China Economy

Economic integration of the Chinese provinces: a business cycle approach

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Key to symbols used in tables

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Kam-Ki Tang is working on a PhD thesis in the Department of Economics at the Research School of Pacific and Asian Studies, The Australian National University.
Abstract

This paper uses a correlation of business cycles to gauge the degree of economic integration of the Chinese provinces. The more integrated the provincial economies are, the stronger their correlations should be. Only the correlations between some provinces in eastern China are found to be consistently strong, suggesting that an integrated national economy is yet to be shaped. It also implies that treating China as a single entity could be misleading—even at the macro level—especially in analysing China’s business cycles.
Introduction

Since China began its economic reform in the late 1970s, its rapid growth has been characterised by volatile business cycles (Tseng et al. 1994). A fundamental cause of these abrupt business cycles is too much administrative decentralisation and too little economic decentralisation (Blejer et al. 1991). Economic reform has only partly shifted economic power from the hands of the central government to the market. Mostly this power has been transferred to local authorities. The pre-reform larger-sized national command economy has been transformed into a number of smaller-sized local command economies (Jia and Wang 1994). Without sufficient coordination, particularly in the presence of inter-regional competition, local policies are not necessarily consistent with national macroeconomic objectives.

While it is acknowledged that macro instability is associated with fragmentation of the economy, most of the literature continues to treat China as a single entity. Differentiation of the business cycles in different regions is rarely noticed. Nonetheless, fragmentation does not necessarily eventuate into idiosyncratic business cycles, rather, this depends on both the symmetry of disturbances experienced by regions and the effectiveness of transmission of the disturbances between them.

Market integration is a key element of economic integration. It is especially important in the reform era, as the role of the planning system in resource allocation and distribution has largely been taken over by the market. Nevertheless, market fragmentation between regions is mostly overlooked. The only two noticeable exceptions are World Bank (1995) and Kumar (1994). Market fragmentation has both micro and macro impacts. From the
micro efficiency perspective, it restricts regional economies from the benefits of exploiting comparative advantages, economies-of-scale, diffusion of technical knowledge and increasing competition. From the macro management perspective, market integration is a major determinant of the effectiveness of transmission of disturbances. This transmission mechanism is especially important once the People’s Bank of China (PBC) replaces the credit plan with the interest rate as the major instrument of macro-control. Unless the PBC can apply different interest rates to different regions, interest rates would be symmetric to all regions. If regional markets are not integrated sufficiently to equalise idiosyncratic disturbances, then the interest rate instrument would not be adequate to smooth their business cycles.

For other China observers, economic/market fragmentation might have far more important implications than micro efficiency and macro stability. A frequently raised issue is whether increasing local autonomy and regionalism could result in disintegration, especially after the dissolution of the former Warsaw group of countries in the early 1990s.

Most studies of the fragmentation of the Chinese economy, have taken a micro approach. While they provide detail and solid analyses of how institutional arrangements, under decentralisation, have led to economic fragmentation, there are some problems with this approach. First, quantifying institutional and political elements is difficult. Second, quantifiable items may not be directly comparable and appropriate weightings between them are barely known. Third, as a consequence, it is difficult to draw an overall picture of fragmentation of the Chinese economy. Finally, the micro level studies have left an important question unanswered: If the Chinese economy is not a united entity, are there any regional economic unions within China?

This paper attempts to bring a macroeconomic framework to this question. It recognises that, even at the macro level, there may be differences between different regions, and thus disaggregates China into the 22 provinces, 5 autonomous regions and 3 municipalities (hereafter all are denoted as ‘province’ unless otherwise specified). Instead of examining various micro elements, it estimates the correlation of business cycles between the provinces as a measure of their degree of integration. Theoretically, the correlation of business cycles between different regions depends on, amongst other things, the degree of interdependence of their economies. Empirically, Frankel and Rose (1996) established that trade linkage can enhance the correlation of business cycles between the partner economies. This framework is associated with the optimum currency areas (OCA) paradigm which is widely adopted in the monetary unification literature. Following a common practice in the literature, the correlation of business cycles is measured as that of the disturbances experienced by the provinces; disturbance or shock, in turn, is defined as the stochastic element of some underlying models.

There are several advantages of using this business cycle approach. It provides a comprehensive measure of various factors that contribute to economic fragmentation; the measure is unit free, thus cross country comparison is feasible; and it reveals whether there are any regional groupings of the provincial economies. On the other hand, the approach
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does have disadvantages. The measure is based on aggregate data. Given limited data, it can not identify how much of the fragmentation is due to intrinsic structural differences between the provinces, and how much to inappropriate policies or institutional settings. Moreover, the measure does not take into account fiscal integration, which is also an important element of economic integration (e.g. Ahmad et al.1995; Wong et al. 1995). Therefore, the macro approach advocated by this paper should be regarded as a complement, not a substitute, to the micro approach.

The rest of this paper is organised as follows. The next briefly reviews the background of decentralisation and fragmentation in the Chinese economy. The third section outlines the theoretical framework underlying the empirical method and the fourth provides the empirical findings. The final section gives the conclusion.

**Economic fragmentation**

Economic fragmentation existed in China well before economic reform. Preceding the reform, there had been progressive decentralisation of the economy. In particular, following the self-sufficient (zili gengsheng) guidance of Mao Zedong, the provinces were required to be economically independent (Zhao 1994). This policy prepared the ground for economic fragmentation. In the late 1970s, after almost three decades of social movements, the central authority urgently needed remedies to cure the damaged economy. To mobilise local enthusiasm in production, the central government decided to conduct the fenquan rangli policy. The principle was to decentralise administrative power and allow local authorities and enterprises to retain part of their revenues. It is commonly recognised that decentralisation was one of the engines behind the fast growth of the Chinese economy in the past two decades. However, this growth was not without costs. Cannon and Zhang (1996) observed that local protectionism became stronger and more widespread in the reform era and that the decentralised power of economic decision-making has not passed fully to enterprises. Local authorities have as much, or even more, control over and self-interest in those enterprises. Local authorities are also reluctant to invest in other regions to avoid losing revenues. To protect the local enterprises, import embargoes of substitutes, and export embargoes of production materials, are not uncommon (Goodman 1994). Barriers exist in the forms of tariffs, quantitative controls and even physical barricades. In summary, neither capital nor commodities are completely free to move across provincial borders. To a certain extent, the provinces have evolved into ‘aristocratic’ or ‘cellular’ economies (Jia and Wang 1994).

The World Bank (1994) provided comprehensive evidence to quantify the above observations. From 1985 to 1992, China’s external exports and imports in local currency grew at 28 and 20 per cent per year, respectively. While inter-provincial exports and imports rose only by 6.9 and 4.8 per cent per year, respectively, another closely related study showed that total inter-provincial trade, as percentages of GDP for China in 1985, 1988 to 1992 were 31.6, 23.0, 18.8, 19.1, 16.9 per cent, respectively (Kumar 1994). By comparison, that of the European Community (EC), in 1989, was 28.3 per cent, and that of the former Soviet
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Union (FSU), in 1990, was 17.3 per cent (27.2 per cent if Russia is excluded). China’s internal trade was not only smaller than that of the EC and FSU, but also declining across time. That is why Breslin (1995) concluded that, to a certain extent, the Chinese provinces are more open to the outside world than to each other.

Another indicator of the degree of market integration is price divergence. The World Bank (1994) found that, for seven daily consumer goods, the standard deviations of prices across the provinces in 1991 were all higher than in 1986. On the other hand, that of five production materials fell in general between 1990 and 1992.3

On the investment side, the issuing of stocks and bonds is supposed to be an effective means of inter-regional investment. However, as the central authority still considers the stock market to be an experimental financial infrastructure in China, this has not been adopted widely. An examination of the ratios of inter-provincial to total local investment of Guangdong, Shaanxi, Beijing, Liaoning and Shanghai, from 1985 to 1992, found that only Shanghai rose significantly. The ratios of the first three provinces actually fell (World Bank 1994). These five provinces accounted for about 30 per cent of the national investment.

Similar to the use of price differential in gauging commodity mobility, capital return differential can be employed to assess capital mobility. Over the period 1986 to 1990, the variation of firms’ profit rates across the provinces increased from 0.19 to 0.66. Further, it was found that inter-provincial investment was induced more by tax concession differentials than by any real difference in capital productivity (World Bank 1994).

Labour is another important factor of production and its mobility reflects the degree of integration of labour markets. Labour mobility differs from that of capital and physical goods, because it is intentionally restricted by the authorities to control the growth of population in city areas. The household registration system (hukou zhidu) is a major policy instrument. Under this system, people who want to change registration status are required to obtain permission from the authorities. Before the economic reform, city residences almost completely relied on their affiliated unit (danwei) for job replacement, housing and rationed foods (Yan 1990). And the counterpart in rural areas was peoples communes (renmin gongshe). The affiliation and registration systems, together, provided an effective means of controlling labour migration. However, as a consequence of the economic reform, the planning system has been giving way to the private market in the provision of foods and jobs. This development has encouraged higher mobility of labour, especially from inland rural to coastal urban areas.

Comprehensive and systematic reports on intra-provincial labour migration are rare. The 1987 interim census revealed that inter-provincial migration accounted for only 20.7 per cent of internal migrants (Wakabayashi 1990). Chinese Labour Statistic has recorded the number of annual inter-provincial migrant workers of state-owned, urban collective-owned and privately owned units. The numbers of workers of these units, as a percentage of total workers that moved out to other provinces in 1990 and 1994, were 0.09 and 0.12 per cent, respectively. The statistics are likely to understate the mobility as only registered workers were counted.
To summarise this section, China is an economy where ‘major elements of economic union including a single currency and a common external tariff are combined with a lack of some basic features of a free trade area, such as the free movement of goods and factors’ (World Bank 1994). Furthermore, even if Chinese provinces are using a single currency, capital is not perfectly mobile, thus China is not quite a currency area either.4

**Theoretical framework**

The theoretical framework of this paper is virtually the reverse of the OCA paradigm. The OCA paradigm suggests that, if the candidate economies satisfy certain criteria, they would be eligible to form a (an optimal) monetary union. These criteria include, labour, capital and commodity mobility.5 Underlying all these criteria are two more fundamental elements: flexibility of price and real wage, and symmetry of disturbances. Primarily, most criteria concern how to attenuate the impacts of asymmetric disturbances between the candidate economies, when price and real wages fail to adjust in the short run. For example, movement of factors and goods from depressed regions to booming regions could reduce unemployment in the former and inflation in the latter. In other words, the more integrated the member economies are, the more effective they will be in equalising the impacts of asymmetric disturbances.

A shortcoming of this kind of criteria-counting approach is that it fails to account for the dynamic impacts of monetary unification. As advocates of the European Monetary Union (EMU) have claimed, zero exchange risk and foreign exchange transaction cost would be likely to boost intra-union trade and investment (CEC 1990). Stronger economic interdependence would lead to more effective transmission of disturbances between the member economies on the one side. Offsetting this, specialisation in production could reduce the correlation of industry-specific shocks. The net impact is therefore an empirical question. Frankel and Rose (1996) looked at this dilemma and found international evidence that stronger trade ties lead to a stronger, not a weaker, correlation of the business cycles between the partner economies. They concluded that OCA is a result of, rather than a prior condition for, monetary unification.

This paper attempts to turn the pitfalls of the OCA paradigm into a useful device to gauge the degree of integration of Chinese provinces simply by reversing the theories. Since the Peoples Republic of China (PRC) was established in 1949, yuan (or renminbi) has been the single legal tender in China. Though the functions of money were largely suppressed in the pre-reform era, this did not preclude the provincial economies from the benefits of zero exchange risk and transition cost.6 After almost 50 years, with respect to the given institutional arrangements, all endogenous benefits of monetary unification should be largely realised, including correlating business cycles. Therefore, if the provinces have still not fulfilled the correlation criterion, it means that, either the provincial economies are structurally too dissimilar to be integrated, or there are institutional settings hindering them from becoming fully integrated under a single currency.
In this paper, correlation of business cycles is measured through the disturbances, or shocks, experienced by the provinces; a shock, in turn, is defined as the stochastic element of some underlying models. In a simple dichotomous world, shocks can be categorised into either nominal or real. An example of the former is money supply shock, and an example of the latter is productivity shock. Their transmission channels are different. Presumably nominal disturbances can be equalised between regions through flows of liquid assets, and real disturbances through flows of physical commodities.

To separate these two kinds of shocks from aggregate data, the Blanchard and Quah (1989) method is employed. If a vector of variables $X_t^e$ is stationary, it can be represented by a vector moving average representation or structural vector autoregression (VAR)

$$X_t^e = A(L)u_t^e, \quad \text{E}(uu'^e) = I.$$ (4.1)

$X_t^e$ is a vector of change of real output ($\Delta y_t$) and inflation ($\Delta^2 p_t$). $u_t^e$ is a vector of structural shocks. $A(L)$ is a matrix polynomial of the lag operator. $\text{E}(uu'^e) = I$ represents three imposed normalisation and orthogonality conditions on the variance-covariance matrix of the structural shocks. $u_t^e$ is not observable, but it can be recovered by estimating a reduced-form VAR of $X_t^e$

$$X_t^e = B(L)e_t, \quad \text{E}(ee'^e) = \Omega.$$ (4.2)

where $e_t$ is a vector of estimated errors. Comparing (4.1) and (4.2), we have

$$u_t^e = A_0^{-1}e_t.$$ (4.3)

To convert $e_t$ back to $u_t^e$, it is necessary to identify the matrix $A_0$. In this bivariate system, $A_0$ has four elements, so it requires at least four restrictions to identify it. The first three restrictions are indeed from the normalisation and orthogonality conditions. They can be denoted by

$$A_0 A_0' = \Omega.$$ (4.4)

The last restriction imposed by Blanchard and Quah (1989) is that one of the components of $u_t^e$, say $u_{1t}^e$, has no long-run impact on output ($y_t$). Since its long-run impact on output is actually equal to the sum of impacts on the change of output ($\Delta y$) from time zero to infinity, the neutrality restriction on $u_{1t}^e$ can be represented by

$$\sum_{j=0}^{\infty} a_{11j} = 0.$$ (4.5)

Equations (4.4) and (4.5) can be used to solve for $A_0$, hence $u_t^e$ can be recovered. In this paper, $u_{1t}^e$ is interpreted as a nominal shock, while the other is real shock. This kind of identification rule is somewhat arbitrary. Blanchard and Quah (1989) and Gali (1992), for
example, interpreted the former as demand shock and the latter as supply shock. The naming of the two shocks itself is irrelevant, but it does reveal the underlying assumptions about the source of the shocks, e.g. either from the real or the nominal side. All of these identification strategies will break down, if either the impacts of real/supply shocks are transitory, or nominal/demand shocks have permanent impacts on output. Therefore, these identifications should be treated as approximations.

The reason the real-nominal instead of the supply-demand interpretation is adopted here is that, based on aggregate-demand-aggregate-supply models, $u_t$ should reduce inflation. However, from the impulse response functions, it is found that $u_t$ increases rather than decreases inflation. This means that it contains a significant amount of demand shock elements which have permanent impacts on output. Therefore, adopting the supply-demand interpretation would be misleading.

Deseasonalised monthly data of industrial output and the retail price index are used for the estimation. Since industrial products in general are tradable, and capital and intermediates intensive, they are suitable for measuring capital and commodity mobility. To maximise the degree of freedom, the VARs of the provinces are estimated with monthly data. Then the estimated structural monthly shocks are aggregated into quarterly shocks to compute correlations. Measuring quarterly correlations allows for cross-country comparison. Uniformly, 12 months lag length is used for all the provinces. Twelve months lag is suggested by the Akaike’s information criterion (AIC) for the national figures. Only 28 provinces have been tested because the data from Tibet are incomplete, and the data from Hainan is included in that of Guangdong. The testing period is 1990Q2–1995Q4. Excluding lags, the number of net observations is 20 quarters. Data on China are obtained from China Monthly Statistics, various issues; data of other countries are obtained from the International Economic Data Base, the Australian National University.

**Estimation of correlation of shocks**

The correlations of real shocks are reported in Table 4.1 and Figure 4.1. A large group of correlated provinces can be identified: include Liaoning, Jilin, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hunan, Guangdong, Guangxi, Yunnan, Gansu, Ningxia, and, to a lesser degree, Shanxi and Sichuan. These cover almost all areas in central and eastern China, excluding Hubei and Guizhou. In 1994, this group of provinces accounted for 72.5 per cent of national industrial output.

The correlations of nominal shocks are reported in Table 4.2 and Figure 4.2. A similar but smaller group of provinces emerges. Anhui, Guangxi, Yunnan and Shanxi are excluded; Shanxi and Gansu become marginal cases, while Beijing is included marginally. In this case the core group accounted for 64.5 per cent of national industrial output in 1994.

Since the patterns of correlation of real and nominal shocks are different, it is informative to know the relative importance of the two shocks. This can be obtained by decomposing the variance of forecast errors into the contributions of the two shocks respectively. The forecast horizon is 5 years. Instead of estimating those of individual
provinces, only that of the whole nation is estimated. The results are reported in Table 4.3. Nominal shocks account for more than 35 per cent of the forecast error of output within a one year horizon, and more than 80 per cent of inflation permanently. In other words, nominal shocks are important in explaining the fluctuations of both output and inflation.

For comparison, the correlations between nine European Community countries (EC-9) across 1986Q1–1993Q3 are estimated. The results are reported in Tables 4.4 and 4.5. In terms of real shock, only half of the EC-9 countries are correlated at a 1 per cent level. In terms of nominal shock, most are insignificantly correlated. Whitt (1995) applied the same method to several EC members across a pre-German unification period: 1965Q2–1992Q2. He found that in terms of real shock, the correlations between Germany and four other EC members (the United Kingdom, France, Italy and the Netherlands) were -0.08, 0.56, 0.46 and 0.40, respectively. While the correlations of nominal shock were -0.32, 0.02, -0.24, and -0.34, respectively. Bayoumi and Eichengreen (1994) used annual data, across the period 1960 to 1990, and found stronger correlations between the EC-9 countries. They also found that the correlation of real shocks between six out of seven US regions ranged from +0.43 to +0.81, and that of nominal shocks ranged from +0.43 to +0.79.

In considering the findings of this paper and other studies, no clear conclusion can be drawn about the relative coherence of the Chinese provinces and the EC-9. The result contrasts with the findings of the World Bank (1994), that the EC countries have much stronger trade ties than those of the Chinese provinces, whereas the US regions seem to be more correlated than these two unions. Nonetheless, the data may not be comparable. Bayoumi and Eichengreen (1994) used annual data and grouped the 30 states of the United States into only seven regions. Some short-term intra-regional asymmetry might have been averaged out.

**Sensitivity tests**

It is not uncommon that the scaling of business cycles are sensitive to the estimation specification such as the amount of lag (Hafer and Sheehan 1991). To ensure the robustness of the results, their sensitivity with respect to lag length, and even to the estimation method, is examined.

First, the exercise is repeated by selecting the lags for individual provinces according to the AIC. It turns out that all lags suggested by the AIC are very short, either one or two. Compared to the previous 12 lags, it can be considered as an extreme testing case. The correlation patterns become sharper than the case of uniform 12 lags. The correlation of real shocks clearly divides China almost exactly into a western and an eastern sphere, with Heilongjiang and Guangxi at the ends of the diagonal. The only exception is Sichuan which is still correlated to eastern provinces. The correlation patterns of nominal shocks changes even more dramatically. Almost all the provinces are strongly correlated.

Second, a different univariate method is used. It is to decompose fluctuations of output and inflation into province-common and specific shocks:

\[ x_{it} = w_t + \rho_{i1} x_{i,t-1} + \rho_{i2} x_{i,t-2} + \ldots + \rho_{ik} x_{i,t-k} + c_t + s_{it} \]  

(4.1)
where the subscript \( i \) and \( t \) denote province and time respectively. \( x \) is the rate of change of logarithm output (\( \Delta y \)) or inflation (\( \Delta p \)); \( w \) is the real growth rate; \( c \) is province-common shock; \( s \) is province-specific shock. The lag terms of \( x \) are to capture the persistence of disturbances. Three and two lags are used in the output and the inflation regression, respectively.

Common shocks are those that affect all provinces to the same degree; specific shocks are those that affect individual provinces only. The more effective the transmission of disturbances across the provinces, the more dominant the common shocks, relative to the specific shocks, will be. The ratio of variances of common to specific inflation shock of the provinces ranges from 12.5 for Inner Mongolia for 1.3 of Beijing. The ratios for 29 provinces are actually above 3.3. The finding is consistent with the nationwide strong correlation of nominal shocks when shorter lags are used in the VAR analysis. On the other hand, that of output shocks ranges from 2.3 for Hebei to 0.2 for Jiangsu. The ratios of only three provinces are above 1.0, while that of 12 provinces are below 0.5.

Furthermore, the more effective the transmission between two provinces is, the stronger the correlation of their specific shocks. Since the variance ratios of common to specific output shocks is generally small, the correlation of output specific shocks becomes more important. Two groups of provinces with strong correlations are identified

- Liaoning, Zhejiang, Anhui, Fujian, Jiangxi and Hunan
- Guizhou, Shaanxi, Gansu, Qinghai and Xinjiang.

The members of the first group are located in eastern China, while the second group is positioned in western China. Furthermore, these two groups are significantly negatively correlated to each other. In terms of correlation of inflation shock, three groups of integrated provinces can be identified

- Beijing, Tianjin, Shanghai and Guangdong
- Jiangsu, Zhejiang and Anhui
- Hunan, Sichuan and Guangxi.

The composition of the first group is tangible, as the members are the most open provinces, in terms of the ratio of external trade to GDP. The second and third group of provinces are close neighbours in eastern and northern China respectively.

Overall, the regional groupings identified both by using shorter lag lengths and by the univariate method are quite different from the previous findings. It means that any conclusions about regional integration would, at the most be suggestive. On the other hand, provinces which are consistently strongly correlated under most estimation specifications can be identified: Jiangsu, Zhejiang, Jiangxi, Fujian, Hunan, and, to a less extent, Anhui. They are close neighbours in eastern China.
Concluding remarks

This paper uses the correlation of business cycles in 28 Chinese provinces to gauge their degree of economic integration. The more integrated the provincial economies are, the more effective the transmission of disturbances between them will be. It was found that the shocks experienced by the provinces were not uniformly correlated. Second, different estimation specifications suggest different groupings of the provincial economies. However, it was found that several eastern provinces are consistently strongly correlated. Overall, the findings seem to suggest that treating China as a united economy might be misleading not only at the micro level, but also at the macro level, especially in understanding its business cycles. From the perspective of economic integration, it indicates that a single national economy is not yet shaped. An extended reading is that either the economic structures of the provinces are too dissimilar to be integrated, or there are some institutional obstacles hindering their integration.

Notes

1 Replacing direct credit controls with indirect instruments compatible with market mechanism, such as interest rates, has been advocated by a number of organisations and individuals. For example, the International Monetary Fund (Blejer et al. 1991), the World Bank (1995), and an economist of the Chinese Ministry of Finance (Ma 1993).

2 For example, see Goodman (1991, 1994), reports cited by Yang (1994:80) and a conclusion of a Pentagon study cited by Huang (1996:2). These authors, themselves, however, did not advocate such views regarding dissolution of China.

3 The seven consumer goods were: flour; rice; vegetable oil; apples; white cotton cloth; color TV; residential coal; and kerosene. The five production materials were: steel sheet; copper; coal; cement; and timber.

4 One of the definitive features of a currency area is free flow of capital. See Cohen (1994) for a discussion of the definition of currency area.

5 For surveys of OCA theories, refer to Tower and Willett (1976) and Ishiyama (1975). Also see Tavlas (1993) for a review of the literature.

6 For a discussion of the function of money in the pre-reform era, see Peebles (1991). Also see Li (1995) for an analysis of monetisation of post-reform China.

7 A constant and a linear time trend are included in practice to capture the growth rates of individual provinces. The discussion will be invariant to those additional variates.

8 First difference and second difference of output and price are used respectively to satisfy the stationary condition. Moreover it is found that the two elements of X are not cointegrated; if it is the case, an error correction term should be included. The inferences are based on the results of augmented Dickey-Fuller tests. Since those unit root and cointegration tests have become standardised with the help of computer econometric packages, the test results are omitted.

9 Since $e_t = A_0 u_t$, $E(e'e') = A_0'E(u'u')' A_0 = A_0'A_0 = \Omega$.

10 The impulse response functions are omitted.
In practice, to maximise the degree of freedom, the shocks of the EC-9 are estimated across a longer period of time, then a section of them is extracted for comparison.

Detail results of the sensitivity tests can be obtained from the author on request.

This method was applied by Cohen and Wyplosz (1989) and Karras (1996) on the EMU. This method itself has various estimation specifications, such as different lag lengths or different growth trends. Since it is for the purpose of illustrating the sensitivity of the VAR results, any plausible specifications which manage to provide altered results would fulfill the purpose. The one we choose here is one of the specifications in Karras (1996).

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