An Empirical Analysis of the Impact of Disposable Income of Urban Residents on Consumption Expenditure in Beijing

Jia-Nan BAO

Central University of Finance and Economics, 39 South College Road, Haidian District, Beijing, China
baojianan2013@163.com

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Abstract. This paper analyzed the effect of per capita disposable income on the per capita consumption expenditure of urban residents in Beijing based on the urban residents' per capita disposable income and per capita consumption expenditure in Beijing from 1990 to 2015, by using the linear regression model based on Keynesian consumption function. And discovered that there are high dependency and put forward relevant suggestions to improve the per capita disposable income of urban residents in Beijing.

Introduction

Since thirty years of reform and opening up, the economy develops fast in China. The direct benefit which the rapid development of economy brings is the significant increase of people’s disposable income, thus causes the consumer expenditure increases fast, people’s living standard is improving day by day. Consumer demand, as one of the “three carriages” driving economic growth, is of great importance to the economic development.

Although in the past two years, the central promotes the structural reform of supply-side, focuses on cutting excessive industrial capacity, destocking, de-leveraging, reducing the cost and making up the short board vigorously, but this does not mean that the government has neglected the role of demand especially consumer demand for economy. Supply and demand, as the two aspects of economic development, are indispensable. If the supply is away from demand, it will lose power and goals. And if there is demand without the supply, it will cause structural imbalance, the effective demand can’t be met. Therefore, in the context of the supply side reform, we still can’t ignore the consumer demand.

Beijing, as the political and economic center of China, whether the level of urban residents’ disposable income or consumer expenditure are among the highest in the whole country. The research on the change trend and correlation between the consumer expenditure and the disposable income of urban residents in Beijing has important practical significance to increase the income of residents and improve the living standard.

Based on statistical data of disposable income and consumer expenditure of urban residents in Beijing during the year of 1990-2015, this paper made an empirical analysis by using Keynes’s absolute income hypothesis model and the method of unitary linear regression.

Model Analysis

The Hypothesis Model of Absolute Income

The Absolute Income Hypothesis is a hypothesis of Keynes' research that consumer demand changes according to the absolute change of income level, that is, Keynes thinks that consumption is current income and is a function of absolute income. The mathematical formula is:

\[ C_i = a + bY_i \]  \hspace{1cm} (1)
Ci represents the current consumption expenditure, Yi represents the current income. a is essential for spontaneous consumption, that is, the consumption is still to be carried out in the case of absence of income. b is the marginal propensity to consume, marginal propensity to consume = change in consumption/change in real income. The mathematical formula is:

\[ \text{MPC} = \frac{\Delta C}{\Delta Y} \quad \text{or} \quad b = \frac{\Delta C}{\Delta Y}. \]  

(2)

The economic implication of the absolute income hypothesis is that spontaneous consumption demand and induced consumption constitute the total expenditure of consumption. With the increase of absolute income, the consumption will also increase. But the increase of consumption is less than the increase of real income and the marginal propensity to consume itself is decreasing with the increase of income.

**Simple Linear Regression Model**

Analytical method of simple linear regression model is one of the most commonly used methods in statistical analysis. It is established the linear regression model by regression analysis of two variables which may have linear relationship under the premise of enough sample data. In this model, there are two variables, the independent variable (usually written as X) and the dependent variable (usually recorded as Y). Simple linear regression is to study the influence of independent variables on the dependent variable.

The simple linear regression model is:

\[ Y_i = a + bX_i + \varepsilon_i \quad (i=1, 2, n). \]  

(3)

Thereunto, X represents the independent variable that variables can be controlled or adjustable. \( \varepsilon \) is a perturbation term. There are several reasons for adding perturbation terms, such as omission of explanatory variables, merging of variables or incorrect setting of models.

The overall regression equation is not directly observable. Generally, we collect data more often and obtain estimates of a and b from an integral sample. Then give the following relationship:

\[ \hat{Y}_i = \hat{a} + \hat{b}X_i. \]  

(4)

This relation is called the sample regression equation, \( \hat{a} \) and \( \hat{b} \) respectively are the sample estimators of the total parameters and \( \hat{Y}_i \) is considered as the estimate of Yi. By determining the sample regression equation, we can predict the Y value from the known X values.

The ordinary least square method is the most commonly used method to study the sample regression equation. The basic principle of OLS is that the best fitting a straight line minimizes the quadratic sum of the distances from each point to the straight line. From this, we can deduce that the estimated values of \( \hat{a} \) and \( \hat{b} \) are:

\[ \hat{a} = \frac{\sum y_i}{n} - b \frac{\sum x_i}{n}. \]  

(5)

\[ \hat{b} = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{n\sum x_i^2 - (\sum x_i)^2}. \]  

(6)

After the regression coefficients are determined, regression models are needed to verify the validity of the model. Among them, the significance test is one of the most commonly used tests and it is prior to make a hypothesis on the overall (random variable) parameters or the overall distribution of the form, and then use the sample information to determine whether this assumption (alternative hypothesis) is reasonable that is to determine whether the overall situation and the original hypothesis was significant differences. Or to say the significance test is to determine whether the difference between the sample and our assumptions about the total is purely opportunistic or caused by inconsistencies between our assumptions and the overall real situation.
In summary, simple linear regression analysis is a statistical method to deal with the relationship between the double variant. According to Keynes's Absolute Income Hypothesis, we can convert the relationship between consumption expenditure and income into a unitary formula:

\[ C_i = a + bY_i \]  

(7)

Therefore, we can use the simple linear regression to analysis the relationship between income and consumer spending.

The Positive Analysis

Data Selection

Here, we referenced the per capita consumption expenditure and per capita disposable income of urban residents in Beijing City from 1990 to 2015 as the object of study. Suppose that the per capita disposable income is \( X \) (independent variable) and the per capita consumption expenditure is \( Y \) (dependent variable).

Table 1. The statistical table of per capita consumption expenditure and per capita disposable income of urban residents in Beijing City from 1990 to 2015 (yuan).

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban per capita disposable income</th>
<th>Per capita consumption expenditure</th>
<th>Year</th>
<th>Urban per capita disposable income</th>
<th>Per capita consumption expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>1787.1</td>
<td>1646.1</td>
<td>2003</td>
<td>13882.6</td>
<td>11123.8</td>
</tr>
<tr>
<td>1991</td>
<td>2040.4</td>
<td>1860.2</td>
<td>2004</td>
<td>15637.8</td>
<td>12200.4</td>
</tr>
<tr>
<td>1992</td>
<td>2363.7</td>
<td>2134.7</td>
<td>2005</td>
<td>17653</td>
<td>13244.2</td>
</tr>
<tr>
<td>1993</td>
<td>3296</td>
<td>2939.6</td>
<td>2006</td>
<td>19978</td>
<td>14825</td>
</tr>
<tr>
<td>1994</td>
<td>4731.2</td>
<td>4134.1</td>
<td>2007</td>
<td>21989</td>
<td>15330</td>
</tr>
<tr>
<td>1995</td>
<td>5868.4</td>
<td>5019.8</td>
<td>2008</td>
<td>24725</td>
<td>16460</td>
</tr>
<tr>
<td>1996</td>
<td>6885.5</td>
<td>5729.5</td>
<td>2009</td>
<td>26738</td>
<td>17893</td>
</tr>
<tr>
<td>1997</td>
<td>7813.1</td>
<td>6531.8</td>
<td>2010</td>
<td>29073</td>
<td>19934</td>
</tr>
<tr>
<td>1998</td>
<td>8472</td>
<td>6970.8</td>
<td>2011</td>
<td>32903</td>
<td>21984</td>
</tr>
<tr>
<td>1999</td>
<td>9182.8</td>
<td>7498.5</td>
<td>2012</td>
<td>36469</td>
<td>24046</td>
</tr>
<tr>
<td>2000</td>
<td>10349.7</td>
<td>8493.5</td>
<td>2013</td>
<td>40321</td>
<td>26275</td>
</tr>
<tr>
<td>2001</td>
<td>11577.8</td>
<td>8922.7</td>
<td>2014</td>
<td>43910</td>
<td>28009</td>
</tr>
<tr>
<td>2002</td>
<td>12463.9</td>
<td>10285.8</td>
<td>2015</td>
<td>52859</td>
<td>36642</td>
</tr>
</tbody>
</table>
Figure 1 is the LnX and LnY timing diagram. The figure shows that the data curve in the 1992-1994 year segment and 2014-2015 year segment, there is a relatively large fluctuation that is rising faster. From the economic point of view, there have been more substantial income and consumption expenditure growth in the 1992-1994 year segment and 2014-2015 year segment.

The increase in income and consumption expenditure that began in 1992 was mainly due to changes in the macroeconomic environment. Since 1992, which is the year we established the socialist market economy system in China, the economic system reform has entered a new stage. The market has played an increasingly important role in the economic development, the income of the residents has also become more and more important with the development of the economy, the resident income is in a rapid growth with the good development of the economical situation and consumer spending has also increased.

The increase in consumption and incomes in 2014-2015 is mainly due to the corresponding policy changes of the Beijing Municipal Government. In 2015, Beijing has set a new minimum wage and corporate wage guidelines, an increase of job subsidies and social insurance subsidies. From January 1st, 2015, the enterprise retiree's basic pension, unemployment insurance and urban and rural low standard are continue to increase and the increase rate is about 10% that promoted the steady growth of the transfer net income of residents.

Combine the Figure1 and the above analysis, we can know that there is a time series of the data, the resulting regression analysis is likely to be inaccurate, so we need to be stable the data and then analysis it.

**ADF Test.**

ADF tests are performed on the sequence LnY and LnX and their first and second differential forms. The results are shown in Table 2.
Table 2. The results of unit root test of urban residents’ disposable income and consumption expenditure on numerical and differential sequence in Beijing from 1990 to 2015.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>ADF Value</th>
<th>Critical value</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnX</td>
<td>-2.342673</td>
<td>-4.374307</td>
<td>Non-Stable</td>
</tr>
<tr>
<td>DLnX</td>
<td>-2.036567</td>
<td>-3.737853</td>
<td>Non-Stable</td>
</tr>
<tr>
<td>D(LnX,2)</td>
<td>-3.788831</td>
<td>-2.669359</td>
<td>Stable</td>
</tr>
<tr>
<td>LnY</td>
<td>-1.953522</td>
<td>-4.374307</td>
<td>non-stable</td>
</tr>
<tr>
<td>DLnY</td>
<td>-2.460005</td>
<td>-3.737853</td>
<td>non-stable</td>
</tr>
<tr>
<td>D(LnY,2)</td>
<td>-4.111824</td>
<td>-2.669359</td>
<td>stable</td>
</tr>
</tbody>
</table>

From the test results, the t statistic of ADF test of LnX and LnY is greater than the corresponding threshold value at the significance level of 1%, so the null hypothesis of unit root cannot be rejected and the sequence is not stable. After the first difference of the original data, the sequence DLnX and DLnY are obtained and the t statistic of the ADF test is still greater than the corresponding critical value at the significance level of 1%, so the sequences DLnX and DLnY are not stable. (LnX, 2) and D (LnY, 2) are obtained after the original data is subjected to second-order difference. The t statistic of D (LnX, 2) and D (LnY, 2) is smaller than the corresponding critical value at the significance level of 1%, so D (LnX, 2) and D (LnY, 2) is stationary. Figures 2 and 3 represent the timing diagrams respectively for DLnX and DLnY, D (LnX, 2) and D (LnY, 2).

Figure 2. DLnX and DLnY timing diagram.
As can be seen from Figure 1, LnX and LnY have obvious time series rather than stationary series, cannot directly analyze the relationship between the two variables. As can be seen from Figure 2, DLnX and DLnY also have significant time series. From the timing chart of D (LnX, 2) and D (LnY, 2) shown in Figure 3, the time trend is eliminated basically and the unit root test which has been carried out above can basically prove the sequence is stable.

**Regression Analysis**

From the above we can see, there exist integrated of order two, D (LnX, 2) and D (LnY, 2), get the results of the regression by using the OLS method:

\[
D (LnY, 2) = 0.007285 + 1.015375 \, D (LnX, 2).
\]  
(8)

\(\begin{align*}
(0.686493) & \quad (5.609452) \\
R^2 &= 0.588523 & F &= 31.46596
\end{align*}\)

In term of the coefficient significance of D (LnX, 2), at the significance level of 1%, the probability (P) of the coefficient statistics (t) of D (LnX, 2) is 0, then at the significant level of 1%, the significance of coefficient statistics is not 0, shows that the per capita disposable income has a significant effect on the consumer expenditure. At the significance level of 1%, the probability (P) of the statistic (F) is 0, shows that the selected model is linear significant in the whole. \(R^2 = 0.588523\), the model’s goodness of fit is good. From the regression equation we can see, the current fluctuation of the disposable income of residents has a significant effect on the fluctuation amplitude of current consumption expenditure, that is to say, when the current disposable income of residents increases by 10%, the consumer expenditure will increase by 10.154%, the changes of disposable income will cause the changes of consumer expenditure in the same direction.
Conclusions and Policy Recommendations

According to the regression analysis of the per capita disposable income and per capita consumption expenditure of urban residents in the sample range of Beijing in 1990-2015, it shows that there is a long-term stable equilibrium relationship between the two economic variables, this also shows that the current consumer expenditure of residents in Beijing city is still determined by the disposable income, the income growth will greatly promote the sustained consumption growth of residents, in the long term.

Through the above empirical analysis, we put forward the following policy recommendations: First, increase the income of residents through a variety of ways, and promote the consumption of residents. We should increase residents’ property income from various channels, further improve the financial market in Beijing, especially the development of the capital market, and promote the structure diversification of the residents’ assets, focus on the transformation of economic growth mode. Beijing should make clear its position in the future economic development, and realize the adjustment of industrial structure, develop the third industry and high-tech industries vigorously, to increase employment, and absorb more labor, thereby improve the income level of residents and consumption levels.

Second, improve the social security system. Beijing municipal government should further expand the financial expenditure for the residents and reduce the worries about the residents’ consumption. With the growth of GDP, we should raise the pension of enterprises and institutions in time, expand the coverage of unemployment insurance and urban minimum living security, increase the financial assistance to special groups, and gradually increase the proportion of Medicare reimbursement, to reduce the economic burden of the residents.

Third, improve the income distribution system. We should narrow the income gap of urban residents in Beijing, regulate excessive income, enhance the income level of low-income groups, increase their consumption capacity, establish long-term normal wage growth mechanism, and strictly enforce the minimum wage, through the formulation of minimum wage system. Although the above empirical analysis has proved that the disposable income of residents has an important impact on consumer expenditure, but disposable income is not the only factor to boost consumer spending, the government should pay equal attention to the non-income factors, to actively foster consumption focus, improve the consumption environment, speed up infrastructure construction, such as trade, logistics, environment, and stabilize the order of market.

In the context of the supply-side reform as the core of the current macroeconomic operation, we still can’t ignore the stimulating effect of demand, especially consumer demand, on the economy. The combination of supply-side reform and the expansion of consumer demand will further promote the stability and balance of economic structure and achieve sound and fast economic development.


Reference


