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CONSUMER CONFIDENCE, NEWS AND CONSUMPTION STIMULATION

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Abstract

In the Chinese urban data, there is a stronger relationship between consumer behavior (measured by consumption income ratio or c/y ratio) and consumer confidence (measured by Consumer Confidence Index or CCI), which implies expectation about the future plays an important role in domestic demand. In our paper, a structural VAR method (based on Beaudry&Portier 2006 AER) is employed to identify the news shock about three markets including housing, education and medical care. We also extract the components in CCI about news shocks for those three sectors. After that, we conduct regression on c/y ratio against those components extracted from CCI, and find that the expectation on housing accounts more importance in consumption, education takes a second place and medical care has little effect.

1 Introduction

There is a huge literature, and a long tradition in macroeconomics research (such as Pigou (1927) and Keynes (1936) and Friedman (1957) and Lucas (1981)) suggesting that changes in expectation may be an important factor to affect the economic behavior. Recently, under the pressure of the worldwide financial crisis and exports declining, it is most urgent for Chinese government to take measures to stimulate domestic demand, which mainly consist

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of consumption. There is a widely consensus that housing, education, medical care are dominant factors in Chinese daily life. However, in the empirical research literature (especially for those based on structural VAR method) rarely exploits whether the news about these three markets have impacts on consumption. In this paper, we take a step in this direction by showing how the news shocks in conjunction with consumer confidence, can be used to shed new light on the forces stimulating the consumption.

In the economics theory (models under rational expectation framework), consumption depends not only on its history, say habit formation, but also on the future (looking forward behavior). This point can be verified from the Chinese data[1]. The variables we use here, are the ratio of consumption and permanent income[2] (denote as cyratio) which indicates the consumption behavior and consumer confidence index (CCI) which may contains some informations of consumers' expectation about future. We regress the difference of cyratio on its own lag term and CCI, say

$$\Delta cyratio_t = \alpha_1 \cdot \Delta cyratio_{t-1} + \alpha_2 \cdot \Delta CCI_t \tag{1}$$

Table 1 reports the estimation results, the number in parenthesis is standard deviation.

Table 1. Estimation Results of Equation (1)

α_1	-0.64	(0.25)
α_2	0.46	(0.19)

The results indicate that consumer confidence has a significant effect on consumption. And a significant α_1 implies consumption behavior is also captured by habit formation. The negative sign of α_1 shows that the rational consumers tend to smooth the intertemporal consumption, namely the more consumption the last period, the less consumption in current period[3]. Based on these results, the underlying policy implication is that the consumption can be fueled by future's favorable economic situation, and government can play a prominent role in guiding this expectation.

In China, the expenditures on housing, education, medical care account for the majority of the households' disposable income. Thus, we believe consumer confidence may mainly

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[1] Since only the rural data is unavailable, we only use urban data.

[2] This permanent income here is calculated according to Friedman (1957). The detailed discussion will be present in section 4.

[3] Note that in our estimation, cyratio takes difference form. In a non-difference case, we can rewrite our equation as:
$$cyratio_t = (1 + \alpha_1) \cdot cyratio_{t-1} - \alpha_1 \cdot cyratio_{t-2} + \alpha_2 \cdot CCI_t$$
Hence, as long as α_1 larger than -1, the coefficient before $cyratio_{t-1}$ is still positive.

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reflect the future expectations on the three aspects. Taking account of this, we employ the price indexes of housing, education, medical care associate with consumer confidence index to extract news shock about these three sectors.

The remaining parts of this paper are organized as follows. In Section I, we briefly introduce our econometrics method based on the paper Beaudry & Portier (2006), and define what is a news shock and what the features it should have. In Section II, we present our empirical model and its specification including the underlying logic. Section III implement our procedure using Chinese data from 2001-2008 monthly. In Sections IV, according to above analysis, we interpret policy implications and offer some constructive policy suggestions. Finally, Section V offers some concluding comments.

2 Structural VAR System for News Shock

This section will clarify what is a news shock by briefly introducing the paper Beaudry & Portier (Hereafter BP) (2006). In their seminal paper, BP first established a bivariate VAR system which contains Total Factor Productivity (TFP) and Stock Price (SP), say $\begin{bmatrix} \Delta TFP_t \\ \Delta SP_t \end{bmatrix}$ to identify the news shock about future's TFP. In their definition, a news shock about ΔTFP_t should have following features:

1. It has no impact on today's total factor productivity, say ΔTFP_t, but affect today's stock price.

2. It should be correlated with future's TFP, say ΔTFP_{t+j}, or equivalently it may have long-run effect on TFP.

To extract the component satisfies above two features, they first conduct following Cholesky decomposition on VAR system,

$$\begin{bmatrix} \Delta TFP_t \\ \Delta SP_t \end{bmatrix} = \Phi(L) \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix} = \Phi(L) \Sigma \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{2}$$

where $\Phi(L)$ is a vector polynomial of lag operator L. $\Omega(= \Sigma\Sigma')$ is the variance-covariance matrix, and Σ is called impact matrix, which is a lower triangle matrix taking the form of $\begin{bmatrix} \times & 0 \\ \times & \times \end{bmatrix}$. In this decomposition, the second innovation ε_{2t} has no impact on current ΔTFP_t, but changes today's stock price ΔSP_t. This point is consistent with the first feature of news shock mentioned previously. In order to verify ε_{2t} to be exactly a news shock, they conduct

another popular decomposition—Blanchard-Quah (BQ for short) decomposition, which is

$$\begin{bmatrix} \Delta TFP_t \\ \Delta SP_t \end{bmatrix} = \Phi\left(L\right)\widetilde{\Sigma} \begin{bmatrix} \widetilde{\varepsilon}_{1t} \\ \widetilde{\varepsilon}_{2t} \end{bmatrix} \tag{3}$$

to identify matrix $\widetilde{\Sigma}$, they impose a long-run restriction which setting the (1,2) element in matrix $\Phi\left(1\right)\widetilde{\Sigma}$ to zero. That is, only the first innovation $\widetilde{\varepsilon}_{1t}$ in system (3) has long run effect on TFP, which is reflected by stock price before it actually increases the productivity.

Now if ε_{2t} in first system (2) is truly a news shock about future's TFP, according to feature 2, it must be highly correlated with $\widetilde{\varepsilon}_{1t}$, or $\varepsilon_{2t} = \widetilde{\varepsilon}_{1t}$. As expected, in BP's paper, these two innovations are identical in a statistics sense[4].

One thing worth noting here, all the procedure of identification of news shock above are potentially based on two assumptions: Firstly, the second variable in VAR system should contain informations about future. Since stock price is the discounting value about future's profit flow, this assumption is satisfied. Second and also most important assumption is that the variable which news shock is based upon, must be exogenous with the economic system. Just as TFP, it is not affected by the equilibrium behavior. If this assumption is failed, then all the conclusions derived previously are incorrect. For example, suppose X_t is a variable in economic system (such as CPI), then a news shock about future's CPI may change today's equilibrium behavior, in turn affect current CPI. Thus, the Cholesky decomposition fails to extract the news shock about CPI. In the light of this, the variable TFP which indicates the technology state naturally satisfies the exogeneity assumption.

3   Our Empirical Issue

In this section, we concentrate on how to extract the news shock about housing, medical care and education section. The data we employ are price index of these three sectors and Chinese consumer confidence index (CCI), span from 2001 Jan to 2008 Dec, monthly[5]. Our interest in focusing on CCI , just as stock price in BP's paper, is motivated by the view that CCI is likely a good variable for capturing any changes in agents' expectation about future economic conditions. However, unlike the TFP which is exogenous from the economic system, price indexes are endogenous which means they are probably affected by the equilibrium behaviors. Thus, our first task is to obtain the relative exogenous part in price index. Throughout this

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[4]To further verify they are identical, BP also compare the impulse responses of TFP and SP with respect to them.

[5]Appendix A offers the details about our data.

section, we take housing price index (HPI for short) as an example, all the logic is similar to medical care and education sectors. To give a straightforward sight, we draw a diagram to demonstrate our strategy.

Figure 1. Logic Diagram of Our Model
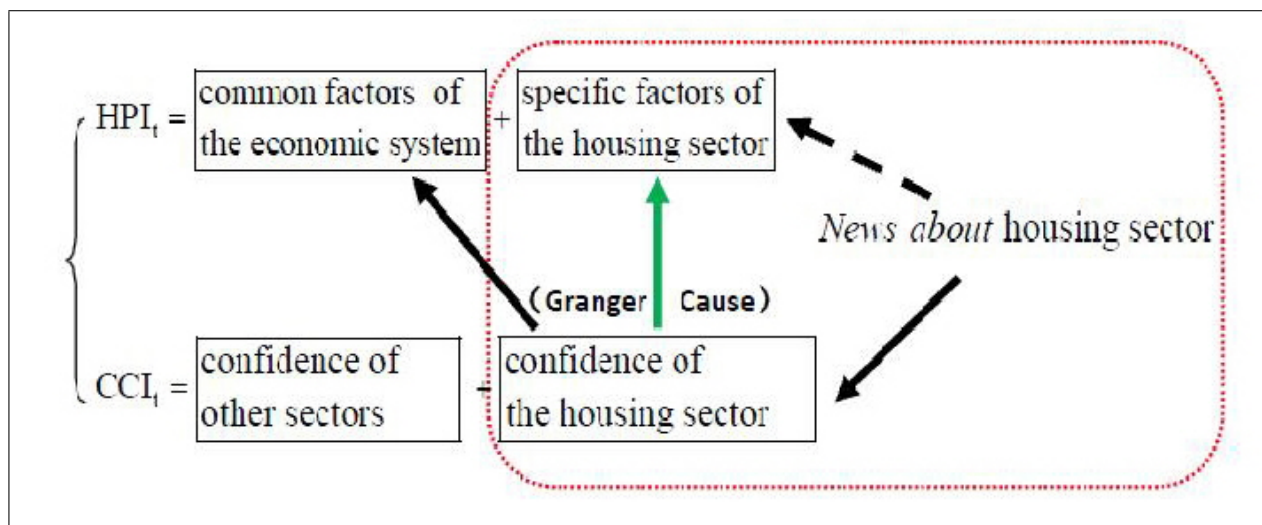
Note: The solid arrow means it has impact on today; the dotted arrow means it does not change today's value but may have effect in future; the green arrow means "Granger Cause"

First, the housing price index (HPI) can be divided into two parts: one is related to the common factors of the economic system, for example, a monetary shock will affect all the economic behaviors including those in housing market. Another part of HPI is related to the specific factors of this sector. These type of factors may be the government's industrial policy. For example, in order to improve the poor households' living condition, the Chinese government provide a large number of low-cost housing. Obviously, the policy itself does not directly depend on (which we call it exogenous) the equilibrium behavior in this economic system. For the consumer confidence index, it may also consist of two parts: confidence of the housing plus confidence of other sectors.

Now, the variables we plan to employ are the specific factors and the confidence of the housing sector, as the right parts of the rectangles. Denote them as IV_{HPI} and IV_{CCI}[6], respectively. Now consider there comes a news about future's IV_{HPI}, then by definition, it should have no impact on today's IV_{HPI_t} as the dotted arrow shows in Figure 1. Meanwhile, it should change today's consumer confidence, as the solid arrow shows. And the changed

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[6]The "IV" means instrument variable, since these two variables in our estimation play a same role as the traditional instrument variable.

CCI will in turn affect today's housing price through consumption (equilibrium behavior), this point is shown in our logic diagram (the left solid arrow). Furthermore, the component in CCI corresponding to this news shock will Granger cause housing price or IV_{HPI}, since CCI contains consumers' expectation on the future's IV_{HPI}, as the green arrow shows.

In order to obtain IV_{HPI} from HPI, we first conduct a Cholesky decomposition, which is[7]

$$\begin{bmatrix} X_t \\ HPI_t \end{bmatrix} = F\left(L\right) \begin{bmatrix} \times & 0 \\ \times & \times \end{bmatrix} \begin{bmatrix} \eta_{1t} \\ \eta_{2t} \end{bmatrix} \tag{4}$$

where X_t is the vector of other macroeconomic indicators. Since the IV_{HPI} as mentioned previously represents the specific factors in housing sector, it may be the component in housing price after eliminating the common factors in the economic system. Hence, our X_t contains interest rate, money supply (M_0) as well as other price indexes such as medical care, education, durable goods, communication etc. Then the IV_{HPI} is the component in HPI with respect to η_{2t}. And it does not contain the fundamental shocks to whole economy, since those types of shock will affect X_t and HPI_t contemporaneously.

By the same method, we eliminate the confidence about other sectors except for housing in CCI to get IV_{CCI}[8].

3.1 Extract and Identify the News Shock about Housing Price Index

Once we have IV_{HPI} and IV_{CCI} in hand, the Structural VAR as in Beaudry and Portier (2006) can be established (see the part embraced by the red dotted line in Figure 1) as follows

$$\begin{bmatrix} IV_{HPI_t} \\ IV_{CCI_t} \end{bmatrix} = \Phi\left(L\right) \Sigma \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{5}$$

where Σ is a low triangle matrix $\begin{bmatrix} \times & 0 \\ \times & \times \end{bmatrix}$, which has the same definition as in system (2). Note that the ε_{2t} here shares the first feature we have list in section 2, that is it has no impact on today's IV_{HPI_t}, but affect today's Consumer Confidence Index. However, the

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[7]The order of AR process we choose is twelve, which means lags one years.

[8]The SVAR we use here is as (4), that is $\begin{bmatrix} X_t \\ CCI_t \end{bmatrix} = H\left(L\right) \begin{bmatrix} \times & 0 \\ \times & \times \end{bmatrix} \begin{bmatrix} \eta_{1t} \\ \eta_{2t} \end{bmatrix}$, and vector X_t contains price index of other sectors except for housing. IV_{CCI} is just the component with respect to η_{2t}.

true news shock should be correlated with future's IV_{HPI_t}, to verify this, we conduct BQ decomposition:

$$\begin{bmatrix} IV_{HPI_t} \\ IV_{CCI_t} \end{bmatrix} = \Phi\left(L\right) \widetilde{\Sigma} \begin{bmatrix} \widetilde{\varepsilon}_{1t} \\ \widetilde{\varepsilon}_{2t} \end{bmatrix} \tag{6}$$

where the (1,2) entry of matrix $\Phi\left(1\right)\widetilde{\Sigma}$ is set to zero, which means $\widetilde{\varepsilon}_{2t}$ only has short-run effect on housing price index.

After calculating the correlation between ε_{2t} and innovations in BQ decomposition, we find it is highly correlated with $\widetilde{\varepsilon}_{2t}$ with the correlation coefficient 0.9531. Figure 2 plots ε_{2t} against $\widetilde{\varepsilon}_{2t}$.

Figure 2. Plot of ε_{2t} against $\widetilde{\varepsilon}_{2t}$ in the (IV_{HPI}, IV_{CCI}) system
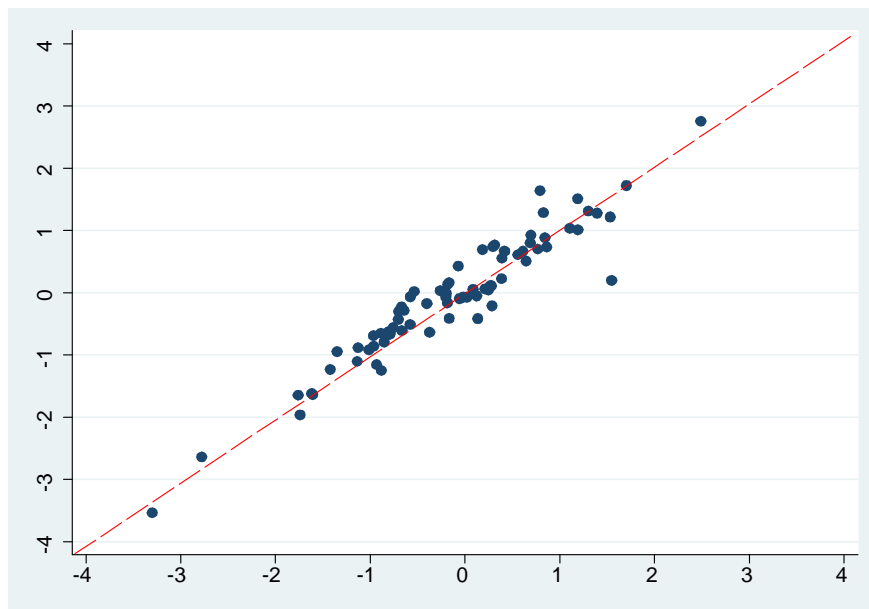
Notes: Both shocks are obtained from the bivariate specification (twelve lags). The straight line is the 45-degree line.

The highly correlation indicates two innovations ε_{2t} and $\widetilde{\varepsilon}_{2t}$ may share the same properties. For ε_{2t}, besides the instinctive feature Cholesky decomposition imposes upon it, it may have the characteristic that $\widetilde{\varepsilon}_{2t}$ bears. That is, ε_{2t} has no impact on today's IV_{HPI_t}, but affect today's Consumer Confidence Index, meanwhile, it is correlated with future's housing price index (in short run). This point can also be seen from the impulse responses to ε_{2t} and $\widetilde{\varepsilon}_{2t}$.

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Figure 3. Impulse Responses to Shocks ε_{2t} and $\widetilde{\varepsilon}_{2t}$ in VAR system (IV_{HPI}, IV_{CCI})
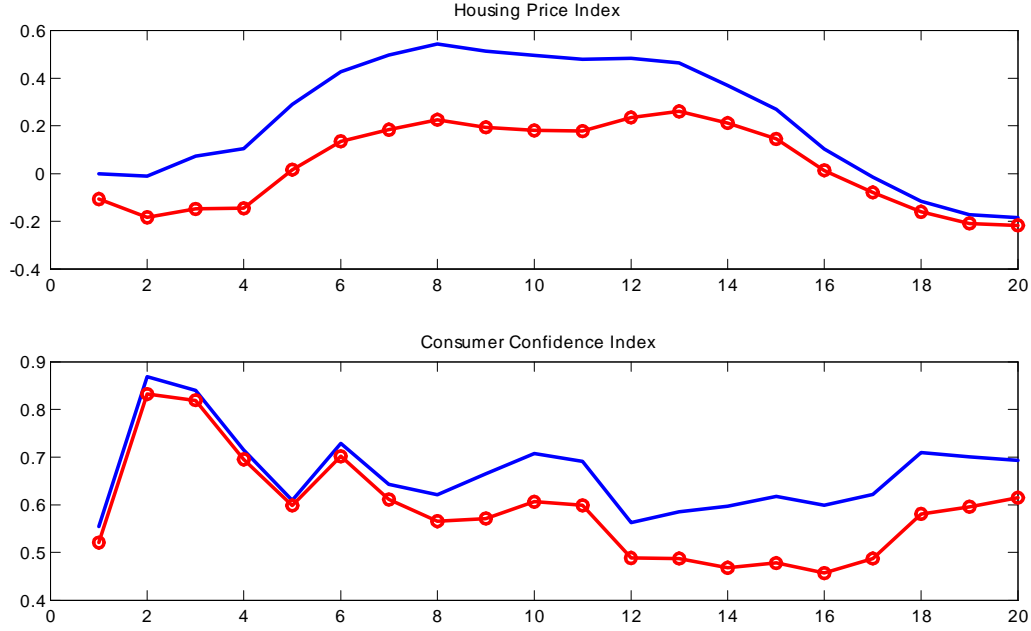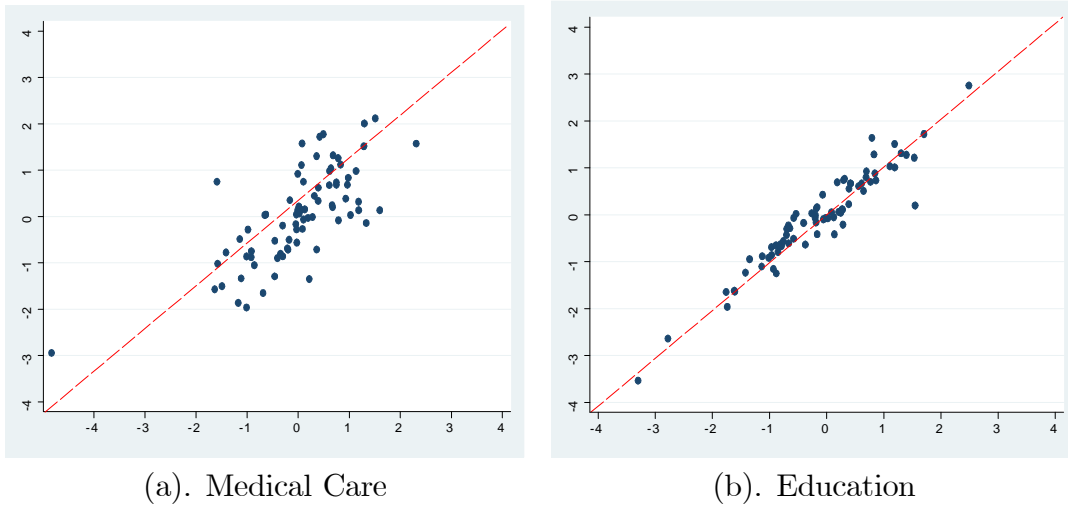

Notes: In both panels of this figure, the blue line represents the point estimate of the responses to a unit ε_2 shock (the shock does not have instantaneous impact on IV_{HPI} in the short-run identification). The line with circles represents the point estimate of the responses to a unit $\widetilde{\varepsilon}_2$ shock (the shock that has a short impact on IV_{HPI} in the long-run identification). Both identifications are conducted in the bivariate VAR representation. The unit of the vertical axis is percentage deviation.

The impulse responses in Figure 3 show that ε_{2t} and $\widetilde{\varepsilon}_{2t}$, to some extent, have the same dynamic effects on housing price and consumer confidence. We also perform a test whether IV_{CCI} Granger cause IV_{HPI} in VAR system (5) and we find such causality could not be rejected at 1-percent level. This result reflects that IV_{CCI} contains the information about future's IV_{HPI}.

Based on the above analysis, we conclude that the second innovation ε_{2t} in VAR system (5) satisfies all the characteristic of a news shock we have present in section 2, and it contains information about future's housing sector.

For the other two sector— Medical Care and Education, all the analysis are the same. To save the space, here we only report the correlationship and impulse responses just as shown in Figure 3 and Figure 4, as well as some estimation results.

Figure 4. Correlations Between ε_{2t} Against $\widetilde{\varepsilon}_{2t}$ for Different Price Indexes
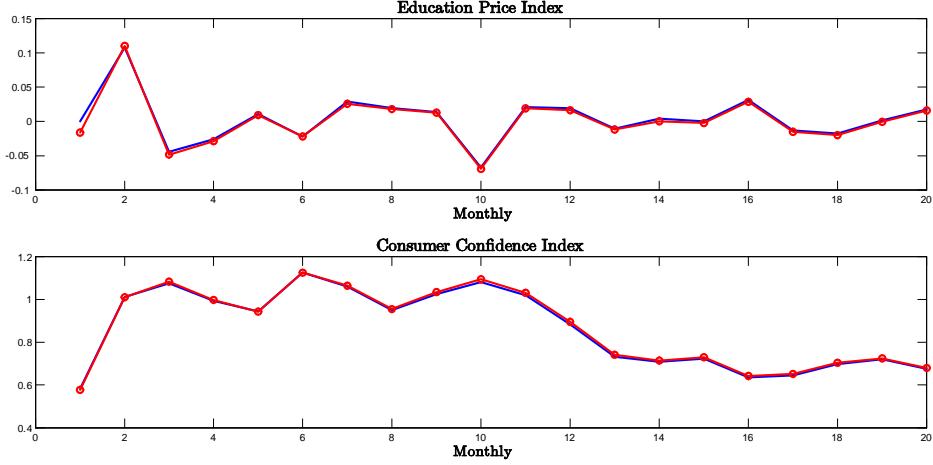

(a). Medical Care   (b). Education

Note: Both shocks are obtained from the bivariate VAR model, namely the (IV_{MPI}, IV_{CCI}) and (IV_{EPI}, IV_{CCI}).

Figure 5. Impulse Responses to Shock ε_{2t} and $\widetilde{\varepsilon}_{2t}$ for Different Price Indexes
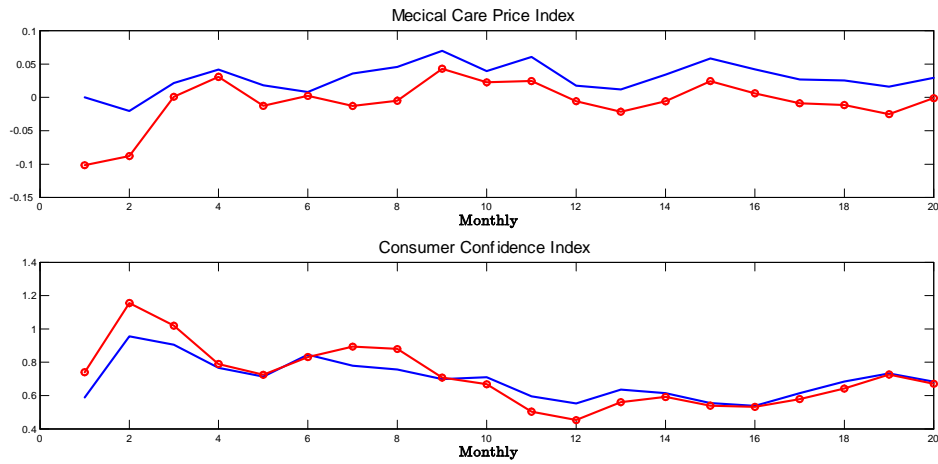
(a) Medical Care

(b) Education

Notes: In each panel of this figure, the blue line represents the point estimate of the responses to a unit ε_2 shock (the shock does not have instantaneous impact on price index). The line with circles represents the point estimate of the responses to a unit $\widetilde{\varepsilon}_2$ shock (the shock that has a short-term impact on price index). Both identifications are conducted in the bivariate VAR representation. The unit of the vertical axis is percentage deviation from the situation without shock.

Extract the Consumer Expectation

The consumer expectation about future is just the component in CCI with respect to news shock ε_{2t}, which can be extracted from following equation (taking housing as an example):

$$\text{Confidence of Housing Sector} = \sum_{j=0}^{\infty} \Phi_j^{21} \varepsilon_{1t-j} + \underbrace{\sum_{j=0}^{\infty} \Phi_j^{22} \varepsilon_{2t-j}}_{\text{Expectation About Housing}} \tag{7}$$

and denote the second part as Ex_Hou. Note that, the equation above is just the second row in VAR system (5). By the same definition, we can obtain consumers' expectation about other two sectors, denoting them as Ex_Med and Ex_Edu.

Next section, we will investigate whether the perspective about future, say Ex_Hou, Ex_Med and Ex_Edu may affect the consumption behavior (cyratio).

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4 Relationship Between Consumption and Consumer Confidence

In this section, we study the systems in which–EX_Hou, EX_Med, EX_Edu are simultaneously introduced to the AR model with a lagged term. For the system, we show results that is consistent with the economic intuition about dominant factors of consumption[10]. All the results we report in this section will be based, as in Section 2, on monthly data spanning from 2003 m1 to 2006 m12.

4.1 Why we use permanent income

In this paper, under the rational expectation hypothesis, we think consumers as forward-looking agents, whose consumption are determined by the permanent income[9] according to Milton Friedman(1957). From the news view, consumers who receive the news from outside, such as government policies, tend to recognize the news whether it will affect the permanent income. If the news shock only temporarily impacts income instead of permanent income, the consumers will possibly have no reactions on the government policy, because the future substitution effect will substantially exceed the temporary income effect. Hence, the government should implement the policies consistently and make good contribution to build up the credible reputation. As a forward-looking consumer, it is reasonable to assume that the permanent income plays a dominant role in enhancing consumers' confidence. Now that permanent income has strong relationship with consumer confidence, which is consistent with economic intuition, then we can acquire the real government policies' effect on individuals' consumption. Furthermore, we take consumption-permanent income ratio (cyratio) as dependent variable after log-difference adjustment.

4.2 Run cyratio against EX_Hou, EX_Med, EX_Edu

In order to evaluate the relative importance of news shock from different sectors, we run cyratio against EX_Hou, EX_Med, EX_Edu using AR model with a lagged term[10].

$$\Delta cyratio_t = \underset{(0.24)}{-0.62^*}\Delta cyratio_{t-1} + \underset{(1.42)}{4.41^*}EX\_Hou_t + \underset{(0.97)}{1.66}EX\_Med_t + \underset{(0.98)}{3.34^*}EX\_Edu_t \quad (8)$$

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[9]Using the calculation method of permanent income according to Milton Freidman (1957), as is shown by $YP_t = 0.6 * Y_t + 0.24 * Y_{t-1} + 0.16 * Y_{t-2}$, where YP_t denotes permanent income calculated at t period, Y denotes real income of consumers.

[10]Here, to overcome the potential multicorrelation problem, we take a two-step regression. First, we run a certain explanatory variable against the rest, obtaining the residual of the explanatory variable, and the other residuals can be obtained similarly. Second, we run cyratio against the three residuals to obtain the above equation.

Note that the number with asterisk means significant under 5% level.

The regression equation reveals three illuminating results as follows. Firstly, the rational consumers tend to smooth intertemporal consumption, who will take the information and its uncertainty into account to adjust their intertemporal decisions after receiving news shock. Secondly, the confidence on the three sectors plays different role in consumption expenditure, and it suggests that the housing is the primary concern for urban residents, the secondary is education, and the medical care seems to have little effect. The reasons for these phenomenons are that urban citizens are under the severe pressure of housing price soaring, and that urban citizens benefit more medical insurance from the relatively complete social security system compared those from rural. Thirdly, one minus average consumption propensity (APC) is equal to saving rate, which is negative to consumers' confidence according to the regression, which reveals that caution motivation can account for the high saving rate in China, namely, the less pessimistic towards future, including future economy development, individuals' future income etc., the more savings of consumers.

For robustness, we also conduct a sensitivity analysis–running another measured cyratio[11] against consumers' confidence, and the result suggests that the regression analysis is rather robust.

5   Policy Implications

The strong relationship between consumption and consumers' expectation on housing, education and medical care sectors gives evidence to support the fiscal policies conducted by Chinese government in these industries. That is the policies, such as offering a large number low-rent housing, launch a series reforms in social security system and educational system, do have positive effect on stimulating consumption. In addition, since the results are based on the urban data, the individual impact of these three factors on consumption are subject to different rank, say from serious to light level, they are housing, education and medical care. This relative importance implies that, in order to enhance the urban's consumer confidence, the government should take more active measures to reduce the uncertainty for future in the first two industries, say housing and education.

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[11]In order to check the robustness of our model, we choose another calculation method of permanent income. Using the same weights summation, $YP_t = 0.5 * Y_t + 0.5 * Y_{t-1} + 0.5 * Y_{t-2}$, where YP_t denotes permanent income calculated at t period, Y denotes real income of consumers. The following regression equation reports the regression results for consumer confidence (CCI) components incorporating news shock from the three different industry, such as housing, medical care, education.

6   Conclusion

In this paper, we have presented properties of the joint behavior between three price indexes of housing, medical care ,education and consumer confidence, which emphasize potential changes for future's economic condition. In particular, we first obtain relative exogenous components of these variables using Choleski decomposition, and then we present two orthogonalized moving representations for them: one based on an impact restriction and one based on a long-run restriction. We then examine the correlation between the innovations that induce the short-term movements in the three sectors' prices and the innovation which is contemporaneously orthogonal to price indexes. We found this correlation to be positive and almost equal to one, indicating that the innovation we obtain from bivariate VAR system has two characteristics: it has no impact on today's price index but affect today's consumer confidence, meanwhile it has short run effect on future's price. In addition, we show how this highly correlated relationships can be verified by the identical impulse response functions. Moreover, we discussed how important role the consumers' expectation on different industries plays in consumption expansion. The results suggest that anticipation about future on these three sectors do have significant effect on consumption behaviors. In addition, the significant coefficients in equation (8) can be used to explain why China has a high saving rate (1-cyratio). This finding also gives evidence to support the current bailout measures carried out by Chinese government. Finally, our finding provides some suggestions on those models which perform policy analysis: agents' expectation about future should be taken into accout, since the agents have the ability to anticipate future's economic condition, and may react to the policy before its implement. This type of expectation do have significant effect on their current behavior.

7   References

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8   Appendix

Data and Specification Issues

Our empirical exercises adopted Chinese data from the period 2001-M1 to 2008-M12 (retrieved from Chinese National Bureau of Statistics). The four series that we are interested in for our bivariate VAR analysis are indexes of the three sectors, such as housing, medical care, education, and an index of consumer confidence. Later, we will conduct a consumption-income ratio (cyratio) regression on consumer confidence towards the three sectors, and we also present the source of related data.

The three price indexes we adopt are the monthly data, which firstly is adjusted seasonally and transformed into gross rate by log-difference. We denote the log-differences of these indexes by ΔHPI, ΔMPI, ΔEPI.

The consumption (C) we use is the per capita value of real personal consumption of goods and services, including education, medical care, entertainment etc., while income (Y) is the permanent income different from total income. Here we differentiate consumers from urban and rural in order to recognize the different concerns between urban and rural residents. Using the calculation method of permanent income according to Freidman (1957), as is shown by

$$YP_t = 0.6 * Y_t + 0.24 * Y_{t-1} + 0.16 * Y_{t-2}$$

where YP_t denotes permanent income calculated at t period, Y denotes real income of consumers. Furthermore, we apply the same method to consumption and income through seasonal adjustment and log-difference sequentially. Finally, given consumption and income, we can easily obtain the cyratio. After the regression between cyratio and the consumers' confidence on the three sectors, we can interpret vividly the economic implications for coefficients, which stands the elasticity variation of cyratio to consumers' confidence on certain industry.