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Macroeconomic Determinants of Housing Prices in the Philippines

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ABSTRACT

Addressing the cause of escalating housing prices in the time of the COVID-19 pandemic is relevant but timely. Housing is both a consumption and an investment good and for many Filipinos, it is a dream worth going abroad for. This thesis studies the housing prices in the Philippines between 2000 to 2020. The overall objective of this thesis is to answer whether important macroeconomic factors can explain these housing prices. Using an econometric model, the Engel-Granger two-step approach captures the dynamic of long- and short-run relationships of the variables. The co-integration test result shows that GDP per capita is positively associated with housing prices by 1.24% inthe long term, the inflation rate by 0.08%, and unemployment rate by 0.398%. Furthermore, the error correction model results show that GDP per capita negatively affects the housing price by 0.075% while the interest rate negatively affects it by 0.01497%. Error correction model result shows that short-term and long-term deviation in the previous level can be adjusted by 11% in the subsequent nine periods. Among the variables that affect housing prices, the GDP per capita has the most significant effect size. This thesis seeks to offer its findings that strongly suggest that policy makers need to pay close attention to the effect of the GDP per capita on housing prices and thus provide policies that adopt in various time horizons.

Keywords: housing prices, macroeconomic determinants, Engle-Granger two-stepapproach, co-integration, error correction model

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INTRODUCTION

The housing and economy nexus gained much attention over the last two decades. The 2008 global financial crisis has shown the vital link between housing and the economy. It was also probably the worst financial crisis in the United States that formed asuper housing bubble in the global real estate market. The current COVID-19 pandemic further altered and created some housing price trends of its own.

Housing is where a substantial fraction of financial sector assets are tied and considered consumption and investment goods. As consumption goods, housing provides shelter for people to live in comfort in a safe and protected environment. A surprisingly large proportion of the household population (55%) was classified as owner-occupant in the country in 2015 (Philippine Statistics Authority, 2021). As investment goods, housing represents the single significant household investment commonly used as collateral for loans. An increase in house prices could (1) boost investment in the construction sector,

(2) attract investments, and (3) increase mortgage and direct funding, among many other desirable effects.

Real estate properties in Manila, Philippines are the most expensive in Asia(Online Mortgage Advisor, 2020). It ranks second to Iran regarding affordability and workers' capacity to pay for their own homes. According to the Bangko Sentral ng Pilipinas (BSP), the unabated increase in housing price warrants a thorough study of its underlying causes. The Philippines experienced the first slump in the second quarter of

2020 since the BSP started monitoring the housing prices. However, it slightly recovered in the fourth quarter of the same year by 2.4% on a quarter-to-quarter basis based on the BSP house price monitoring. This market recovery was primarily due to the increasing demand for housing outside of Metro Manila. In 2014, there was an average of 133.2% price increase in NCR, while about a 117% increase outside the NCR. Condominiums consistently had the highest housing price in NCR in 2004. However, the duplex prices overtook condo prices during the fourth quarter of 2020. Outside the NCR, townhouse units dominated the market with house prices as high as 200% in the fourth quarter of 2020. This price trend prevailed in the housing market in the country during the pandemic (BSP, 2021).

The major real estate boom in the Philippines happened in the periods 2000–2001,2004–2005, and 2007–2008 before the financial crisis (PSA,2021). Conversely, in the same period, the interest rates, inflation rates, and unemployment rates declined (International Monetary Fund, 2019). The bank lending rates showed a reduction from 15.5% in 2000 to 8% in 2019. Consequently, the demand for housing increased (PSA, 2016). Of the 23 million households surveyed, about 12.7 million declared that they did not own the house and lot they lived in. Five million households stated that they owned a house on a rent-free lot but with the owner's consent and another half a million occupied houses and lots without rent and the owner's consent. The government projected the housing requirement of the country to reach over seven million units by 2022. This demand included accumulated needs for housing totaling 1.3 million units at the start of 2016. The Philippine government targeted 1.4 million units to prioritize homeless

Filipinos, informal settlers, and those categorized as double-up households (PSA, 2016). The Housing and Land Use and Regulatory Board (HLURB) provided the data of housing supply in the country based on the approved projects and housing units offered for sale. The data reported that the number of licenses to sell (LTS) permits for condominiums and house and lot units increased from 216,503 in 2014 to 274,545 in 2017. However, in 2018, the LTS dropped by 26% when the total approved house and lotunits significantly declined from 140,627 units in 2017 to just 95,970 units. Similarly, LTS for condominiums decreased from 104,196 units in 2017 to just 91,161 units (Congressional Policy and Budget Research, 2021)

The decline in the gross domestic product (GDP) in the Philippines due to the recession and the incessantly increase in house prices raise the question among economists on whether the Philippine housing market is being overvalued or is facing a housing bubble. Theoretically, like other asset prices, house prices are equal to the discounted stream of future cash flows such as rent in the long run. However, the rents and discount factors are affected by macroeconomic shocks, and supply and demand factors are also reflected in housing prices to avoid overvaluation. A study on housing price and its determinants are compelling for two reasons: first, housing has a vital role in the economy; second, there is no published literature in the country that explains the correlation between housing and the macroeconomic determinants with the use of time series analysis. Thus, studying macroeconomic determinants that affect housing prices underscores the importance of a clear understanding of the housing market. This thesis seeks to offset this dearth in the literature and thus fill that research gap.

Statement of the Problem

This study aims to analyze the effects of macroeconomic variables on the housing prices in the Philippines as indicated in the 2000-2020 house price indexes of residential housing to formulate policies for stable pricing.

The specific objectives are to:

1. Profile the housing prices and the macroeconomic variables considered in the study
2. Analyze the effects of GDP per capita, inflation rate, interest rate, and unemployment rate on housing prices in the Philippines
3. Derive policy recommendations based on the results of the study.

Statement of Assumptions

Null hypothesis (H_o): Gross domestic product per capita, interest rate, inflation rate and unemployment rate are not statistically significant in explaining housing prices.

Alternative hypothesis (H_a): Gross domestic product per capita and other factors are statistically significant in explaining housing prices.

Significance of the Study

When one understands the drivers in real estate prices, one gets to know the role ofreal estate in the economy. This study would be beneficial to the following:

Students and academicians, particularly those who are interested in housing studies, that the findings of this study may help them understand the causes of housing price increase in the Philippines.

Economists and government agencies that this study may offer a better grasp of the causes and effects of housing volatility, consequently helping them formulate specific policies or amend existing ones to stabilize the housing market and meet economic targets.

Real estate market stakeholders, particularly the real estate developers, builders, sellers, buyers, and real estate practitioners, that this study may provide them with guidance in decision-making process in buying or selling real estate assets; venturing into real estate developments; marketing real estate houses; and providing sound advice to clients and suppliers to the development process.

Researchers, that the data analysis, conclusion, and references of this study may contribute to the existing academic efforts by filling the gap in academic research, providing solutions to housing problems, and improving their understanding of housing and development economics.

Operational Definition of Terms

Determinants are factors that influence housing prices, such as GDP per capita, realinterest rate, inflation rate, and unemployment rate.

Gross Domestic Product per capita (GDP per capita) is the sum of the total value of goods and services produced in a certain period divided by the total population. Inthis study, the real GDP per capita as nominal divided by GDP deflator was employed

Inflation Rate (INFR) refers to the annual rate of change or the year-on-year change in the consumer price index.

Interest rate (IR) is the cost of borrowing money measured in percentage.

Residential Real Estate Price Index (RREPI) measures the rate of change at which the prices of residential properties (e.g., flats, detached houses, terraced houses, etc.)purchased by

households change over time. It includes new and existingdwellings, independent of their final use and previous owner. The index includedland and residential buildings but excluded purchases through in-house financingand direct construction of the property owners.

Unemployment rate (UR) refers to the percentage of the total number of unemployed persons to the total number of persons in the labor force.

Scope and Limitation of the Study

This study covers the Philippine residential houses only at the national level and did not include regional or city levels. The study uses the residential eleven-year quarterly real estate prices index (RREPI) data from 2000 to 2020 with a total of 84 observations. Likewise, this study uses the error correction model to estimate the influence of gross domestic product per capita, interest rate, inflation rate and unemployment rate on housing prices.

REVIEW OF LITERATURE

Addressing the cause of escalating housing prices in the time of the COVID-19 pandemic is relevant and timely. Prior to the 2008 financial crisis, many extensive studies posed the same question in the United States, the United Kingdom, and other developed countries. For example, many states in America experienced urban to rural migration which also led to skyrocketing house prices in San Francisco but lower rents in New York. To date, there are only a few pieces of literature in developing countries that examine the interaction of housing prices and macroeconomic variables.

Over the last two decades, many researchers have looked into the determinants of residential housing prices in various levels, countries, intervals, and methods (Cohen & Karpavičiūtė, 2017; Ho & Wong, 2008; Hossain & Latif, 2016; Hu et al., 2021; Panagiotidis & Printzis, 2016; Pillaiyan, 2015; Tse et al., 1999; Wen et al., 2014; Xu & Tang, 2014). However, in

perusing the literature on the determinant of housing prices, conflicting results were observed in the relationship of determinants and housing prices in developing, developed, and transitioning countries.

Tripathi (2019), in an extensive cross-country research using the random-effect model, suggested that the government should adjust monetary policies such as inflation and money supply to contain the actual house prices. Khoo et al. (2019) studied Malaysian housing prices and, in the same manner, recommended that the government should strengthen the promotion of stable prices to avoid severe inflation. Price stability helps to maintain financial-economic activity at a satisfactory level. In short, a price stability policy is a valuable tool to lower and stabilize inflation.

Tsatsaronis and Zhu (2004) examined data on 17 industrialized countries using a vector auto-regression model. A low and declining interest rate keeps servicing costs of ever-larger mortgages within the household budget. This situation boosts the demand for real estate. Additionally, a change in the inflation rate considerably accounted for 50% of the total variation in house prices in the long run and tended to increase in the short run to 90% of the total variation in one-quarter horizon and two-thirds over a one-year horizon.

The study of Adams and Fuss (2010) applied panel cointegration analysis for data of 15 countries over 30 years and showed a robust connection between GDP per capita and housing prices. They noted that a 1% increase in economic activities propelled the need for a 34% housing price increase. On the other hand, when depression happens in a country, people have less income and more jobless situations resulting in a lower capacity to pay for loans and a drop in demand for houses. This scenario also affects the housing developers as they are forced to lower their housing prices to sell out houses. The results of their study showed that the error correction value was 0.04 in the long run which indicated the speed of adjustment to

equilibrium. In theory, if the variables are in equilibrium, the error correction term is zero. Deviations from the equilibrium reflects in a non-zero error term would mean that if house prices are high relative to equilibrium value, the error term is positive. The house price decreases until it reaches equilibrium.

Meanwhile, Pillaiyan (2015 found an inverse relationship between the lending rate and housing prices in Malaysia and argued that the meager interest rate has fueled a bubble in house prices. She purported that any increase in interest rates in the short-run results in a corresponding change in housing prices. Using the vector error correction model (VECM), she found out that GDP per capita is not significant in explaining the movement of housing prices. The growing house price has exceeded the growth based on economic fundamentals. In contrast, this phenomenon contradicts the consistent findings in developed countries that GDP per capita drives housing prices up. The study concluded that there could be a possibility of an existing housing bubble in Malaysia.

Nandago (2015) conducted a study on the determinants of housing prices inNamibia. She used the error correction model to distinguish between the effects of the macroeconomic variables in the short and long run. Her findings showed that the GDP and interest rates are the critical explanatory variables in house prices in the short run, while the inflation rate does not affect house prices in the short run. Moreover, the study demonstrated that the independent variables-GDP, interest rates, money supply, and labor force except inflation rate positively influence the house prices in the long run. He also asserted that an increase in the GDP would imply that the general welfare of the people is improving, and people can then afford to buy new houses. If the supply of dwellings does not respond, this puts upward pressure on the housing prices.

Xu and Tang (2014) looked into the determinants of housing prices in the United Kingdom

using a cointegration approach and correction model. The result showed that in the long run, the GDP per capita is a composite component of economic activities such as actual consumption, natural industrial, and employment that are closely related to housing. They concluded that GDP per capita is one of the variables that significantly impact housing prices. Moreover, the error correction term was negative and significant with a coefficient of 0.037 which indicated that the model corrected its previous level of disequilibrium by 3.7% in one quarter. The study of Wang and Jiang (2016) emphasized that the GDP per capita reflects the economic development level in Shanghai and closely relates to housing prices. The country is growing when the GDP per capita is high which in turn creates more job opportunities for the people and increases demand for housing. As a result, the standard of living rises, consumption is vibrant, and housing developers build more houses and get higher profitability in the process.

According to the study of Toome (2018), the interest rate, construction costs, real disposable income, and unemployment rate have a significant long-term relationship withhousing prices in Germany. However, in the short run, the unemployment rate is insignificant. Furthermore, the study observed that the error correction model also showed that the residual from the regression had a coefficient of -0.12 which indicatedthe short-term deviation from the long-term equilibrium level at the speed of adjustment of 12%. This result suggested that when the price deviated from the equilibrium level, it adjusted by 12% every quarter. And since the error correction term had a lag order ofone, it changed in the next quarter.

On the other hand, Sari et al. (2007) explained the relation of housing and macroeconomic variables in Turkey. They showed that the monetary aggregate, and not employment, is significant and provides an essential contribution to housing investment. They posited that this result might be attributable to Turkey's undeveloped housing mortgage market which is a borrowing constraint. Furthermore, Sari et al. (2007) observed that studies on housing and

macroeconomic variables are mostly confined primarily to developed countries and observed that different studies have different results. They further argued that an increase in housing investment results to a corresponding rise in employment in the construction industry and related sectors that specifically provide goods and services to the housing sector. This increase in work increases income and demand for housing. Moreover, any change in employment is a significant factor in investment decisions. The study found that GDP per capita had a statistically significant 0.18% effect on house prices. An increase in economic activity logically requires more spaces and houses. However, due to a construction lag demand in the short run cannot be satisfied bringing about soaring rents and soaring housing prices.. Higher real GDP per capita also gives rise to higher demand for construction of new houses and mortgage loans in financing house investments.

In more recent cross-country level studies, Tripathi (2019) employed the random- effect model and found that the interest rate does not affect house prices. He noted that when the cost of borrowing rises, and potential buyers become discouraged therefore, the demand for housing falls. However, Himmerlberg et al (2005) showed a contrastingresult in their study. In the United States., interest rates have relevance to housing price changes. They asserted that house prices are more vulnerable to long term interestchanges in cities that value faster growth. Hubbard and Mayer (2009) also studied U.S. housing prices using the user cost model. They confirmed that the declining interest rate is typical in the booming house market across countries. They stressed that low-interest rates has been the major contributor to the booming housing markets in most industrialized countries. A higher interest rate raises the defaults on mortgages followed by a fall in house prices.

Inflation is another essential factor to explain changes in house prices. Kuang and Liu (2015) used the four-sector equilibrium model and argued that inflation and house prices are positively

correlated. Higher inflation and higher housing prices affect both household consumption and economic growth. Additionally, the increase in the prices of construction materials resulted in higher housing prices. Similarly, Zainuddin (2010), in his study of Malaysian housing prices, also revealed that inflation has a positive relationship with housing prices. The study suggested that inflation reduces the after-tax user cost of ownership, thus encouraging the demand for owner-occupied houses. He further argued that higher inflation rates raise the mortgage payments by increasing the nominal interest rate and resulting in higher capital gains. Leung et al. (2007) demonstrated that unemployment rate and other macroeconomic factors explain housing price changes in Hongkong. The study employed the ordinary least square (OLS) and the principal component method. Decrease in income from high unemployment lowers the capability of the people to buy houses

Conversely, lower unemployment results in a higher financial power of the people, higher housing demand and higher house ownership. An increase in the number of unemployed people is found to generally lower the income of the people and eventually lower-the demand for housing (Jacobsen and Naug (2005). Meanwhile, Pinter (2015), using a vector auto-regression model and data of housing price index in the showed that unemployment and job separation fluctuations determine the house price shock in the United Kingdom.

THEORETICAL FRAMEWORK

The foregoing review of related literature used some notable frameworks in explaining the relationship between macroeconomic determinants and housing prices. This section discusses the partial adjustment model by DiPasquale and Wheaton (1994) as an analytical framework closely related to this research and one use in this thesis.

Housing supply and demand factors determine housing prices. Mahalik and Mallick (2016)

argued that studies differ in modeling the aspects of housing prices. What holds in the micro-level may not hold in the macro-level due to variations in location and other specific characteristics. Housing supply measured by the housing production is relatively stable in the short term since building new dwellings takes time and housing construction per year is low concerning the total housing stock. House prices generally fluctuate in the short term with changes in demand. Eventually, the housing supply is adapted to demand over time. The house prices model should contain explanatory factors for developments in housing construction and building site costs and prices for newdwellings in the long term.

Given the relationship of the macroeconomic determinants and housing price as discussed in the review of related studies, housing price behavior in the Philippines canbe explained using the partial macroeconomic framework, particularly the partial adjustment housing market model proposed by DiPasquale and Wheaton (1994). This proposal is a variation of the stock-flow model and contains several innovations. The innovations debunk portions of the stock-flow assumptions: (1) the housing market clears quickly, and (2) the housing market captures the consumers' expectations on future house prices. Riddel (2004) and Mahalik and Mallick (2011) adopted this model to study the housing market in the United States and India, respectively.

The partial adjustment housing-market model by DiPasquale and Wheaton developed from the market research lessons to make the model more consistent with the current times. Traditional housing market models assume that housing markets clear instantly to adjust almost simultaneously with the demand for housing to make it equal with the housing stock. This study observes housing markets in stock and flow dimensions like other durable goods. The flow dimension is the net investment while the sum of new residential units and depreciation of existing units are the stocks. Further, the long-run supply is the accumulation of the net

investment. DiPasquale and Wheaton (1994) define the long-run equilibrium stock, S_t, as a function of price, P_t, and an array of cost-shifting variables, X_t. In functional form, one can write this definition as:

Correspondingly, housing equilibrium demand is defined as D_t for the current stock of housing as a function price, P_t and the set of demand variables such as income, mortgage interest rate, population growth, wealth as $X_{d,t}$. It is a functional form as the following:

$$D_t = D(P_t, X_{d,t}) \quad (2)$$

Mahalik and Mallick (2011) argued that the housing price model is most often an inverted demand equation that can be summarized in the following equation wherein Z_t refers to the qualitative variables that influence the housing price:

$$P_t = f(X_{d,t}, X_{s,t} Z_t) \quad (3)$$

Mahalik and Mallick (2011) further argued that economic theory does not provide a finite list of variables and observations. However, it helps examine the main possible determinants of housing prices as it is challenging to capture all of the factors that explain house prices. Given the above framework, the final computable housing price equation is as follows:

$$HPI_t = \emptyset_1 GDP_t + \emptyset_2 INTR_t + \emptyset_3 INFR_t + \emptyset_2 UNMR_t \quad (4)$$

Where HPI refers to housing prices, GDP per capita denotes gross domestic product, INTR denotes interest rate, INFO denotes inflation rate, UNMR denotes unemployment rate, and *t* denotes period.

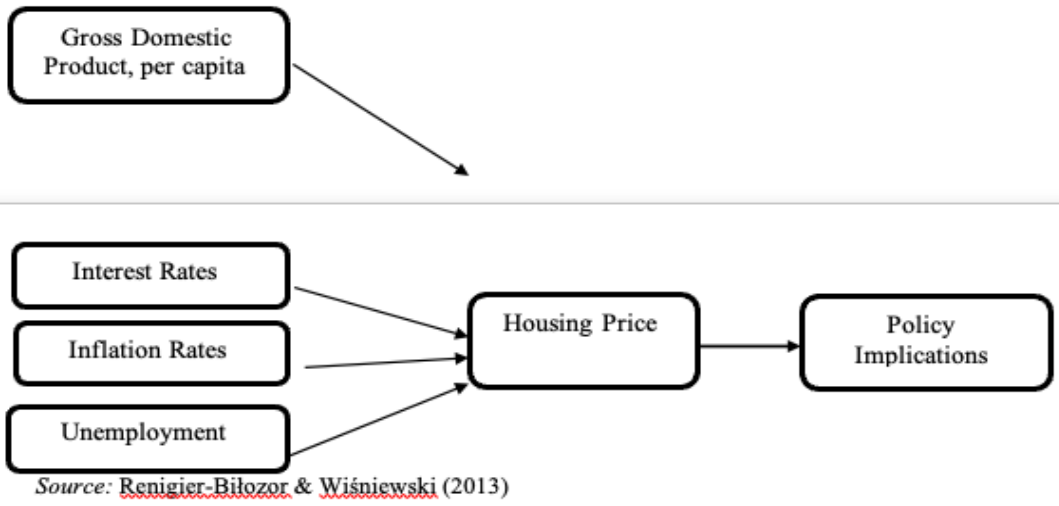
However, the relationship between housing prices and their determinants arevaried depending on the country's economic condition and housing market. Previous studies viewed the determinants of housing prices as exogenous variables affecting house price changes (Mahalik & Mallick, 2011; Panagiotidis & Printzis, 2015; Cao et al., 2018. However, some cases have a bi-directional relationship, meaning the housing prices may also affect those determinants. This study focused on the unidirectional relationship between macroeconomic determinants and housing prices. Following the explanations of DiPasquale and Wheaton (1994), this study hypothesizes that the macroeconomic determinants could explain the changes in housing prices in the long run. However, the housing price may deviate from its long-run equilibrium in the short run but continue to adjust to the deviations through the error correction mechanism.

CONCEPTUAL FRAMEWORK

In the literature review, key concepts and indicators describe the nexus of housing prices and the macroeconomic determinants. This conceptual framework shows that the dependent variable is the housing price while the independent variables are gross domestic product, interest, inflation, and unemployment.

Figure 1

Conceptual Framework Showing the Factors Affecting Housing Prices



Source: Renigier-Biłozor & Wiśniewski (2013)

This chapter covers the framework and approaches to developing the research design, data

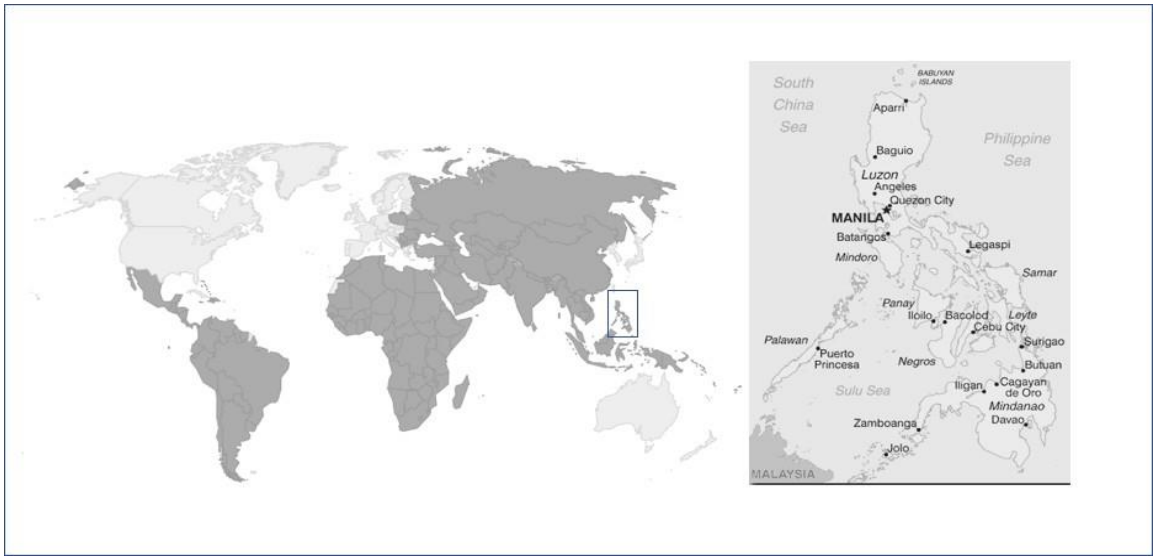
collection, analysis, and treatment. The definition and operationalization of such concepts into entities that can be measured are essential in guiding empirical research. The research design is a quantitative statistical analysis method using secondarydata.

Research Environment

The study is confined to the Philippines. As shown in Figure 3, the study area is part of the developing countries (dark gray) whose standard of living, income, economic and industrial development remains more or less below average.

Figure 2

Location Map



Source: WorldData.info (2021)

Research Procedures

This paper adopts the methodology of Riddel (2000), Xu and Tang (2014), and Barksenius and Rundell. (2012) using the Engel-Granger two-step approach, consisting of a co-integrating test and subsequent construction of an error correction model. The Engel-Granger approach process is as follows: First, the approach separates the short- and long-run equilibrium housing prices. The theoretical framework postulates a long-run equilibrium relationship between the

dependent and independent variables. Second, in the short run, there is a divergence of arbitrage profitability in housing price which needs enough information about the relative position of the housing market in the long-run equilibrium development. The quarterly statistical data such as the residential price index covering 2000 to 2020 are obtained from the Bank International for Settlement (BIS) website. BIS is an international financial institution in which the Bangko Sentral ng Pilipinas is a member. However, some variables such as interest rate and an inflation rate have no quarterly data available. Thus, the researcher manually transforms yearly data into a quarterly form by dividing the annual data by four. The advantage of using quarterly data over the annual data is the number of observations which provides a more significant degree of freedomto conduct testing and draw inferences. All data used in the analysis are secondary from the Philippine Statistics Authority, Bank International for Settlement, Bangko Sentral ng Pilipinas, and the World Bank.

These variables are used in different tests and series of steps, determining the relationship of the dependent and independent variables, and such tests and steps are the following:

1. Graphical Analysis
2. Unit Root Test
3. Co-integration
4. Granger Causality Test
5. Diagnostic Checking

First, the graphical analysis shows the, patterns, and trends of the variables in the study. This analysis answers sub-problem 1. Then, this method is used to perform the movement of the independent variables that affect housing prices in the Philippines.

Second, it utilizes the unit root test to determine the non-stationary tendency. This test avoids spurious regression following the classical linear regression model assumptions. The unit root test makes it possible to know if the time series are I(1) and whether the Engle-Granger two-step approach fits and proceeds with the analysis (Toome,2018). Static variables in the regression model can forecast the economic situation. The assumption for asymptomatic analysis is untrue when the variables are nonstationary. The nonstationary series cannot proceed to the next step and provide a long-run prediction. The variation of the series is time-sensitive, moves towards limitless, and generates a series of problems in forecasting. Sometimes, higher-order differencesare necessary to achieve stationarity (Baumohl & Lycosa, as cited in Toome, 2018). Further, it is helpful to take the natural logarithm of the data before differencing to deal with linear trends. The stationarity of the variables are examined using the Augmented Dickey and Fuller (ADF) test. This test, which is an improvement of the Dickey and Fuller test made in 1981, is used in analyzing the autocorrelation in the explainedvariable ΔYt and lag length under the following equation:

$$\Delta Y_t = \varphi y_{t-1} + \epsilon_t \qquad (6)$$

The null and alternative hypotheses as the following:

H_0: $\varphi = 0$ is non-stationarity (φhas unit root) H_1: $\varphi = 1$ is stationarity (φhas no unit root)

Decision rule: Reject H_0 if absolute t-statistic is higher than an absolute criticalvalue.

Otherwise, do not reject H_0.

Third, the study conducts a cointegration test. The ordinary least square testexamines whether the nonstationary variables were co-integrated or not. The Engle-

Granger co-integration has drawbacks. If the sample size of the test does not provide reliable results and the dependent variable is not known, then the Engle-Granger test is not appropriate. However, the sample size is enough for reliable estimation in this study. This test can evade spurious regression and appraise the long-run equilibrium. Using the following equation enables us to answer sub-problem number two of the Engel-Granger relationship of the explained and explanatory variables.

$$HP_t = \alpha + \beta_0 GDP_t + \beta_1 INTR_t + \beta_{0\,2} INTR_t + \beta_3 UNEMP_t + \epsilon_t \quad (7)$$

This step in the regression model integrates all co-integrated variables in levels and differences. The study assumes that the error term *e* is zero if the system is in equilibrium. However, if *e* is not in zero, it is not equilibrium. Then, if Y (dependent variable) and X (independent variable) form a co-integrating relationship, it corrects deviations or shocks in the next period until equilibrium. The co-integration regression contains only the long-term dynamics relationship (Toome 2018). This process also builds an error correction model that includes the estimated residuals from the initial regression.

Fourth, after evaluation of the cointegration between the independent and dependent variables, the dynamic error correction model (ECM) is generated which can state the long-run relationship in the following equation:

$$HP_t = \beta_0 + \beta_1 GDP_{t-1} + \beta_2 INF_{t-1} + \beta_3 INTR_{t-1} + \beta_4 UNEMP_{t-1} + \epsilon_t \quad (8)$$

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The basic form of an ECM is as follows: the first differences of *Y* (the house prices) at time *t* depend on a constant γ_0. The co-integrated X (the first differences) changes at the previous period t − 1 and on the error correction component, the error termof the prior period.

In the present study, the short run relationship equation between the house price and the independent variables can be shown as follows:

$$\Delta HP_t = \alpha + \sum \alpha_{i(\tau-1)} \Delta yHP_{t-1} + \sum \alpha_{i(\tau-1)} \Delta yHP_{t-2} + \sum \beta_{i\,(t-1)} (\Delta) xGDP_{i\,(t-1)} - \sum \beta_{i\,(t-1)} (\Delta) xINTR_{i\,(t-1)} - \sum \beta_{i\,(t-1)} (\Delta) xINTR_{i\,(t-2)} - \sum \beta_{i\,(t-1)} (\Delta) xINFR_{i\,(t-1)} + \sum \beta_{i\,(t-1)} (\Delta) xUNEMP_{i\,(t-1)} + \eta_{i\,(t-1)} + \varepsilon_\tau \quad (9)$$

$$r_{\tau-1} = y_{\tau-1} - \sum \eta_{i\,(\tau-1)} y_{i\,(t-1)} - x \quad (10)$$

Where,

α = constant

$\Delta y_{(t-1)}$ = lagged difference of dependent variable $(\Delta) x_{i\,(\tau-1)}$ = are the lagged difference independent variables $X_{i\,(t-1)}$ = long run independent variable

η = the coefficient of long run relationship ε_τ = error term

$r_{\tau-1}$ = lagged residual of the long-run relationship

= constant term of the long-run relationship

When the model is not in equilibrium, the error term from the period e_{t-1} can demonstrate the amount of disequilibrium of the model and which is defined as follows:

$$_{t-1} = Y_{t-1} - \beta 0 - \beta_1 X_{t-1} > 0 \quad (11)$$

The error term from the previous period *t−1* can capture the model's disequilibrium. Shocks have two effects on Y; one part of the shock influences Y only in the following period, *t+1*, so ΔYt is influenced by *t−1*. A shock brings the system out of equilibrium for longer than one period, which occurs with the error correction mechanism. The study uncovers the long-run

relationship between the macroeconomic determinants and the housing prices and the short-run relation of the variables. The following decision rule is as follows:

H_o: dependent variable Y does not granger-cause the independent X.H_1: dependent variable Y does granger-cause the independent X.

Decision Rule: Reject H_0 if it is lesser than the critical value at 95 per centlevel of significance.

Finally, it is important to test for autocorrelation in the residuals after performing the 2-step Engle-Granger approach. If the residuals are autocorrelated, then assumption 4 of the classical linear regression model (CLRM) is violated, thus rendering the OLS invalid. This step is expressed in the following equation:

$$\epsilon_t = \rho\epsilon_t + \mu_t \quad (12)$$

The null hypothesis should not be ρ_1=0. Otherwise, the ECM estimated model isinvalid.

After the analysis, this study summarizes policy recommendations for the future development of housing prices.

RESULTS AND DISCUSSION

This section presents the results of the graphical analysis, stationarity, cointegration, and error correction models. Some discussions on the determinants of house prices illustrate following the cointegration test results. The deviation of house prices is examined and the model is evaluated.

Trends of Housing Prices

House prices experience unprecedented growth in the last two decades and several factors drive housing prices.. The succeeding graphs and descriptive statistics show the situation, trends and direction of the variables.

Figure 3 shows an upward trend of house prices in the country which reaches its peak in 2000,

2007, and 2009 to 2019. However, the house price index fluctuates in 2008 may be attributed to the economic crisis. The index falls again in 2020 because of thepandemic in which both the per capita disposable income and spending are greatlyaffected.

Figures 4a to 4d show the trend of the macroeconomic factors affecting house prices. As shown in the graph, only GDP per capita has an increasing trend but abruptly fall in 2020 because of the health crisis. Housing prices and GDP per capita have a similar increasing trend throughout the study period. On the other hand, interest rates show a non-linear trend with several periods of volatilities in different periods while the inflation rates show small rising trends and several spikes in different periods. The unemployment rate depicts a small through and peak trends; however, the lowest through is in 2019. As noted, the housing prices and GDP per capita have a similar increasing trends. Consequently, the lowest inflation rate was in 2015 with a 0.6 percent while the housing price index peaks in the fourth quarter of 2020 (Figure 3).

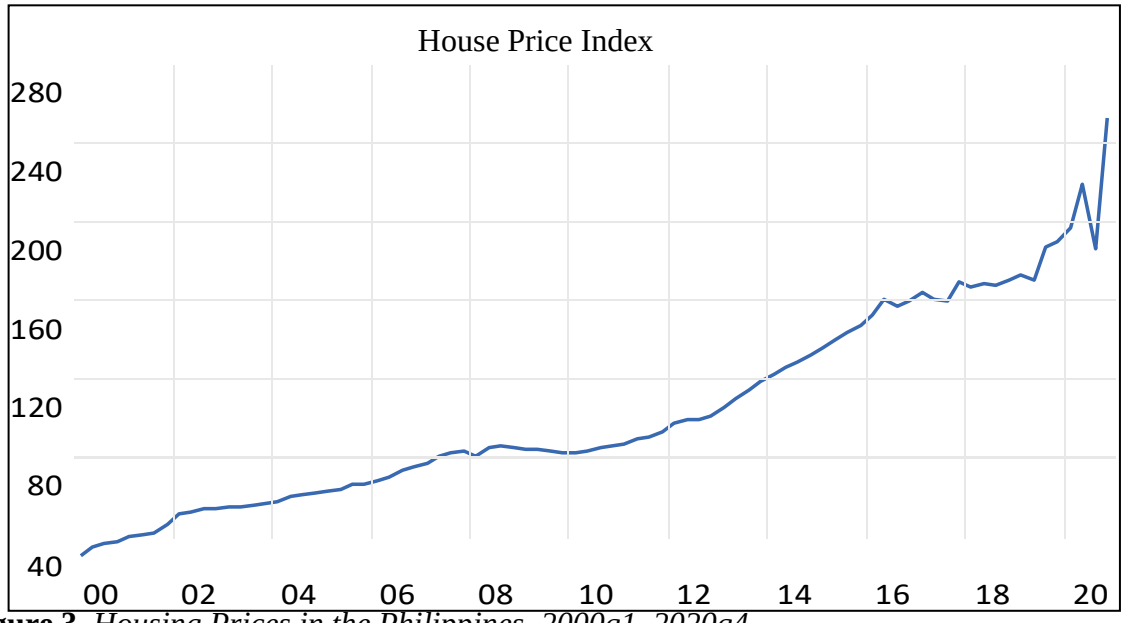

Figure 3. *Housing Prices in the Philippines, 2000q1–2020q4*

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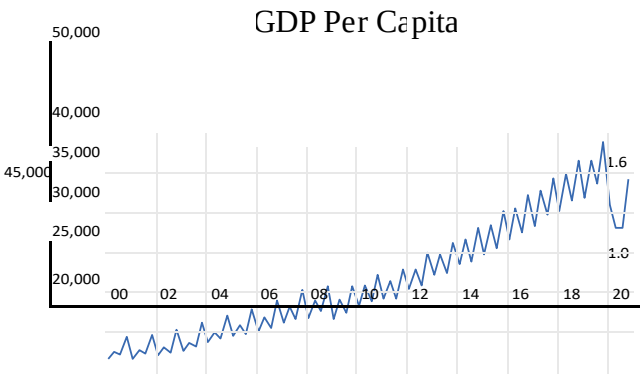

Figure 4a GDP Per Capita

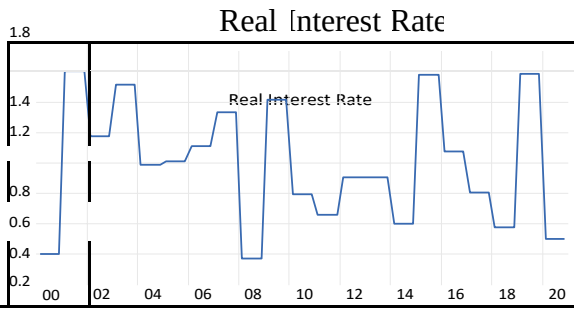

Figure 4b Real Interest Rate

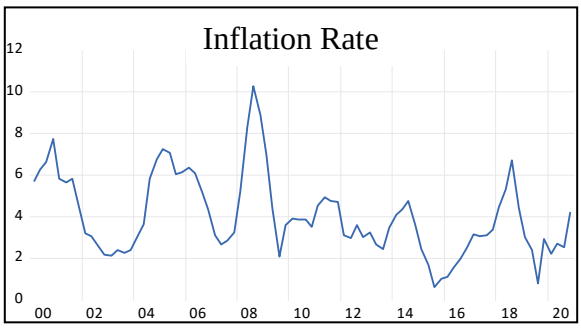

Figure 4c Inflation Rate

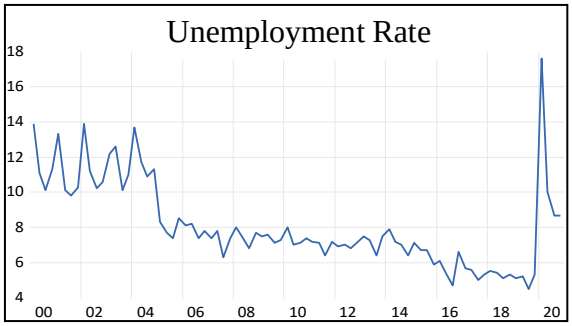

Figure 4d Unemployment Rate

Figures 4a–4d. *Macroeconomic Determinants (2000Q1–2020Q4)*

Table 1 shows the summary statistics of the data. As noted, the mean of the variables is greater than the median which indicates that the distribution of the data is positively skewed. Subsequently, all variables except the GDP per capita has a high value which denotes that data is spread out from the mean. In contrast, housing prices and inflation rates are moderately skewed in their distribution.

Table 1. Summary Statistics of Variables

	HPI	GDP per capita	INFR	INTR	UNEMP
Mean	118.80	31654.60	4.0357	1.021	8.10
Median	101.02	30429.50	3.5666	0.9988	7.400
Maximum	268.13	48859.00	10.2667	1.605	17.600
Minimum	45.82	21723.00	0.6000	0.3666	4.5000
Std. Dev.	49.59	7237.245	1.9136	0.388	2.509
Skewness	0.70	0.507	0.779	0.023	1.221
Kurtosis	2.70	2.167	3.427	1.912	4.546
Probability	0.04	0.04	0.02	0.13	0.000

Source: Researcher's own computation using Eviews

It is arbitrary to conclude stationarity without employing a unit root test using the Augmented Dickey-Fuller (ADF) test. From the differenced data or at levels, the Engel- Granger co-integration is appropriate in the study.

Analysis of the Relationship of Variables

Table 2 shows the unit root test analysis. Results indicate that the GDP per capita and housing prices are not stationary at level. Interestingly, the inflation and unemployment rates are stationary, I (0). However, the non-stationary variable must be differenced to be stationary and integrated in the first order (1) to avoid spurious regression and align with the classical linear regression model assumptions. After that, all variables are stationary and integrated into the first differencing, I (1). Differencing is

required to make the variable stationary (Barksenius, 2012). This result is confirmedusing the Engel-Granger test and the Philips-Person unit root test. Thus, the Engel- Grainger co-integration is appropriate in the study. However, all the non-stationary variables are stationary at their first differences and integrated in the order of one. As a result, the co-integration process is possible.

Then, there is a need for the residual to be stationary. The ADF tests are employed to analyze the residual. The null hypothesis is set non-stationary or it containsa unit root. Meanwhile, the alternative view is a stationary series and the null hypothesis is rejected when the p-value is more significant than the critical value or less than a = 0.05.

Table 2. Result of Unit Root Test

	At Level	Analysis	1st Diff	Analysis
L_hpi	0.9578	Constant	0.0055***	Without trend
L_gdppc	0.5252	Constant	0.0496***	Without trend
L_Infr	0.0014***	Constant	0.0000***	Constant
L_Intra	0.0388***	Constant	0.0035	Without trend
L_Unemp	0.0094***	Constant	0.0000***	Constant

The stationary test of residuals shows that the p-value is <0.05. Thus, one can reject the null hypothesis. This indicates a long-run cointegrating relationship betweenthe housing price and the macroeconomic variables. This relationship is also confirmed inthe cointegration test using Engle-Granger and the Phillips-Ouliaris test. Therefore, the

variables are cointegrated. In Table 3, the coefficients of the cointegration test are significant at a 1% confidence level which means that the independent variables in the model have substantial impacts on housing prices. This implies that the variables are cointegrated as the residuals are stationary.

Table 3

Stationary Test of Residual

		t-stat	P-value
Augmented Dickey-Fuller test statistic		-4.25	0.0000
Test critical values:	1% level	-2.596	
	5% level	-1.945	
	10% level	-1.613	

Cointegration Test

The cointegration test analysis is presented in Table 4. The result shows that GDP per capita is positively related to housing prices. It has the highest coefficient among the essential variables investigated to impact housing prices. For every one percent increasein the GDP per capita on average, there is a corresponding increase of 1.24% in housing prices. This implies that an increase in the GDP per capita also leads to a rise in housing prices. This indicates that people have more significant income to acquire their desired houses. With the growing GDP per capita, demand for housing increases. On the other hand, inflation and unemployment rates are negatively associated with the cointegration regression which suggests that if the inflation rate increases by 1%, the house price declines by 0.075 percent. Interestingly, the result shows that the interest rate is

insignificant to the housing prices in the long run. This implies that the interest rate could not explain the housing prices in the long term. Likewise, when the unemployment rate increases by a percent, house prices also decrease by 0.398% (Table 4). The GDP per capita, inflation rate, and unemployment are significant in the long run, while the interest rate is insignificant. Moreover, GDP per capita and interest rate are significant in theshort run, and inflation and unemployment rates are insignificant (Table 4).

The researcher hypothesizes that the relationship between the interest rate and housing prices is negative; however, the sign is correct, but the relationship is insignificant (Table 4). There is no adequate evidence to determine that the housing price index and interest rate are related. The reason may be because of the Bangko Sentral ng Pilipinas (BSP) policy which imposes a statutory limit of 30% on the share of real estate loans to the total bank loan portfolio and the cap on the 60-70% loan-to-value ratio that is allowed for real estate loans. Eligibility to mortgage loans requires a sufficient level and stability of income and good financial prospects (Glindro et al., 2007).

The inflation rate and housing price are negatively related (Table 4). Results reveal that when the inflation rate goes up by one percent, the housing price index decreases by .075 percent, with the remaining other factors being equal. A high inflation rate lowers the purchasing power of consumers/buyers, bringing down demand for real estate; thus, prices also go down. The negative relationship may be due to the adoption of the inflation-targeting framework of the Philippines in 2002. The Philippines has high inflation in the 1980s to 1990s; however, it slows down to 3.8percent starting 2002. This

framework enables the BSP to manage inflation and keep it in manageable bounds (BIS, 2020).

The unemployment rate negatively affects the housing price (Table 4). Results show that when the unemployment rate goes up by one percent, on average, the housing price index decreases by 0.398 percent. This implies that when people have no jobs and subsequently no income, the demand for housing falls, and thus the housing price also drops. This finding confirms the researcher's hypothesis that the unemployment rate and housing prices are inversely related. This result explains clearly that with the increase in unemployment, more people cannot buy new houses. Thus, the demand for housing is lowered and the prices are reduced.

Table 4. Co-integration and Error Correction Model Result 2000:1-2020:4 (T=84)

Variable	Coeff	t-stat	P-value
Long-Run Effects			
Constant	-7.205	-5.14	0.0000
L_GDPPC	1.237	10.41	0.0000
L_INFR	-0.075	-2.37	0.0199
L_INTRA	0.0323	-0.013	0.914
L_UNEMP	-0.398	-0.398	0.0000
Short-Run Effects			
Constant	0.018	4.45	0.000
D(LGDPPC(-1))	-0.075	-1.928	0.0368
D(INFR(-1))	-0.0022	0.249	0.7674

D(INTRA(-1))	-0.01497	-1.796	0.0430
D(UNEMP(-1))	-0.0335	1.48	0.0999
ECT(-1)	-0.112	-3.054	0.0025
S.E. of regression	0.090		
F.Statistic	348.77		
Prob(F-statistic)	0.0000		

Note: INFR is inflation rate; INTRA is interest rate; UNEMP is unemployment rate.
Source: Researcher's own computations

Estimating ECM

Results of the ECM showed that one could not reject the hypothesis, (Table 4). The lags of GDP per capita are significant in explaining the housing prices and reveal- that GDP per capita negatively affects housing prices in the short run. The lags also indicate a corresponding .075 decrease in housing prices with a one percent GDP per capita increase. An equivalent to a rise of 786.82 in GDP per capita (PSA, 2017), there is an equivalent decrease of Php 187,500.00 from the price of a Php 2,500,000.00 medium- cost housing. The negative relation in the short run might be due to the fixed nature of construction lag in the short run. The construction of housing needs at least six months to 2 years, depending on the size of the development. This situation happened last year in which the GDP per capita plummeted, and although people had less income due to lockdowns, housing prices continued to escalate.

The findings also reveal that the interest rate is negatively related to housing prices but significant in the short run. The result indicates that with a one percent increase in the interest rate, there is a corresponding 0.015 percent decrease in the housing price in the short run. A medium-cost housing of 2,500,000 will reduce by Php 37,425.00 of its price. This implies that when the interest rate increases, the cost of borrowing also rises, and potential buyers become discouraged; therefore, the demand for housing falls. The negative relation and dismal impact of interest rate on the housing price in the short run might be due to the nature of the mortgage loan in our country. The banking sector cannot compete with the government housing finance system such as the Social Security System, Pag-IBIG, and Government Service and Insurance System on the low-interest rate and longer loan terms. The middle-income segment can quickly shift when the commercial mortgage rate is higher. Besides, access to mortgage loans requires a sufficient income level and financial prospects; thus, only a few can qualify. Lower interest rate raises the capabilities of the people to buy houses, thus raising the demandfor housing and eventually increasing the housing price.

The negative coefficient of the housing price has some considerable deviation from the equilibrium in the short run but continuously re-adjust to the departure through the error correction model. The error correction term is statistically significant. It has a coefficient of -0.11 which suggests that 11% of the disequilibrium in the previous quarterrevert to equilibrium in the next two and half years. The speed of adjustment by 11% is almost similar to Toome's (2018) finding in studying the housing market in Germany thatthe model corrects its previous disequilibrium level by 12% in the current period. It is

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higher than the findings of Xu and Tang (2014) in the U.K., which indicates that 3.7 percent is the quarterly speed of adjustment.

Equation 13 describes the short and long-run relationship between housing prices and the independent variables. This study finds that the GDP per capita, inflation, interest, and unemployment are inversely related to housing prices in the short term. The initial regression of the long-run relationship of GDP per capita is positive, while inflation rate and unemployment are negative. The model excludes insignificant variables such as inflation rate and unemployment rate in the short run; and interest rate in the longrun. This suggests that GDP per capita should have full attention in the short term due to its significant inverse relationship with the housing price.

Moreover, the insignificant relationship of interest rate and housing price, in the long run, implies that it is vital to promote long-term fixed interest rates for housing loans. The coefficient of -0.11005 suggests that 11% of the disequilibrium in the previous quarter returns to equilibrium in the subsequent nine periods. This means that the speed of adjustment to balance is nine quarters to total adjustment. In sum, the coefficient adjustments and movements in GDP per capita, inflation rate, and the unemployment ratein the long and short term help the housing price return to equilibrium.

$$\Delta HPI = 0.18+.049HPI(-1) -0.075GDPPC(-1) - 0.014INTRA(-1) - 0.011ECT(-1)+ 1.237GDPPC-0.075INFR – 0.398UNEMP \quad (13)$$

Diagnostic Test

Table 5 shows no autocorrelation and heteroskedasticity in the error correction model. The model shows no autocorrelation as determined by the Breaush-Godfrey Serial Correlation LM test. The Q Statistics correlation probabilities confirm these findings, indicating that the model's p-value is more significant than 0.05; hence, there is no autocorrelation among variables. The heteroskedasticity test is conducted using Breusch- Pagan-Godfrey and the null hypothesis is rejected. Therefore, an error correction model can explain the short-run relationship between house prices and other variables.

Table 5. Result of Diagnostic Test

	Prob.
Histogram Normality Test	
Probability	0.054
Breausch-Godfrey Serial Correlation LM Test	
F-statistic	0.1490
Obs*R-squared	0.1172
Heteroskedasticity Test: BPG	
Null hypothesis: Homoskedasticity if p-value>.05	
F-statistic	0.0810
Obs*R-squared	0.0840

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Policy Implications

Policymakers need to pay close attention to the performance of the Gross Domestic Product as it directly impacts housing prices. Policies should focus on slowly raising the housing market demand and regard monetary policies, particularly on managing the interest rate in the short run. They can adopt measures to overcome high- interest rates by promoting long-term fixed interest housing loans. In either situation, policymakers should focus on the interaction of supply and demand in the housing market. Furthermore, balancing the substitution effect of housing as consumption and investment good in managing the interest rate proves essential.

Generally, policies can be based on two fundamental assumptions. One is in the long-run economic growth where GDP per capita increases, and the housing prices increase. In the short run, the different scenario is where the GDP per capita rises and housing prices decrease. Government should promote the availability of new houses through direct production or assistance to housing developers such as tax incentives and financial support.

Likewise, the government can focus on constraining the demand to increase house prices and propose policy measures to curb the need to increase housing demand. The measures are first, setting the loan-to-value ratio higher on individuals and investors, and second, expanding the down payment percentage for second and succeeding house purchases. (Pillaiyan, 2015), and third, providing measures such as higher property taxation to housing investors and speculators. The Bangko Sentral ng Pilipinas policies

which impose a statutory limit of 30% on the share of real estate exposure to the bank loan portfolio are in the right direction. In the short run, the government should encourage policy measures that mitigate the fall of the demand for housing. A soft landing approach for housing prices not to fall fast is necessary. Increasing the role of the government housing finance system helps mitigate the increase of interest rates. The government can provide housing subsidies and alternatives such as low-rent and affordable housing for the unemployed and homeless and provide employment or income opportunities to the underemployed. The government can call for a moratorium to construct new houses for 5-10 years in a supply glut. It can also buy excess supplies from developers through discounts and turn them into public housing. The government canalso constrict the loan exposures of banks in real estate from the current 80-20 to 90-10 loan exposures.

CONCLUSION AND RECOMMENDATIONS

This thesis investigates the macroeconomic determinants of housing prices and focuses on the Philippine housing price using the residential real estate price index from 2000q1 to 2020q4. The result indicates that the GDP per capita, inflation rate, and unemployment rate significantly affect housing prices in the Philippines. Conversely, the interest rate is insignificant. Results indicate that GDP per capita and inflation rate are positively related. The unemployment rate projection has a significant inverse relationship to housing price. The findings suggest that GDP per capita is the most significant explanatory variable. In addition, the error correction model demonstrates the short-run relationship between macroeconomic variables and house prices. It shows that GDP per capita and interest rate affect housing prices in the short term, while inflation and unemployment are insignificant.

In the Engle-Granger two-steps approach, the cointegration test reveals that the residuals reached the highest magnitude of value in the year 2008 financial crisis and 2020. Conversely,

the lowest value happens in the early part of 2001. The error correction model shows that the disequilibrium between the short and long-run corrects at the speed of 11% in the preceding quarter. It implies that the disequilibrium in the previous quarter reverts to equilibrium in the subsequent nine periods.

Admittedly, the outcome of the research has limitations. First, the number of the explanatory variables is limited to four. Future research might include other variables such as population, exchange rate, mortgage loans, and construction cost. Second, the study uses macroeconomic factors to determine housing prices. However, real estate is a location base; thus, microeconomic determinants are important. Hence, future researchers are encouraged to examine the housing price with macroeconomic and microeconomic factors to provide accurate information. Prospective researchers are also encouraged to look into how the pandemic with its many downturns has invaded the migration plans (Frey, 2021) of those from the rural areas to more urban areas like Metro Manila.

To enhance future research on housing prices, the researcher recommends the following areas for further study. Firstly, increase the number of independent variables to include population, remittances, mortgage loans, and construction cost. More variables will enhance the viability of the result to factor in the demand of housing and supply.

Secondly, future researchers should also study the causal relationship among the dependent and independent variables. For example, the relationship between housing price and GDP per capita, interest rate, inflation rate, and the unemployment rate will deepen understanding of the relationships and of the variables.

Finally, future researchers are encouraged to comprehensively analyze the housing price with

the macroeconomic and microeconomic factors—the difference among various housing types such as condominiums, townhouses, raw houses; the geographical areas such as urban and rural areas of people with different income levels and consumption.

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