

This PDF is a selection from a published volume from the National Bureau of Economic Research

Volume Title: NBER Macroeconomics Annual 2015, Volume 30

Volume Author/Editor: Martin Eichenbaum and Jonathan A. Parker, editors

Volume Publisher: University of Chicago Press

Volume ISBNs: 978-0-226-39560-9 (cloth); 978-0-226-39574-6 (e-ISBN)

Volume URL: <http://www.nber.org/books/eich15-1>

Conference Date: April 17–18, 2015

Publication Date: June 2016

Chapter Title: Comment on "Trends and Cycles in China's Macroeconomy"

Chapter Author(s): Mark W. Watson

Chapter URL: <http://www.nber.org/chapters/c13593>

Chapter pages in book: (p. 85 – 89)

Comment

Mark W. Watson, Princeton University and NBER

Chang et al. make three contributions. First, they describe a new annual and quarterly macro data set for China detailed in Higgins and Zha (2015). Second, they use these data to characterize trend and cyclical variation and covariance between important real and financial aggregates. Finally, they construct a dynamic equilibrium model to explain the trend and cycle facts.

The paper begins in Section II with a discussion of the challenges faced by researchers using China's data and then describes the new data set. The work putting the data set together was substantial and faced several challenges: (a) the raw data come from disparate sources and are based on different approaches; (b) much of the data is annual and there is only limited information about quarterly and monthly variation; (c) data series are available over different, and sometimes short, sample periods; (d) several of the important series are available only as growth rates, sometimes computed in nonstandard ways; (e) some series have pronounced seasonality; and (f) there are challenges converting nominal to real quantities. These are familiar measurement challenges faced by national income accountants everywhere, and the hard and careful work described here goes a long way to producing a macro data set for China that many researchers will find useful.

In this brief discussion I will say nothing more about the first (data) and third (model) contributions of the paper and instead focus on the various "trend" and "cycle" constructs used in the paper. This reflects my comparative advantage and not the relative importance of the paper's three contributions.

Trends and Cycles

Section I of the paper begins by listing five key “trend facts” and three key “cyclical patterns.” A prerequisite for understanding these facts and patterns is to understand how “trend” and “cycle” are defined and measured by the authors. They do this in two distinct ways.

The first is exemplified in the paper’s figure 2, which plots the annual growth rates of real GDP and its price deflator along with the ratios of consumption-to-income and investment-to-income ratios, each from 1980 through 2013. The growth rates show “ups and downs” with periods of 10 years and shorter. To a macroeconomist this looks like a cycle. The ratios exhibit much lower frequency variability: the dominant feature of these sample paths is a monotonic rise or fall over the entire 30-year sample period. This looks like a trend.

These definitions of trend and cycle rely on periodicities. Variations in a macro time series with periodicities of, say, 10 years or less, define cyclical variation. Variations with much longer periodicities, say beyond 20 or 30 years, define the trend. Spectral analysis provides a framework for analyzing cycles and trends defined in this way. Transformations like first differencing or Hodrick-Prescott moving averages are linear “filters” that amplify or attenuate the various periodicities in the data. The authors use these definitions when discussing trend facts and patterns based on figures 2–3 and 5–7 in Section IV.

In Section III, the authors use a very different definition of trend and cycle based on “permanent” and “transitory” shocks in a vector error correction model (VECM), that is a VAR with common $I(1)$ trends. The model is given in their equation (2), which I rewrite here using slightly different notation, as

$$\Delta y_t = c_t + \alpha \beta' y_{t-1} + \Phi(L) \Delta y_{t-1} + H e_t,$$

where the vector y_t includes the logarithms of real values of GDP, consumption, investment, labor income, and the ratio of long-term and short-term loans to GDP, and e_t is vector of shocks. In the authors’ formulation there are three common $I(1)$ trends. As they show, this implies that e can be partitioned into three permanent and three transitory shocks: $e_t = (e_t^{\text{Permanent}}, e_t^{\text{Transitory}})'$, where $e^{\text{Permanent}}$ has a permanent effect on y ($\lim_{k \rightarrow \infty} \partial y_{t+k} / \partial e_{it}^{\text{Permanent}} \neq 0$), and $e^{\text{Transitory}}$ has only a transitory effect ($\lim_{k \rightarrow \infty} \partial y_{t+k} / \partial e_{it}^{\text{Transitory}} = 0$).

Using this decomposition of e , the authors define the trend in y as the process

$$\Delta y_t^{Permanent} = c_t + \alpha\beta' y_{t-1}^{Permanent} + \Phi(L)\Delta y_{t-1}^{Permanent} + H \begin{bmatrix} e_t^{Permanent} \\ 0 \end{bmatrix}$$

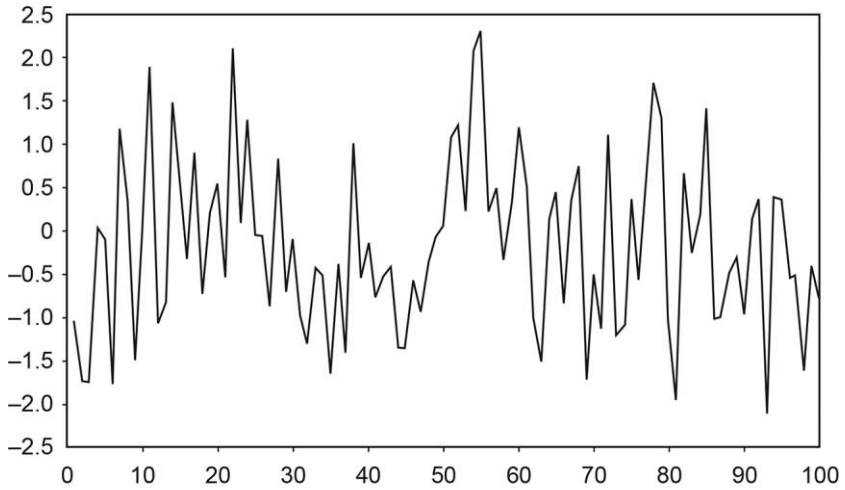
which is the implied value of y from the VECM, but with the transitory shocks set to zero. The cyclical component is defined as $y_t^{Transitory} = y_t - y_t^{Permanent}$. Figure 1 in the paper plots the trend values for the consumption-to-income and investment-to-income ratios using these definitions.

This “permanent shock” definition of the trend in y is much different than the definition based on low-frequency variation because, while $e^{Permanent}$ has a permanent effect on the level of y , it may also have important transitory effects on y . Indeed, VECM models are often used in macroeconomics to measure these transitory effects of permanent shocks, with leading examples being the effect of TFP shocks on output, consumption, investment (King, Plosser, Stock, and Watson 1991) and employment (Gali 1999; Christiano, Eichenbaum, and Vigfusson 2006).

My figure 1 below shows an extreme example of this. Panel A plots a realization from a univariate IMA(1,1) model: $\Delta y_t = \epsilon_t - 0.9\epsilon_{t-1}$. Because ϵ_t has a permanent effect of y , it is a permanent shock, and because the model is univariate, it is the only shock. Thus $y_t = y_t^{Permanent}$. However, much of the variation in $y_t^{Permanent}$ is associated with transitory oscillations (because of the negative MA coefficient), so that, arguably, $y_t^{Permanent}$ is a poor measure of the trend in the process. Panel B shows the same series and two trend measures: one computed as the (two-sided) Hodrick-Prescott trend and the other as the (one-sided, long-run forecast) Beveridge-Nelson (1981) trend. Both appear to capture the trend variation in the series better (to my eye) than does $y_t^{Permanent}$ ($= y_t$). Thus, as a general matter, while $y_t^{Permanent}$ captures interesting variation in the data, it can be a poor measure of the trend.

Let me conclude with two remarks about $y_t^{Permanent}$ as computed by the authors using their data. First, comparing their figure 1 (which plots consumption-income and investment-incomes using $y^{Permanent}$) to their figure 6 (which plots the ratios computed from annual data) shows that their VECM measure of $y_t^{Permanent}$ *does* capture trend variability as defined using long periodicities. (My suspicion is that the flexible deterministic trend included in their VECM helps $y_t^{Permanent}$ achieve this.) Thus, the point made in my figure 1 does not apply to their analysis. Second, and importantly, they use their equilibrium model to study transition paths, that is, changes in key ratios in response to a permanent shock; $y^{Permanent}$ is well-designed for that purpose.

(a) Realization from the IMA(1,1) process: $\Delta y_t = \varepsilon_t - 0.95 \varepsilon_{t-1}$



(b) HP Filtered Trend (dashes) and Beveridge-Nelson Trend (dots)

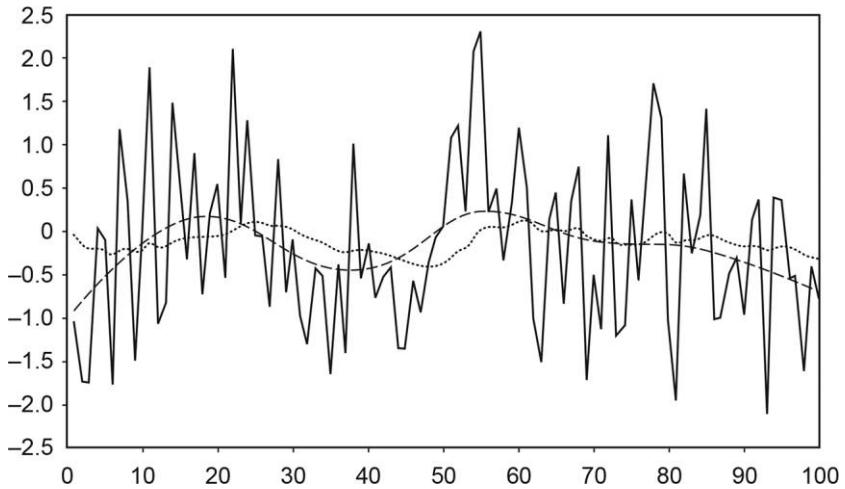


Fig. 1. A: Realization from the IMA(1,1) Process: $\Delta y_t = \varepsilon_t - 0.95 \varepsilon_{t-1}$; B: HP-Filtered Trend (dashes) and Beveridge-Nelson Trend (dots)

Endnote

For acknowledgments, sources of research support, and disclosure of the author's material financial relationships, if any, please see <http://www.nber.org/chapters/c13593.ack>.

References

- Beveridge, S., and C. R. Nelson. 1981. "A New Approach to Decomposition of Economic Time Series into Permanent and Transitory Components with Particular Attention to Measurement of the Business Cycle." *Journal of Monetary Economics* 7:151–74.
- Christiano, L., M. Eichenbaum, and R. Vigfusson. 2006. "Assessing Structural VARs." *NBER Macroeconomics Annual 2006*, vol. 21, ed. D. Acemoglu, K. Rogoff, and M. Woodford. Cambridge, MA: MIT Press.
- Gali, J. 1999. "Technology, Employment, and the Business Cycle: Do Technology Shocks Explain Aggregate Fluctuations?" *American Economic Review* 89 (1): 249–71.
- Higgins, P. C., and T. Zha. 2015. "China's Macroeconomic Time Series: Method and Implications." Unpublished Manuscript, Federal Reserve Bank of Atlanta.
- King, R. G., C. I. Plosser, J. H. Stock, and M. W. Watson. 1991. "Stochastic Trends and Economic Fluctuations." *American Economic Review* 81:819–40.