximum lag length while Y_t^k represents locally detrended series of Y_t. The Modified Akaike Information Criterion (MAIC) proposed by Ng and Perron (2002) is used to ascertain the maximum lag lengths for the model's various variables. In respect of the DF-GLS unit root techniques, the null hypothesis is that α_0 = 0. While the alternative hypothesis is that α_0 < 0 in equation (1). The Generalized Method of Moments (GMM) system estimator is then applied to validate the effects of economic GDP (Gross Domestic Product) growth, average mortgage rate, population growth and unemployment rate on changes in the median home price. The model is illustrated the expression as follows:

$$CMP = f(AMR, EG, POP, UR) \qquad (2)$$

For the purpose of econometric estimation, equation (1) is rewritten as equation (3):

$$CMP_t = \beta_0 + \beta_1 AMR_t + \beta_2 EG_t + \beta_3 POP_t + \beta_4 UR_t + \varepsilon_t \qquad (3)$$

Where, equations (2) and (3), CMP represents the changes in the median home price; AMR represents the average mortgage rate; EG represents for the economic GDP growth rate; POP stands for the population growth; and UR represents the unemployment rate. β_1 to β_4 represent the coefficient estimators of the explanatory variables and ε is the error term.

ANALYSIS AND RESULTS

The trend observations indicate an anomaly. Volume of sales increased in many years when average prices increased. Earlier research evidence indicated that average home prices levels responded to movements in unemployment rates and mortgage interest rate as increases in unemployment will lead to reduction in home prices and home sales and vice versa. Further, declines in mortgages interest rates will lead to increases in average home prices and vice versa. However, the actualizations of these relations were not observed, refer to the Figures 1 and 2.

Table 1 depicts the estimated pairwise Pearson correlation coefficients for the average mortgage rate, economic GDP growth rate, changes in the median home price, population growth and unemployment rate for Connecticut State. The correlation coefficients between the average mortgage rate and population growth; between changes in the median home price and population growth; between population growth and unemployment rate all exhibit statistical significance at the 1 percent significance level. The coefficient of correlation between the economic GDP growth rate and unemployment rate is of statistical significance at the 5 percent significance level. The coefficient of correlation (0.77) between the average mortgage rate and population growth represents the highest coefficient of correlation. The correlation coefficient (-0.06) between changes in the median home price and economic GDP growth rate is observed to be the lowest coefficient of correlation and this is not statistically significant. Although the pairwise correlation coefficients have shown perfunctory evidence of the relationships between the changes in the median home prices and the other variables, however, to achieve a better understanding, a more robust and rigorous econometric model such as the GMM is needed.

Table 1: Pearson Correlation Coefficients

	AMR	CMP	EG	POP	UR
AMR	1.00				
CMP	-0.61***	1.00			
EG	-0.19	-0.06	1.00		
POP	0.77***	-0.72***	-0.12	1.00	
UR	0.11	-0.34	-0.42**	0.62***	1.00

*** and ** represent the levels of statistical significance at the 1% and 5% levels, respectively.

AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate.

Table 2 displays the results from the modified augmented Dickey-Fuller (DF_GLS) unit root test for Connecticut State. The Modified Akaike Information Criterion (MAIC) is used to compute the lag lengths for the unit root tests. The results indicate that the average mortgage rate, changes in the median home price, economic GDP growth rate and unemployment rate are level stationary. The test statistics -2.69, -2.11, -1.95, and -1.76 respectively for average mortgage rate, changes in the median home price, economic GDP growth rate and unemployment rate are higher than the critical value (-2.75) at the 5 percent significance level. For each case, the null hypothesis of a unit root is rejected as the test statistics exceed the critical values at the conventional threshold levels. The results however show that the population growth variable is first difference stationary. On the whole, the unit root test results show that the average mortgage rate, changes in the median home price, economic GDP

growth rate and unemployment rate variables are level stationary while the population growth variable is first level stationary.

Table 2: Modified Dickey-Fuller Unit Root Tests

Series	Level	Difference	K	1%CV	5%CV	10%CV
AMR	-2.69**	—	0	-2.77	-1.97	-1.67
CMP	-2.11**	—	1	-2.77	-1.97	-1.67
EG	-1.95*	—	1	-2.77	-1.97	-1.67
POP	-1.09	-3.71	0	-2.77	-1.97	-1.67
UR	-1.76**	—	5	-2.77	-1.97	-1.67

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively. AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate. Lag lengths were determined using SIC (Schwarz Information Criterion) values.

The GMM estimator is applied to evaluate the effects of the macroeconomic variables on changes in the median home prices for Connecticut, given that the order of integration for the model's various variables has now been determined. The lagged values of the variables substituted as for the GMM estimator's instruments. To ascertain how suitable these instruments are in the model, the study used the *J*-statistic also referred to as the over-identifying restrictions test. The *J*-statistic (2.14, *p*-value =0.71) shown in Table 3 indicates that the selected instruments are valid. The GMM coefficient estimators are displayed in Table 3. The results show that the average mortgage rate, as expected, has a negatively highly statistically significant effect on changes in the median home price. The coefficient estimator of AMR_t (coef. = -7.37, *t*-stat = -5.10, *p*-value = 0.01) is negative and statistically significant at the 1% level.

Table 3: Connecticut: GMM Estimation Results (Dependent Variable: CMP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.53***	0.04	14.16	0.00
AMR	-7.37***	1.44	-5.10	0.01
EG	1.48**	0.52	2.82	0.05
ΔPOP	-0.42***	0.03	-14.28	0.00
UR	-3.74***	0.84	-4.43	0.01
Diagnostic Tests				
R-squared	0.56	J-statistic		2.14
Durbin-Watson stat	1.21	Prob(J-statistic)		0.71

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10%, levels, respectively. C = Constant, AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate.

The results shown in Table 3 also reveal that economic GDP growth exerts a positive effect on changes in the median home prices as the coefficient estimator of EG_t (coef. = 1.48, *t*-stat = 2.82, *p*-value = 0.05) is both positive and statistically significant at the 5% significance level. In contrast, changes in population growth have a negative effect on changes in the median home prices. The coefficient estimator of ΔPOP_t (coef. = -0.42, *t*-stat = 14.28, *p*-value = 0.00) is both negative and statistically significant at the 1% significance level. Similarly, unemployment rate has a highly statistically significant detrimental impact on changes in the home prices. The coefficient estimator of UR_t (coef. = -3.74, *t*-stat = -4.43, *p*-value = 0.01). A unit increase in unemployment rate indicating a major economic reversal reduces changes in home median prices by approximately 374%.

The Modified Dickey-Fuller Unit Root Tests initially performed for Connecticut State is repeated for the Fairfield, Hartford, New Haven and Windham counties as per Tables 2A, 2B, 2C and 2D respectively. Overall, the unit root test results show that average mortgage rate, changes in the median home price, economic GDP growth rate and unemployment rate are all level stationary for all the counties.

Table 2A: Fairfield Modified Dickey-Fuller Unit Root Tests

Series	Level	Difference	K	1%CV	5%CV	10%CV
AMR	-2.69**	—	0	-2.77	-1.97	-1.67
CMP	-4.95***	—	0	-2.77	-1.97	-1.67
EG	-1.95*	—	1	-2.77	-1.97	-1.67
POP	-3.15***	—	0	-2.77	-1.97	-1.67
UR	-1.76**	—	5	-2.77	-1.97	-1.67

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively. AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate. Lag lengths were determined using SIC (Schwarz Information Criterion) values.

Table 2B: Hartford Modified Dickey-Fuller Unit Root Tests

Series	Level	Difference	K	1%CV	5%CV	10%CV
AMR	-2.69**	—	0	-2.77	-1.97	-1.67
CMP	-3.45***	—	0	-2.77	-1.97	-1.67
EG	-1.95*	—	1	-2.77	-1.97	-1.67
POP	-2.53**	—	0	-2.77	-1.97	-1.67
UR	-1.76**	—	5	-2.77	-1.97	-1.67

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively. AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate. Lag lengths were determined using SIC (Schwarz Information Criterion) values.

Table 2C: New Haven Modified Dickey-Fuller Unit Root Tests

Series	Level	Difference	K	1%CV	5%CV	10%CV
AMR	-2.69**	—	0	-2.77	-1.97	-1.67
CMP	-3.45***	—	0	-2.77	-1.97	-1.67
EG	-1.95*	—	1	-2.77	-1.97	-1.67
POP	-4.10***	—	0	-2.77	-1.97	-1.67
UR	-1.76**	—	5	-2.77	-1.97	-1.67

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively. AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = changes in median home price, POP = population growth, UR = Unemployment rate. Lag lengths were determined using SIC (Schwarz Information Criterion) values.

Table 2D: Windham Modified Dickey-Fuller Unit Root Tests

Series	Level	Difference	k	1%CV	5%CV	10%CV
AMR	-2.69**	—	0	-2.77	-1.97	-1.67
CMP	-2.61**	—	0	-2.77	-1.97	-1.67
EG	-1.95*	—	1	-2.77	-1.97	-1.67
POP	-3.37***	—	0	-2.77	-1.97	-1.67
UR	-1.76**	—	5	-2.77	-1.97	-1.67

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively. AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate. Lag lengths were determined using SIC (Schwarz Information Criterion) values.

A heterogeneous cluster analysis is performed by extending and implementing the GMM estimator to evaluate the effects of the macroeconomic variables on changes in the median home prices for the Fairfield, Hartford, New Haven and Windham counties as shown in Tables 3A, 3B, 3C and 3D respectively. The heterogeneous cluster analysis involved the comparison of the statistical GMM results of the different counties. It is observed that the heterogeneous clustering analysis yielded certain important surprising results.

Table 3A: Fairfield: GMM Estimation Results (Dependent Variable: CMP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.55***	0.06	8.52	0.00
AMR	-12.96***	1.20	-10.80	0.00
EG	-1.60**	0.61	-2.62	0.04
POP	-1.88**	0.73	-2.57	0.04
UR	0.73*	0.36	2.04	0.09
Diagnostic Tests				
R-squared	0.29	J-statistic		3.82
Durbin-Watson stat	2.10	Prob(J-statistic)		0.70

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively. C = Constant, AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate.

Table 3B: Hartford-GMM Estimation Results (Dependent Variable: CMP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.32**	0.09	3.43	0.02
AMR	-11.78***	2.94	-4.00	0.01
EG	-0.18	1.16	-0.16	0.88
POP	8.97	12.89	0.70	0.52
UR	3.01*	1.38	2.18	0.08
Diagnostic Tests				
R-squared	0.02	J-statistic		2.59
Durbin-Watson stat	3.05	Prob(J-statistic)		0.76

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively.

C = Constant, AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate.

Table 3C: New Haven-GMM Estimation Results (Dependent Variable: CMP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.74***	0.01	144.56	0.00
AMR	-15.53***	0.03	-504.60	0.00
EG	-5.74***	0.08	-71.61	0.00
POP	5.85***	0.08	74.24	0.00
UR	-0.83***	0.06	-13.65	0.00
Diagnostic Tests				
R-squared	0.29	J-statistic		5.08
Durbin-Watson stat	2.48	Prob(J-statistic)		0.41

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively.

C = Constant, AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = Changes in median home price, POP = Population growth, UR = Unemployment rate.

Table 3D: Windham-GMM Estimation Results (Dependent Variable: CMP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.29***	0.05	6.46	0.00
AMR	-4.03***	0.45	-9.00	0.00
EG	1.06*	0.43	2.47	0.06
POP	-1.19**	0.48	-2.50	0.05
UR	-1.69***	0.43	-3.96	0.01
Diagnostic Tests				
R-squared	0.15	J-statistic		1.96
Durbin-Watson stat	2.90	Prob(J-statistic)		0.74

***, ** and * represent the levels of statistical significance at the 1%, 5% and 10% levels, respectively.

C = Constant, AMR = Average mortgage rate, EG = Economic GDP growth rate, CMP = changes in median home price, POP = population growth, UR = Unemployment rate.

Using the conservative 10% level of statistical significance, it is found that the population growth of big population high density city counties such as Hartford and New Haven is either not significantly related or positively related to changes in the median home price. This is evidenced

in Table 3B for the Hartford-GMM estimation that shows the coefficient estimator of the population growth parameter, POPt to be statistically insignificant (coef. = -8.97, t-stat = 0.70, p-value = 0.01). Further, Table 3C for the New Haven-GMM estimation shows the coefficient estimator of the population growth parameter, POPt to be positively statistically significant (coef. = 5.85, t-stat = -13.65, p-value = 0.00).

Conversely, it is found that the population growth parameters of the smaller population low density cities Fairfield and Windham are positively related to changes in the median home price. This is evidenced in Table 3A for the Fairfield-GMM estimation that shows the coefficient estimator of the population growth parameter, POPt to be negatively statistically significant at the 5% significance level (coef. = -1.88, t-stat = 2.57, p-value = 0.04). Further, Table 3D for the Windham-GMM estimation shows the coefficient estimator of the population growth parameter, POPt to be negatively statistically significant at the 5% significance level (coef. = -1.19, t-stat = -2.50, p-value = 0.05). A plausible explanation for this anomalous finding is that the increases in home prices in these smaller population low density county towns are mainly due to wealthier buyers migrating from big cities and purchasing real estate in suburbs. In other words, the smaller the population growth of the small population low density county, the higher the median home prices. This peculiar trait appears to be what is motivating these wealthier buyers as they prefer to live in more exclusive smaller less densely populated suburbs.

INTERPRETATIONS AND CONCLUSION

This study examines the state of Connecticut's Real Estate market with particular focus on the impact of the 2020 COVID -19 Pandemic. The data is at a macro level and limits causal inferences. This study has examined the state of Connecticut's Real Estate market with particular focus on the impact of the 2020 COVID -19 pandemic. Specifically, this study explored the changes in the trend of the state of Connecticut's median home prices and the underlying determining factors. The study is important because it is a topical issue given the current impact of high interest mortgage rates and the Covid-19 pandemic on the residential housing market in the state of Connecticut. The findings of the study are also applicable to the neighboring states in the United. This paper contributes both incrementally and marginally to the real estate and urban economics literature in several ways. First, it is the finding that certain macroeconomic variables which include the average mortgage rate, economic growth rate represented by the GDP growth rate, population growth, and unemployment level significantly explain changes in Connecticut State's median home prices. An examination of some real estate statistics such as the historical average home prices, home sales, and 30-year mortgage interest rates, indicate that there is evidence to suggest that even though the unemployment

rate worsened to above 8 percent in 2020 and there was only a slight increase in the state's GDP growth rate to 3.4 percent, average home prices increased by 8.7 percent. A possible explanation for Connecticut home sales heating up may be due to the influx of residents from high density cities to low density suburbs in recent years. This steadily increasing trend may also be due to high income earners such as New Yorkers fleeing their cities as a result of the Covid-19 pandemic and at-home workers searching for more space.

This study also contributes by finding statistical evidence inferred from macroeconomic variables to suggest that the smaller the population growth of the small population low density county, the higher the median home prices when examining Connecticut State's counties comprising Fairfield, Hartford, New Haven and Windham, as clusters. The heterogeneous cluster analysis involved the comparison of the statistical GMM results of the different counties. The results thus indicate that wealthier buyers prefer to live in more exclusive smaller less densely populated suburbs that are characterized by declining population growth rates. This observation is generally consistent with the findings of other researchers such as D'Lima et al. (2021); Gupta et al. (2021); and Liu and Su, (2021); that use other novel non-macroeconomic methods to arrive at the same conclusion regarding the impact of Covid-19 pandemic on US real estate.

The observation that the increases in home prices in the smaller population low density county towns are mainly due to wealthier buyers migrating from big cities and purchasing real estate in suburbs is also consistent with the finding of Frey (2018) who state that the Census Bureau's annual county and metropolitan area estimates through 2017, indicate a resuscitation of suburbanization and migration to rural areas along with Snow Belt-to-Sun Belt population shifts. In addition, consistent with our study, the data depicts a new dissemination to large- and moderate-sized metro areas in the middle part of the United States—particularly in the Northeast and Midwest. Frey (2018) further state that if these trends persist, they will likely challenge the sharp clustering of the nation's population—in large metropolitan areas and their cities—that was observed in the first half of the 2010s. Thus, this provides evidence that suburbanization is on the rise and this trend is being accelerated by the Covid-19 pandemic which has led to a burst of mobility that is increasingly rapidly changing where and how Americans live.

Furthermore, the observation that the rises in home prices in the smaller population low density county towns are mainly as a result of high-income purchasers moving from big cities and buying real estate in suburbs is corroborated by Campo-Flores et al. (2021) who state that the Covid-19 pandemic changed where Americans live. The authors observe that big cities are losing residents, as younger households migrate to the suburbs and older people accelerate

retirement moves, while fewer newcomers and new residents emerge to take their places. This is because many of the fading industrial cities are experiencing an overabundance of housing and declining population that is worsened by job loss, out-migration, and the aging of their remaining residents. This is consistent with the finding that prior to the occurrence of the Coronavirus pandemic, the census showed US cities' growth to be stagnating (Frey, 2020).

Finally, due to data limitations, the analyses in this paper focus on data only from one state (the U.S. State of Connecticut). A future possible area of research is to therefore extend the testing to more U.S. states in order for the inferences and findings to be generalizable.

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