



A REAL ACTIVITY INDEX FOR MAINLAND CHINA

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Abstract

This paper develops a composite real activity index (RAI) using eight monthly activity indicators for the Mainland economy based on the methodology of the Conference Board. The RAI appears to be able to track the Mainland GDP growth quite well. The results from a logit regression indicate that the RAI can correctly predict the next movement of the quarterly GDP growth rate with a probability of up to 68 percent. In addition, the RAI can beat a random walk process when used to conduct forecasts. Compared with indexes constructed using alternative methods, the RAI has economic properties that are easier to interpret. While the predictability of the RAI can be enhanced further with better data, it is a useful leading indicator to help monitor the momentum of the aggregate activities of the Mainland economy before the official release of the quarterly GDP data.

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I. INTRODUCTION

The objective of this paper is to develop a composite real activity index for the Mainland economy. This index intends to provide a more accurate reading of the pace of the Mainland economy ahead of the official release of the GDP data. In the past, the index of industrial production was used as the sole indicator to proximate the latest developments in aggregate economic activity. However, the industrial production index does not capture other components of output such as services and agriculture, nor does it incorporate information in the demand side of the economy. Therefore, it is useful to construct a composite index that can present a more balanced reading of the aggregate economic activity.

The article proceeds by first discussing the data and the methodology. It is followed by sections of robustness check by comparing the newly constructed index with those constructed using alternative methods. It concludes by suggesting possible improvements when more high-frequency data become available.

II. DATA AND METHODOLOGY

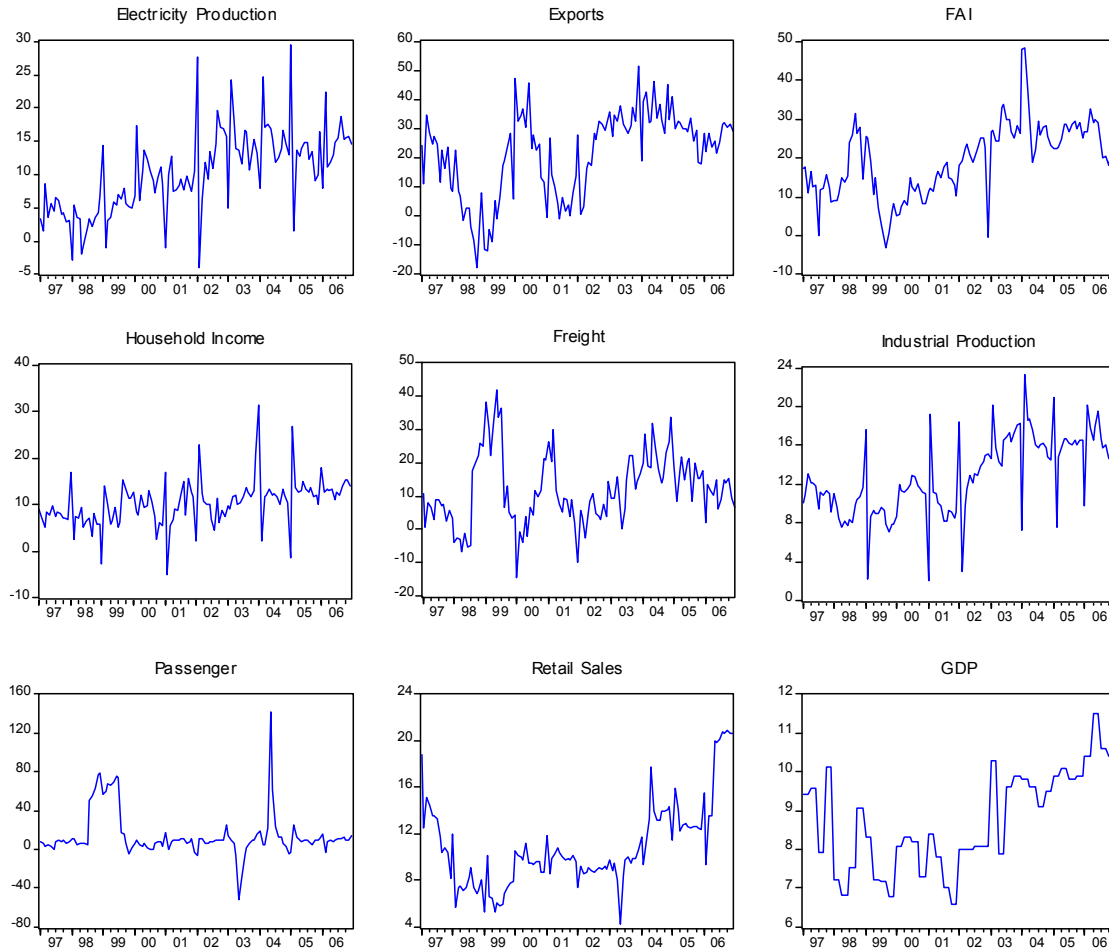
Eight indicators of economic activity are selected to construct the composite index. The selection criteria of these indicators are based on economic theory, methodological requirement, and data availability.² From the supply side, industrial and electricity production are selected. From the demand side, exports, real retail sales, real fixed asset investment (FAI), and the volumes of passenger and freight transport are chosen. In addition, an index of the real per-capita household income in urban area³ is included to reflect wage developments. The year-on-year growth rates of these seasonally adjusted monthly indexes are shown in Figure 1, together with the quarterly GDP growth rate. A causal observation suggests that most of these indexes follow the pattern of the GDP growth rate

² As we adopt the methodology by Conference Board (2001), the data selection criteria also need to satisfy the following conditions: a) conformity: the series must conform well to the business cycle; b) consistent timing: the series must exhibit a consistent pattern over time as a leading, coincident or lagging indicator; c) economic significance: cyclical timing must be economically logical; d) statistical adequacy: data must be collected and processed in a statistically reliable way; e) smoothness: month-to-month movements must not be too erratic; and f) currency: the series must be published on a reasonably prompt schedule. Indeed, our data appear to satisfy most of the criteria.

³ The survey data are from CEIC, which cover the monthly per capita income for urban households across 36 cities.

rather closely, though the growth rate of the passenger volume has some significant outliers.⁴ The composite index is constructed using data after January 1997, as only after which a complete set of the eight indicators became available.

Figure 1: Monthly Activity Indicators and Real GDP (Year-on-Year Change)



Sources: CEIC and staff estimates.

Following the methodology of the US Conference Board,⁵ a non-profit and non-partisan organisation reputed for its leading indicators for the US and the world economy, we construct the composite index for Mainland China using the steps below:

1. First, we difference or calculate *month-to-month* changes for each indicator. If indicator i (X_{it}) is in the form of percentage change, a simple arithmetic

⁴ These outliers were mostly caused by the SARS pandemic.

⁵ See the website of the Conference Board (www.conference-board.org/economics/bci/ci_method.cfm) for details.

difference is adopted to calculate the difference, that is, $x_{it} = X_{it} - X_{it-1}$.⁶ As all our indicators are in the form of year-on-year growth rate, a simple arithmetic difference is applied.

2. We next calculate the standard deviations of the month-to-month changes of these indicators. Let v_i denote the standard deviation of $x_{i,t}$ of indicator i , and let $s_i = 1/v_i$, i.e. the inverse of the standard deviation of the indicator. Thus the weight of each indicator based on the inverse of the standard deviation can be defined as $w_i = \frac{s_i}{\sum_{i=1}^n s_i}$. This setup implies that the more volatile an index is, the smaller the weight it will have in the composite index.⁷
3. The weights calculated in Step 2 are used to combine the month-to-month changes of each indicator into a composite index, i_t , which is computed using the expression, $i_t = \sum_{i=1}^n w_i x_{it}$.
4. Finally, we rescale the composite index calculated in Step 3 by treating January 1997 as 100. We then use the symmetric difference equation ($I_{it} = I_{it-1} \frac{200 + i_t}{200 - i_t}$) to update the index recursively,⁸ where I_t denotes the level of the composite index at time t and I_0 as 100.

Based on the calculated standard deviation (or volatility) of each of these indicators, the weights assigned to individual indexes, w_i 's, over the sample period, are shown in Table 1.

⁶ A symmetric difference, i.e., $x_{it} = 200 \frac{X_{it} - X_{it-1}}{X_{it} + X_{it-1}}$, is more appropriate if x_{it} is in levels. A nice

property of the symmetric difference is that it treats both positive and negative changes proportionally.

⁷ As an appropriate measure of business cycles, a composite indicator usually should smooth out a good part of the volatility of individual series. The rationale of the weighting method employed here is in fact a smoothing operation. As an analogy, this is similar to that used in weighted least squares estimation that takes the inverse of the variances of noises as weights.

⁸ This is derived from symmetrical differences of $i_t = 200 \frac{I_t - I_{t-1}}{I_t + I_{t-1}}$.

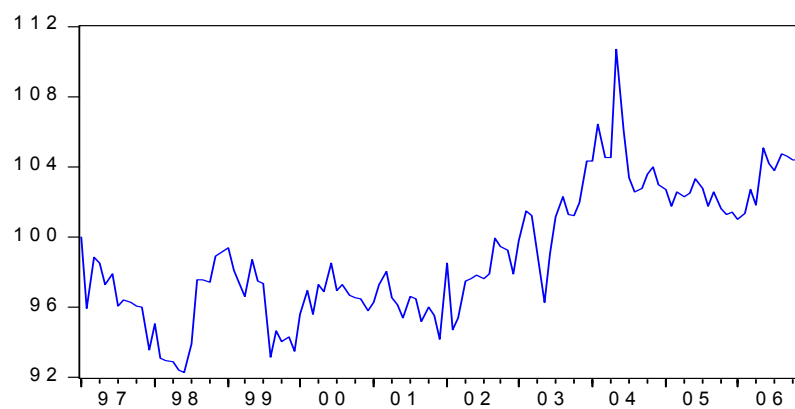
Table 1: Weights of Individual Components

Electricity	Exports	FAI	Freight	Passenger	Industry	Income	Retail sales
0.098	0.063	0.115	0.085	0.038	0.157	0.102	0.342

Source: Staff estimates.

The composite real activity index (RAI) produced with the above methodology is shown in Figure 2 with January 1997 set to 100.

Figure 2: The Real Activity Index



Source: Staff estimates.

III. HOW DOES THE COMPOSITE INDEX PERFORM?

Correlation with GDP growth rate: Few criteria are available to evaluate the adequacy of a real activity index as such. However, one obvious criterion is to see whether the composite index can adequately capture the ups and downs of the real economy. Figure 3 presents the composite index, together with the index of the quarterly GDP growth rate also rescaled by treating 1997 Q1 as 100.⁹ Overall, these two series appear to move in the same direction most of the time. The correlation coefficient of these two indexes is quite high, at 0.78, and it is also statistically significant. In particular, the index appears to be able to capture the recent economic cycles rather well.¹⁰ For example, the index dipped to a low in May 2003, largely reflecting the economic impact of the SARS. Furthermore, the index reached 106.42 in February 2004 and peaked in May 2004, echoing the fact

⁹ The re-scaled GDP index is graphed by assuming equal GDP growth within the same quarter.

¹⁰ The forecast property of the RAI appears to be adequate. Measured by the Theil inequality statistics, we find that most of the bias is concentrated on the covariance proportions, implying the bias and variance proportions are quite small.

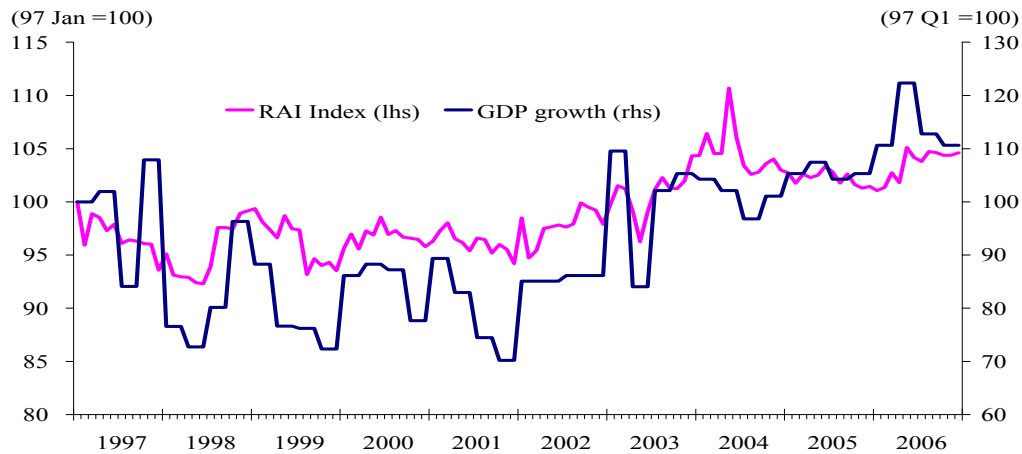
that the economy was overheated in the first half of 2004. After a sizeable drop in 2005 Q4 because of various macroeconomic tightening measures, the index rebounded in March 2006, consistent with our observation that the economy accelerated again. However, it should be noted that the spike of RAI index deviated from the GDP index in May 2004. This is largely attributable to a large base effect because of a sharp increase in passenger volume after the SARS. Table 2 illustrates this point by presenting the contribution (measured by the product of w_i and x_i) made by the indicator of the passenger volume. Obviously, it is the indicator of the passenger volume that affects the sharp rise of the index in May 2004, as indicated by the largest value of 4.45% owing the passenger volume indicator in absolute value.

Table 2: The Product of w_i and x_i (Percent, May-2004)

Electricity	Exports	FAI	Freight	Passenger	Industry	Income	Retail sales
-0.06	0.03	-1.41	1.12	4.53	-0.16	0.15	1.5

Source: Staff estimates.

Figure 3: Relationship between GDP growth and the RAI



Source: Staff estimates.

Predictability of the RAI: Another way to evaluate the performance of the RAI is to see how well it can predict the movements (ups and downs) of the GDP growth rate. This evaluation is carried out using a logit regression. Before doing so, we have to transform both the RAI and GDP growth into binary data by treating an upward movement and a no change as 1 and a downward movement as

0. In general, a complete set of the eight monthly indicators required to construct the RAI is usually available at about two-month and one-month ahead of the official release of the quarterly GDP data. Therefore, two sets of regressions using the RAI at two-month and one-month ahead of the quarterly GDP figure can be conducted to evaluate the predictability of the RAI index. The logit model, with the cumulative logistic density function, can be expressed as the following.

$$p(GDP_t = 1) = \frac{1}{1 + e^{-(\alpha_0 + \alpha_1 index_t + \varepsilon_t)}}$$

where $index_t$ refers to the composite RAI. This expression indicates the likelihood that both the RAI and the GDP growth rate move together and it is measured by p , the probability. After some simple algebraic manipulation, the above expression can be transformed into a linear expression:

$$\ln \left[\frac{p(GDP_t = 1)}{1 - p(GDP_t = 1)} \right] = \alpha_0 + \alpha_1 index_t + \varepsilon_t$$

The sign for $index_t$ is expected to be positive. In addition, we also run a regression by replacing the RAI for the lagged GDP growth rate.

$$\ln \left[\frac{p(GDP_t = 1)}{1 - p(GDP_t = 1)} \right] = \alpha_0 + \alpha_1 GDP_{t-1} + \varepsilon_t$$

This specification intends to evaluate how well the current quarterly GDP growth rate tends to help predict future movements of the GDP growth rate. By comparing the power of the predictability of the RAI (as indicated by the probability, p) as well as a random walk specification using the lagged GDP growth rate, we will be able to assess whether the RAI has a higher predictability than a random walk process. Table 3 presents the estimated coefficients, their corresponding z-statistics, and the estimated probability.

Table 3: result of the logit regression¹¹

index	2-month-ahead	1-month-ahead	random walk
α_1	0.573	1.39*	0.424
z-stat	(0.86)	(2.05)	(0.65)
estimated probability	0.60	0.68	0.55

* statistically significant at 5% level

Note: The estimated probability is calculated from using the estimated coefficient in the table.

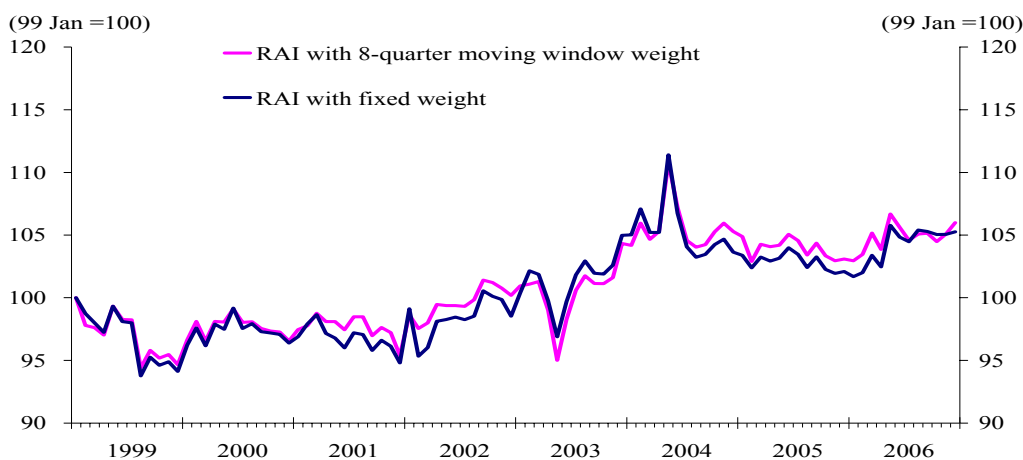
The findings from the logit regression are quite revealing. If we use our RAI two-month ahead of the official release of the quarterly GDP growth rate, there is a chance of 60 percent that our RAI will correctly predict the upcoming movement of the GDP growth rate. If we use our RAI one-month ahead of the official release of the GDP data, there is a chance of 68 percent that our RAI will correctly predict the GDP movement. In addition, it is also statistically significant. It is worth to note that in both cases, our RAI appears to have a higher probability in predicting the future movement of the GDP growth rate than the random walk process.

IV. THE INDEX WITH TIME VARYING WEIGHTS

To reflect the changing nature of the volatility in each indicator, we also construct a RAI with time-varying weights. In other words, we allow the weight of each of the eight indicators to vary over time according to its volatility at time t . This is computed by rolling the sample over 24 months. The index with moving weights is shown in Figure 4, together with the one constructed with fixed weights. In general, these two indexes move closely to each other. However, the time-varying index has a higher correlation coefficient (0.846) with the GDP index.

¹¹ The random walk model is used as a reference to see whether our index can beat it. The explanatory variable is the lag of the qualitative GDP used in our logit model.

Figure 4: Indexes with Fixed and Time-Varying Weights



Source: Staff estimates.

V. DISCUSSIONS AND ALTERNATIVE METHODS

It should be noted that the Conference Board Methodology is just one of the approaches to computing the composite real activity index.¹² Goldman Sachs (GS) has also produced an activity index for China (Goldman Sachs, 2004). The index is computed using the correlation coefficients between one of the eight indicators and real GDP as weights to combine individual indexes. To compare with our weights in Table 1, the correlation coefficients for both seasonally and non-seasonally adjusted 3-month moving average of individual series and GDP growth are computed in Table 3. It shows that the correlation coefficients are quite sensitive to the effect of seasonality. The index is then replicated in Figure 5 as denoted as the GS Index, together with the real GDP growth rate.¹³ The index also appears to capture the main changes of the GDP index. The correlation coefficient between the GS index and GDP growth is 0.74, slightly lower than that of RAI index, 0.78. Although the correlation coefficient between RAI index and the GS

¹² Stock and Watson (1991), for example, use the Kalman filter method to estimate the coincident index for the US by assuming a common trend for a group of indicators. However, their method does not appear to be a good choice in our case for two reasons: First, we have eight components and therefore will have about 40 parameters to estimate using the Kalman filter approach. Considering the short sample period, the estimates may not be reliable. Secondly, it will be difficult to get a reasonable common trend from the eight series due to their quite different volatility pattern. For example, the standard deviation of retail sales growth is only 2.79, while that of the passenger volume is 24.33.

¹³ Note that the GS index uses growth rates of the non-seasonally adjusted time series as components. Therefore, our replication shown in Figure 4 also uses non-seasonally adjusted time series.

one is 0.85, RAI index has lower volatility than the GS index, possibly reflecting the different weighting schemes.

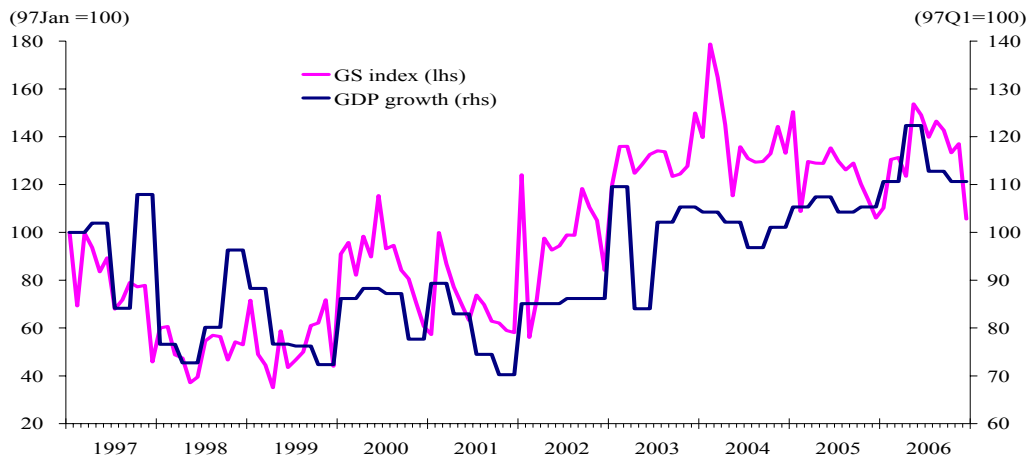
However, one problem concerning the GS method is that the correlation coefficient between the passenger volume indicator and the GDP growth is negative at -0.098 over the sample period. This is contrary to our intuition, as the correlation coefficient between GDP growth and the passenger volume is 0.24 for the sample of 1999 Q4-2002 Q3, a calm period without shocks. As a result, the GS weighting scheme may have made the index vulnerable to the effect of outliers.

Table 4: Correlation Coefficients between Components and GDP Growth

	Electricity	Exports	FAI	Freight	Passenger	Industry	Income	Retail Sales
N SA	0.536	0.531	0.577	0.244	-0.098	0.806	0.427	0.693
SA	0.543	0.537	0.624	0.240	-0.098	0.791	0.424	0.680

Note: NSA and SA represent non-seasonally adjusted and seasonally adjusted, respectively.
Source: Staff estimates.

Figure 5: The Replicated GS Index



Source: Staff estimates.

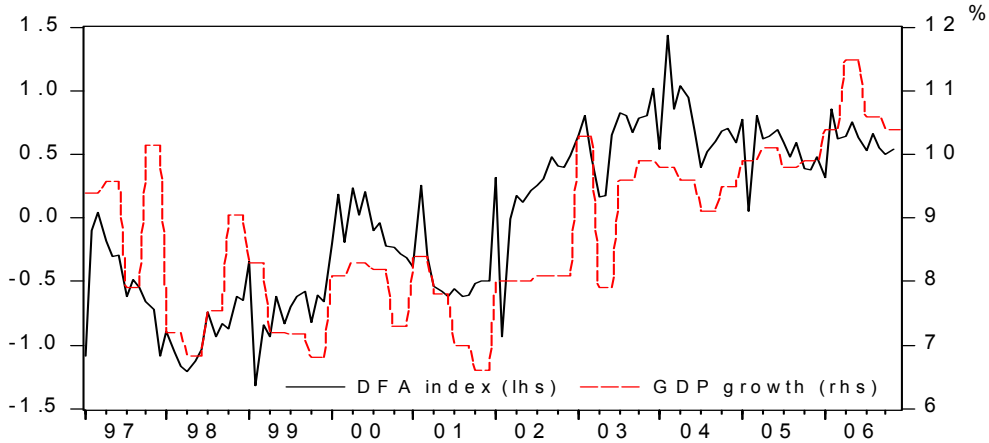
Recently, applying the dynamic factor analysis (DFA) to construct composite indexes has increasingly gained popularity and recognition (Reichlin and Giannone, 2004). The general idea of the dynamic factor analysis is that a $n \times 1$ vector of stationary series can be expressed as the sum of a common component and idiosyncratic components. These two components are assumed to be

orthogonal to each other. Define a group of indicators, $x_{it} = (x_{1t}, x_{2t}, \dots, x_{nt})'$, then x_{it} ($i=1, \dots, n$) can be written as

$$\begin{aligned} x_{it} &= b_{i1}(L)u_{1t} + b_{i2}(L)u_{2t} + \dots + b_{iq}(L)u_{qt} + \xi_{it} \\ &= b_i(L)u_t + \xi_{it} \end{aligned}$$

where $u_t = (u_{1t} \dots u_{qt})'$ is a q -dimensional vector of common shocks (q is small with respect to n), which are assumed to be unobservable but orthogonal to each other white noises. In addition, $b_i(L) = (b_{i1}(L), \dots, b_{iq}(L))$ is a q -dimensional vector of lag operators and $b_{ij}(L) = \sum_{k=0}^{\infty} b_{ij,k} L^k$ ($i=1, \dots, n, j=1, \dots, q$) is a one-sided square-summable filter. The processes u_t and ξ_{it} ($i=1, \dots, n$) are assumed to be mutually orthogonal at all leads and lags. Moreover, the idiosyncratic processes ξ_{it} ($i=1 \dots n$) and $\xi_{\tau t}$ ($\tau=1, \dots, n$) are also mutually orthogonal at all leads and lags for all $i \neq \tau$. The term $b_i(L)u_t$ (the common component) is the index we would like to obtain. Note that one can estimate the common component either in the time domain (the Kalman filter) or in the frequency domain. Here we follow the algorithm developed by Reichlin and Giannone (2004) and estimate the common component in the frequency domain. The index constructed using the DFA is shown in Figure 6.¹⁴

Figure 6: Real Activity Index Constructed with Dynamic Factor Analysis

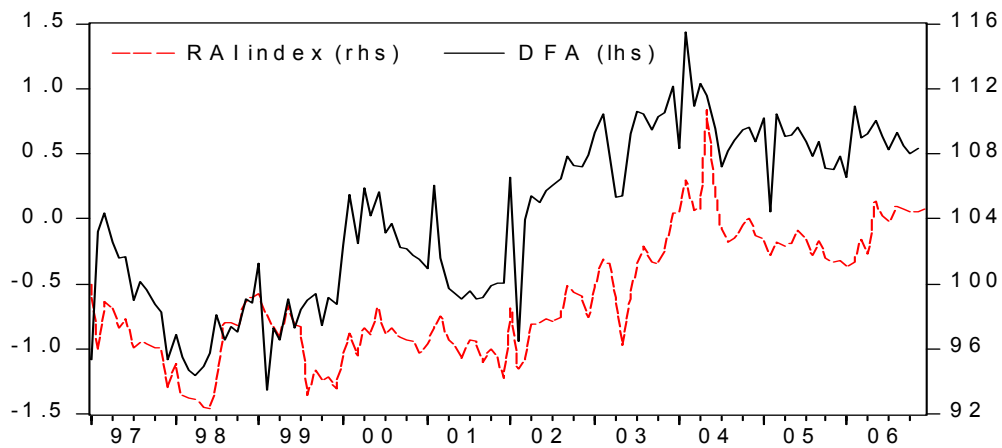


Source: Staff estimates.

¹⁴ Note that the eight series shown in Figure 1 must be normalised before being used for estimation. That is, they are made subject to standard normal distribution.

The DFA index appears to be able to capture the ups and downs of GDP growth well, albeit with some exceptions. For instance, GDP growth remained relatively stable during February and March 2002, while the DFA index declined significantly. Similarly, there is also discrepancy for the first quarter of 2005. The correlation coefficient between the real GDP growth and the DFA index over the sample period is 0.67, lower than those between our RAI indexes constructed with both fixed and time-varying weights using the Conference Board method and the GDP index. In Figure 7, both the DFA index and the RAI index are displayed. Note that the correlation coefficient between these two indexes is 0.822.

Figure 7: The DFA Index and the RAI Index



Source: Staff estimates.

Overall, it appears that the indexes using these alternative methods also track the momentums of the real GDP growth closely. Although the index constructed using the Conference Board methodology has a higher correlation coefficient with the GDP index, it remains to be seen how well it will perform going forward.¹⁵

¹⁵ Not reported here, the index using the Conference Board methodology is also superior to the one constructed using the principal component approach. This could be largely attributable to large difference in volatility among these eight indicators. In addition, we have also computed the principal components of the eight indexes by rescaling each series with the inverse of their standard deviations to reduce the volatility. The result does not appear to improve much as the correlation coefficients of the index constructed using the principal component method with the GDP growth is only 0.147.

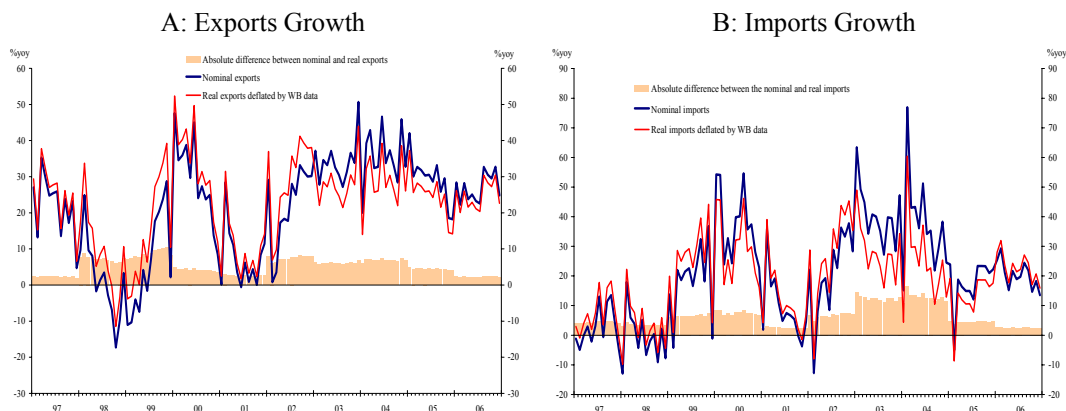
VI. ROBUSTNESS

There are obvious data problems that may have affected both the magnitudes and even directions of the composite index. This section explores these issues, and specifically, adjustments are made to the data series of exports, imports, retail sales, and the fixed asset investment in order to check for the robustness of the RAI.

Exports and Imports

As it is well known, China's trade statistics are published in nominal terms.¹⁶ Therefore, one might argue that the growth rate of exports and imports shown in Figure 1 may not truly reflect trade contribution to real GDP. We first use the *annual* data of trade price index (in terms of US dollar) from the World Bank (WB) to deflate the data series of exports and imports.¹⁷ Both the deflated (real) and nominal imports and exports growth rates are shown in Figure 8.

Figure 8: Nominal and Real Trade Growth Adjusted using the World Bank Data



Source: Staff estimates.

It is apparent from the figure that the difference between the real and nominal series can be substantial. In some cases, the differences can be as high as 10.4% for exports and 16.5% for imports. The absolute values of the differences between the real and nominal growth rates are shown in the lower part of the charts. While the difference is large, we are not able to use the adjusted real export growth rates to construct the index because the annual trade price index from World Bank

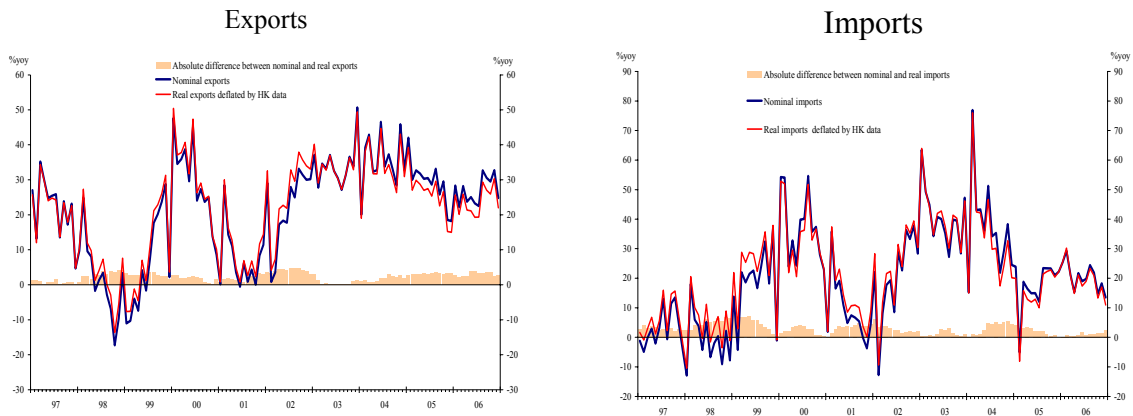
¹⁶ The National Bureau of Statistics only releases *nominal* growth of exports and imports monthly.

¹⁷ In fact, the World Bank obtained the data from the Customs Bureau of Mainland China.

may not capture the monthly changes in trade price well. As mentioned in section II, a good indicator should meet the criterion of currency, that is, the series must be published with a reasonably prompt schedule.

We next use an alternative measure to deflate China's exports and imports. As Hong Kong handles close to 20% of the trade of Mainland China, Hong Kong's indexes of import price from China and re-export price to China may be good proxies.

Figure 9: Nominal and Real Trade Growth Adjusted using the HK Data



Sources: CEIC and staff estimates

As shown in Figure 9, the differences between the real and nominal growth rates of exports and imports are much smaller than those adjusted with the World Bank data. Part of the difference may be due to the different frequency of the time series data. Nevertheless, we find that the standard deviations (SDs) of the adjusted export and import growth rates are close to those of the nominal series. For example, the SDs of the real and nominal exports growth are 0.14 and 0.15, respectively, and those of the real and nominal imports growth are 0.18 and 0.16, respectively. Therefore, the RAI constructed with the exports growth rate adjusted with HK data should be essentially unchanged.

Retail Sales

Although the real retail sales indicator is a good proxy for domestic consumption and demand, it will be useful to investigate whether an alternative measure, the monthly household expenditure survey data, perform even better.¹⁸ A simple correlation analysis shows that close to one third of consumption can be associated with retail sales, while there is little correlation between private consumption and the monthly household expenditure survey.¹⁹ This is also confirmed by the following regression specifications.

$$\begin{aligned}\Delta c_t &= -0.012 + 1.341 \Delta rs_t - 0.396 \Delta c_{t-1}, R^2 = 0.390, \\ &\quad (0.207) \quad (2.225) \quad (1.312) \\ \Delta c_t &= 0.078 + 0.367 \Delta e_t - 0.146 \Delta c_{t-1}, R^2 = 0.034, \\ &\quad (1.377) \quad (0.418) \quad (0.413)\end{aligned}$$

where Δc_t denotes growth rate of private consumption, Δrs_t growth rate of retail sales, and Δe_t growth rate of per capita living expenditure. Numbers in parentheses are t statistics. In view of the evidence above, we continue to use retail sales rather than the monthly household expenditure data to construct the RAI.

Fixed-Asset Investment

As pointed out by Anderson (2006) and Liang et al. (2006), the monthly data of FAI may contain sizeable noise that may often overstate Mainland's investment for the following reasons: First, the FAI is not a value-added concept. Second, it includes transactions such as land and property that may overstate the true corporate investment. It would be useful to compare the FAI number with the gross capital formation (GCF) figure from the national income account. We next regress the real FAI on the real gross capital formation using annual data from 1991 to 2004. The results are shown below (t-statistics in parentheses):²⁰

¹⁸ The number of household surveyed may change each time. Its sample contains 56,099 households in June 2006.

¹⁹ It is calculated for the period from 1993-2005 using annualised data series. Retail sales has been converted to per-capita retail sales, so for consumption in the regression below.

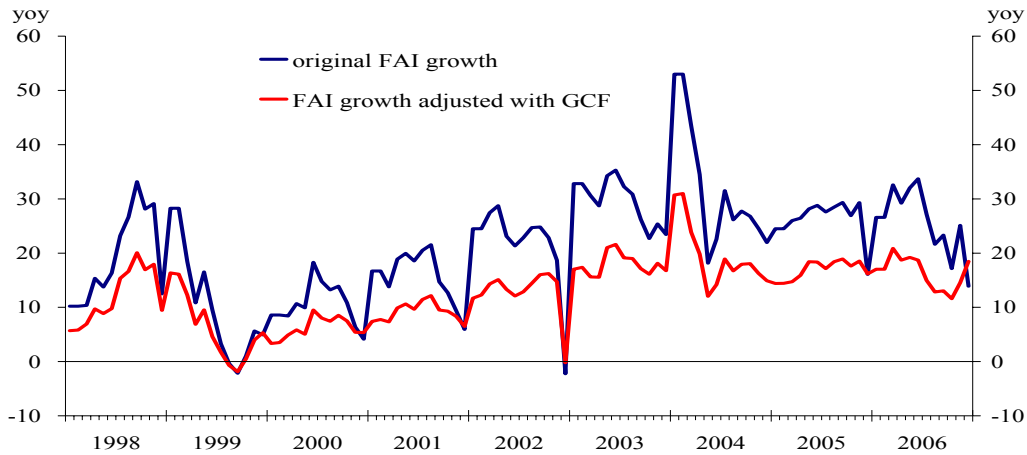
²⁰ Anderson (2006) adjusts the FAI growth just by subtracting the gap between the annual FAI and GCF growth rates from the monthly FAI growth rate.

$$\Delta FAI_t = 0.070 + 0.638 \Delta GCF_t, \quad R^2 = 0.697.$$

(4.209) (5.254)

The coefficient of the GCF is about 0.64, suggesting that a 1% increase in GCF will usually lead to a 0.64% increase in FAI. Given these two measures of investment should be in principle the same, the less than one percent response in FAI implies that the monthly published FAI data may potentially overstate the actual amount of investment in reality. Indeed, it is quite common that FAI should be larger than GCF because FAI is yet adjusted by factors such as capital depreciation and the treatment of land transactions. Nevertheless, this regression is revealing as it could be used to help adjust the FAI data series more in line with the GCF data. Figure 10 compares FAI with the adjusted FAI growth rate using the above regression. We find that the adjusted FAI has become less volatile, with the SD at 3.7%, much lower than that of the original one, 5.9%. This then leads to a higher weight for the adjusted FAI (0.168) than the original one (0.114). The composite index constructed using the adjusted FAI growth is shown in Figure 11. These almost overlapping lines suggest that using original unadjusted FAI may not affect the composite index much.²¹

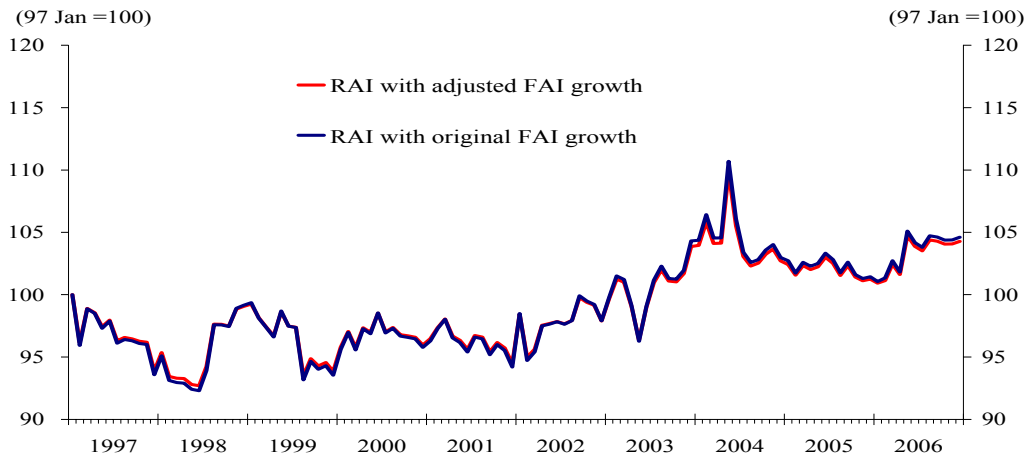
Figure 10: GCF Adjusted FAI Growth



Source: Staff estimates.

²¹ We have also tried to adjust the FAI growth with imports of capital goods, but did not find any significant relationship between these two series.

Figure 11: Index with GCF-Adjusted FAI Growth



Source: Staff estimates.

VII. AN RAI BASED ON THREE MONTH-ON-THREE MONTH GROWTH RATES

The RAI presented in Figure 2 is calculated using the year-on-year growth rates, which may have overlooked the underlying changes of economic momentum. We then compute a new RAI using three-month-on-three-month (3m-on-3m) and seasonally adjusted growth rates of these eight indicators. The weights for these components are shown in Table 4.

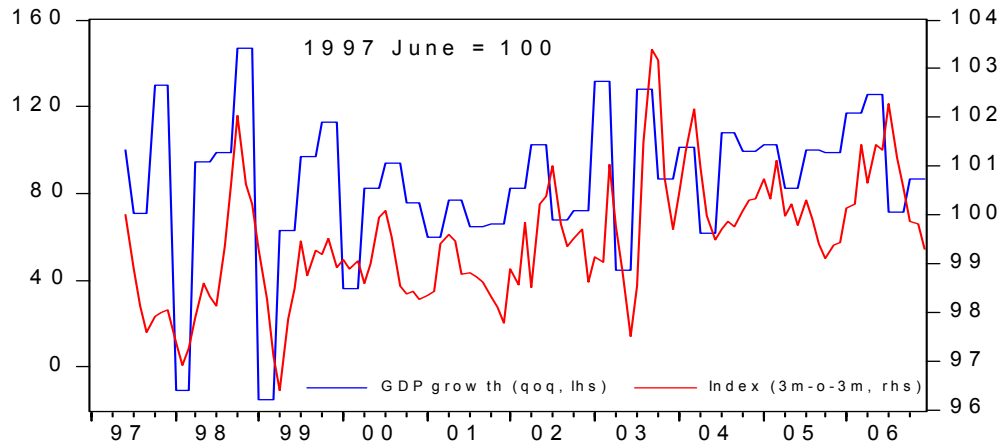
Table 5: Weights of Individual Components (3m-o-3m)

Electricity	Exports	FAI	Freight	Passenger	Industry	Income	Retail Sales
0.146	0.068	0.044	0.084	0.040	0.184	0.137	0.297

Source: Staff estimates.

The seasonally adjusted RAI that attempts to account for the changes of momentum is shown in Figure 12, together with the (quarter-on-quarter, s.a.) GDP index. The seasonally adjusted RAI appears to be able to capture the fluctuations of the GDP index well, though its correlation coefficient with the GDP growth rate drops slightly, compared with that using the year-on-year data.

Figure 12: 3-Month-On-3-Month RAI and GDP Growth



Source: Staff estimates

VIII. CONCLUDING REMARKS

This paper applies a well-established Conference Board methodology to construct a real activity index for China. The index performs relatively well in tracking the GDP growth rate as well as their ability in capturing the turning points of the economy. The results from a logit regression indicate that our index can correctly predict the next movement of GDP with a probability of up to 68 percent. In addition, the index can also beat the random walk process when used to conduct forecasts on the movements of the real GDP growth.

We also conduct robustness checks after adjusting for noises in individual indicators and find that the data quality does not appear to have affected the index much. This index is further cross-checked with other RAIs constructed using alternative methodologies. In particular, we find that the RAI using the dynamic factor analysis also looks quite promising, despite its relatively low correlation with the GDP growth rate. Indeed, both indicators can be utilised to monitor the Mainland economy. That said, these indexes need to be further enhanced for their reliability when used to monitor real economic activities in Mainland China.

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