

IMPACT OF ECONOMIC FACTORS ON URBAN LAND PRICE BEHAVIOUR

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Abstract

This study attempts to examine the factors correlated with land price and then estimate the future land price by applying the pricing model which incorporated those factors. A land price model derived from multiple regression analysis is developed for the purpose. Correlation analysis has been carried out to study the impact, as well as the co-movement of the land price and the independent variables. The coefficient of determination (R^2) indicates that about 99.5% of the land price is explained by this multiple regression model.

Keywords: Land Price, Economic Factors, Regression Analysis, Land Price Model, Future trend

I. INTRODUCTION

The upward trend of land price is more or less uniform over the entire Chennai Metropolitan Area (CMA) in the past decade. The price rise is highly significant due to the development in the area of Information Technology and Technology in Communication in the South and the West of CMA. The inflated land price in turn has increased the residential property price to a new high. This has also impacted the sub-urban property prices with the thrust laid on infrastructure development. Since land price hike affects the economy of buyers the trend needs to be studied. The modern metropolitan planning involves integration of economic, social, environmental, infrastructure and management aspects. Urbanization is closely associated with increasing level of income and improvement in social aspects. Urban-based economic activity accounts for more than fifty percent of Gross Domestic Product (GDP) in all the countries.

The study of trend helps to ascertain the changes in growth occurred in the past and the reasons for the same. It will help to identify the potential for future growth and helps in planning aspects. To quantify the rise of land price over a period of time is essential for future policy implicating and to assess the compensation amount for the land which will be acquired for public purpose. Cities are at the root of all economic growth. With the skyrocketing of land price and shortage of land at Chennai's prime locations, affordable housing continuous to remain a distant dream for many.

II. ABOUT CHENNAI METROPOLITAN AREA (CMA)

Chennai, the capital city of Tamilnadu is the fourth largest metropolitan city in India. CMA comprises of city of Chennai, 16 municipalities, 20 town panchayats and 214 village panchayats. The extent of CMA is 1189 square

kilometers and it falls in three districts. Chennai Metropolis lies in the latitude between 12°50'49" and 13°17'24" and the longitude between 79°59'53" and 80°20'12". It is located in Coramandal coast in South India and the land is a flat coastal plain. It has three rivers and a man made Buckingham canal which runs North-South through this metropolis. The existing land use of Chennai City and rest of CMA is given in Table 1. The physical growth of CMA is to be monitored by aerial photographs for every five years to forecast the trend.

Table 1. Land use of Chennai City and CMA

Zone	Chennai City (square kilometers)	Rest of CMA (square kilometers)
Residential	92.93	208.33
Commercial	12.38	3.78
Industrial	8.90	64.19
Institutional	31.80	28.76
Open space and Recreational	3.64	2.00
Agriculture	0.94	122.57
Non-Urban	0.82	16.89
Others	24.59	566.48
Total	176	1013

III. STUDY AREA - TAMBARAM

Tambaram is located about 30 kilometers away from the city centre on the National Highway NH₄₅. It is well connected with transportation network by excellent roadways and railway lines. Sub-urban trains are frequently operated between Tambaram and the city core. Moreover the international and domestic airports are very near to this node. Many public transport routes are originating from Tambaram which connects Mudichur, Mannivakkam, Mambakkam, Padappai and upto Sripermbudur in the West and Medavakkam,

Sithalapakkam, Chitlapakkam, Kelambakkam and upto Thiruporur in the East. Many villages surrounding Tambaram are well developed as dense residential locations in the recent years. The population in Tambaram till the year 2006 is 1.56 lakhs and is expected to be 1.72 lakhs in 2011.

The Detailed Development Plan (DDP) of Tambaram divides the land into various zones as primary residential (41 %), mixed residential (3.3 %), commercial (0.4 %), light and general industrial (8.8 %), institutional (20 %), open space, recreational, forest and water body (24 %) and agricultural zone (2.5 %) and it is shown in the Fig. 1.

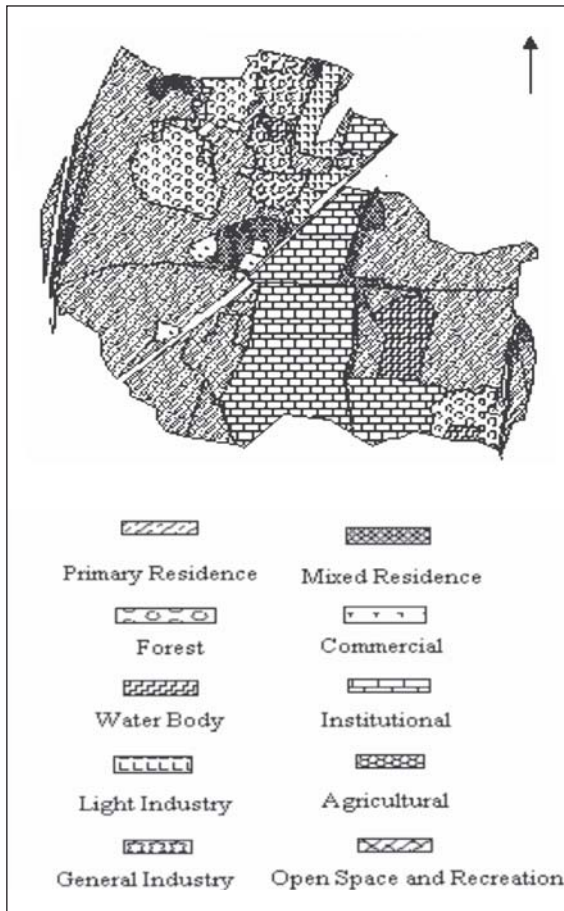


Fig. 1. Various Zones of Tambaram

IV. ASSESSMENT OF REAL ESTATE TREND OF TAMBARAM

With unrealistic land prices, builders are compelled to go five kilometers beyond Tambaram to the areas such as Nolambur, Mogappair, Manimangalam, Mannivakkam, Kishkintha, Padappai for future extension. The steep increase in land price has pushed the housing cost to a

new high which proliferates layout violation, unapproved plots on agriculture land, etc. Value of land is more significant in deciding the property price. The rise in land price is partly due to speculation and partly due to the gap between demand and supply. This may be minimized by the regulatory government policies on land price and affordable housing. The land price of any location depends upon the guide line value, time period, population and economic factors. The present study focuses on the impact of factors such as guide line value, time period, population, gold price, silver price, crude oil price, dollar equivalence, inflation, GDP, housing loan interest, construction cost of residential building, BSE and NSE on the trend of land price at Tambaram. The selected factors are collected as monthly average since 1997.

The dependence between the various economic factors can be explained from past experiences. It is felt that the fall of dollar equivalence lifts the price of gold and crude oil. The rise in the price of crude oil pulls down the share index which in turn increases the rate of inflation. The rise in inflation and fall of share index increases the interest rate of housing loan which alters the land price.

V. ANALYSIS

The annual growth rate of selected factors over the past ten years is calculated by compounding factor method and is shown in Fig. 2. It can be seen that the factors such as land price, crude oil and share index are highly significant in the annual growth rate of Tambaram. The land price at Tambaram is tested for past ten years by Chi-square test method and it is found that the price rise has increased in an abnormal manner.

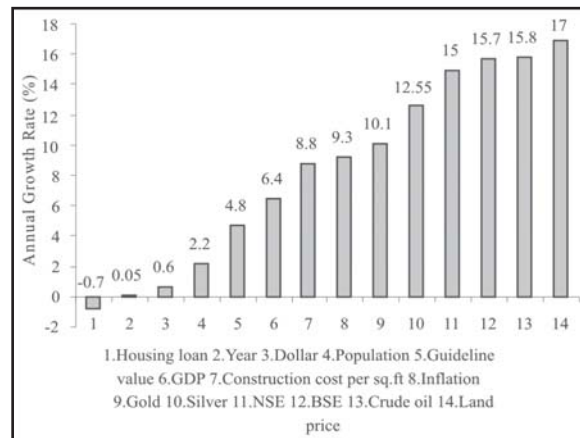


Fig. 2. Annual Growth Rate of Factors over the Past Ten Years

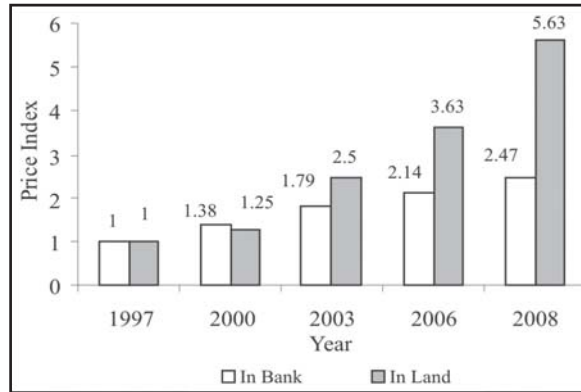


Fig. 3. Capital Growth on Land and in Bank

Fig. 3. shows the comparison between the growth of capital money invested on land in Tambaram and that invested in bank over the past ten years. It is observed that the price index on land is more than twice the price index on bank.

The interaction effect of economic factors is analyzed by regression coefficient (R^2) method using Statistical Package on Social Science (SPSS) Software and is shown in Table 2. From the analysis it is observed that the inflation and dollar equivalence have minimum correlation with all the other economic factors, on the other hand land price, guide line value, time period, population, gold, silver, crude oil, GDP, housing loan interest, construction cost, BSE and NSE have high correlation with each other.

Table 2. Regression Co-Efficients (R^2) of Factors

Factors	Guideline Value	Time Period	Population	Gold Price	Silver Price	Crude oil	Dollar equivalence	Inflation	GDP	Housing loan interest	Construction cost	BSE	NSE
Land Price	0.86	0.98	0.99	0.99	0.86	0.96	0.51	0.75	0.9	0.9	0.97	0.92	0.97
Guideline Value	1	0.84	0.87	0.98	0.78	0.84	0.27	0.42	0.46	0.76	0.89	0.87	0.62
Time Period		1	0.99	0.96	0.94	0.97	0.98	0.55	0.63	0.71	0.98	0.96	0.93
Population			1	0.98	0.95	0.96	0.87	0.52	0.62	0.8	0.98	0.98	0.96
Gold Price				1	0.89	0.85	0.12	0.21	0.69	0.59	0.78	0.97	0.97
Silver Price					1	0.89	0.61	0.15	0.69	0.62	0.93	0.93	0.93
Crude oil						1	0.18	0.32	0.61	0.88	0.92	0.92	0.97
Dollar equivalence							1	0.36	0.33	0.19	0.81	0.24	0.20
Inflation								1	0.18	0.21	0.13	0.33	0.35
GDP									1	0.58	0.43	0.58	0.65
Housing loan interest										1	0.83	0.39	0.83
Construction cost											1	0.97	0.98
BSE												1	0.99
NSE													1

VI. MODELING OF LAND PRICE AT TAMBARAM

A model is developed by step-wise regression analysis using SPSS Software. The land price per 5.5 cents is treated as a dependent variable and all other economic factors, guideline value, time factor and population are treated as independent variables. The step-wise regression analysis is processed with 95 % confidence and 5 % error significance level. The independent factors are processed one by one with interaction effect. Table 3. shows the factors with the error significance levels.

Table 3. Step-wise Regression Model of Tambaram

Variables	Error significance
Population in numbers	0.00
Gold price in Rupees per gram	0.00
Silver price in Rupees per gram	0.00
Crude oil price in dollar	0.00
Inflation in percentage	0.00
Guideline value in Rupees	0.00
Gross domestic product in percentage	0.004
Year and month	0.236
Dollar equivalence in Rupees	0.801
Mumbai index	0.265
National index	0.617
Housing loan interest in percentage	0.207
Construction cost in Rupees	0.202

The factors such as population, gold price, silver price, crude oil price, inflation, guide line value and GDP show very good response and rest of the factors show less response and they are rejected in the model. Because the step-wise technique excludes redundant variables, it minimizes multi-co linearity.

The land price model at Tambaram which is derived from the analysis is:

$$\text{Land price} = 66.87 * \text{Population} + 694.65 * \text{Gold Price} - 22130.198 * \text{Silver} + 11682.157 * \text{Crude oil price} - 68955.021 * \text{Inflation} + 0.775 * \text{Guide line value} - 7437.4 * \text{GDP} - 8432000...$$

The variation of land price and the model derived from the step- wise regression method is shown in Fig. 4.

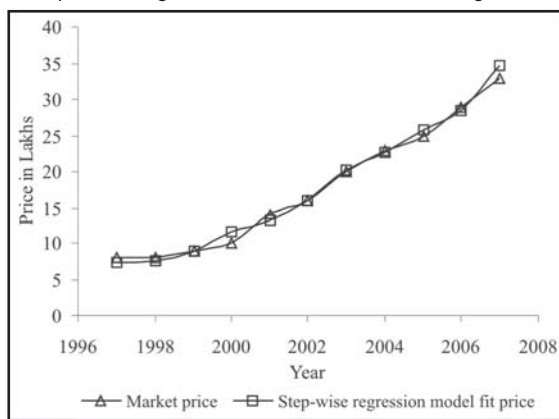


Fig. 4. Land Price and Step-wise Regression Model Fit

The difference between the land price and the model fit price is the residue of the model. The residual value ranges from 0.87 to -1.68 lakhs. The residual price of the study area is shown in Fig. 5.

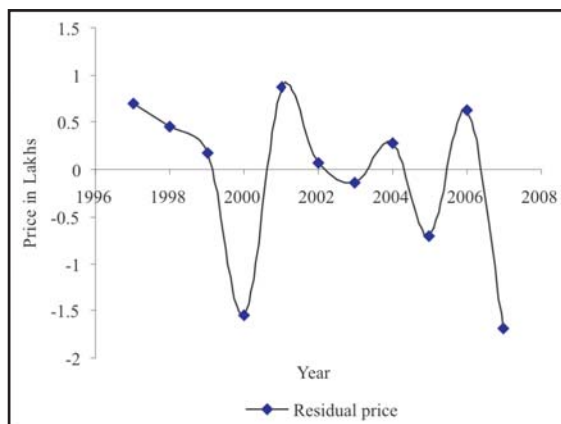


Fig. 5. Residual Price of Study Area

The land price at Tambaram is actively forecasted by step-wise regression method with projected factor values

and passively by polynomial method by extending the past trend up to the year 2013. The comparison between the methods is given in Table 4.

Table 4. Comparison of Forcasted Land Price in Lakhs

Year	By active method	By passive method	By expert opinion
2009	45.81	49.44	50.18
2010	49.64	54.13	-
2011	53.58	59.08	-
2012	57.65	64.28	-
2013	61.83	69.73	-

The land price trend for the next five years obtained from active and passive methods is shown in Fig. 6. The trend in both the methods is in the ascending pattern and the expert opinion is almost matches with the passively forecasted method for the year 2009. The difference in both the methods may be due to the negligence of some of the selected factors in the step-wise regression analysis.

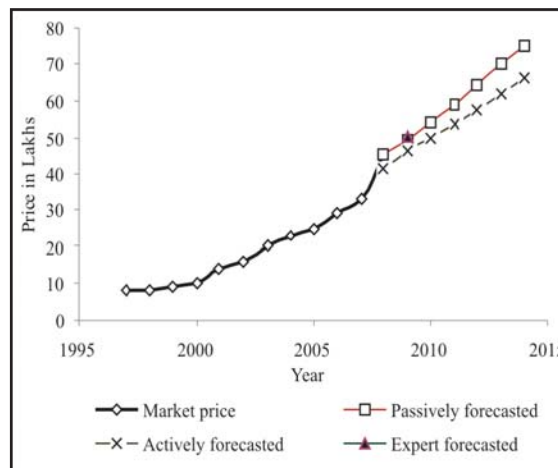


Fig. 6. Forecasted Land price at Tambaram

VII. FORECASTING THE LAND PRICE AT TAMBARAM

The projected values of economic factors with regression coefficients for the next five years and the expert predicted values for the year 2009 are given in Table 5.

Table 5. Projected values of selected factors

Factor	R ²	Expert Opinion Forecast	Year				
		2009	2009	2010	2011	2012	2013
Population in numbers	0.99	165000	168230	172013	175876	179819	189842
Gold per gram (Rs.)	0.82	1300	1132	1235	1345	1463	1588
Silver per gram (Rs.)	0.89	23.80	24.32	26.45	28.70	31.06	33.55
Crude oil per barrel (\$)	0.88	143.00	102.36	112.36	123.00	134.28	146.20
Inflation (%)	0.60	4.50	5.51	6.13	6.79	7.50	8.27
Guideline value (Rs.)	0.93	960000	1012032	1064909	1118698	1173398	1229010
Gross Domestic Product (%)	0.63	8.50	11.31	12.67	14.14	15.72	17.43

VIII. CONCLUSION

The land price at Tambaram is determined by the identified economic factors. From the analysis it is concluded that seven out of thirteen factors are significant determinants of land price. The regression model, which account for 99.5 % variation in the land price is applied to determine the future land price of the study area.

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