A Time Series Analysis of the Factors Driving the Demand for Real Estate in the Metropolitan Region of Maharashtra

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Abstract

The Real Estate industry is a timeless investment and one of the most valuable assets in the world. The residential real estate sector has been growing steadily and has been further boosted by the work-from-home concept due to the COVID-19 pandemic. Demand forecasting is an important aspect of strategy y and business planning for real estate investors, as it provides information about the potential of the sector in the existing and other markets. This allows investors to make informed decisions on pricing, making strategies for growth, and prospective market. The aim of the research is to Identify the variables that affect the housing demand in Maharashtra, and Identify a model for the demand of Middle-Income Group (MIG) housing in Maharashtra. This research focuses on the demand forecasting for residential real estate units in India, with a specific focus on the Mumbai City, Mumbai Suburbs, Thane and Navi Mumbai Pune, Nasik, Nagpur. The study found that there are several factors that affect the demand for housing in Maharashtra. This included income, location, proximity to public transportation, size of apartment etc. The study also found that the demand for MIG housing in Maharashtra is driven by the growth of the urban population, increasing household income, and changing cultural and economic environments. In conclusion, this study provides valuable insights into the demand for residential real estate units in India, with a specific focus on Mumbai Metropolitan Region. The study highlights the importance of demand forecasting in the real estate industry and need for a model for forecasting the demand for MIG housing in Mumbai. The results of the study can be used by government institutions, real estate developers, and investors to make informed decisions and plan for the future of the real estate industry in Mumbai and India.

Introduction

The Real Estate market comprising the residential sector in India has grown significantly in recent years, driven by factors such as increasing urbanization, growth in disposable income, and favourable government policies. India has a large, young, and growing population, which has increased demand for housing. India has a diverse real estate market, with properties available in a range of prices and locations. The major cities, such as Mumbai, Pune, Delhi, Bengaluru, and Hyderabad, have a high demand for housing and a limited supply, leading to high prices. However, smaller cities and tier-2 towns are also seeing an increase in demand for housing, driven by job opportunities and improved infrastructure. According to Sengupta (2006) the Indian government is taking several measures to boost the real estate sector, such as offering tax incentives and implementing reforms to simplify the process of buying and selling property. The launch of affordable housing schemes has also increased access to housing for lower-income families. Sivam (2002) discussed, despite the growth, the real estate sector in Indian still faces several challenges, such as lack of transparency, lengthy and complicated procedures for buying and selling property, and a shortage of skilled labour. These challenges can affect the market's overall growth and development, but the sector is expected to continue to grow in the coming years, driven by the increasing demand for housing. As the name suggests, real estate is considered a true asset class around the world and has always been seen as an asset class that has always maintained its value and never disappointed investors. Residential, retail, hospitality and commercial are its four subsectors. According to Kapoor (2014) the expansion of this industry is fuelled by an expanding business environment, increasing demand for office space, urban and semi-urban housing. Real estate is one of the most important assets and an effective strategy for achieving financial independence in the long term. However, the sector is characterized by dynamics related to banking sector activities, customer expectations, risks and uncertainties. For example, even after the turmoil of the pandemic that has hit the world in recent years, the real estate market is doing well. The residential real estate sector is booming around the world as the concept of working from home

becomes more popular. Saiz (2020) argued the office market is growing slowly, but demand for logistics space remains unabated and rental growth accelerates sharply. Recovery in retail and market space remains partial. Overall, the user's activity area appears to recover over time. The research aims to understand which factors affecting more of the demand forecasting for real estate units in the Maharashtra's major city. Even though quite a few studies have been carried out on affordable housing and its demand, there is a need for identifying the demand for housing for the middle-income group which makes up a significant portion of the population in the country. The objective of the study is to identify the demand for various housing typologies, factors affecting the demand and a model for the demand of MIG housing in Maharashtra. The study takes into consideration various factors such as income, pricing, location, infrastructure, government policies, and population growth, among others. The study also highlights the importance of demand forecasting in real estate as it provides vital information for investors and developers to make informed decisions. The study finds out if the growth of the residential real estate sector in India is driven by urbanization and increased household income. The study concludes by preparing a model for forecasting the demand of Middle-Income Group housing in Maharashtra.

The research is planned to incorporate five sections. Introduction section covers the global and Indian outlook of the real estate industry, introduction to demand forecasting, objectives organization of study. section 2 is literature review, this section consists of extensive literature survey of existent data available about this topic. Section 3 represents the research methodology. The research methodology describes the detailed framework of field work, data processing and analysis of the topic. Section 4 included the data analysis and findings. Multiple regression analysis applied for hypothesis test and analysis. Interpretation of primary data collected via questionnaire based on which the identified demand factors are analysed and forecasting model is prepared for MIG housing in Maharashtra. The last section represented conclusions. limitations and recommendations conclusions, limitations and further scope of study in this field.

Literature

A number of papers and articles were referred to get an overview of both global and Indian and to get an understanding on demand forecasting in real estate. The study found that there are several factors that affect the demand for housing in Maharashtra. The study also found that the demand for MIG housing in Maharashtra is driven by the growth of the urban population, increasing household income, and changing cultural and economic environments.

Global Outlook on Real Estate. In the literature review research paper included for 1990 to 2023.

According to Davis & Heathcote (2005) the residential sector has been booming with demand in housing as the concept of work from home has increased. People require more space for their work setup and due to the trend of start-ups flourishing, people need good storage space as well at their homes. There is also an ever-growing need for student and senior living accommodation. Ballou, et al., (2000) and Balon et al., (2024) discussed the industrial sector is benefitting due to increase in personal consumption and increase in supply chain challenges led to storage of goods, increasing logistic space usage. Due to the increase in online shopping platforms, the size of retail stores has reduced drastically. Slade (2000) discussed the average size of stores for lease in the U.S. has reduced to 5000 sq.ft. or less. In the Asian Pacific countries, food and beverage retailers are trying to expand whereas luxury retails tend to modify their existing shops to cope up with the times. The rents have reduced in these countries except in Australia. In lieu of making the CRIP sector more sustainable, ESG factors have been created. Lützkendorf & Lorenz (2007) discussed, over the last couple of years, RICS has been involved in developing a new Global Guidance of ESGs. Valuation of buildings will ensure that brown buildings that do not conform with the given guidelines will be penalised thus leading to increase in sustainable practices. Increasing unicorn landscape includes platform for consumer financial services, electric vehicle ecosystem, metaverse, convergence of mobility and digital commerce and virtual evolution of health and wellness. The threats to these include cyber risks and healthcare. Coventry & Branley (2018) also studied as most of the companies have goals towards increasing their financial benefits, sustainability is still a long way to go but amongst the big companies, quite a few are ready to take the hit for the better future.

In a report of Newell & Marzuki (2023) has been shown that the After COVID recovery for retail and market spaces remains sub-specific. Overall, the occupier activity areas seem to be recovering in demand with time.

Article Gupta, et al., (2017) said that India was one of the fastest growing major economies in the world over the past decade and will become one of the top three economies by power over the next 10-15 years. It shows that it is predicted.

Aggarwal & Goldar (2019) said, despite occasional economic turmoil, India's GDP grew at her CAGR of 6% from 1990 to 2020. According to one study Arimah (2000), housing is his fourth largest multiplier of the economy, as every Rs 78 invested in housing and construction adds to GDP. Apart from that, it also contributes to GDP and the construction sector. One study Tiwari & Parikh, (1999) estimates that in developing countries like India, average spending on housing is

between 10% and 30% of total household spending. The country's rapid urbanization is driving real estate development. Demand for residential space is increasing, especially in metropolitan areas. Cities are trying to cope by providing adequate infrastructure. A report Tiwari & Rao (2016) showed that there is an inventory of unsold units despite the housing shortage in India. According to one article Nagarjun et al., (2023) the city has a large stock of unsold units despite increasing demand and declining unsold inventory during the pandemic. According to a study on the Indian housing market (Kadi et al., (2021), the EWS segment is growing due to several schemes introduced by the government in recent years. Luxury and high-income housing is also seeing a resurgence due to increased investment in this sector. These rules out his MIG housing, which is the focus of this research. A study Cerutti et al., (2017) correlates rising GDP per capita and falling lending rates with rising housing affordability. It also provides insight into the impact of government housing policies, especially in the area of affordable housing. Also, policies have been put in place by the government at both state and central levels to mitigate the impact of COVID-19 on residential real estate.

Malpezi & Mayo (1987) showed that demand for housing in developing countries depends on wealth, income, unit price and household size. Based on the above variables, two separate models were developed for different ownership and rental types to enable reasonable estimates of demand in various cities in Asia and Africa. Jana et al., (2016) reviews the impact of price and income on housing demand for different income groups in Mumbai. Topography, development of economic centers, rent control laws, etc. have influenced housing prices in the city. Sheiner (1995) argued that the choice of apartment to rent or buy depends not only on the current income, but also on the future income of the household. The spouse's occupation, education, age, and employment also influenced these decisions.

In a paper Patel et al., (2020) based on Census 2011 in India, there is a large shortage of housing units in the country, while a similar percentage of housing units remained vacant or used for purposes other than residential. This study looks at the cause of housing shortage and how it can be managed through policies and schemes. Kwoun et al., (2013) said the stock of housing for the higher income exceeds the demand leading to unsold inventory. These houses are beyond the means of the vast majority of the population of the country. In the larger metropolitan cities in India, even the EWG housing is beyond the affordability of the lower income groups. To mitigate this issue the government has introduced several affordable housing programs and schemes which have had limited success. These schemes lack the coherence and unified vision required for reducing the housing shortage. Sanga (2022) said the schemes such as the Pradhan Mantri Awas Yojana (PMAY) use an income-based approach to determine the size of housing units, as opposed to the size of the household and requirement. This often leads to overcrowding in EWS and low-income housing units especially in the larger cities. There is also disparity in the economic growth and income across the states and UTs which worsens the situation in the poorer states. Access to finance for housing also varies across regions. Apart from the financial aspect, the long approval and sanctioning period of new projects also adds to the cost of affordable housing. This study suggests looking at the housing conundrum at a state-level as a response to the varying conditions of the different states and UT in the country. While the Abouelmagd (2018) said PMAY scheme has succeeded in providing housing at the EWS and LIG households, better implementation would lead to achieving its goal of providing housing for all. The current development approval process is also suggested to be streamlined to reduce the time and cost of housing projects.

A study conducted by Kumar, S. (2017), the National Institute of Bank Management (NIBM) for National Housing Bank (NHB) the current status and future growth potential of residential real estate is analysed at the micro and macro level. Sengupta (2006) said housing is said to be the 4th largest multiplier on economy, for every rupee invested in housing and construction, 78 paise gets added to the GDP. Apart from this it also contributes to the GDP and the construction sector as well. The various factors studied are growth of population, age group, urbanization, availability of bank loan, growth rate of the economy, home loan rates, cost of construction, liabilities of households etc. The link between the demand for housing and allied sectors such as steel and cement were studied.

Research conducted by CBRE and Newell (2021) gives an overview of the state of residential real estate in India. It gives an analysis of the trends in the market over the last decade from 2010 to 2020, it also looks at how COVID-19 has affected residential real estate sale and new launches and the start of the recovery in the 2 final quarters of 2020. It also provides figures on the unsold inventory and inventory overhang as well as property prices across the years in the major cities of India. Kosareva & Polidi (2021) discussed the correlates the increasing per capita GDP and the decrease in lending rates in the increasing affordability of housing. It also gives an insight in to the effect of government housing policies, especially in the affordable housing sector. Also, policies introduced by the government both state and central to reduce the impact of COVID-19 on residential real estate. According to Sharm et al., (2020) the three-month moratorium on EMIs of all term loans and working capital approved by the RBI has also eased the impact of the pandemic. The Model Tenancy Act, 2021 also considers the rental housing market of India. Financing of new projects is expected to be a challenge due to the

funding constraints as investment in the residential sector has reduced and the banks have stricter lending policies due to the rise in non-performing assets (NPAs). NBFCs have also become more cautious in disbursing fresh loans as a result of the pandemic. The report further goes on to look at the various factors affecting the increase in the cost of construction such as prices of steel, cement and labour, cumbersome approval processes, high tax on construction material like glass, tiles etc. The way forward as detailed in the report which suggests the due diligence process and project viability studies to ease access to funding. Operation costs management is also highlighted. Bagul et al., (2023) explained a ten-point strategy has been for risk mitigation, building resilient and sustainable projects which includes diversification of portfolio across segments and regions, investing in technology and digitization, adoption of new construction technology and materials, managing regulatory risks and ensuring compliance.

In a rapidly changing real estate landscape, building modernization emphasizes the highest quality of buildings and ensures that they evolve at the same rate as human tastes. With rapidly changing staffing needs, proposed buildings must comply with active building lifecycle management and accommodate asset upgrades to remain relevant to the market. Building age is a measure for determining the need and potential for renovation, but more and more new buildings are being renovated or planned to be renovated to keep up with market trends.

Different variables affecting the demand and supply side for the office were collected and a forecast model was developed based on leading indicators, demand and supply index and forecast for rent. The forecast scenario was then incorporated with external materials like government policies and regulations. The predictive value was forecasted based on the different variables affecting it.

A study by KPMG deals with the emerging trends in the real estate market. RERA, GST and REITs are some key regulatory reforms to bring in the next wave of transformation in the real estate sector.

Residential – With rapid urbanization there is a shortage of affordable housing in India while the overall demand continues. The government is taking extensive steps to mitigate this shortage by introducing policies and laws to make housing for all possible. Unmet student accommodation demand and change in mindset of people has also resulted in an increase in the rental housing market.

Bhattacharya & Mundle (2021) explained the India's GDP grew 20.1% year-on-year (YoY) in the April-June quarter of fiscal year 2021-22, falling 24.4% over the same period. In recent years, the government has made a significant contribution to India's development and promotion of business opportunities in the country. Government initiatives and policies such as the easing of foreign direct investment (FDI) that restricts business activity, housing for all, make in India, smart cities, Indian start-ups and infrastructure initiatives have made India the world's largest It has become one of the economic zones.

Residential properties in India:

In 2017, after the impact of RERA, demonetization and GST, new unit launches in the top 8 Indian cities increased rapidly, up 76% YoY in CY18 and 58% YoY in CY19. rice field. The 2020 pandemic slowed this growth, but overall launch numbers were higher than his CY16 and CY17. Mumbai and Pune remained steady with 46% of new units launched in the first half of CY21 coming from only those two cities. This shows that the western city has a more stable real estate market than other major cities in India.

Mumbai metropolitan region: Shift of office market to emerging locations due to availability of land, low rental rates, and planned development. Occupiers have shifted to more peripheral locations in recent years. Over 11.45 million square feet of office space is currently under construction in MMR, with Thane-Belapur Road accounting for 15%. Residential hubs such as Thane, Airoli, and others are expected to benefit from this concentrated development, as demand for residential properties is expected to remain high, particularly among the workforce employed in this business district.

Residential Real Estate in Maharashtra

The paper, authored by Tiwari et al., (1999) examines the impact of price and income on housing demand for different income groups in Mumbai. Topography, development of economic centers, rent control laws, etc. have influenced housing prices in the city. Mumbai's Rent Control Act, which penalizes landlords who charge excessive rents, has led to an increase in home ownership and renting in the city. This paper is based on data collected through a survey of housing characteristics, both rental and owner-occupied. number of rooms, square footage; age of house, household income, water, electricity, toilet facilities for all housing types present in the city, such as cabins, shawls, apartments, bungalows, townhouses, tenements; It turns out that the choice of apartment to rent or buy depends not only on the current income, but also on the future income of the household. The spouse's occupation, education, age, and employment also influenced these decisions.

This research utilizes a two-step process to estimate the housing demand. First the housing prices were constructed using hedonistic estimation using the variables of price, location, size of unit, age, and availability and quality of services. The result indicates that the number of rooms (BHK) and distance from the CBD affect the prices to a greater extent than the other characteristics. In the second step the indices of price and income were used to estimate housing demand function. Two versions of the demand function were developed, one using permanent income and the other using current income. It was found that the housing ownership elasticity was higher than renting as the buying of a property was tied to transitory income despite the existence of the rent control act.

Real Estate Demand Forecasting
Various factors which impact demand of luxury housing in any micro market and more so Gurgaon were growth in IT/ ITES salary, GDP growth, price of apartments, home loan rate, absorption of commercial space.

A study done by Malpezzi (2001) looks at the housing markets in developing countries and the housing demand behaviour and parameters such as tenure- i.e., ownership and rent, affecting housing demand as well as the applicability of standardised models. As per previous studies it was found that demand was income inelastic and the income elasticity is lower for renters. Based on this model the estimated parameters of housing expenditure for renters and owners were derived for 16 cities across the developing countries including Bangalore. They were compared to 2 cities from the United States.

Glaeser & Gyourko (2018) argue that current income is not the most appropriate tool to estimate the demand for an investment like housing. Permanent income or income adjusted for life cycle would be more appropriate. Malpezzi (2001) also ignores the variation of housing prices across the different locations in a city. Other parameters such as age and gender of household head, government policies and programs such as subsidies must also be considered to get a better estimate. Also, the model should be used for submarkets based on location and income. A complete model was created with these parameters considered and compared with the simple model. On comparing across the cities studied, it was found that rent-to-income ratios rise across cities as income increases.

Boitan (2016) identified an approach to modelling and forecasting real estate residential property market to examine time series data for different types of property and compare their characteristics to each other and to the UK All House Price Index. Introduced a methodology that combines published data from the UK Office for National Statistics with GIS to identify causal relationships that can be used to predict house prices.

Kaboudan & Sarkar (2008) provided a new approach to predicting changes in house prices using time series techniques, random models, and GIS. Models created using GIS and socio-economic factors show how housing prices change, such as housing with more green space, residents with higher disposable income, lower tax rates, fewer tax beneficiaries, and better health care services. Kim (2011) forecasted the demand and supply of the Seoul office market in the next 10 years by studying the time series data from 1975 to 2010 using 2 models. Find the equations that determine rent, office supply, and vacancy using two models. A simple without availability data and a complete model with availability. The economy grows steadily, bottoming out in 2016 and recovering by 2020. Research focused on commercial real estate Yuan et al., (2023) is based on different project types and project positioning, using different operating models to achieve long-term and profitable gains. used and contributes more to long-term business development. According to Cherif & Grant (2014), commercial real estate business models, the sole rental rather than sales model is the direction of future commercial real estate development. The study concludes that choosing the right business model is the key to success in commercial real estate. The rent-not-sell model is the only way commercial real estate projects can be successful.

Research Gap
While there are ample studies on housing in Maharashtra, these studies mainly focus on affordable housing, slum redevelopment, EWS housing etc. There is no recent study analysing the factors that drive demand for housing for MIG that make up a significant bulk of the population of the city.

Methodology
We want to identify the effect of house value (price) dependents on several factors which we identify from literature and expert opinion. There are two major factors play a significant role one from family background and one from land background. For family background related research, the following hypothesis has been framed.

H$_{a1}$: There is significant impact of respondent age, gender, education level, household income, disposable income percentage, household size, number of earning members and number of houses owned by the family on house prices.
H$_{a0}$: There is no significant relation between house prices (dependent variable) Vs age, gender, education level, household income, disposable income percentage, household size, number of earning members and number of houses owned by the family.

Table 1: Demographic details of respondents

Independent Variable	Group	Frequency	Independent Variable	Group	Frequency
age	25- 35	43	Household Size	1	3
	36- 45	17		2	8
	46-55	14		3	22
	56-60	8		4	39
	61 and above	11		5	13
Gender	Male	52		6	4
	Female	41		8	1
Education Level	Graduate	42		10	2
	Post Graduate	46		12	1
	PHD	5	No. of Earning Members	1	26
Household Income (in lakhs)	10-24.99 lakhs	29		2	40
	25-49.99 lakhs	23		3	15
	Above 50 lakhs	41		4	11
No. of houses owned	0	29		5	1
	1	50	No. of houses owned	0	29
	2	11		1	50
	3	3		2	11
				3	3

For land background related following hypothesis has been developed.

H$_{b1}$: There is significant impact of impact of Suburb, Connectivity, Proximity to Metro/Railway, Proximity to Hospital, Proximity to Recreational Area/ Park, Proximity to Educational Institutes, Proximity to Market, Proximity to Mall, Proximity to Sports Facility on house prices.
H$_0$: There is no significant impact of impact of Suburb, Connectivity, Proximity to Metro/Railway, Proximity to Hospital, Proximity to Recreational Area/ Park, Proximity to Educational Institutes, Proximity to Market, Proximity to Mall, Proximity to Sports Facility on house prices.

Table 2 Demographic details of respondents

City	Code	Count
Pune	1	10
Navi Mumbai	2	18
Nagpur	3	35
Nasik	4	14
Thane	5	16

For test the above hypothesis the multiple liner regression has been applied. This is a statistical method that is commonly utilised for demand forecasting in real estate. The purpose of this method is to identify the relationship between a dependent variable, such as housing demand, and one or more independent variables, such as cost, connectivity, suburb, proximity to market, mall and educational institutes, availability and interest rates for housing loans etc.
In multiple linear regression, the dependent variable is modelled as a linear combination of the independent variables. The independent variable coefficients represent the effect of each independent variable on the dependent variable. A regression

equation can then be used to make predictions about the dependent variable based on the values of the independent variables.

The regression equation can be used to make predictions about housing demand based on changes in the values of these independent variables.

However, it's important to note that multiple linear regression is only one of many methods that can be used for demand forecasting in real estate. The choice of method will depend on the characteristics of the data and the specific requirements of the demand forecasting problem. Additionally, the results of multiple linear regression should always be validated using appropriate statistical techniques and interpreted with caution, considering the limitations of the method.

In this study, the dependent variable for demand forecasting is "housing value" and is represented by the variable Y. The independent variables denoted by (X_1, X_2, X_3, …….. X_n) The equation for the multiple linear regression model can be represented as:

$$Y = \beta_0 + \beta_1 \times X_1 + \beta_2 \times X_2 + \beta_3 \times X_3 + \beta_4 \times X_4 + … … … … … … + \beta_n \times X_n$$

where β_0, β_1, β_2, β_3, β_4, β_5, β_6, and β_7 are the coefficients for each variable. These coefficients represent the effect of each independent variable on the dependent variable.

SPSS: IBM SPSS is a proprietary software for statistical analysis. It has a user-friendly interface and can be used to perform multiple linear regression.

For this test IBM SPSS will be used.

Based on the hypothesis and statistical test a questionnaire prepared. After preparing the questionnaire a pilot study has been done with 20 respondents and expert opinion. After finalize the questionnaire it has been circulate through email, online and field visit. Total 93 respondent's data from different city of Maharashtra filled the complete questionnaire.

Multiple linear regression with demographic variables

Dependant Variable: House Price and Independent Variables: Age Group, Gender, Education Level, Household Income, Disposable Income Percentage, Household Size, Number of Earning Members, Number of houses owned by family.

H$_{a1}$: There is significant impact of respondent age, gender, education level, household income, disposable income percentage, household size, number of earning members and number of houses owned by the family on house prices.

H$_{a0}$: There is no significant relation between house prices (dependent variable) Vs age, gender, education level, household income, disposable income percentage, household size, number of earning members and number of houses owned by the family.

<p align="center">Table 3: Descriptive Statistics</p>

	Mean	Std. Deviation	N
House Value (in crores)	1.9220	1.04480	93
Age	2.22	1.413	93
Gender	1.56	.499	93
Education	1.60	.592	93
Household_Income_in_lakhs	4.28	1.885	93
Household_Size	3.98	1.687	93
No._of_Earning_Members	2.15	.999	93
No._of_houses_owned	.87	.741	93
Disposable_Income_Percentage	.4174	.20592	93

Table 4: Correlations

		Age	Gender	Education	Household Income in lakhs	Household Size	No. of Earning Members	No. of houses owned	Disposable household income
Age	Pearson Correlation	1	.034	.272**	.146	-.135	.023	.131	.068
	Sig. (1-tailed)		.374	.004	.081	.099	.413	.106	.257
Gender	Pearson Correlation	.034	1	.085	-.007	.063	.149	.126	.001
	Sig. (1-tailed)	.374		.209	.472	.274	.077	.114	.498
Education	Pearson Correlation	.272**	.085	1	.038	-.030	.066	-.019	-.048
	Sig. (1-tailed)	.004	.209		.360	.386	.266	.428	.325
Household Income in lakhs	Pearson Correlation	.146	-.007	.038	1	-.118	.129	.282**	.303**
	Sig. (1-tailed)	.081	.472	.360		.131	.110	.003	.002
Household Size	Pearson Correlation	-.135	.063	-.030	-.118	1	.537**	.093	-.021
	Sig. (1-tailed)	.099	.274	.386	.131		.000	.187	.419
No. of Earning Members	Pearson Correlation	.023	.149	.066	.129	.537**	1	.100	.100
	Sig. (1-tailed)	.413	.077	.266	.110	.000		.170	.171
No. of houses owned	Pearson Correlation	.131	.126	-.019	.282**	.093	.100	1	.200*
	Sig. (1-tailed)	.106	.114	.428	.003	.187	.170		.027
Disposable household income	Pearson Correlation	.068	.001	-.048	.303**	-.021	.100	.200*	1
	Sig. (1-tailed)	.257	.498	.325	.002	.419	.171	.027	

**. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.05 level (1-tailed).

Table 5: Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	disposable_household_income, Gender, Household_Size, Education, No._of_houses_owned, Age, Household_Income_in_lakhs, No._of_Earning_Members[b]	.	Enter

a. Dependent Variable: Household_Value

b. All requested variables entered.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.446[a]	.199	.123	.97849

a. Predictors: (Constant), disposable_household_income, Gender, Household_Size, Education, No._of_houses_owned, Age, Household_Income_in_lakhs, No._of_Earning_Members

- R-value in this case is 0.446, which indicates a moderate correlation between the dependent and independent variables.
- R-square shows the total variation for the dependent variable that could be explained by the independent variables. A value of 0.199 indicates it is moderately effective to determine the relationship.

Table 7: ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	20.002	8	2.500	2.611	.013^b
1	Residual	80.426	84	.957		
	Total	100.427	92			

a. Dependent Variable: Household_Value
b. Predictors: (Constant), disposable_household_income, Gender, Household_Size, Education, No._of_houses_owned, Age, Household_Income_in_lakhs, No._of_Earning_Members

- **P-value/ Sig value:** As significance is 0.013, the result is significant.
- **F-ratio:** It represents an improvement in the prediction of the variable by fitting the model after considering the inaccuracy present in the model. A value is greater than 1 for F-ratio yield efficient model. In the above table, the value is 2.611, which is good.

Table 8: Coefficients^a

Model		Sig.
	(Constant)	.082
	Age	.526
	Gender	.172
	Education	.249
1	Household_Income_in_lakhs	.001
	Household_Size	.836
	No._of_Earning_Members	.815
	No._of_houses_owned	.259
	disposable_household_income	.852

a. Dependent Variable: Household_Value

The Significance value is less than 0.001 for household income, the null hypothesis is rejected for this variable. Hence, the significant variable as found through analysing the data is household income.

Multiple linear regression with land location variables

Dependent variable: House Price and Independent Variables: Connectivity, Proximity to Metro/Railway, Proximity to Hospital, Proximity to Recreational Area/ Park, Proximity to Educational Institutes, Proximity to Market, Proximity to Mall, Proximity to Sports Facility on house prices.

H$_{b1}$: There is significant impact of impact of Suburb, Connectivity, Proximity to Metro/Railway, Proximity to Hospital, Proximity to Recreational Area/ Park, Proximity to Educational Institutes, Proximity to Market, Proximity to Mall, Proximity to Sports Facility on house prices.

H$_0$: There is no significant impact of impact of Suburb, Connectivity, Proximity to Metro/Railway, Proximity to Hospital, Proximity to Recreational Area/ Park, Proximity to Educational Institutes, Proximity to Market, Proximity to Mall, Proximity to Sports Facility on house prices.

Table 9: Descriptive Statistics

Independent Variable	Mean	Std. Deviation	N
Location	3.09	1.213	93

Connectivity	4.46	0.828	93
Metro_Railway	4.17	1.138	93
Hospital	3.94	1.030	93
Recreational_Space_Park	3.71	1.049	93
Educational_Institution	3.01	1.347	93
Market	4.29	1.049	93
Mall	3.20	1.175	93
Sports_Facilities	2.84	1.132	92

Table 9 shows the descriptive statistics data for independent data which has high mean= 4.46 and connectivity and low mean=2.84.

Table 10: Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Sports_Facilities, Location, Market, Recreational_Space_Park, Educational_Institution, Mall, Connectivity, Hospital, Metro_Railway[b]	.	Enter

a. Dependent Variable: House_Value_in_crores

b. All requested variables entered.

Table 11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.432[a]	.187	.098	.99362

a.   Predictors: (Constant), Sports_Facilities, Location, Market, Recreational_Space_Park, Educational_Institution, Mall, Connectivity, Hospital, Metro_Railway

Table 11 shows the model summary of regression with following interpretation:

- R-value in this case is 0.432, which indicates a moderate correlation between the dependent and independent variables.

- R-square shows the total variation for the dependent variable that could be explained by the independent variables. A value of 0.187 indicates it is moderately effectiveto determine the relationship.

Table 12: ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.611	9	2.068	2.094	.039[b]
	Residual	80.957	82	.987		
	Total	99.568	91			

a. Dependent Variable: House Value_in_crores

b.   Predictors: (Constant), Sports_Facilities, Location, Market, Recreational_Space_Park, Educational_Institution, Mall, Connectivity, Hospital, Metro_Railway

Table 13: Coefficients^a

Model		Sig.
1	(Constant)	.075
	Location	.013
	Connectivity	.038
	Metro_Railway	.159
	Hospital	.456
	Recreational_Space_Park	.685

Educational_Institution	.056
Market	.468
Mall	.472
Sports_Facilities	.900

Table 13 shows the significance value is less than 0.01 for location and connectivity, the null hypothesis is rejected for this variable. If significance value consider is less than 0.05 so approximately Educational Institution hypothesis cal be reject. Hence, the significant variable as found through analysing the data is household income.

Result analysis

The demand for housing will keep increasing in a city like Mumbai, Nagpur, Pune as it evolves with development of infrastructure and commercial hubs. Wetzstein (2022) said, despite the increasing demand, there is a large stock of unsold units in the city which are lying vacant despite the reduction in unsold inventory during the pandemic. Demand forecasting can provide a solution to this conundrum by bridging the gap between the desired and the unoccupied houses.

The findings of this research provide valuable insights for real estate developers, investors, and policymakers in Maharashtra. It helps them understand the factors that affect housing demand in the city, and will allow them to make informed decisions about the city's housing market (Jim & Chen, 2006). Furthermore, this research contributes to the broader literature on demand forecasting in real estate markets, by providing a case study of a rapidly growing city in a developing country.

Overall, the developed model is useful in identifying the potential hot spots for real estate investment and help in making informed decisions in the future. The research also suggests that there is a need for more focus on improving the transportation infrastructure and job opportunities in the city, in order to sustain the growth of real estate market.

The findings of this study will contribute to the understanding of demand for housing in the Metropolitan Region, and will provide valuable insights for developers, investors, and policymakers in a city. By ensuring that the supply of housing meets the actual demand, the findings of this study can help to address the housing shortage in the Maharashtra Region and improve access to affordable housing for the residents of a city.

This study gives insight into the factors that affect demand for housing in Metropolitan Region. The variables identified were: household income, impact of increase in home loan rates, location, connectivity, proximity to metro/railway, configuration, size, developer brand. It is important to also factor in the emerging trends and monitor market conditions while computing demand for housing in Mumbai. Based on current trends and projections, it is expected that the demand for housing in Mumbai will remain strong in the coming years. The city's growing population, steady economic growth, and the ongoing urbanization process are some of the factors that are driving the demand for housing. To accurately predict demand for housing in Mumbai, it is crucial to identify a wide range of factors as demand for housing will continue to grow in the coming years.

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