

What Determines Housing Prices in Egypt?

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Abstract

The Egyptian housing market is a very dynamic market and has many interactions with monetary and financial markets in the economy. In this paper, we investigate the macro-financial fundamentals, institutional as well as specific behavioural and cultural factors that are argued to play a role in housing demand and prices in Egypt. We design a field survey for a representative sample of household homebuyers and sellers as well as real estate developers and brokers. We then run an Ordinal Logistic Regression Model (OLM) based on the results of the field survey and a constructed housing price index. Analysis reveal many important findings, firstly, land construction and licensing costs, government real estate and housing policies are all perceived as main determinants of housing prices in the Egyptian market. On the contrary, macro-financial variables, namely inflation and interest rates were not significant indicating a possibly weak monetary transmission mechanism through the theoretically explained asset-price channel. Results also affirm that housing investment is perceived by Egyptians as the safest form of investment during uncertainty shocks and good hedge against inflation and other financial turbulence. Finally, findings reveal a huge discrepancy in information and data on housing dynamics and expectations across the sampled groups, households and Developers & Brokers. Lack of information makes market actors more vulnerable to principal-agent problems and result into asymmetric information moral hazard outcomes. The above results altogether reinforce the importance of constructing a micro dataset on housing prices in Egypt and constructing a housing price index for the Egyptian market as was initiated in this research and planned to be further developed in future research.

JEL Classification: G1, G5, E7, E44.

Keywords: Housing demand, house price index, mortgage finance, expectations, household behaviour.

ملخص

يعد سوق الإسكان المصري سوقا ديناميكية للغاية له العديد من التفاعلات مع الأسواق النقدية والمالية في الاقتصاد. ونقوم في هذه الورقة البحثية بالتحقيق في أساسيات الاقتصاد الكلي، والعوامل المؤسسية وكذلك السلوكية والثقافية المحددة التي يقال إنها تلعب دورا في الطلب على المساكن وأسعارها في مصر. وضع تصميم مسح ميداني لعينة تمثيلية من مشتري وبائعي الوحدات السكنية والمطورين العقاريين والوسطاء. ثم تم تطبيق نموذج الانحدار اللوجستي الترتيبي (OLM) بناء على نتائج المسح الميداني ومؤشر أسعار المساكن المبنية. ويكشف التحليل عن العديد من النتائج المهمة، أولا، ينظر إلى تكاليف بناء الأراضي وترخيصها، والعقارات الحكومية وسياسات الإسكان على أنها المحددات الرئيسية لأسعار المساكن في السوق المصرية. بل على العكس من ذلك، لم تكن المتغيرات المالية الكلية، أي التذبذب وأسعار الفائدة، ذات أهمية كبيرة، مما يشير إلى احتمال ضعف آلية انتقال النقد من خلال قناة أسعار الأصول المفسرة نظريا. وتؤكد النتائج أيضا أن المصريين ينظرون إلى الاستثمار في الإسكان على أنه الشكل الأكثر أمانا للاستثمار خلال صدمات عدم اليقين والتحوط الجيد ضد التضخم والاضطرابات المالية الأخرى. وأخيرا، تكشف النتائج عن تباين كبير في المعلومات والبيانات المتعلقة بديناميكيات الإسكان والتوقعات عبر المجموعات التي تم أخذ عينات منها والأسر والمطورين والوسطاء. إن نقص المعلومات يجعل الجهات الفاعلة في السوق أكثر عرضة لمشاكل الوكيل الرئيسي. ويؤدي إلى نتائج مخاطر أخلاقية غير متماثلة في المعلومات. تعزز النتائج المذكورة أعلاه تماما أهمية بناء مجموعة بيانات جزئية عن أسعار المساكن في مصر. وبناء مؤشر أسعار المساكن للسوق المصرية كما بدأ في هذا البحث ومن المخطط تطويره في الأبحاث المستقبلية.

1. Introduction

Housing markets are evolving quickly in emerging markets as part of the natural urban development as well as the evolution of financial instruments and global financial integration. However, limited research and lack of data constitute a challenge to addressing the above theoretical interrelationships and dynamics in these markets.

It is argued in literature that housing demand is affected by many determinants in theory and literature and follow many patterns; either a normal cyclical pattern or a bubble-bust behaviour that is mainly driven by expectations about the future. Main macro-financial fundamentals mainly affect cyclical housing prices. They include interest rates, real per-capita income, access to finance and sectoral developments. This is in addition to institutional variables such as mortgage laws, banking regulations and other financial instruments (Lambertini et al., 2010).

Behavioural factors also affect home buying decisions and thus impact housing demand and prices during normal cycles. Case and Shiller (2003) referred to the importance of behavioural factors in influencing household home buying economic decisions; either for occupation or for investment and can be a core cause of housing bubbles with increased uncertainty. People's perceptions about the risks associated with investment in the housing sector affect their expectations about the future.

Regarding the factors affecting the so-called housing bubbles, as argued in Stiglitz (1990), an excessive increase in demand and prices that results solely from expectations about a future increase in selling prices will cause a housing bubble. A housing bubble occurs when prices are high today *only* because investors believe that the future selling price will be higher which will result in higher yields compared to alternative assets while fundamental variables do not seem to play a role in this price rise. This bubble phenomenon usually gets reversed when expectations about the future are altered because of sudden uncertainty shocks, expected changes in monetary policy stance and/or reaching the fourth stage of the so-called Minsky's cycle – known as Minsky's moment. According to this theory, housing markets would collapse because of a fall in business sentiment and elevated debt following an era of persisting speculative behaviour that accompanied loose access to credit that gets quickly transmitted from the housing sector to other sectors in the economy (Vercelli, 2009).

In Egypt, the housing sector is a very important sector for many reasons. First, it has established backward and forward domestic linkages with other sectors in the economy and contributes to more than 20% of real growth rate according to the Egyptian Ministry of Planning and Economic Development official data (MPED). There is a lack of evidence-based data on housing prices in Egypt in official sources, surveys, national accounts, etc. Unavailability of housing prices data and asymmetric information result in many problems related to market equilibrium and decisions of all stakeholders. They distort market operations and adversely affect policy design. Lack of data

also constitute an obstacle towards developing evidence-based research on the market and poses a challenge for researchers to understand the interactions between the housing market dynamics and the macroeconomic fundamentals in the Egyptian economy.

Second, the housing sector in Egypt has interactions with financial and monetary dynamics in the economy where monetary policy, access to credit, changes in per-capita income as well as overall macroeconomic and financial performance affect housing prices on the macro level. Third, the housing and construction sector in Egypt runs within a sophisticated system of institutions and regulations that has to do with land ownership, access to finance and other laws and regulations altogether adding to the specific nature of the Egyptian housing market. Fourth, home buying decisions in Egypt are also governed with many *cultural and behavioural* factors that add to the specific nature of the Egyptian housing market. For example, religious beliefs where people would resort to housing investment as a religiously safer option to comply with Islamic Sharia compared to fixed-interest banking schemes.

To our knowledge, despite the above significance, studying the housing market and demand in Egypt from this perspective has not yet received good attention in academic literature and/or relevant policy works. We also believe that studying the recent COVID19 crisis shall also have important implications on housing prices and demand in Egypt as per the reviewed literature of sudden uncertainty shocks. While it is too early to anticipate the impact, we argue that the housing demand in Egypt might follow either the overall recessionary wave in the economy and hence would witness deflating prices or oppositely the housing prices might surge; being a safe form of domestic investment in times of high economic uncertainty compared to other investment assets. The paper intends to answer three main questions: (1) What are the main determinants of housing prices in Egypt, (2) How do macroeconomic and financial, legal, and institutional variables affect housing demand for occupation and investment in the Egyptian market and (3) How do behavioural factors influence public choices and expectations in the Egyptian housing market.

Based on the above, this paper employs statistical and empirical methods to answer the above questions. We start by designing two field surveys that are implemented on a sample of household homebuyers and sellers as well as a sample of real-estate developers and brokers. We then construct an Egyptian Housing Price Index (EHPI) to capture the recent trends in the Egyptian housing prices. The EPHI is considered the first attempt to construct a micro dataset on housing prices in Egypt. The outcomes of the field survey and the EHPI are integrated into an Ordinal Logistic Regression Model (OLM) to examine the significance of different hypothesized determinants of housing prices in the Egyptian housing market represented by the surveyed sample.

The paper is structured as follows: section one reviews relevant theory and literature on housing prices determinants and interactions with macro-financial variables. Section two presents the methodology. Section three describes and discusses the results of the field surveys. Section four explains the Egyptian Housing Price Index and section five presents the results of the empirical models. Empirical Findings are discussed in section six. Finally, section seven concludes, provides some policy implications and sheds the light on the research limitations.

2. Determinants of Housing Prices: Theory and Literature

The interactions among macroeconomic policies, the housing market, and overall economic performance are well-established in the literature. Macro-financial fundamentals and socioeconomic factors are believed to strongly impact the behaviour in housing prices and demand. Also, institutional, behavioural, and cultural factors are also examined in literature using different methods. In this section, we review the relevant literature on the determinants of housing prices and demand on housing.

2.1. Macro-Financial and Socioeconomic Fundamentals

Literature discussed many macro-financial and socioeconomic factors as determinants of housing prices. Primarily, monetary policy interacts with the housing market and housing prices and thus households' consumption, investments, and real output levels. As originally established in Mishkin (1995), housing prices interact with monetary policy through the asset price channel which is one of the core channels of the *monetary transmission mechanism*. Mishkin (2007) illustrates that fluctuations in interest rates have a direct impact on user cost of capital of housing, expectations of future housing prices patterns, and the supply of housing. This will then have an indirect impact on real economic conditions through housing prices' wealth effects, bank lending channel and balance sheet effects on consumption as well as on housing demand.

A contractionary monetary policy will lead to higher mortgage rates, amplified costs of housing debt-financing⁴ and higher user cost of capital (Andersen & Kennedy, 1994; Apergis, 2003; Adams & Füss, 2010; Agnello & Schuknecht, 2011; Simo-Kengne et al., 2014) When real interest rates rise, fixed-income assets like bonds are more attractive compared to real-estate causing capital switching – investments shift from the housing sector to other assets (Cohen & Karpaviciute, 2017). To add, if the nation's currency devaluates, foreign investment in the domestic real-estate market will increase creating a surge in housing prices (Alkali et al., 2018)

⁴ It is important to note that higher real interest rates will have an adverse impact on both housing supply and demand due to the higher cost of debt-financing. Thus, if the adverse impact of real interest rate on housing supply exceeds that of demand, housing stock will fall to an extent that creates upward pressures on prices. Meanwhile, if adverse repercussions on housing demand is greater, housing prices will fall (Zhang et al., 2016).

The impact of inflation on demand on housing is mixed in literature. Inflation -resulting from an expansionary monetary policy- can result in boosting housing prices as it is resulting from a decline in policy rates Tsatsaronis & Zhu (2004). The strength of this effect depends on the strength of the bank credit channel and the feedback between credit and real-estate cycles and by the housing and financial market institutional setups as affirmed also by Iacoviello (2000) empirical findings.

On the other hand, inflation can have an opposing negative effect on housing prices through the supply channel; where it will ultimately raise the real cost of housing capital and reduce economic agents' purchasing power causing a reduction in housing demand and thus in prices, *ceteris paribus* (Kearl, 1979; Andersen & Kennedy, 1994; Alkali et al., 2018). The direction of inflation impact is thus mixed in literature. It is important to note that individuals' expectations of higher inflation can also increase the current demand and prices of owner-occupied housing units (Summers, 1980; Baffoe-Bonnie, 1998).

Milcheva & Sebastian (2010) assert that the strength of these indirect effects on the real economy ultimately depend on the nation's institutional setup where more developed economies with developed mortgage and financial markets tend to experience a stronger housing monetary transmission channel. (Mishkin, 1995; Bernanke & Gertler, 1995; Kosfeld, 2002; Milcheva & Sebastian, 2010; Erdogan et al., 2019).

Some literature discussed the housing pricing determinants from a rather socioeconomic perspective. For example, Modigliani and Brumber's life-cycle hypothesis was used to discuss to what extent savings/ investment decision in housing are chosen as opposed to other financial assets. Bakshi & Chen (1994) maintain that individuals devote most of their bounded savings on housing when they are relatively young and in the age of building a family⁵. However, as population ages, the demand drifts more towards in the form of other financial assets to secure retirement investments. This, in turn, diminishes the demand for housing and reduces housing prices⁶.

Another key socioeconomic determinant of housing prices is households' disposable income. Higher income – resulting from increased employment rates- will drive housing prices up through increased demand on housing (Hwang & Quigley, 2006; Adams & Füss, 2010; Demary, 2010; Simo-Kengne et al., 2014; Geng, 2018; Case & Shiller, 2003).

⁵ Supporting the life-cycle investment hypothesis, Mankiw & Weil (1989) utilised cross-sectional data and found that housing prices dramatically increased in the United States between 1970 and 1980 because baby boomers aged.

⁶⁶ Historically, economies that witnessed “baby-booms”, baby boomers investments shift from financial assets to housing which lead to depressing stock prices and housing prices hikes. However, baby boomers began to invest in educating their children and in planning for retirement in their late 30s and early 40s ultimately shifting demand away from housing and towards financial assets in the 1980s and creating downward pressures on housing prices (Bakshi & Chen, 1994).

2.2. Institutional Determinants

Institutional variables such as mortgage laws, banking regulations, macroprudential policies, and other financial instruments are also key determinants of housing demand and prices (Lambertini et al., 2013). A key factor affecting housing prices is the extent to which the financial market is developed. According to Andersen & Kennedy (1994), deregulation and liberalisation of the financial market will cause an upsurge in the prices of owner-occupied housing units since the reductions in liquidity constraints will facilitate access to finance and boost the demand for housing. Lecat & Mesonnier (2005) explain that changes in regulatory constraints – including a fall in transaction costs and less restrictive bank lending conditions – have contributed to the upsurge in housing prices in industrialised countries over the last 20 years.

On the supply side, housing market dynamics are, to a great extent, driven by the construction industry's profitability which tends to be sticky in the short run (Mayer, 2011; Geng, 2018). Adams & Füss (2010) assert that a spike in construction costs will decrease housing stock which, in turn, increases housing prices. Furthermore, the saturation of housing needs, cost components, and geographical limitations contribute to defining housing prices (Paciorek, 2013; Belke & Keil, 2018).

Also, the supply-side of the housing market is affected by institutional factors such as building permits, restrictions on land use, administrative processes, social housing supply and access to credit (Milcheva & Sebastian, 2010; Belke & Keil, 2018). Furthermore, fiscal institutions can also affect housing prices especially through tax policy (Baffoe-Bonnie, 1998). Favourable tax treatments for mortgage financing and real-estate investment decrease housing's user cost of capital and thus increase housing demand and prices (Geng, 2018).

2.3. Behavioural, Cultural, and Speculative-Driven Fundamentals

Building on the abovementioned Modigliani and Brumber's Life-cycle hypothesis, Bakshi & Chen (1994) propose the *life-cycle risk-aversion hypothesis* stating that a portfolio-selection behaviour tends to change with an increase in relative risk-aversion. With higher uncertainty associated with future earnings, an aging individual will likely be less willing to participate in a financially risky investment since it will be difficult to cover prospective losses and thus smooth consumption. Case and Shiller (2003) also implicitly highlighted the significance of behavioural factors and "*how people think*" in making housing decisions. These behaviour-based determinants include investment motivations, expectations, risk perceptions, and widespread attitudes towards real-estate (Case and Shiller, 2003).

Newer strands of literature, after the Global Financial Crisis, started to explicitly incorporate behavioural factors, speculative-driven fundamentals, biases and cognitive errors and cultural

values in examining housing prices and demand (Elsinga & Hoekstra, 2004; Stoykova & Chou, 2013; Whittle et al., 2014).

Expectations of future prices, being one of the key behavioural determinants of housing prices, also received a considerable attention in literature. Keynes' famous "*animal spirits*" term was used to justify how individuals act as a "*herd*" leading to pessimism or irrational exuberance in an economy (Whittle et al., 2014). The resulting speculation can cause adverse repercussions on the housing market dynamics even if there are no changes in the macro-financial fundamentals⁷. This leads to what Stiglitz (1990) had earlier referred to as a "*bubble*"; the unexplained part of price changes that cannot be explained by the macro-financial fundamentals but can *only* be explained by investors' expectations of a future increase in prices. Shiller (2007) explains the bubble as a *feedback mechanism* where observations of current price increases and the resulting expectations of future price spikes lead to a speculative increase in housing demand and prices, reinforcing public expectations and this vicious feedback loop⁸. This bubble phenomenon usually gets reversed when expectations about the future are altered as a result of sudden uncertainty shocks, expected changes in monetary policy stance and/or reaching the fourth stage of Minsky's cycle – known as Minsky's moment. According to this theory, housing markets would suddenly collapse as a result of a fall in business sentiment and elevated debt following an era of persisting speculative behaviour that accompanied loose access to credit that gets quickly transmitted from the housing sector to other sectors in the economy (Vercelli, 2009). Once the bubble bursts, *loss-aversion* serves as a chief factor that influences housing prices where owners, influenced by a reference point like the purchase price, find it difficult to sell their house at a loss stemming from Kahneman's & Tversky's (1979) "*prospect theory*" (Whittle et al., 2014).

A similar explanation is offered by the *disposition effect* where individuals tend to be risk-averse if they are enjoying profit and risk-loving when they are at loss (DeWeaver & Shannon, 2010). The loss-aversion and/or disposition effects lead to sticky housing prices. Furthermore, Akerlof & Shiller (2009) and Ackert et al. (2011) argue that *money illusion* will substantially affect housing prices since individuals might be unwilling to sell their house at a nominal loss yet are willing to sell it at *only* nominal gain even if it means real losses. This behavioural bias often occurs because owning a house offers a sense of security (Ackert et al., 2011).

Elsinga & Hoekstra (2004) refer to three core cultural values that influence housing prices: (i) effective systems of social security boost housing rentals, (ii) pressure associated with gaining economic independence leads to an increase in the price of owner-occupied homes, and (iii)

⁷ To a certain extent, this speculation is inherent in the housing market because of the construction lag (Toome, 2018).

⁸ In his book "*Irrational Exuberance*", Shiller (2000) provides a basis of this feedback mechanism of speculative bubbles from several principles of sociology and psychology including framing, heuristics, and myopic loss-aversion – among other things.

extended households in need of more space. Survival and self-expression cultural values can also influence long-run housing prices where survival cultures focus on the crucialness of economic security and costs when making housing purchasing decisions; meanwhile, self-expression cultures stress on the quality of life and individual preferences (Harris & Young,1983).

3. Methodology

To investigate the relation between housing prices and the variables identified in the literature, primary data on housing prices is essential. In the reviewed works, such as Case and Shiller (2003), data on housing prices were generally obtained from countries official censuses, statistical bureaus and/or other sources of primary data. Hence, the construction of housing prices indices was doable. However, some research, such as Bricongne et al. (2019) highlighted the unavailability of such primary data, where they resorted to other sources such as websites, social media, and housing advertisement to construct primary datasets on housing prices. In our research, we do face a problem of the unavailability of housing prices data in Egypt, which constructs a main obstacle towards investigating the research questions. We also believe that providing primary data for the housing market in Egypt is not only essential for research reasons, but it will also support the operation of the sector with proper information, decrease malpractices and principal-agent problems and most importantly will support the design of proper housing-related financial, institutional and social policies.

Accordingly, we start our analysis by designing a method to construct a dataset on housing prices in the Egyptian market upon which we can start investigating the interactions between housing prices and the previously identified determinants. Our analysis is three-fold: (1) We conduct a field survey to determine the main housing characteristics. (2) We construct an Egyptian Housing Price Index (EHPI) that calculates prices of different housing units according to a set of predetermined characteristics. (3) finally, we interact the Egyptian Housing Price Index (EHPI) with the hypothesized housing determinants.

3.1. Field Survey on the Determinants of Housing Prices in Egypt

Following, Dillman et al. (2009), Gentry & Good (2008), and other literature, we implement self-administered mixed-mode surveys.

The *population* of the study will be divided into target groups: (1) Households/homebuyers (estimated around 25 million)⁹ and (2) Real Estate Developers and Brokers (estimated around 36,000)¹⁰. We applied a *simple stratified random sample* where the population will be categorised according to socioeconomic status. A simple random sample were selected from

⁹ [CAPMAS](#)

¹⁰ <http://www.tasheed.org/ar/Default.aspx>

each category. Results are then aggregated to make inferences about the population and hence inferences about the subpopulation of each category.

In addition to the socioeconomic characteristics of the sample, the survey collected primary data on the previously identified factors that are argued in the literature to influence housing prices from the households' perspectives as well as the real-estate developers' and brokers' perspectives.

The survey is conducted in four geographical areas (cities): Cairo, Damietta, Alexandria, and Suhag since they are characterized by having new urban development zones as well as mega housing projects. This will be helpful in obtaining data and information about recent price trends. A pilot study was conducted to test the reliability of the survey; furthermore, different stakeholders were interviewed before and after the survey's implementation to complement the survey with more specific data and information. The results of the survey were incorporated to design the price index and the empirical model. We employ two surveys; one targets a sample of household homebuyers and home-sellers in Egypt, while the other survey developers and brokers.

Based on the surveyed population and using the sample size (ss) in equation (1), the selected random sample is 398 for the Household survey and 380 for the Developers and Brokers survey.

$$SS = \frac{\frac{z^2 \cdot p(1-p)}{e^2}}{1 + \frac{z^2 \cdot p(1-p)}{e^2 N}} \quad (1)$$

Where, z : z-score, p : Population proportion, e : Margin of Error (5%), and N : Population size.

We approached 800 respondents since the non-response rate was found to be around 50%. The final respondents were 401 households and 421 developers and brokers. Accordingly, More on the survey design is presented in Annex (1).

3.2. Constructing a Housing Price Index for Egypt (Constructing the Base Year)

Literature identified different methods of constructing housing prices indices, such as changes in median sales, hedonic methods, as well as weighted repeat sales methods (Case and Shiller, 1987). These methods depend on the availability of primary data on housing sales obtained from census bureaus and other databases. However, in the Egyptian context, accurate data on the housing market sales and resales are not available.

Some scholars attempt to overcome the data unavailability challenge through using other ways: such as the *Fall-Back Method* identified in Bricongne et al. (2019). This method mainly depends on gathering primary data and information from the field market in the absence of national accounts. Accordingly, data can be collected from property advertisements, real estate agents' websites, and surveys applied to a baseline approach of indexing housing prices.

Calculating a house price index using the Fall-Back Method is a two-stepped approach. First, the average price per square metre across several housing units is computed for a given geographical location. Second, an aggregate national-level price is calculated from the average price of housing units in each geographical location. As per Bricongne et al. (2019), the *Fall-Back Method* depends on the area of the housing units and their price retrieved from property agents' websites. Nevertheless, this method cannot be applied in our research for several reasons. Firstly, prices published on distinct real-estate websites are considerably different and full of outliers. Although some websites – such as Aqarmap – provide some price information and data, they cannot be considered as reliable sources of information. Secondly, precise disaggregated data are not available on these websites or any other sources. Based on all the above and, after reviewing the available methods in the related literature, we conduct a survey to collect all the needed data and information from their primary sources. These survey results are then used to construct an Egyptian Housing Price Index (EHPI) as explained below:

To construct the Egyptian Housing Price Index (EHPI) as illustrated in equation (2), we identify the main components as the average price per square meter for an apartment in a compound (P1) and the average price per square meter for an apartment outside a compound (P2) for year 2016 (base year). However, since it is well-established that today's prices are a function of historical prices as well as expected future prices, we include the following as components of our index: change in the price compared to 2016 (P3), change in price compared to 2019 (P4), the forecasted price for 2022 compared to 2021 (P5) and the forecasted price for 2023 compared to 2021 (P6).

$$EHPI = \sum_{i=1}^6 w_i * p_i \quad (2)$$

Where;

w_i is determined based on Principle component analysis (PCA)

p_1 is the average price per square meter for an apartment in a compound.

p_2 is the average price per square meter for an apartment outside compound.

p_3 is the change of the price compared with 2016.

p_4 is the change of the price compared with 2019.

p_5 is the forecasting price for 2022 compared with 2021.

p_6 is the forecasting price for 2023 compared with 2021.

p_1 , which is the average price per square meter for apartment in a compound, is the average of the price per square meter for apartment in a compound in three cases, without finishing, half finishing and totally finishing.

p_2 , which is the average price per square meter for apartment outside compound, is the average of the price per square meter for apartment outside compound in three cases, without finishing, half finishing and totally finishing.

3.3. Empirical Model to Examine the Micro Determinants of Housing Prices in Egypt

To further investigate the determinants of housing prices in Egypt, an Ordinal Logistic Regression Model (OLM) was estimated based on the results of the field survey and the constructed housing price index. We use the *Proportional Odds Model* which is a form of the Ordinal Logistic Regression Model that we believe is the most relevant to the nature of the variables. This is particularly because most of the included variables are categorical in nature (Harrell, 2015; Warner, 2008; Parsons et al. 2009).

The EHPI is the dependent variable and it is ordinal in nature (equation 3) and categorized into three levels: low, moderate, and high, where the high is the reference point for future comparisons. The ordinal logistic regression model takes the following form:

$$\log \left[\frac{P(Y \leq j)}{1 - P(Y \leq j)} \right] = \alpha_j - (\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k), \quad j = 1, \dots, J - 1 \quad (3)$$

Where,

- X is the set of k predictors/independent variables with J-1 levels response/dependent variable,
- α_j is called the threshold,
- β is the parameter for each predictor variable.

Based on the above, the cumulative logit probability model (e.g., $P(Y \leq j)$) Takes the form as:

$$P(Y \leq j) = \frac{e^{\alpha_j - (\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k)}}{1 + e^{\alpha_j - (\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k)}} \quad (4)$$

The model variables are explained in details in the remainder of this section. First, the dependent variable is the Egyptian Housing Price Index (EHPI) is shown in table (1). Three housing price

levels are distinguished in the study as the dependent variable of the ordinal logit model: Low (low prices), Moderate (moderate prices), High (high prices).

Table 1. The Dependent variable: EHPI

Categories	Code
Low	1
Moderate	2
High	3

Second, tables (2) and (3) respectively depict the independent variables employed in the household survey and the real-estate developers and brokers survey.

Table 2. Independent variables for model (1): The Developers and Brokers Survey

Variable	Description	Value labels
Macro Fundamentals		
X₁ (Inflation)	From your point of view to what extent has inflation affected real estate prices during the last five years	Not important, Neutral, Important
X₂ (economic reform program and flotation)	How did the following factors affect the direction of the real estate market: The economic reform program and the flotation (negative/positive)	Positive, Negative
Institutions and procedures		
X₃ (cost of land, construction and licenses)	From your point of view to what extent did the cost of land, construction, and licenses affect property prices during the last five years	Not important, Neutral, Important
Government Housing Policies		
X₄ (State Projects and new cities)	From your point of view to what extent have state projects and new cities affected real estate prices during the last five years	Not important, Neutral, Important
X₅ (Suspending housing permits policies)	How did the following factors affect the trend of the real estate market: suspending housing permits policies	Positive, Negative
Cultural and Religious Beliefs		
X₆ (Cultural and religious reasons)	Why don't you deal with banks? Religious and cultural reasons	Administrative and financial reasons, Cultural and religious reasons
Uncertainty and Shocks		
X₇ (COVID-19)	How did the following factors affect the trend of the real estate market: COVID-19 Crisis (negative/positive)	Positive, Negative
X₈ (Pound Flotation)	How did the following factors affect the direction of the real estate market: The pound flotation crisis	Positive, Negative

Table 3. Independent variables for model (2): The Households Survey

Variable	Description	Value labels
Socio-economic		
X₁ (Income)	Buyer income*	Less than 6000, Less than 10000, Less than 20000, 2000 and above
Macro Fundamentals		
X₂ (Inflation)	From your point of view to what extent has inflation affected real estate prices during the last five years	Not effective, Simple Effect, very effective
Access to mortgage Finance		
X₃ (Ease of contracting procedures)	Determine the importance of the following reasons in choosing your financing method? Ease of contracting procedures	Yes, No
Institutions and procedures		
X₄ (Taxes and fees)	To what extent do real estate taxes and fees affect your real estate purchase decision?	Not effective, Moderate effect, Effective
X₅ (cost of land, construction and licenses)	From your point of view to what extent did the cost of land, construction, and licenses affect property prices during the last five years	Not effective, Simple Effect, very effective
Government Housing Policies		
X₆ (State Projects and new cities)	From your point of view, to what extent have state projects and new cities affected real estate prices during the last five years	Not effective, effective, Very effective
Cultural and Religious Beliefs		
X₇ (Types of banks preferences)	Which type of banks do you prefer?	Governmental, Commercial, Islamic, Don't prefer banks
Uncertainty and Shocks		
X₈ (I will be able to buy any time soon)	To what extent do you agree with the following statement: It is very likely that housing will sharply increase and thus, if I do not buy now, I will not be able to buy anytime soon	Agree, I don't know/Neutral, Not agree
X₉ (cash better than housing investment)	To what extent do you agree with the following statement: The high cost of living makes keeping cash better than housing investment	Agree, I don't know/Neutral, Not agree

4. Survey Findings and Descriptive Analysis

In this section, we present the results of the two surveys done on a sample of household homebuyers and sellers as well as a sample of surveyed Developers and Brokers. The sample socio-demographic and socioeconomic characteristics are presented in the Annex. This descriptive analysis lays a foundation for the empirical model results that are presented in the next section.

4.1. Macroeconomic Fundamentals

As shown in the table (4), respondents from both the household and developers & brokers surveys perceive inflation as a key factor that has significantly affected housing prices in Egypt over the

past five years. Findings also indicate that the cost of living, influenced by inflation, represented a key challenge for housing sales in Egypt during 2020 (table 5). Furthermore, respondents from the real-estate developers' and brokers' survey affirmed the negative impact of both the exchange rate misalignments that followed the 2016 IMF-supported reform programme and the resulting devaluation of the EGP as well as the COVID-19 crisis (table 6). This result is consistent with Zhang et al. (2012) findings that monetary and price variables, including the real effective exchange rate, have a substantial impact on housing prices.

Table 4. Factors Affecting Housing Prices in Egypt over the Past five Years

	Land Costs, Construction, and Licenses		Inflation		State Projects and New Cities	
	Household Survey	Real-Estate Developers Survey	Household Survey	Real-Estate Developers Survey	Household Survey	Real-Estate Developers Survey
No Effect	10.9	2.9	3.7	5.1	17.1	13.8
Simple Effect	4.4	6.8	5.6	12.6	12.1	22.3
Large Effect	84.7	90.3	90.7	82.3	70.7	63.8
Total	100	100	100	100	100	100

Table 5. Challenges Facing Housing Sales in the Egypt Market in 2020

	Cost of Living	Liquidity Preferences (Cash)	Competition and Excess Supply	High Construction and Licensing Costs and New Public Housing Projects
Important	64.5	27.8	69.7	82.1
Neutral	16.2	19.2	7.3	11.5
Not important	19.2	53	23	6.4

Table 6. Implications of Recent Economic Dynamics on the Housing Prices Trends

How did the following factors impact the housing market?	Negative Impact
Exchange Rate Misalignments	84
COVID-19 Crisis	85
Suspending Housing Construction Permits	64.3

4.2. Institutions and Procedures

Respondents from both surveys perceive land costs, construction, and licenses as the main factors that have significantly affected housing prices in Egypt in the past five years (table 4) and served as a key challenge for housing sales in 2020 (table 5) supporting the literature strand and maintaining that housing market dynamics are, to a great extent, driven by the construction industry's profitability (Mayer, 2011; Geng, 2018). It also upholds that the housing market is

affected by institutional fundamentals including building regulations and restrictions on land use (Milcheva & Sebastian, 2010; Belke & Keil, 2018).

Table 8. Factors Affecting Homebuying Decisions

To what degree do you believe the following factors affect your homebuying decision?	Location	Infrastructure	Real-Estate Taxes and Fees	Ease of Resale	Finishing
No effect	2.8	0.3	4.7	7.5	8.7
Moderate Effect	9.3	1.2	6.5	3.7	6.5
Strong Effect	87.9	98.4	88.8	88.8	84.7
Total	100	100	100	100	100

Respondents perceived infrastructure, real-estate taxes and fees, ease of resale, location, as well as finishing level as significantly important determinants of their homebuying decisions (table 8). The fact that 88.8% of the surveyed sample believe that real-estate taxes and fees have a strong effect on homebuying decisions emphasises that they are key institutional determinants of housing prices and is aligned with Baffoe-Bonnie (1998) and Geng (2018).

4.3. Government Real-Estate and Housing Policies

Respondents from both surveys affirmed that state projects and new cities were key determinants of housing prices in Egypt over the past five years (table 4). Findings from the developers and brokers survey also emphasised that new public housing projects was a chief challenge facing housing sales in Egypt during 2020, affirming Milcheva & Sebastian (2010) and Belke & Keil (2018) earlier results that the supply-side of the housing market is influenced by the government real-estate decisions including the provision of social housing. It is important to note, however, that around one third of the surveyed developers and brokers believe that government social housing projects do impact the demand on housing demand (table 9). The majority of those who believe that the government’s social housing projects have an impact argue that they tend to decrease the demand on housing in the private sector.

Table 9. Social Housing Impact on Housing Demand in Egypt

	Yes	No
In your opinion, did social housing projects affect demand on housing in the Egyptian market?	28.9	
In which direction was the effect?	Increase in demand	Decrease in demand
	30.3	69.7

Around 40% of the surveyed developers and brokers responded that the housing market is overpriced (table 10). When asked about the possible reasons behind this assumed overpricing, a majority 64.1% indicated that government policies and regulations are important reasons behind the overpricing in the housing sector, followed by easy access to finance then the exaggeration in advertising and marketing campaigns. As indicated earlier in (table 6), respondents from the real-estate survey affirmed that the recent government decisions on suspending housing construction permits had significant negative implications on the Egyptian housing market.

Table 10. Is Housing in Egypt Overpriced?

In your opinion, are housing prices in Egypt overpriced?	Responses		
Yes	39.2		
No	60.8		
I don't know	0.1		
Total	100		
If you believe that the housing market in Egypt is overpriced, in your opinion, what is the relative importance of the following factors in this overpricing?	Important	Neutral	Not Important
Government Policies and Regulations in the Housing and Real-Estate Sector	64.1	13.4	22.5
Easy Access to Finance	56.3	16.2	27.5
Exaggeration in Advertising and Marketing Campaigns	53.5	16.2	30.3

4.4 Access to Mortgage Finance

Around half of the surveyed sample believe that unfamiliarity and insufficient information on mortgage finance is also an important reason behind favouring direct instalments to banking services and mortgage finance (table 11). Interestingly, interest rates, difficulty of banking procedures, and required guarantees are perceived as not important by most of the surveyed sample of developers and brokers. This result is reinforced by the empirical findings as it will be discussed in the next section.

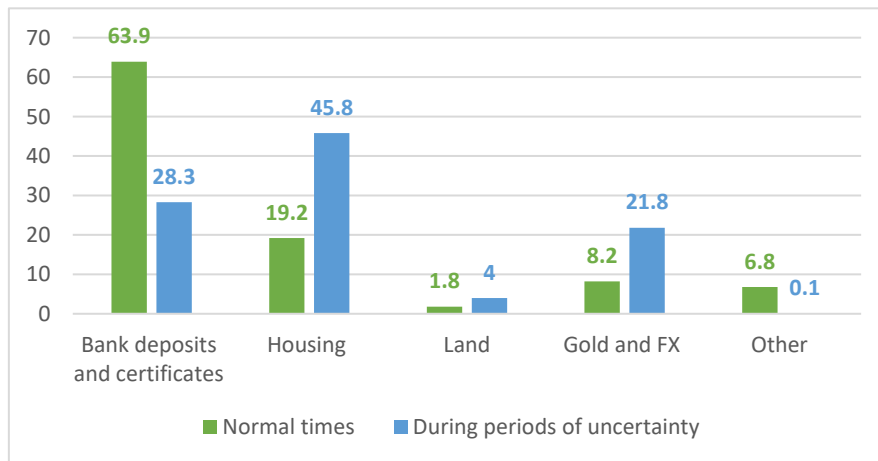
Table 11. Mortgage Finance versus Direct Instalments in the Egyptian Housing Market

Determine the importance of the following reasons for the homebuyer's choice of direct instalment instead of banks/mortgage finance	Important	Neutral	Not important
Dealing with banks is not Shariah-compliant	71.9%	16.9%	11.3%
Interest rates	15.0%	8.1%	76.9%
Difficulty of banking procedures and guarantees	9.7%	8.2%	82.2%
Unfamiliarity and insufficient information on mortgage finance services	55.6%	18.1%	26.3%

4.5. Uncertainty, Expectations, and Shocks

As Case and Shiller (2003) maintain, investment motivations also serve as a key behavioural determinant of housing prices. In our sample, 35% of the respondents buy a new housing unit for investment motives while around 65% buy it for occupation motives. Investment preferences change significantly during uncertainty periods as compared to normal times. According to the surveyed sample, while 64% of the respondents would invest their savings in bank deposits and certificates during normal times, only one third of respondents would prefer this form of investment during uncertainty periods (figure 1). Housing investments appear to be the safest form of investment during uncertainty episodes as perceived by almost half of the respondents although in normal times this form of investment is not as preferred (around 20% of the surveyed sample). This emphasises Case’s and Shiller’s (2003) focus on the significance of behaviour-based determinants and “*how people think,*” especially with regards to risk perceptions and expectations, in making housing decisions. This might also support the literature strand maintaining that individuals perceive investment in real-estate as a good hedge against inflation and thus increase housing investments in the presence of inflationary pressures to safeguard their wealth (Demary, 2010; Zhang et al., 2012; Alkali et al., 2018).

Figure 1. Investment Preferences Among the Sample Respondents During Normal Times Versus Uncertainty Periods



Investment in gold, foreign exchange, and land altogether account for 10% of the respondents’ investments in normal times while this form of investment would increase to around 25.8% during uncertainty periods (figure 1). It is worth noting that around 62-64% of the respondents – both households and real estate developers – prefer to take no investment decision during a crisis time and less than 30% of both surveyed samples have a tendency towards buying (table 12). This again re-affirms the previous finding that housing is believed to be a safe form of investment during uncertainty times. Results are interesting from a behavioural perspective as indicated in the literature section where public could prefer housing investment since individuals believe that purchasing a house is a safe rather than risky investment.

Table 12. Housing Preferences During a Crisis

	<i>If you invest in housing, what is your preference with regards to housing investment during a crisis?</i>	<i>During a crisis, how do you perceive the investment behaviour in the housing market?</i>
	Household Survey	Real-Estate Developers and Brokers Survey
More preferences to sell	9.3	10.9
More preferences to buy	29.3	22.0
More preferences to wait	61.4	63.8

Table (13) shows that, according to the surveyed sample, housing prices are expected to witness future increase, constitute a good and safe opportunity for future investment, and hence housing investment will remain to be a preferred option for safe investment by Egyptians.

Table 13. To what extent do you agree with the following statements?

	<i>It is very likely that housing prices will sharply increase and thus, if I do not buy now, I will not be able to buy anytime soon</i>	<i>Economic conditions are mostly stable that make investing in housing a good opportunity</i>	<i>The high cost of living makes keeping cash better than investing it in housing market</i>	<i>Housing prices are very high and are expected to decrease in the near future</i>
Do not agree	40.8	33.3	42.1	56.7
I don't know	8.1	9.7	6.9	7.8
Agree	51.1	57	51.1	35.5
Total	100.0	100	100	100

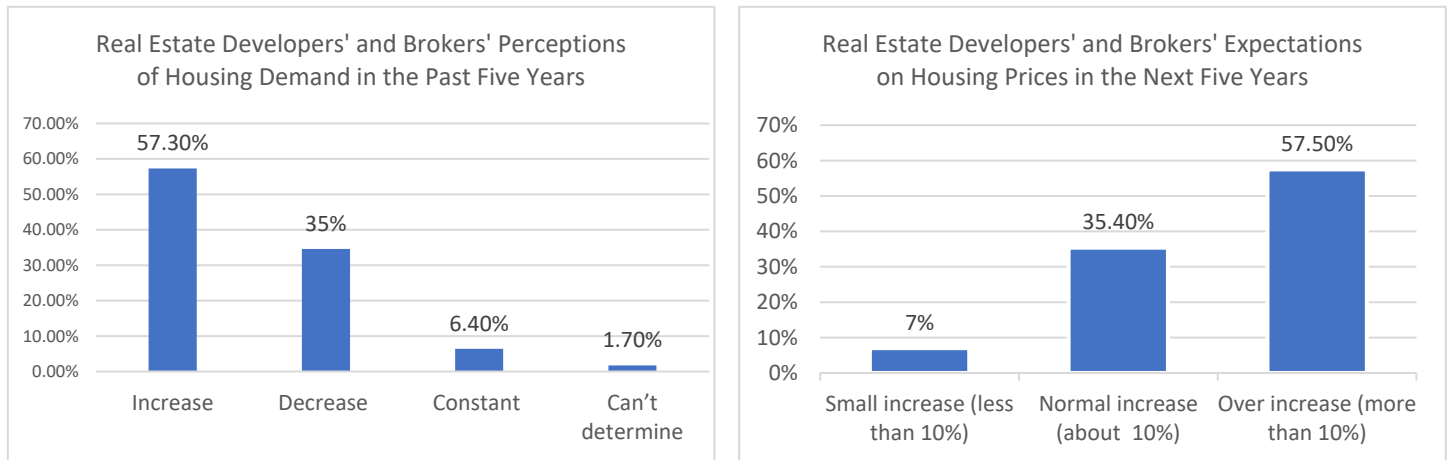
A good majority of household respondents – both as homebuyers and home-sellers – perceive that price trends in the housing markets witnessed significant increases that exceeded 10% during the past five years and are expected to follow the same trend of price rise in the near future (table 14). On the other hand, around two-thirds of surveyed real-estate developers and brokers indicate that housing prices have witnessed a significant increase in the past five years and expect that it will increase by more than 10% during the coming five years (figure 2). Around one-third of the surveyed sample indicate that housing demand in Egypt witnessed a decrease in the past five years and expect that the market will witness a normal increase that does not exceed 10%. This reflects a discrepancy in the perceptions of both groups about housing prices and trends, possibly resulting from many reasons; most importantly is the lack of accurate price databases on the housing market which leaves both historical prices and future expectations to a great extent to perceptions rather than facts. Tracking public expectations of future housing prices since, as proven in literature such

as Stiglitz (1990) and Shiller (2007), they have a role in influencing housing prices under the bubble-bust behaviour theory.

Table 14. Housing Prices Perceptions and Expectations

	Homebuyer	Home-Seller	Homebuyer	Home-Seller
	<i>From your point of view, how did housing prices change in the past five years?</i>		<i>Your expectation in the near future (one year) for housing prices?</i>	
Normal increase around 10%	21.8	18.6	32.4	26.7
Over increase more than 10%	69.8	73.3	44.5	48.4
Constant price	5	6.8	14.3	17.4
Decrease in price	0.6	0.6	5.3	6.2
I don't know	2.8	0.6	3.4	1.2
Total	100	100	100	100

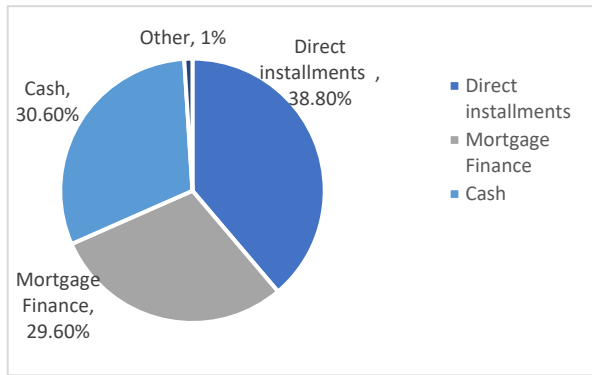
Figure 2. Real-Estate Developers' and Brokers' Perceptions of Housing Demand and Expectations on Future Housing Prices



5. Cultural and Religious Beliefs

Survey results reveal that households opt for instalments rather than cash in general. Around 40% of the surveyed real-estate developers and brokers believe that homebuyers prefer direct instalments through developers while around 30% believe that homebuyers prefer banking and 30% believe that cash is the optimum financing method for households (figure 3). Around 72% of the surveyed real-estate developers and brokers believe that the most important reason that makes homebuyers prefer direct instalments rather than mortgage finance is that the latter is non-sharia compliant (table 15).

Figure 3. What is the commonly used financing method by the buyer in your opinion?



Almost half of the surveyed real-estate developers and brokers indicated that they do not deal with banks; mostly for financial reasons while religious and cultural reasons came of a less importance (table 15). On the other side, those who deal with banks generally prefer commercial banks compared to state-owned or Islamic banks.

Table 15. Banking Preferences and Housing Finance

Do you deal with banks to finance your housing projects?	Responses (%)	
	Yes	No
	53.6	46.4
If yes, what are the types of banks you prefer dealing with?	Responses (%)	
Commercial Banks	79.6	
State-owned banks	19	
Islamic banks	1.4	
If no, specify the reason	Responses (%)	
Financial reasons	67	
Religious and cultural reasons	33	

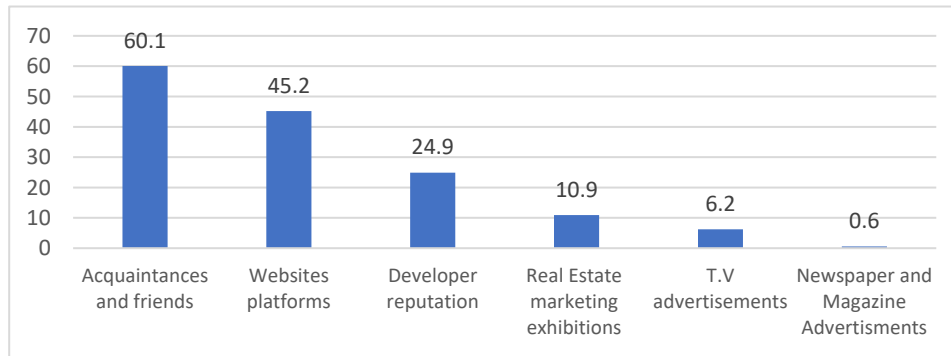
6. Information and Housing Characteristics

Regarding the source of information in the Egyptian housing markets, household sample identified social media as the top source of information followed by friends and acquaintances and website platforms (table 16 and figure 4). The three marketing tools were also perceived as the most effective tools by the surveyed real-estate developers. Interestingly, while real-estate developers and brokers believe that the developers' reputation is the most important marketing tool, it was not recognised at the same level by the surveyed household sample. Real-estate marketing exhibitions was also perceived as a very effective tool by almost half of the surveyed real-estate developers and brokers while it was not perceived as important source of information by the surveyed households.

Table 16. Information on housing opportunities and prices

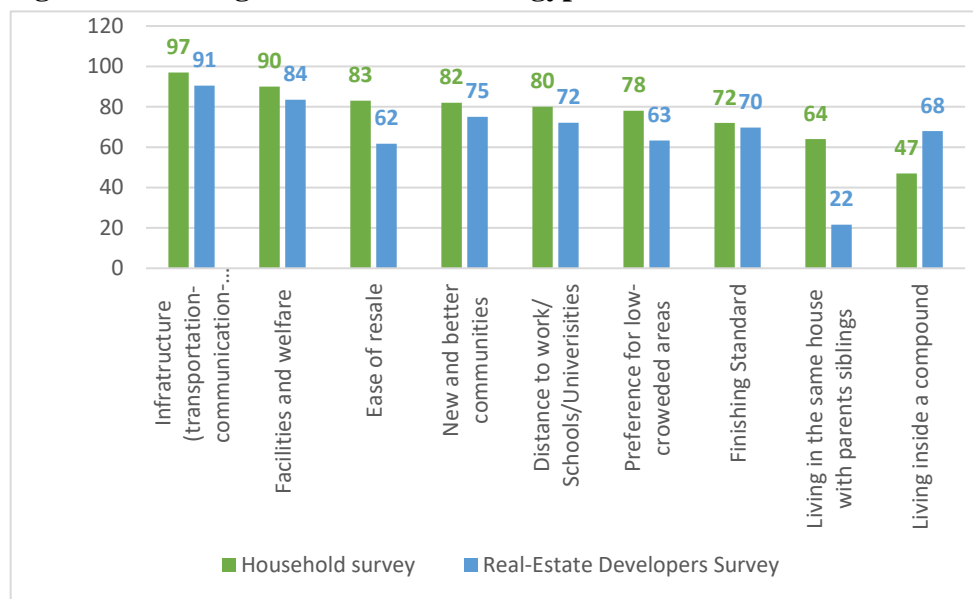
	Real-Estate Developers and Brokers Survey			Household Survey
	<i>What is the relative importance of the below marketing tools in the housing market in your opinion?</i>			<i>To what extent you believe the following factors an important source of information in your homebuying decision?</i>
	Very Effective	Effective	Not Effective	Important
Social Media	81.1	15.3	3.6	71.7
Acquaintances and Friends	63.1	23.8	13.1	60.1
Website Platforms	74	21.1	4.9	45.2
Developer Reputation	95	3.4	0.7	24.9
Real-Estate Marketing Exhibitions	39.3	30.3	30.3	10.9
T.V Advertisements	30.1	43.9	26	6.2
Newspaper and Magazine Advertisements	4.4	20.6	75	0.6
Returned Client	86.7	11.9	1.5	NA

Figure 4. How do you search for a new house? (%)



When respondents were asked about the relative importance of different housing characteristics they responded as shown in figure (5). Infrastructure came as the most important factor followed by facilities and welfare services. Resale easiness, distance from work and tendency to move to new and better communities *were of equal importance*.

Figure 5. Housing Characteristics in Egypt



7. Constructing the Egyptian Housing Price Index (EHPI)

Primarily, a correlation matrix using Pearson Correlation test was constructed to check the significance of the index components (table 17). We checked for missing data and outliers to ensure data reliability. Missing values were estimated using the Single Imputation Method (Zhang, 2016).

Table 17. Correlation Matrix: Current Prices, Previous Prices, and Future Price Expectations

	Pearson Correlation	P1*	P2**
1- The Change of the Price Compared to 2016 (P3)	Pearson Correlation	.377**	.361**
	Sig. (2-tailed)	.000	.000
	N	412	412
2- The Change of the Price Compared to 2019 (P4)	Pearson Correlation	.451**	.283**
	Sig. (2-tailed)	.000	.000
	N	412	412
3- The Forecasted Price for 2022 Compared to 2021 (P5)	Pearson Correlation	.368**	.251**
	Sig. (2-tailed)	.000	.000
	N	412	412
4- The Forecasted Price for 2023 Compared to 2021 (P6)	Pearson Correlation	.607**	.392**
	Sig. (2-tailed)	.000	.000
	N	412	412

*P1 is the average price per square meter for an apartment in a compound in three categories: without finishing, half finishing, and full finishing.

**P2 is the average price per square meter for an apartment outside a compound in three categories: without finishing, half finishing, and full finishing.

Table (17) above shows the significance of the proposed index components and affirms the strong correlation between the components. We compose the index through three main steps: (1) weighing, (2) normalization, and (3) aggregation. To estimate the index weights, Principal Components Analysis was used (PCA) as indicated in (Filmer and Pritchett 2010). This approach standardizes the sub-indicators by calculating z-scores using the following formula:

$$I = \frac{x - \bar{x}}{\sigma}, \quad (2)$$

Where,

- x is the sub-indicator value,
- \bar{x} is the mean value,
- σ is the standard deviation value.

After applying the normalization and aggregation steps, the index scores are then divided into three quintiles: low, moderate, and high. The adequacy of the data to employing Factor Analysis is measured by Kaiser-Meyer-Olkin (KMO) test. As indicated in table (18), KMO is equal to 0.8 which affirms the robustness of designed index.

Table 18. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.802
Bartlett's Test of Sphericity	Approx. Chi-Square	939.480
	Df	15
	Sig.	.000

The constructed index is then employed in the empirical model to examine the determinants of housing prices in Egypt, as illustrated in the next section.

8. Determinants of Housing Prices in Egypt: Empirical Model

As previously indicated, we apply Ordinal Logistic Regression model (Logit). To make sure that our results are reliable, Ordinal Logistic Regression model (OLM) assumptions were checked and verified for both models¹¹. As established in literature (e.g. Akın & Şentürk (2012) and Garson (2012) parameter interpretation of the Ordinal Logistic regressions is different and more complex than Binary and Multinomial Logistic regression analysis. It requires both the identification of a reference category as well as deriving and interpreting exponential of the estimated parameters. In the below models, we define a reference category for each variable and interpret according to the known 'interpretation Odds Ratio' method as explained in Field (2009)¹².

¹¹ Assumptions of the Ordinal Logistic Model are: (1) The dependent variable should be measured at an ordinal level, (2) Ordinal independent variables must be either continuous or categorical, (3) there is no multicollinearity between independent variables and (4) the effects of any explanatory variables are consistent or proportional across the different thresholds.

¹² The odds ratio indicates how many times more or less is the likelihood of one event being investigated with respect to another event being investigated and is calculated by getting the exponential for β (Salmi et. al. 2015).

To interpret the empirical models, it is worth noting that the reference category is the ‘important’/ ‘effective’ category. This means that, the smaller the value of exponential β , the higher the effect of the independent variable on dependent variable. In other words, small values of the exponential coefficients indicate that they are less likely to be ‘not important’, hence implying a strong perceived impact on the housing prices.

Model 1. The Developers and Brokers Survey-LOGIT Equation

$logit(\text{Low prices}) = -0.534 - 1.297 * \text{Cost of Land is not important} - 0.260 * \text{Cost of land is neutral}$

$-0.655 * \text{Changing housing permits policies has positive effect} + 0.353 * \text{Administrative and Financial reasons} - 0.502 * \text{COVID-19 has positive effect}$

$logit(\text{Medium prices}) = 1.121 - 1.297 * \text{Cost of Land is not important} - 0.260 * \text{Cost of Land is neutral}$

$-0.655 * \text{Changing housing permits policies has positive effect} + 0.353 * \text{administrative and financial reasons} - 0.502 * \text{COVID-19 has positive effect}$

Table 19. Ordinal logit model estimation results for developers (dependent variable is housing price index)

<i>Variable</i>	<i>Parameter Estimates</i>	
<i>Variable Option</i>	B	Exp(B) / Odds Ratio
$\alpha_1 (\leq \text{Low prices})$	-.534***	
$\alpha_2 (\leq \text{Medium prices})$	1.121***	
X₁ (Inflation)		
<i>Not important</i>	.374	1.454
<i>Neutral</i>	.199	1.22
<i>Important (Ref)</i>	-	-
X₂ (Economic reform program and flotation)		
<i>Positive</i>	-.079	0.924
<i>Negative (Ref)</i>	-	-
X₃ (Cost of land, constructions and licenses)		
<i>Not important</i>	-1.297***	0.273***
<i>Neutral</i>	-0.260*	0.771*
<i>Important/ (Ref)</i>	-	-
X₄ (State projects and new cities)		
<i>Not important/Not effective</i>	.062	1.064
<i>Moderate effective</i>	-.098	0.907
<i>Important/Very effective (Ref)</i>	-	-

Table 19. Ordinal logit model estimation results for developers (dependent variable is housing price index) (contd.)

X₅ (Suspending housing permits policies)		
<i>Positive</i>	0.655***	1.925***
<i>Negative (Ref)</i>	-	-
X₆ (Cultural and religious reasons)		
<i>Administrative and financial reasons</i>	.353*	1.423
<i>Cultural and religious Reasons (Ref)</i>	-	-
X₇ (COVID-19)		
<i>Positive</i>	-.502**	0.605**
<i>Negative (Ref)</i>	-	-
X₈ (Pound Floatation)		
<i>Positive</i>	-.043	0.958
<i>Negative (Ref)</i>	-	-
<i>Pseudo R² (Nagelkerke)</i>		0.171

Source: own study, * significant at 0.1; ** significant at 0.05; *** significant at 0.01
 -2loglikelihood= 439.969, $\chi^2_{(11)} = 26.934$, p-value= 0.005

Model 2. The Households Survey-Logit Equation

$logit(\text{Low prices}) = -1.517 - 1.637 * \text{Cost of land is not effective} - 0.846 * \text{Cost of Land is moderate effect}$

$+0.971 * \text{Bank preferences are commercial}$

$logit(\text{Medium prices}) = -1.517 - 1.637 * \text{Cost of land is not effective} - 0.846 * \text{Cost of land is moderate effect} + 0.971 * \text{Bank preferences are commercial}$

Table 20. Ordinal logit model estimation results for buyers (dependent variable is housing price index)

<i>Variable</i>	<i>Parameter Estimates</i>	
	<i>Buyer</i>	
<i>Variable Option</i>	B	Exp(B) / odds ratio
$\alpha_1 (\leq \text{Low prices})$	-1.517***	
$\alpha_2 (\leq \text{Medium prices})$	0.288*	
X₁ (Income)		
<i>Less than 6000</i>	-0.116	0.890
<i>Less than 10,000</i>	-0.059	0.943
<i>Less 20,000</i>	0.080	1.083
<i>20,000 and above</i>	-	-
X₂ (Inflation)		
<i>Not effective</i>	-.422	0.656
<i>effective</i>	-.553	0.575
<i>Very effective (Ref)</i>	-	-

Table 20. Ordinal logit model estimation results for buyers (dependent variable is housing price index) (contd.)

X₃(Ease of contracting procedures)		
<i>No</i>	-0.400	0.67
<i>Yes</i>	-	-
X₄(Taxes and fees)		
<i>Not effective</i>	-0.359	0.698
<i>Moderate effective</i>	-0.299	0.742
<i>Very effective (Ref)</i>	-	-
X₅(Cost of land, constructions and licenses)		
<i>Not effective</i>	-1.637***	0.195***
<i>Moderate effective</i>	-0.846**	0.429**
<i>Very effective (Ref)</i>	-	-
X₆(State projects and new cities)		
<i>Not effective</i>	-0.364	0.965
<i>Moderate effective</i>	0.313	1.37
<i>Very effective (Ref)</i>	-	-
X₇(Types of banks preferences)		
<i>Governmental</i>	.466	1.594
<i>Commercial</i>	.971***	2.64***
<i>Islamic</i>	-0.039	0.962
<i>Don't prefer to deal with banks (Ref)</i>	-	-
X₈(I will be able to buy any time soon)		
<i>Agree</i>	-0.139	0.870
<i>I don't know</i>	-0.563	0.569
<i>Not Agree (Ref)</i>	-	-
X₉(Cash better than housing investment)		
<i>Agree</i>	-0.013	0.987
<i>I don't know</i>	0.358	1.43
<i>Not Agree (Ref)</i>	-	-
<i>Pseuduo R² (Nagelkerke)</i>		0.154

Source: own study, * significant at 0.1; ** significant at 0.05; *** significant at 0.01

-2loglikelihood= 515.612, $\chi^2_{(19)} = 47.312$, p-value= 0.000

Primarily, the two intercepts are used to differentiate the category of price index for comparison. These are also called the cut points of comparison -0.534 is used for comparison of lowest to Moderate and highest, 1.121 is used to compare category lowest, moderate to highest.

Cost of Land, Construction and Licensing. In the Developers and Brokers model, the small exponential β of the Cost of land, Construction and Licenses (0.273) indicate that this variable is significantly perceived as important¹³. This result is reinforced by the results of the Household model (table 20). The odds ratio for Cost of land, Constructions and licenses for being not effective

¹³ The odds ratio for being not important is less likely to be in the highest quintile compared with the reference category 'important'. Cost of land 'neutral' is 0.771 time less odd of being in the highest category of price index quintile compared to land cost being 'important'.

is 0.195 time less likely to be in the highest category of price index quintile as compared to cost of land is effective.

Government housing policies are examined in our model through two variables 1) *state projects and new cities* 2) *suspending housing permits*. Results show that *state projects and new cities* don't have a significant effect on housing prices. Whereas *suspending of housing permits policies* had a significant effect on the housing price index as indicated by the parameter estimate for suspending housing permits policies having positive effect of 1.925 times more odds of being in the highest category of price index as compared to negative effect.

Cultural & Religious beliefs. Results of the Developers and Brokers model show that Administrative and Financial Reasons are more significant in affecting the housing prices as compared to the reference 'Cultural and Religious Reasons' when to comes to access to finance¹⁴.

Banking Preferences. The Household model results revealed that amongst the respondents that generally preferred dealing with banks, commercial banks were generally preferred compared to the governmental banks¹⁵.

Uncertainty and Shocks. The shock is believed to have a significant negative effect on the housing prices in Egypt as the parameter estimates for 'COVID-19 Positive Effect' has 0.605 times less likely of being in the highest category of price index as compared to reference category 'Negative Effect'.

Statistical Checks

Model Fitting Information, Goodness-of-Fit, Pseudo R-Square, Parameter Estimates and Test of parallel lines are checked. Tables (19) and (20) illustrate the results of the Developers and Brokers and the Household models respectively. Results in table (21) suggest that the two models fit very well ($p > 0.05$) which indicates that we fail to reject the null hypothesis depending on the observed data with adequate fitness. Pseudo-R- Square show that approximately 17.1% and 15% of the variation in the EHPI can be attributed to the independent variables included in the model (1) and model (2) respectively.

¹⁴ The odds ratio for Administrative and Financial Reasons are 1.423 times more likely to be in the highest category of the price index as compared to Cultural & Religious reasons

¹⁵ The odds ratio for preferring Commercial Banks' is 2.64 times more likely to be in the highest category of price index as compared to the reference of 'Don't prefer to deal with banks.'

Table 21. Goodness of fit for Model (1) and Model (2)

	Model	-2 Log Likelihood	df	Sig.
Developer Model	Pearson	266.595	261	.393
	Deviance	293.540	261	.181
Buyer Model	Pearson	420.860	401	.238
	Deviance	447.929	401	.153

As shown in (table 22), Model fitting information for Model (1), -2 loglikelihood for the estimated model is 439.969 and the value for Chi-square (26.934, df = 11, (p-value < 0.05). The statistically significant Chi-square statistic (p < 0.05) indicates the statistical significance of the model. The same is for Model (2) where the P-value is less than 0.05, which indicates that the model is significant.

Table 22. Test of Parallel Lines for both models

	Model	-2 Log Likelihood	Chi-Square	df	Sig.
Developer Model	Null Hypothesis	439.969			
	General	427.999	11.970	11	.366
Buyer Model	Null Hypothesis	515.612			
	General	491.032	24.580	19	.175

Also, we tested the *Parallel Lines* which is one of the assumptions underlying Ordinal Logistic Regression. It shows that the relationship between each pair of outcome groups is the same. This is commonly referred to as the test of Parallel Lines because the null hypothesis states that the slope coefficients in the model are the same across response categories (and lines of the same slope are parallel). If we fail to reject the null hypothesis, we conclude that the assumption holds.

The null hypothesis in the test of parallel lines states that the location parameters (slope coefficients) are the same across response categories.

As shown in table 22 for Model (2), the Parallel Line test for the model is 427.999 with Chi square value 11.970 and p-value = 0.366 which is greater than the 5% level of significance. This indicates a failure to reject the null hypothesis. Thus, the proportional odds assumption appears to hold for the general model. Also, the same result is obtained for Model (1) model as P-value = 0.175, which is greater than 0.05.

9. Discussion

Reflecting on the above results of the descriptive analysis as well as the empirical model that examined the interaction between the EHPI and the hypothesized determinants, several results can be concluded.

Determinants of housing prices in Egypt. Primarily, according to the statistical and empirical results, Land Construction and Licensing Costs are perceived as the main determinants of housing prices in the Egyptian market. Government real estate and housing policies (such as the recent decision on suspending housing permits) have significantly affected housing prices in Egypt. Shocks and Crises -represented in the recent COVID19 shock- are also proven to have significant impact on housing prices and expectations in the Egyptian market. On the contrary, examined macro financial fundamentals such as inflation and interest rates were not perceived as significant. This result is interesting as it might reflect weakness in the monetary transmission mechanism in the Egyptian market through the theoretically explained asset-price mechanism. Some variables were perceived as important in the survey results however, when empirically examined they are found to be insignificant. These variables are real-estate taxes and fees, social housing and the 2016 exchange rate devaluation; all perceived to have a strong effect by respondents, however they were insignificant in the model.

Investment motivations in normal times and during uncertainty. During normal times, Egyptians perceive banking deposits and certificates as the safest and most preferred saving scheme followed by investment in housing. Nevertheless, investment preferences change significantly during uncertainty periods where Egyptians prefer investment in housing as the prime safe investment compared to other investment schemes. Housing investment is perceived by Egyptians as a good a good hedge against inflation and other financial shocks.

From a behavioural perspective, Egyptians tend to have buying/ investing in the housing market during crisis compared to other investment forms. This would be interpreted as a risk-aversion behaviour and would also reflect trust in the market and that housing is believed to be a safe form of investment during uncertainty times. We plan to propose these findings for an experimental research design in the future.

Perceptions on Banking and mortgage Finance. An interesting finding indicated by most of the surveyed developers and brokers is that one of the main reasons behind homebuyers increased preferences to direct instalments over mortgage finance is that the latter is perceived as non-sharia compliant. This result requires deeper analysis and investigation into the Egyptian cultural and religious beliefs towards finance tools on the one side and on the other side raise interest in the new governmental strategic directions to include sharia-compliant investment tools such as the recently announced Sukuk law.

Data and information on housing market dynamics and opportunities. Our analysis reveals a discrepancy in knowledge about housing historical price trends and expectations across the sampled groups, households and Developers & Brokers. This discrepancy could possibly be due to several reasons among which is the lack of accurate housing prices databases. This leaves both historical prices and future expectations subject to speculations rather than facts. Lack of information about housing prices makes the market actors more vulnerable to principal-agent problems and result into asymmetric information moral hazard outcomes. This again reaffirms the importance of building a micro dataset on housing prices in Egypt and constructing a housing price index for the Egyptian market.

Regarding marketing and advertisement in the housing sector, results show the importance of social media platforms as the homebuyers' top source of information. Developers and brokers identified the broker reputation as the most important marketing; not being recognised at the same level by the surveyed household sample. This also adds to the unavailability of reliable sources of information and reaffirms the abovementioned conclusion.

10. Conclusion and Policy Recommendations

Demand on housing in Emerging Markets and Developing Economies (EMDEs) is affected by many economic, financial, behavioural and institutional factors. Such factors not only affect the cyclical trends of housing prices but also influence future price expectations in the housing sector. Likewise, the housing sector, with all its forward and backward linkages, is a key player in both economic and financial cycles in economies. In this paper, we investigate the determinants of housing prices in the Egyptian market. We design our hypotheses and analysis based on literature findings as well as observations on the Egyptian market.

Despite its significant role in the Egyptian economy, the Egyptian housing market suffers from the lack accurate data and information which constitutes serious challenges for all stakeholders.

In light of all the above, we design two field surveys to investigate the determinants of housing prices in the Egyptian market both for household homebuyers and sellers as well as a representative sample of real estate developers and brokers. To establish a dataset on Egyptian housing prices, we construct the first Egyptian Housing Price Index (EPHI). We then integrate the housing price index with the findings of the survey through regression model to investigate the main determinants of housing prices in Egypt.

Findings show that land construction and licensing costs, government real estate and housing policies are perceived as main determinants of housing prices in the Egyptian market. Shocks and

crises -represented in the recent COVID19 shock- is also proven to be significant factor impacting housing prices and expectations in the Egyptian market. On the contrary, macro-financial variables, namely inflation and interest rates were not significant indicating a possibly weak monetary transmission mechanism through the theoretically explained asset-price channel.

Results also affirm that housing investment is perceived by Egyptians as the safest form of investment during uncertainty shocks and good hedge against inflation and other financial turbulence. Finally, findings reveal a huge discrepancy in information and data on housing dynamics and expectations across the sampled groups, households and developers & brokers. Lack of information makes market actors more vulnerable to principal-agent problems and result into asymmetric information moral hazard outcomes. The above results altogether reinforce the importance of constructing a micro dataset on housing prices in Egypt and the significant importance of the Egyptian Housing Price Index as was initiated in this research and planned to be further developed in future research. In addition to the likely contribution to literature, the findings of this research some policy implications that could support the future development of the sector in Egypt amongst all actors.

- ***Housing data availability and disclosure***: it is highly recommended to construct a sustainable dataset of housing prices in Egypt with wide geographical coverage and replicate and further develop the Egyptian Housing Price Index designed in this paper. In addition to its importance for research, data availability and disclosure will help design proper monetary and financial policies, support a proper operation of supply and demand mechanisms and most importantly minimize moral hazards and asymmetric information problems.
- ***Institutional measures***: since government policies were proven to highly impact housing prices and expectations, it is essential to study more deeply the implications of recent housing policies on the Egyptian housing market dynamics. Initiatives such as the recent mortgage finance initiative are expected to influence this market significantly through many channels top of which is the asset price channel.
- ***Cultural and religious variables***: Cultural and religious variables that affect investment behaviour in general and housing investment is worth more investigation. Housing investment could reflect an alternative to banking investment -perceived as non-sharia compliant- by some Egyptians. Housing investment could also be perceived as an alternative to the weak non-banking financial sector in Egypt. In a close sense, Sharia-compliant housing tools can be introduced and can encourage public preferences towards mortgage finance.

11. Limitations and Future Research

The main limitation of our study is the absence of housing prices datasets or references through which we can compare our results to. Also, due to funding constraints, the field study was limited to four geographical areas. For future research and due to the significant discrepancy between households and developers & brokers perception, we plan to conduct a lab experiment to better

investigate and illustrate the behavioural assumptions highlighted in literature such as the life-cycle risk-aversion hypothesis, the loss aversion hypothesis and the endowment bias. Finally, we hope to widen the geographical scope of this analysis in future research and, ultimately, we plan to construct an applied “Egyptian Housing Price Index” that would be periodically calculated based on consequent future waves of the field surveys implemented in this paper.

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Annex (1)

Survey design

Two questionnaires are conducted which are, developer questionnaire and buyer and seller questionnaire. The study is conducted on a sample of developer questionnaire/ buyer and seller in the following governorates: (Cairo - Alexandria - Damietta - Suhag). A pre-test was conducted for the two study tools by contacting about 25 individual sellers and buyers and about 25 developers. Based on the pretest the survey of sellers and buyers has been rearranged better. The questionnaire was written in Arabic since Arabic is the official language in Egypt. Demographic data was collected on age, gender, education and marital status.

Sampling

As mentioned above, the sample for this study was drawn from both developer/ buyer and seller. So, we determine the relevant sample size from both of them. Sample size determination is the act of choosing the number of observations or replicates to include in a statistical sample. It depends on a number of factors including the purpose of the study, population size, sampling error permitted etc. The appropriate sample size is determined based on the following formula:

$$n_0 = \frac{(Z_{\alpha/2})^2 p(1-p)}{e^2}$$

where:

$Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$ (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96).

e is the margin of error and it is approximated to be 0.05.

p is the sample proportion and we used 50%, that is conservative and gives the largest sample size.

$$\text{So, } n_0 = (1.69)^2 (0.5)(1-0.5) / 0.05^2 = 385$$

So, we targeted to reach to around 400 for developers and 400 for buyer and seller as well. For developers, 412 are respondent after asking 750. For buyer and seller, 401 are respondent after asking 850. Non response occurs based on some reasons and shown in table 3.1.

Table 3.1. Non Respondents number across the four governorates for developer /buyer and seller questionnaire

Governorates	Non Respondents Developers	Non Respondents Buyer and seller
Reject to respond	110	145
phone number removed from the service	55	45
wrong number	35	35
not answered (after several attempts)	64	60
closed / busy all the time and difficulty of access.	74	64
Total	338	349

Respondents number across the four governorates in our sample for developer /buyer and seller are shown in table 3.2.

Table 3.2. Respondents number across the four governorates for developer /buyer and seller questionnaire

Governorates	Developer Respondents	Buyer and seller Respondents
Cairo	322	337
Alexandria	54	39
Damietta	23	10
Suhag	13	15
Total	412	401

The following table shows the classification for buyer and seller, which included in our sample.

Classification	Number
Buy & sell	103
want to buy & sell	35
Sell only	23
Buy only	38
want to buy only	145
Not Buy & Not sell	57
Total	401

Data Collection Method

The data necessary for this study is collected through a mobile phone and a smart computer at the company's headquarters. Seven highly experienced researchers, a general supervisor (quality controllers), supervision and maintenance engineers participated in the phase of data collection to solve the technical problems facing researchers in the form system and its transfer from one department to another. The data collection system was built using Survey solutions which an advanced electronic data collection system, and the database was saved on the Microsoft azure database.

To assure the quality of the data, work was done on two levels of quality as follows:

- 1- Direct listening from the call center supervisor of the call while it is being made to ensure the safety of the method of asking questions
- 2- Post review through the data collection system and approval of the consistent forms and return of the inconsistent ones through the quality monitors.

Annex (2)

Survey Socio-demographic and Socioeconomic Characteristics

Variable	<i>Percent</i>
Gender	
Male	79.1%
Female	20.9%
Age Group	
20-25	8.5%
25-30	24.3%
30-35	18.4%
35-40	19.9%
40-45	12.9%
45-50	7%
50-55	5.3%
55-60	1.9%
60-65	0.7%
65 and above	1%
Governorate	
Cairo	78.2%
Alexandria	13.1%
Damietta	5.6%
Suhag	3.2%
Marital Status	
Single	38.3%
Married	58.7%
Divorced	2.9%
Widow	0%
Nature of real estate activity	
Real estate developer	10.2%
Broker	88.3%
Contractor	1.2%
Other	0.2%