Japan and the World Economy 24 (2012) 292–304

Contents lists available at SciVerse ScienceDirect

Japan and the World Economy

journal homepage: www.elsevier.com/locate/jwe

News shocks and Japanese macroeconomic fluctuations☆

Jun-Hyung Ko[a,*], Kensuke Miyazawa[b], Tuan Khai Vu[c]

[a] The University of Tokyo, Hongo 7-3-1, Bunkyo-ku, Tokyo 113-8656, Japan
[b] Kyushu University, 6-10-1 Hakozaki, Higashi-ku, Fukuoka 812-8581, Japan
[c] Seikei University, 3-3-1 Kichijoji-Kitamachi, Musashino-city, Tokyo 180-8633, Japan

ARTICLE INFO

Article history:
Received 11 December 2011
Received in revised form 29 April 2012
Accepted 20 May 2012
Available online 5 June 2012

JEL classification:
E32

Keywords:
TFP
Investment-specific technology
News shock
SVECM
Sign restriction

ABSTRACT

Are the changes in the future technology process, the so-called "news shocks," the main contributors to the macroeconomic fluctuations in Japan over the past forty years? In this paper, we take two structural vector-auto-regression (SVAR) approaches to answer this question. First, we quantitatively evaluate the relative importance of news shocks among candidate shocks, estimating a structural vector-error–correction model (SVECM). Our estimated results suggest that the contribution of the TFP news shocks is nonnegligible, which is in line with the findings of previous works. Furthermore, we disentangle the source of news shocks by adopting several kinds of restrictions and find that news shocks on investment-specific technology (IST) also have an important effect. Second, to minimize the gap between the SVAR approach and the Bayesian estimation of a dynamic stochastic general equilibrium model, we adopt an alternative approach: SVAR with sign restrictions. The SVAR with sign restrictions reconfirms the results that the news shocks are important in explaining the Japanese macroeconomic fluctuations.

1. Introduction

Are news shocks the main source of the Japanese macroeconomic fluctuations? Previous works have presented different results. Beaudry and Portier (2005) employ a SVECM with a combination of long-run and short-run restrictions to divide the TFP shocks into surprise and news components. The news shock in their econometric model is the shock that does not have an impact effect on the current TFP but increases the future TFP several quarters after. They find that the estimated TFP news shock is a dark horse behind the Japanese macroeconomic fluctuations, and that a negative news shock occurred in the beginning at the 1990s which might have been relevant with the so-called "lost decade." Fujiwara et al. (2011) assess the importance of news shocks based on an estimation of a dynamic stochastic general equilibrium (DSGE) model using a Bayesian method. They introduced one-to-four-quarters-ahead TFP news shocks and find that the TFP news shocks are nonnegligible but minor in explaining the macroeconomic fluctuations in Japan.

The first purpose of this paper is to re-investigate whether news shocks are the major source of the Japanese macroeconomic fluctuations. As a first step, extending the two-variable SVECM in Beaudry and Portier (2005), we employ a SVECM with more variables so that TFP news shocks compete with other candidate shocks. This is to respond to the criticism that in a framework with too few shocks like that of Beaudry and Portier (2005), the role of news shocks might be overemphasized. In the benchmark case, we identify four shocks: surprise TFP shocks, IST shocks, TFP news shocks, and demand shocks. Following Beaudry and Portier (2005), we identify TFP news shocks by imposing a restriction that they do not have an impact effect, but might have long-run effects on TFP. Furthermore, we impose an additional restriction that they do not have long-run effects on IST. Our main finding is that TFP news shocks are the driving force of the Japanese economic fluctuations over the last 40 years, accounting for more than 50 percent of variances of hours worked and investment. However, the contribution to output and consumption is rather minor.

Furthermore, we disentangle the source of news shocks, which was not highlighted by previous studies. We adopt the alternative

☆ The first author is obliged to Tsutomu Watanabe, Etsuro Shioji, Makoto Saito, and Naohito Abe. We are grateful for comments and suggestions to Richard A. Braun, Matthias Doepke, Takuji Fueki, Gary Hansen, Minchung Hsu, Selahattin Imrohoroglu, Masaru Inaba, Kengo Nutahara, and the seminar participants at 2009 International Conference of Economic Growth, Dynamics, and Policies, at Macro Lunch Seminar in Hitotsubashi University, and DSGE seminar at Senshu University. The first author is supported by the project entitled: Understanding Inflation Dynamics of the Japanese Economy, funded by JSPS Grant-in-Aid for Creative Scientific Research (18GS0101). The second author is supported by a grant obtained by the Nihon University Population Research Institute from the "Academic Frontier" Project for Private Universities: matching fund subsidy from MEXT (Ministry of Education, Culture, Sports, Science and Technology), 2006–2010.

* Corresponding author.
E-mail addresses: kojunhyung@e.u-tokyo.ac.jp (J.-H. Ko), kensuke.miyazawa@gmail.com (K. Miyazawa), vtkhai@econ.seikei.ac.jp (T.K. Vu).

0922-1425/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.japwor.2012.05.004

identification schemes in line with Beaudry and Lucke (2010), where the news shocks include the news on IST as well as on TFP. Comparing their results with our benchmark case, we can assess the relative importance of news shocks to TFP and IST. We find that IST news shocks are another crucial factor in explaining postwar Japanese business cycles. This feature is not observed in the U.S. data by Beaudry and Lucke (2010).

Our second purpose is to compare the results of two different approaches: SVAR and the structural estimation of a DSGE model. Fujiwara et al. (2011) find that TFP news shocks play a minor role, explaining less than 10 percent of real macro activities in Japan. A direct comparison is difficult for several reasons. First, news shocks estimated by our SVECM are somewhat different from those in Fujiwara et al. (2011). Our estimated news shocks start to increase TFP around four to 32 periods after the stock market innovation, while the news shocks in Fujiwara et al. (2011) like other previous DSGE works are built until four periods ahead. Second, the treatment of the trend is different. In our SVECM, we assume the number of stochastic trends based on the Johansen cointegration test and explicitly incorporate the common cointegrating vector, while they examine the model around the deterministic trend. Third, Fujiwara et al. (2011) investigate only news shocks on TFP, while we also examine the role of IST news. Fourth, only four types of structural shocks are identified in our four-variable SVECM, while more types of shocks are identified in their DSGE estimation.

Therefore, to narrow the gap between these two approaches, we employ an alternative approach: SVAR with sign restrictions. SVAR with sign restrictions has the following strengths. First, in contrast to the SVECM approach, the dependent variables do not have to be set in a (log) differenced form because we do not need to rely on the long-run restriction in this case. Therefore, the discrepancy originating from the trend assumptions can be resolved. Second, the actual timing of the future TFP increase can be modified. In the DSGE literature, the timing is around one to four periods ahead, while those of our estimated news shocks in SVECM are from four to 32 periods.[1] Therefore, to identify the same types of news shocks in the VAR system, we follow the same assumptions made by the DSGE literature. Third, we are able to identify only a subset of the structural shocks and thus need to impose much fewer restrictions. This enables us to estimate a larger VAR with more variables. We estimate a seven-variable VAR model in level and identify news shocks as ones that increase TFP from one to four periods ahead. The estimated results under SVAR with sign restrictions lie between the results of our SVECM and those of Fujiwara et al. (2011), showing that the news shocks explain large portions of Japanese macroeconomic fluctuations. We also find that the contribution of news shocks is larger in the U.S. economy than in the Japanese economy.

The rest of the paper is organized as follows. Section 2 describes the SVECM system and data. The identification procedure and benchmark results are presented in Section 3, while Section 4 discusses the source of the news shocks. Section 5 conducts a robustness check. Section 5 also compares the results for SVAR with sign restrictions with those in Fujiwara et al. (2011), and Section 6 concludes.

2. Setup

2.1. SVECM

In this subsection, we briefly explain our SVECM. The basic model of order p has the form

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \Phi D_t + u_t, \tag{1}$$

where $y_t = (y_{1t}, \ldots, y_{Kt})'$ is a vector of K observable endogenous variables, A_is are $(K \times K)$ coefficient matrices, D_t is a deterministic term, and $u_t = (u_{1t}, \ldots, u_{Kt})'$ is a vector of unobservable error terms. We consider the case where the variables in y_t are integrated of order one. If these variables have a common stochastic trend, there is a possibility that one of their linear combinations is $I(0)$. When they are cointegrated, the vector error–correction representation of the process can be written as

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \cdots + \Gamma_{p-1} \Delta y_{t-p+1} + \Phi D_t + u_t, \tag{2}$$

where $\Pi = -(I_K - A_1 - \cdots - A_p)$ and $\Gamma_i = -(A_{i+1} + \cdots + A_p)$ for $i = 1, \ldots, p-1$. Because Δy_t does not contain stochastic trends, Πy_{t-1}, which must be $I(0)$, is the only one that includes $I(1)$ variables and contains the cointegration relations. If rank$(\Pi) = r$, Π can be written as a product of $(K \times r)$ matrices α and β with rank(α) = rank$(\beta) = r$ as follows: $\Pi = \alpha\beta'$.

$$\Delta y_t = \alpha\beta' y_{t-1} + \sum_{j=1}^{p-1} \Gamma_j \Delta y_{t-j} + \Phi D_t + u_t, \tag{3}$$

where α and β are $K \times r$ matrices of loading coefficients and cointegrating vectors, respectively, and the Γ_js, $j = 1, \ldots, p-1$, are $K \times K$ coefficient matrices. From Johansen's version of Granger's Representation Theorem, if y_t is generated by a reduced form as in Eq. (3), it has the following moving average representation:

$$y_t = L\sum_{i=1}^{t-1} \varepsilon_i + \sum_{i=0}^{\infty} \Xi_i^* (u_{t-i} + \Phi D_{t-i}) + y_0^*, \tag{4}$$

where y_0^* is a vector of initial variables;

$$L \equiv \beta_\perp \left[\alpha'_\perp \left(I_K - \sum_{i=1}^{p-1} \Gamma_i \right) \beta_\perp \right]^{-1} \alpha'_\perp$$

is a $K \times K$ matrix with rank $K - r$; $\alpha_\perp$ and $\beta_\perp$ denote the orthogonal complements of α and β, respectively, and the matrices Ξ_i^*, $i = 1, \ldots, \infty$, are absolutely summable. L is the matrix that represents the long-run effects of the forecast error impulse responses, whereas Ξ_i^* contains the transitory effects. In line with the literature, we assume that the covariance matrix of the vector of structural shocks, ε_t, is the identity matrix I_K. Since the covariance matrix of u_t is nonsingular, there exists a nonsingular matrix B such that $u_t = B\varepsilon_t$. Therefore, in terms of structural interpretation, L can be interpreted as the long-run effect matrix of the structural shocks ε_t, whereas B is the corresponding short-run matrix. Since the number of endogenous variables is K, we need to impose additionally $K(K-1)/2$ restrictions on B and L to identify K types of structural shocks. The restrictions imposed should be economically meaningful.

2.2. Choice of endogenous variables and data

In our benchmark case, we include four endogenous variables in the SVECM: TFP, an IST variable, stock prices, and an economic activity variable, and wish to identify four shocks: surprise TFP shocks, surprise IST shocks, TFP news shocks, and demand shocks. The first variable, measured TFP, is necessary to identify surprise TFP shocks and TFP news shocks. Regarding the second variable, following previous studies in the literature such as Braun and Shioji (2007), we use the inverse of the real investment price to identify IST shocks. The third variable, stock prices, is included because it is a forward-looking variable which reflects news about

[1] For example, see Schmitt-Grohé and Uribe (2009) and Khan and Tsoukalas (2009).