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Comovement of Chinese provincial business cycles ☆

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ABSTRACT

In this paper, we establish a turning point chronology for the Chinese provincial deviation cycles during the period 1989–2009. The existing work has exclusively focused on the national business cycle.
We detect different properties of the provincial deviation cycles. Using the mixture models clustering approach of Chris Fraley and Adrian Raftery (2002), we find that provinces can be classified among seven major clusters as a function of standard measures of cyclical characteristics. The results show that while the majority of coastal provinces remained in expansion around the Asian crisis, the nation as a whole was in recession. We uncover that all Coastal provinces are synchronized with the national cycle except Hainan. Further, the main four national recessions that occurred during this period are well diffused across the country.

1. Introduction

Fluctuations in Chinese growth have become a major concern not simply for the government but increasingly as a driving force for cycles in East Asian as well as world economies. Domestically, the degree of business cycle synchronization among provinces is a good metric of the success of the Chinese economic reforms in supporting domestic market integration Young (2000). As a sixty-year plus currency union, it is expected that China would have had ample time to progress toward deeper regional integration.

However given the sub-continent nature of the country, the remaining intra-national obstacles to the movement of goods and people, and the uneven degree of development of its regions, some of them could have remained unsynchronized with the rest. In an attempt to shed light on the above issues, this paper identifies the provincial deviation cycles in order to assess the degree of synchronization among Chinese provinces.

To the best of our knowledge, no available study has examined the differences among Chinese provinces in the usual properties of the phases of business cycles, such as the probabilities of expansion and recession, duration, amplitude and steepness, and the associated measure of concordance. Similarly, no work has used, for Chinese provinces, a business cycle dating algorithm in the tradition of Bry and Boschan (1971). We thus propose to merge the two literatures and provide a detailed business cycle dating and analysis for Chinese provinces with high-frequency data. The issue here is not to treat regional economic disparities in China, which was widely discussed in recent literature.

Furthermore, most of the empirical studies have focused only on one aspect of business cycle dynamics: synchronization. However, the analysis of how similar/dissimilar are business-cycle characteristics other than synchronization has been granted little attention and, if conducted, has remained only descriptive. In this paper, in addition to assessing business-cycle synchronization, we analyze the form of the cycles.

In fact, the presence of synchronized cycles is a necessary but not sufficient condition to conclude that provinces enjoy low stabilization costs from being part of a currency union. The suitability of these policies for all regions may depend on the duration of cycles; they may be too long for provinces with a short duration of cycles and too short for provinces with long cycles. In the same way, the strength of common stabilization policies may be associated with the deepness of the cycle; it may be inadequate for the provinces exhibiting deep cycles and inconsistent for provinces with mild cycles.

Existing work on business cycles in China provides some evidence that the lack of synchronization would be the dominant feature, with cycles in the Northwestern region uncorrelated with cycles in other regions. However, such evidence relies on the use of low-frequency data over the period since the start of reforms in the late 1970s. It is unlikely that the pattern of co-movements would have remained unchanged over such a period of accelerated structural changes. The use of annual data over a short sample is also unsuitable to study the standard characteristics of business cycles such as duration, amplitude, etc., as well as usual measures of co-movements such as concordance. At the national level business cycle analysis in China provides us with a precise dating of phases which has not been replicated at the provincial level. Three series of work on business cycles have examined

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respectively national cycles in China, regional cycles in advanced countries, and provincial cycles in China.

In line with a tradition of business cycle studies in China dating back to the mid 1980s (for a review, see Zhang and Wan, 2005), Wang et al. (2009) examine Chinese national growth cycles on a monthly composite indicator, made of industrial output, fixed asset investment, wholesale and retail sales as well as money supply. Over the 1990–2008 period, for year-on-year growth rates, using the model of Stock and Watson (1989, 1991, 2003), they find one full cycle with peaks in May 1993 and February 2004, and a trough in May 1998. With quarterly GDP data and a longer sample, going back to the start of reforms in 1978, Girardin (2005), using the Hamilton Markov-switching approach to growth cycles extended to a three-regime classification (with a rapid growth regime), and comparing the dating of Chinese cycles with that of 9 other East Asian countries, finds growth recessions in China in the late eighties and late nineties.

Regional business cycle analysis started in the mid 1990s for the US (Carlino and Sill, 1997) and was later applied to European countries (Spain, Barrios and Lucio, 2003; and the UK, Barrios et al., 2003), as well as Australia (Norman and Walker (2007)) and Japan (Wall, 2006). More recently, Owyang et al. (2005), Kouparitsas (2002) and Crone (2005) provide deeper analysis of business cycle characteristics and co-movements for US states. In a similar vein but from an international perspective, Artis et al. (2004b) examine business cycle characteristics and comovements of old and recently-accessed EU member countries in a very innovative way, focusing on the deviation cycles and using a new dating algorithm (Artis et al., 2004a algorithm).

For Chinese provinces, Tang (1998) uses monthly data, subsequently aggregated at a quarterly frequency over 1990 through 1995, to measure business-cycle synchronization via the correlation of real shocks from a structural vector autoregressive model (VAR). He uncovers two groups within which provincial cycles are synchronized: one in the West: Gansu, Guizhou, Qinghai, Shaanxi and Xinjiang, and one in the East: Anhui, Fujian, Hunan, Jiangxi, Liaoning and Zhejiang. Barthélémy and Poncet (2008) examine with quarterly data the synchronization of employment cycles among Chinese provinces over the 1992–2004 period. Synchronization is present between most provinces but not for a group including Gansu, Guizhou, Ningxia, Shaanxi, Tibet and Yunan, which do not correlate either with each other or with provinces outside this group. Among explanatory factors of synchronization, inter-provincial labor mobility, as well as similarities in production structure and fiscal policies, play a major role. Gerlach-Kristen (2009) studies macroeconomic cycles in China with annual GDP and inflation data for 30 provinces over the 1962–2003 period. Using principal-component analysis to extract a common business cycle among provinces, she confirms that business cycles in Northwestern provinces are disconnected from the rest of the country.

Furthermore, diffusion indexes have been frequently suggested as a useful tool which can facilitate the business cycle analysis by aggregating the behavior of a group of economic time series. More precisely, the diffusion indexes measure in percentage form the number of series among the entire selected series that are showing an increase (decrease) over a given span time. These indexes allow policymakers to identify the turning points chronology and business cycle phases. Thus, we construct a non parametric diffusion index in order to judge the diffusion of national recessions across the country.

Since the start of the reform period more than thirty years ago, China has enjoyed uninterrupted growth. Classical business cycle analysis in terms of level is thus of little use since on that metric hardly any recession would be detected. The band-pass filters of Baxter and King (1999) and Christiano and Fitzgerald (2003) which are most-commonly used, extract the business cycle component by eliminating the trend and the irregular component of a time series. In light of the work of Artis et al. (2004b) on East-European transition countries, we thus study the growth cycles with a band-pass filter combining two low-pass Hodrick and Prescott (1997) filters.

Harding and Pagan (2003), comparing the Bry and Bochan algorithm with the Markov-switching dating approach, find that the former, non-parametric, approach is valid in a wider range of circumstances while the latter approach depends on the validity of the statistical model. As a generalization of the Bry and Boshan algorithm, Artis et al. (2004a) developed a dating methodology based on a Markov-chain algorithm that allows for the identification of turning points (the AMP dating Algorithm, henceforth). The main advantage of this algorithm is the internalization of the uncertainty associated with the identified turning points. Indeed, the description of business cycles as simply either expansions or recessions ignores the many sources of uncertainty that surround the dating operation. This motivates us to adopt the AMP dating algorithm in this paper.

Our analysis establishes how valuable provincial data are to a deeper analysis of business cycle properties, especially to explain the diverse provincial effects of the Asian and global financial crises. We do this with the AMP new dating methodology which generalizes the Bry and Boshan dating algorithm.

The main findings of this study are as follows: First, using the basic structural time series model, we find that the provincial industrial production time series are characterized by stochastic seasonality. This result is particularly important since it takes into account the Chinese new year effect based on the lunar calendar.

Second, using the AMP dating algorithm, we detect different properties of the provincial deviation cycles. On average recessions are longer than recessions in the Coastal provinces of Hainan, Hebei, Shandong and Tianjing, in the Central province of Hubei and Shanxi, in the Northeastern provinces of Jilin and Liaoning and in the Western provinces of Guizhou, Neimongol, Ningxia, Shaanxi and Yunnan. We find evidence of asymmetries across the phases of the cycle. The amplitude is on average about three times larger for expansions than for recessions. This implies that the production gain in expansions (about 46% on average) is higher than the output loss during the contractions (about 17%). Globally, the results show low values of steepness.

Then, using the clustering methodology of Fraley and Raftery (2002), we test whether the deviation cycle features of the Chinese provinces are homogeneous. We find strong evidence against the null of one Chinese regional cycle. Furthermore, we find that there are seven clusters with a very strong evidence of homogeneous and separate growth cycle characteristics.

Finally, based on the concordance index, all Coastal provinces are synchronized with the national cycle except Hainan. Especially, the timing of recessions in Zhejiang is very close to the national cycle. Seven provinces are decoupled from the national cycle, namely, Anhui, Guizhou, Hainan, Helongjiang, Neimongol, Ningxia and Shaanxi. Furthermore, using the diffusion index, we find that the main national recessions are well diffused across the country.

This paper is structured as follows: Section 2 introduces the data and methodology used for analyzing the deviation cycle characteristics. Section 3 reports the empirical results and interprets the findings. Section 4 discusses the results of concordance tests between provincial business cycles while section 5 gives the results of the diffusion index. Section 6 summarizes our empirical results and gives our conclusions.

2. Analysis of the deviation cycle characteristics

This section presents the methodology used to extract provincial deviation-cycle characteristics. Our investigation focuses on the notion of the deviation cycles, i.e. the fluctuations are relative to a trend. We are interested in this type of cycle because of the nature of our data, and moreover deviation cycles have gained much policy relevance for Taylor-rule[1] driven monetary policy and for cyclically-adjusted

[1] See Taylor (1993).