

Analysis about expenditure for commodity houses by migrant workers in cities ——Taking Hubei province as an example

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Abstract: As marketing economy develops, migrant workers who are from bottom of society have become a part of the city gradually, i.e., the process of urbanization. During the process, migrant workers have changed in many respects, especially there comes a trend that they will purchase commodity houses in cities. But when does the trend come true, i.e., when do majority of migrant workers will buy commodity houses by installment in the city? We will give detail analysis of them. Firstly, the article refers to the importance of analyzing migrant workers' demand of purchasing commodity houses, and explaining the reasons why they want to buy commodity houses in cities; Secondly, based on Sampling survey data and the future house prices which are calculated by Grey Model of GM (1,1), we set up the expenditure percentage model for commodity houses to judge if migrant workers would like to buy the houses by installment, as well as to calculate the time when they will choose to buy the houses. At last, some deficiencies and the directions of research in future are stated clearly, which are expected to be modified and followed in the future research. Above all the analysis, we can conclude as follows: migrant workers have strong demand for purchasing commodity houses in cities of Hubei province and most of them will choose to buy them in 2030.

Keywords: Migrant workers; Commodity houses; Trend; Prediction

Recently, the fact that general demand for an apartment and cost of developing commodity houses are both larger than before, incomes of people are ever-increasing, government policy has changed, etc., makes the prices of commodity houses in city go up. To save more money so that they can afford houses, people are willing to lower their living standards and live a uptight life. However, demands for houses still don't reach saturation point in the market, and have full potential, such as migrant workers working in the cities for a long-term.

At present, the total number of migrant workers in cities is large. According to the National Bureau of statistics, national migrant workers totaled 252.78 million in 2011, which has increased by 10.55 million people over the previous year with a growth rate of 4.4%. Meanwhile, total number of migrant workers in Hubei Province was 11.636 million, accounting for 4.6% of all cross the nation, and comparing with last year, there is an increase of 384,000 people with a growth rate of 3.4%. However, people who choose to purchase commodity houses in cities account for a small proportion of the total number. According to the Hubei Statistics Bureau, the species and proportions of houses living by migrant workers in Hubei are listed as follows: accommodations provided by the employers accounted for 40.4%, 8.2% of migrant workers lived in the construction site or in the shed, the production premises accounted for 5.9%, rented houses with others accounted for 17.3%, independent rental houses accounted for 12.3%, 11.2% of migrant workers went back home to live every day, and only 0.7% of the

migrant workers bought their own houses in the construction site. Therefore, migrant workers is still huge potential purchasing power in urban commodity houses market. Not only that, due to growth of income, consumer psychology and their children's educational condition preferences, solution of household registration problem, implementation of houses welfare policy and need of social stability and harmony, migrant workers are more and more inclined to purchase commodity houses in cities.

From this point, migrant workers are indeed a huge potential consumer groups. If the demands of this group for purchasing commodity houses turn up, and they have enough conditions of that, the demand for commodity houses market will be even greater, and thus having an enormous impact on the real estate market and the whole social economy.

Therefore, here we firstly analyze the reasons for remarkable trend of migrant workers purchasing commodity houses in cities, and then through the establishment of the the expenditure percentage model for commodity houses, we will predict when migrant workers in cities choose to buy commodity houses, hoping that relevant departments can take measures in advance to deal with the expansion of house demands in cities before that happens.

— **The reasons why demands of migrant workers for purchasing commodity houses in cities are strong**

Migrant workers' demands for commodity houses in cities are not so clear, that is to say, the number of migrant workers who have purchased commodity houses in cities is not large. But as a trend, it has already become more and more obvious in the group of migrant workers. It's expected in the near future that the migrant workers will choose to purchase commodity houses by installment, the specific reasons of which are listed as follows:

[1] In a subjective point, the expenditure for commodity houses in cities has become a trend. By analyzing questionnaire data, it shows that: 46.4% of migrant workers plan to purchase commodity houses in cities, 21.6% of them do not want to purchase houses, 26.0% of migrant workers intend to but did not plan to do it, and 6% of migrant workers have never considered this issue.

[2] In an objective point, there are a lot of factors prompting migrant workers to buy houses in cities.

1. Poor living conditions of the migrant workers will stimulate the purchase for houses

The most common living types for migrant workers is to live in the dormitories provided by employers, most of them have small space (some of the rooms are even less than 10 square meters), bad surrounding environment, lack of infrastructure and so on. Secondly, migrant workers tend to rent the old building in the old town to live, because it's close to the work place and expenses can be reduced to a certain extent, which can improve their quality of life. But most of these houses are built in the last century 80s to 90s, and they can't reach new living standards. In addition, old town's dense population and illegal expansion of houses cause the narrow room of the residence and activities, at the same time, both health and safety can't be guaranteed. Thirdly, part of migrant workers in cities without living place in cities have to go back home every day. Data shows that these workers mostly come from urban fringe around city. Though they have fixed shelter and stable family in suburb, commuting from city to suburb everyday still cause negative effects on their lives; there still a kind of migrant workers changing their locations as work locations change, such as some workers living in site sheds and production business places. They generally agreed that the better sheds are built of brick and asbestos, and the poor one is made of wood and metal structure. However these two living sheds are never able to meet the basic standard of living. Therefore, when they want to live a better life, they need to and have a strong desire to purchase commodity houses in the cities.

2. Increasing income of migrant workers

At present, the average annual income of migrant workers is 24192 yuan, which has 4488 yuan more than last year with a growth rate of 22.9%. The rising incomes not only enable migrant workers to buy commodity houses in cities, but also them more confident about the life in cities. Thus they are willing to improve their houses conditions as well as buy commodity houses in cities which have better living conditions.

3. with the development of urbanization, psychology patterns of consumption between migrant workers and citizens resemble with each other.

According to 《"income paradox" of migrant workers in fusion with cities》 (2007 Meng Yingying Deng Dasong), with the progress of fusion between migrant workers and cities, incomes of migrant workers continue to increase, but not to promote the degree of process of fusion. In fact, there is still a low level of self-concept about fusion of them, which means there is a decreasing trend in income's elasticity for fusion. However, migrant workers (especially the new generation of migrant workers) want to merge into the city, and achieve the public identity, they choose to change their conversational consumer attitudes and patterns into public's patterns, for example, they pay more and more attention to the quality and taste of the goods, and prefer more comfortable, fashionable, convenient commodity houses in order to improve their standard and quality of life.

4. They prefer cities with a wealth of educational resources when choosing the area for children to be educated

Data from 《Hubei Statistical Yearbook》 show that, although the number of schools in rural areas is twice than that in urban areas in compulsory education, that does not mean that rural education have advantages. First, some schools in rural have fewer attendance and lower rate of resource utilization, while other schools have too heavy burden, which causes irrational distribution of educational resources; Second, with the restrictions of rural economy, natural conditions and different inputs in education resource from our country, rural areas have shortages about infrastructure and faculty; Third, due to the low average level of knowledge and the barrier of natural or economic factors on the dissemination of information in rural areas, the poor concept, contents and methods of education are not conducive to cultivate comprehensive talented. In fact, migrant workers who live in cities for a long time have broader vision, and know the fact that knowledge can change the fate of a person. Therefore hoping that their children could change their lives by knowledge, they would make children receive education in the city equipped with high quality, and purchase commodity houses in cities to create a good learning and living conditions for their children.

5. The access of household registration as a citizen helps to improve welfare policy for migrant workers' accommodation

In August of 2008, Hubei province formally carry out the reform of the household registration system, and part of it is as follows: except for the Wuhan central city, workers who have stable employment and fixed residence in counties (cities) in Hubei and prefecture-level city, towns, and far town in Wuhan can obtain urban account, and enjoy the same right of employment, social security, compulsory education for children with citizens. That is to say, as long as migrant workers have a fixed residence

and a stable work, they can obtain urban account, so as to enjoy the same priorities as the urban residents. Therefore, in the urbanization process, purchase of commodity houses is the best choice for the migrant workers who need obtain account and above priorities; Besides, the acquisition of the household registration can help migrant workers gradually be incorporated into the coverage of national housing welfare policy, which can reduce the cost of loans on houses and enhance confidence in purchasing houses.

6. It is badly needed to realize social harmony and stability

Migrant workers are the economic pillar of their family, and had to work in the places far away from home, even they cannot go home throughout a year. Therefore, the children of them have to stay home, only getting companionship and care from the old. Because these children are still in growth, lack of love from parents for a long term will lead to great difficulties in learning, life and developing good characters. According to a survey, occurrence rate of psychological problems of rural children was 21.6%, which means that one in five children will have a psychological abnormality, over time; it will lead to the disintegration of families and even social harmony and stability. As parents, migrant workers need to solve this problem, and the country also needs to provide appropriate fundings to improve this situation. However, the best solution is to make the family merge into the city, into the city life, thereby eliminating geographical restrictions as well as reaching a balanced

point between work and family. In this way, stable and long-term commodity houses that can guarantee a certain living standard is indispensable.

二. To establish the expenditure percentage model for commodity houses and predict the time when most peasant workers are willing to buy them

In the first part of this article, we have summarized both subjective and objective factors to analyze why the migrant workers in the city have strong will to purchase commodity houses, and we can easily draw the conclusion: in the coming future, migrant workers are going to make their strong will realized and do purchase commodity houses to live a better life. But when it comes to be realized so as to let the demand for commodity houses be ever-increasing and finally reach a high tide? We will answer the questions in this part by establishing the expenditure percentage model for commodity houses with which we can calculate actual relative data.

(一) The grey GM (1, 1) model will be used to forecast the future prices houses

To predict when migrant workers are going to purchase commodity houses, we need to know the exact price of houses in average, which is evaluated by a valid model of grey GM (1, 1).

As the record of “statistics yearbook of Hubei province in China”, we are informed of real data of house prices in average of years from 2001 to 2011 (table 1) :

Table 1 house prices in average of years from 2001 to 2011 (yuan per square meter)

year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
<i>k</i>	1	2	3	4	5	6	7	8	9	10	11
House prices in average	1632	1896	2234	2351	2667	3345	3823	5463	6602	6196	6273

(note: in order to simplify the calculation, we use *k* to stand for a certain year, for example, when *k* = 1 , *k* stands for the year of 2001; when *k* = 2 , *k* stands for the year of 2002; so on.)

If we analysis data by GM(1,1), we can do that like this:

$$y_n = (x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), x^{(0)}(4), x^{(0)}(5), x^{(0)}(6), x^{(0)}(7), x^{(0)}(8), x^{(0)}(9), x^{(0)}(10), x^{(0)}(11))^T$$

$$= (1632, 1896, 2234, 2351, 2667, 3345, 3823, 5463, 6602, 6196, 6273)^T$$

Accumulate n figures before term by term:

$$x^{(1)} = (x^{(1)}(1), x^{(1)}(2), x^{(1)}(3), x^{(1)}(4), x^{(1)}(5), x^{(1)}(6), x^{(1)}(7), x^{(1)}(8), x^{(1)}(9), x^{(1)}(10), x^{(1)}(11))$$

$$= (1632, 3528, 5762, 8113, 10780, 14125, 17948, 23411, 30013, 36209, 37982)$$

We will calculate by this differential equation:

$$\frac{dx^{(1)}}{dt} + ax^{(1)} = u$$

We can get the prediction function:

$$\hat{x}^{(1)}(k_1+1) = \left[x^{(0)}(1) - \frac{u}{a} \right] e^{-ak_1} + \frac{u}{a} \quad (k_1 = 11, 12, 13 \dots n, \text{ meanwhile } n \geq 11)$$

$$\hat{x}^{(0)}(k_1+1) = \hat{x}^{(1)}(k_1+1) - \hat{x}^{(1)}(k_1) \quad (k_1 = 11, 12, 13 \dots n, \text{ meanwhile } n \geq 11)$$

Calculating the prediction function with the numeric value of $x^{(1)}$ and y^N , it is easy for us to predict the mean values of house prices year by year after 2011 in cities of Hubei province: (table 2)

Table 2 mean values of house prices each year from 2012 to 2041 in cities of Hubei province (yuan per square meter)

(note:

year	2012	2013	2014	2015	2016	2017
k_1	11	12	13	14	15	16
P_{k_1+1}	6583.6	7148.2	7760.8	8425.2	9147.2	9931.5
year	2018	2019	2020	2021	2022	2023
k_1	17	18	19	20	21	22
P_{k_1+1}	10781.7	11705.4	12709.1	13797.7	14979.9	16263.2
year	2024	2025	2026	2027	2028	2029
k_1	23	24	25	26	27	28
P_{k_1+1}	17656.6	19169.5	20811.9	22595.2	24530.8	26633.3
year	2030	2031	2032	2033	2034	2035
k_1	29	30	31	32	33	34
P_{k_1+1}	28914.6	31392.0	34082.0	37001.7	40172.5	43613.3
year	2036	2037	2038	2039	2040	2041
k_1	35	36	37	38	39	40
P_{k_1+1}	47351.6	51408.5	55811.2	60595.9	65787.7	71421.5

$k = k_1 + 1$, in which the definition of k is the same with that in note of table 1, which means we use k to stand for a certain year, for example, when $k = 1$, k stand for the year of 2001; when $k = 2$, k stand for the year of 2002; so on.)

(二) Establishing the expenditure percentage model for commodity houses

Due to the high house prices, the expenditure percentage (that is a proportion of between gross discount value of buying houses by installment and gross discount value of migrant workers incomes during the same period) has been higher. But if this proportion obtained by calculating is higher than the one that migrant workers choose basing on their actual situation and expected proportion, namely the ratio between gross discount value of buying houses by installment and gross discount value of migrant workers incomes exceed the upper limit that migrant workers can withstand, they will realize that expenditure of houses affects the consumption for other goods or services, which, to some degree, reduces their life levels. Therefore, they will seek for lower-cost housing model instead of buying expensive commodity houses in cities, for example, as the first part mentioned, they can live in dormitories provided by the employers, or in the work shed of building site, or in the houses hiring with others etc. If the proportion is less than or equal to level expected, it is natural for them to think that expenditure for houses do not lower their living standard and there are even more chances to make lives better, thus they will choose to buy a house in cities. Form this point, the key for migrant workers to decide when to buy houses is due to the time when the actual expenditure percentage will be lower than or equal to the one expected. Based on the statement above, we can calculate the actual expenditure percentage by setting up the expenditure percentage model and get the proportion expected by analyzing effective questionnaire data to estimate the time when migrant workers will buy their houses.

Now we can set up the expenditure percentage model:

Firstly, we need to give the definition of variety mentioned. P_k is the mean of house prices in the year which k stand for in cities of Hubei province; S is average housing area (square meters); R is the gross income of each family of migrant workers during 2011; r is the growth rate of gross incomes per family during a year; M_k is the actual expenditure percentage for buying houses by installment during the year represented by k ; B is the net income ratio through providing a loan; h is the expected length of period during which migrant workers have been repaying the loan period to period; i is the bank lending rate in 2012.

The expenditure percentage model for commodity houses can be described in this way:

$$M_k \left[\frac{R(1+r)^{k-11}}{(1+i)^0} + \frac{R(1+r)^{k-10}}{(1+i)^1} + \dots + \frac{R(1+r)^{k+h-12}}{(1+i)^{h-1}} \right] = P_k S (1+B+0.5\%) + (1-\frac{3}{10}) * 0.3\% P_k S$$

In the right side of this model: $P_k S$ is house price for the year represented by k ; $P_k S B$ is the profit of bank for proving loan to migrant workers who want to buy a house with the price of $P_k S$; $0.5\% P_k S$ is the stamp duty (stamp duty rate * commodity house price) that the person buying commodity house need to pay, meanwhile 0.5% is stamp duty rate; $(1-\frac{3}{10}) * 0.3\% P_k S$ is attorney's fee that people need to pay when they buy houses by installment

(0.3% of the loan), because thirty percent of house price needs to be paid as down payment, the house price without down payment is loan value; therefore, the right side of the equation is the total cost for the migrant workers to pay for commodity houses (note: here is a difference that installment should be paid discretely in accordance with the time sequence, but in order to establish model, we calculate the total cost at a time in the year represented by k).

In the left side of this model: $\frac{R(1+r)^{k-11}}{(1+i)^0}$ is discount value of in the year represented by k ; $\frac{R(1+r)^{k-10}}{(1+i)^1}$ is the discount value in the year represented by k of family income in the year represented by $(k+1)$; $\frac{R(1+r)^{k+h-12}}{(1+i)^{h-1}}$ is the discount value in the year represented by k of family income in the year represented by $(k+h-1)$; in this way, $\left[\frac{R(1+r)^{k-11}}{(1+i)^0} + \frac{R(1+r)^{k-10}}{(1+i)^1} + \dots + \frac{R(1+r)^{k+h-12}}{(1+i)^{h-1}} \right]$ is the sum of discount value in the year represented by k of family income from the year represented k to the year represented $(k+h-1)$; therefore, according to the definition of M_k , the left side of the equation equals to the total discount value of expenditure for buying a commodity house .

This model can be used to calculate the actual expenditure percentage M_k . To simplify the model and make it countable, we can give some reasonable and meaningful hypotheses:

1. The income of migrant workers will have been increasing in linear trend. With the development of economy, people's income distributed by the society will increase, therefore, the continuous growth of the income can be realized; Through observing the plot of incomes year by year, the income growth can be approximately considered as linear growth, therefore, continuing and linear growth can be used to solve problems with practical significance.

2. The expected expenditure percentage is still for a certain time, that is to say, consumption of migrant workers is proportional to income. In the consumption function theory, the relationship between income and

consumption can be approximately viewed as linearity, of which the expression is $c = a + by (0 < b < 1)$. Therefore, that the percentage stays still in a certain period is reasonable.

3. The bank lending rate is relatively steady in a certain period. Bank's income mainly comes from profits of providing loans, and as the carrier of national monetary policy implementation, banks make tremendous impacts on economy. Therefore, that the bank lending rate remains relatively stable is theoretically and practically significant in a certain period of time when the economy remains relatively gentle.

4. The family that have been investigated have two sources of income (men and women in adult are the family's main sources of income). In this model, R is the gross income of each family of migrant workers during 2011, including the two income sources. Firstly, their old parents usually live in the countryside, and make a living by farming, in most cases, the old parents still need help from migrant workers in financial, therefore, they have less active influence on income of whole family. Secondly, here we focus on core family so as to take no account of the old parents. From this perspective, the hypotheses is reasonable.

(三) Based on the prediction of house prices in average and the expenditure percentage model for commodity houses, we can analyze when the migrant workers will purchase commodity houses.

Before we calculate the actual expenditure percentage for commodity houses, it is necessary for us to identify the varieties and determine the values of them according to the valid questionnaire, " Hubei statistical yearbook " and " China statistical yearbook " : expenditure percentage expected is less than or equal to $M^0 = 19.559\%$; the growth rate of gross incomes per family during a year is $r = 0.10737$; the expected length of period during which migrant workers have been repaying the loan period to period $h = 30$ years; the gross income of each family of migrant workers during 2011 $R = 49600.8$ yuan; average housing area $S = 80$ square meters; the net income ratio through providing a loan $B = 45.5422\%$; the bank lending rate in 2012 is $i = 7.05\%$. Let us take these values into model for calculation, we can get results as follows (table 3) :

Table 3. Results of calculation

year	k	Left side of equation	Right side of equation	year	k	Left side of equation	Right side of equation
2012	12	2809546.815	770292.7871	2027	27	12972616.5	2643678.168
2013	13	3111207.857	836351.9808	2028	28	14365486.34	2870146.774
2014	14	3445258.244	908027.259	2029	29	15907908.6	3116142.975

2015	15	3815175.622	985763.2284	2030	30	17615940.75	3383059.09
2016	16	4224811.028	1070238.499	2031	31	19507364.31	3672919.25
2017	17	4678428.988	1162002.979	2032	32	21601870.01	3987653.984
2018	18	5180751.909	1261477.876	2033	33	23921262.8	4329264.023
2019	19	5737009.241	1369552.402	2034	34	26489688.78	4700253.204
2020	20	6352991.924	1486987.068	2035	35	29333886.67	5102832.859
2021	21	7035112.666	1614355.184	2036	36	32483466.08	5540220.539
2022	22	7790472.713	1752674.665	2037	37	35971215.83	6014884.979
2023	23	8626935.769	1902823.023	2038	38	39833445.28	6530008.628
2024	24	9553209.862	2065853.276	2039	39	44110362.3	7089826.949
2025	25	10578938	2242865.238	2040	40	48846491.9	7697276.686
2026	26	11714798.58	2435028.929	2041	41	54091139.73	8356441.202

Using data above, we can calculate the actual installment M_k of each year afterwards (table 4): expenditure percentage for commodity houses by

Table 4 actual expenditure percentage for commodity houses M_k

year	k	actual expenditure percentage for commodity houses M_k	year	k	actual expenditure percentage for commodity houses M_k
2012	21	27.4169764%	2027	27	20.3789125%
2013	22	26.8819063%	2028	28	19.9794612%
2014	23	26.3558548%	2029	29	19.5886402%
2015	24	25.8379515%	2030	30	19.2045326%
2016	25	25.3322218%	2031	31	18.8283727%
2017	26	24.8374611%	2032	32	18.4597629%
2018	27	24.3493203%	2033	33	18.0979744%
2019	28	23.8722363%	2034	34	17.7437087%
2020	29	23.406091%	2035	35	17.395693%
2021	21	22.947112%	2036	36	17.0555092%
2022	22	22.4976677%	2037	37	16.7213836%
2023	23	22.0567659%	2038	38	16.393281%
2024	24	21.6247032%	2039	39	16.0729284%
2025	25	21.2012325%	2040	40	15.7580952%
2026	26	20.7859223%	2041	41	15.448817%

The expenditure percentage expected is 19.559%, and according to table 4, the percentage predicted is 19.5886402% in 2029, which is more than percentage predicted; the percentage predicted is 19.2045326% in 2030, which is less than percentage predicted. Therefore,

migrant workers will averagely choose to purchase commodity houses in 2030.

一、The deficiencies of the model and research directions of future

In order to calculate the actual expenditure percentage to compare with the one expected by migrant workers, we have established the expenditure percentage model for commodity houses. First of all, the establishment of the model is based on some reasonable hypotheses. Although hypotheses are rational in some sense, we still ignore some possible situations. For example, supposing a migrant worker income has linear growth, which means r (income growth rate) remains unchanged. This hypothesis depends on the steady development of our economy and unchangeable income of migrant workers. If there happen rises and falls during a period, or migrant workers increased skills so as to get higher incomes, or they can obtain extra incomes, or the policy for them has changed, this hypothesis will be negatively affected. The second hypothesis requires consumption of migrant workers is proportional to income. In theory, the hypothesis is right, but it is not ruled out that migrant worker will save lots of money in real life, or prefer to buy luxury goods. In this way, as their income increase, their expenditure may remains unchanged, or appears to be increasing by multiplier. The third hypothesis is about the bank lending rate i is relatively steady in a certain period, the premise of which is also stable development of economy and capital can circulate in market freely, so there is no need for government to change the loan interest rate to adjust the market. However, it is difficult to achieve. What is more, this model has omitted some tiny factors. For example, the right side of the equation model means that the total cost for commodity house by installment at a time in the year represented by k , in which we have taken account into house price, loan, stamp duty, attorney's fee, which will cost a lot comparatively, however, some cost of small amount is omitted, such as commission fee, transportation fee, and time cost, etc. Finally, some expected values in model (the expenditure percentage expected, the expected length of period during which migrant workers have been repaying the loan period to period and average housing area) is based on sampling survey, which will be greatly influenced by finance, human and material resource.

To improve the analysis of this topic, we have two research directions in the future: one is to increase the random variables on the basis of existing model and provide variables more accurate values by using regression and grey prediction model; The other is to

make deep research about the effect on real estate market after migrant workers' expenditure for commodity houses in 2030, and to give corresponding policy recommendations, hoping this study can be helpful for smooth development of the real estate market and will improve people's standard of life.

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