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Developing a composite index of economic activity for Australia

Phillip Chindamo

18 January 2012

Developing a composite index of economic activity

Introduction

The Australian Industry Group produces three monthly indices of economic activity: the Performance of Manufacturing Index (Australian PMI®); the Performance of Services Index (Australian PSI®); and the Performance of Construction Index (Australian PCI®). Combined, the indices cover industries representing around 65 per cent of the economy (in terms of share of gross domestic product). The indices provide timely and accurate information on the state of these sectors, often well before official ABS data for economic activity in these sectors covering the same time period is published.

A previous Economics Research Note outlined the potential for creating a composite index of economic activity, including combining the three existing Ai Group indices and/or creating a more complex index by combining the Ai Group indices with other information such as financial market data.[1] This Economics Research Note builds on this analysis by exploring the preliminary development of a composite index of economic activity that includes the existing industries covered by the performance indices as well as additional industries not currently covered, namely, the agriculture, forestry and fishing ('rural') and mining industries.

The existing Ai Group monthly indices

The Australian PMI, PSI and PCI indices are compiled through monthly surveys of up to 500 businesses in aggregate, conducted on a representative sample basis for the respective manufacturing, services and construction industries. The monthly surveys cover actual business performance over the previous month with respect to a number of components, including production, new orders, employment, sales, supplier deliveries and inventories. Respondents are asked to report changes against the previous month in terms of qualitative responses (e.g. whether sales increased, decreased or did not change at all).

From the survey information, an aggregate 'diffusion index' is calculated. A diffusion index indicates the degree to which an indicated change for a given component (for example, such as sales or employment) is dispersed throughout the sample population. As a result of the diffusion index methodology, an aggregate index reading above 50 points indicates activity is generally expanding;
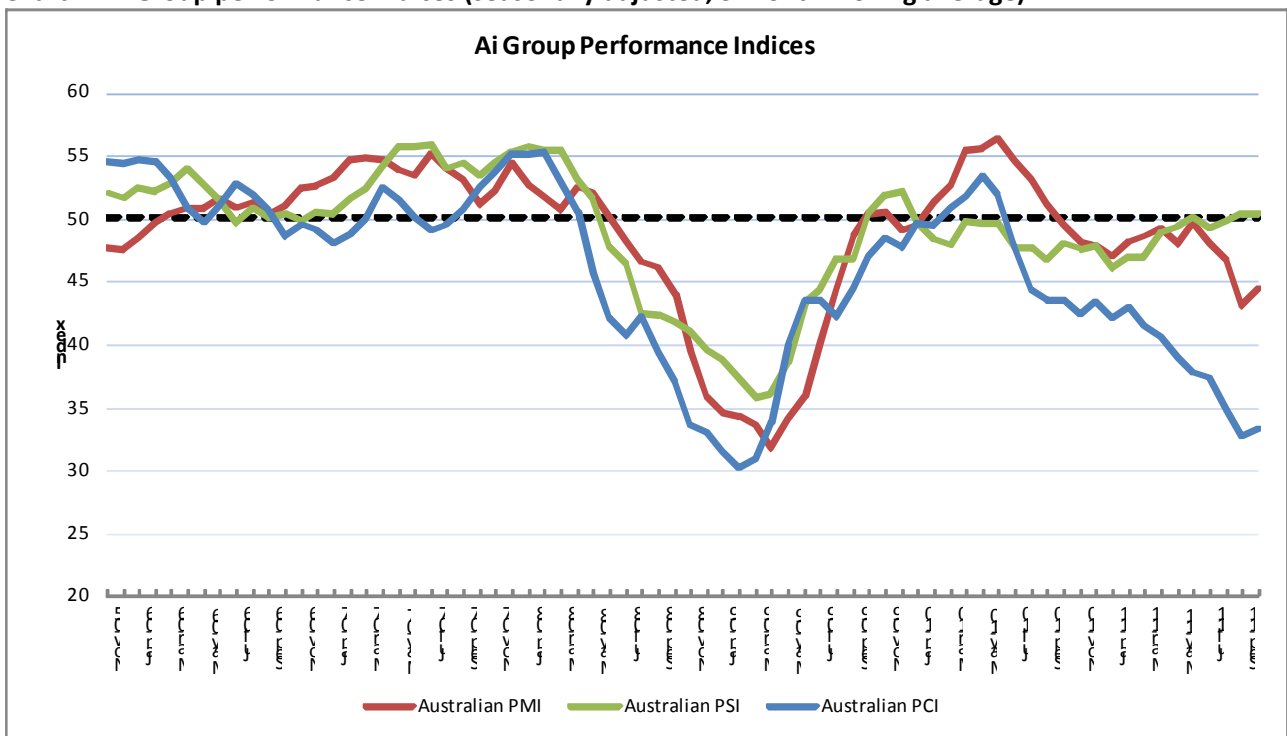
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[1] The Economics Research Note by Chris Lill titled 'A Coincident Indicator of Economic Activity' and can be accessed at: http://www.aigroup.com.au/economicsresearch/researchnotes

while below 50 indicates it is declining. The distance from 50 is indicative of the strength of the expansion or contraction in the industry.

The Australian PMI has been the longest running of the three monthly indices, with monthly data available from May 2001 (previous to this the PMI survey was conducted on a quarterly basis and this quarterly data is available back to 1992). The monthly Australian PSI is available from February 2003 while the monthly Australian PCI is available from September 2005.

Chart 1 presents the seasonally adjusted 3-month moving average of each of the three Ai Group monthly performance indices since November 2005 (which is the concurrent period from which all three indices are available). As indicated earlier, a reading above 50 points indicates activity is generally expanding; while below 50 indicates it is declining. The period from November 2005 to the onset of the global financial crisis in 2008 involved the three indices generally indicating an expansion in economic activity for all three industries, in line with the Great Moderation. The GFC period saw a sharp decline in all three indices, indicative of a sharp contraction in economic activity, with the 3-month moving average Australian PCI reaching a low of 30.1 in February 2009.
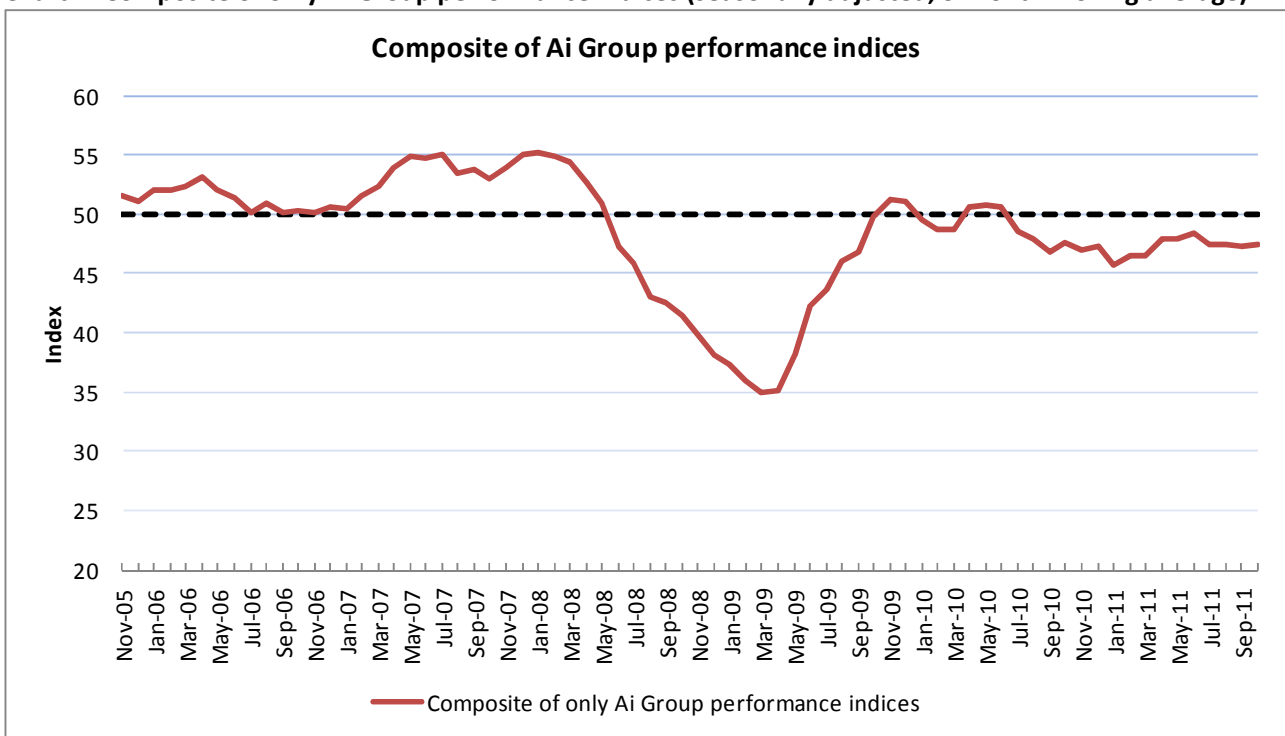
Chart 1: Ai Group performance indices (seasonally adjusted, 3-month moving average)

Source: Ai Group data.

Constructing a composite index

The first step in constructing a composite index is to combine the three Ai Group indices. This is fairly straightforward given that the indices follow the same methodology as diffusion indexes and can be

weighted to form one composite index. One issue is the appropriate weighting to give to each index when combining them into a composite index. The weights used here are based on the relative shares of gross value added for each of the manufacturing; services and construction sectors in each month of the sample. That is, over the sample since November 2005, the PMI is given an average weighting of 0.13; the PSI is given an average weighting of 0.75 and the PCI is given an average weighting of 0.12.

The results of combining the Ai Group performance indices using this weighting method is illustrated in Chart 2 over the common sample since November 2005.

Chart 2: Composite of only Ai Group performance indices (seasonally adjusted, 3-month moving average)

Source: Ai Group data.

Two features stand-out:

- As expected, given the relatively high weighting given to the PSI, the composite of the three Ai Group performance indices follows a similar path to the PSI outlined in Chart 1.

- The composite index smoothes out the volatility exhibited by the individual performance indices. For example, comparing Charts 1 and 2, the trough in the composite index during the GFC is at around the 35 point mark whereas the Chart 1 shows the trough for the PCI and PMI over this same period was around the 30 point mark. Moreover the composite index suggests the last 18 months has been a period of mild contraction across the three industries, whereas the individual performance indices such as the PCI indicate a much severe contraction.

The next step is to augment the composite index of the Ai Group indices with information on economic activity for other industries. Three questions emerge at this juncture:

- Which additional industries should be included in constructing a composite index?

- What is the availability of relevant economic data for other industries in order to amalgamate this information with the existing three performance indices?

- What methodology should be used to incorporate the data for other industries to enable comparability with the performance indices which are on a diffusion basis?

Which additional industries should be included?

Combined the three existing performance indices cover industries that are the equivalent of approximately 65 per cent of Australian GDP.[2] Key industries (in terms of size and supply chain importance) that are not covered include:

- Agriculture, including forestry and fishing ('rural') (ANZSIC 2006 Division A).

- Mining (ANZSIC 2006 Division B).

- Electricity, gas, water and waste services ('utilities') (ANZSIC 2006 Division D).

The next question regards the availability of relevant data for these industries is in order to amalgamate with the existing three Ai Group performance indices.

Availability of relevant data for other industries

In the absence of Ai Group directly surveying respondents in the agriculture, mining and utilities industries on a monthly basis so as to construct diffusion indexes for these industries, 'secondary' data sources need to be examined and utilised. The criterion for assessing these secondary data sources is:

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[2] The Australian PSI involves surveying services industries other than public administration & safety (a non-market sector industry) and education & training (which also have large non-market sector elements).

- The data must be available and accessible monthly at the same time as the performance indices are published to allow timely compilation of the composite index (assuming the composite index will be produced monthly) on a comprehensive and transparent basis (i.e. through using a reliable and transparent methodology, rather than merely anecdotal information).

- The data must provide a meaningful indication of economic activity for a given industry or sector.

On this criterion a comprehensive review of available secondary data sources suggests two potential avenues:

- Monthly ABS data on goods exports (credits) by industry from Cat. No. 5368.0 - International Trade in Goods and Services.

- Monthly RBA indices of commodity prices. The RBA commodity price indices are aggregated into a rural commodity price index and non-rural commodity price index (of which there is a subset metals commodity price index also published).[3]

- Monthly ABS data on commercial finance (fixed loans) by industry from Cat. No. 5671.0 - Lending Finance.

However, even within this small set of available monthly economic data, the industry coverage does not include the utilities industry in any of the three data sets outlined above. Hence in the absence of other monthly data for this industry that meets the above criterion, the utilities sector cannot be included in the development of a composite index. Moreover, the ABS goods exports and RBA commodity prices data are classified on a commodity rather than industry basis.

It is also not clear that the limited available monthly data outlined above is necessarily a useful measure of economic activity for a given month and for a given industry (or that commodity level data is a good indicator of economic activity for an industry for where industry data is not available). For example, all three data sets are obviously an incomplete measure of economic activity. For example, goods exports data obviously reflects only one aspect of output of a given industry in a given period. Moreover, commercial finance data for a given month may not necessarily reflect economic activity within that month but future economic activity as finance (loans) data may be a forward indicator of actual future investment and production.

Given the lack of data for the utilities sector, let us focus on the available monthly data outlined above for the rural and mining industries, keeping in mind the reservations outlined above.

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[3] The ABS does publish more detailed international trade price indices but these are on a quarterly basis.
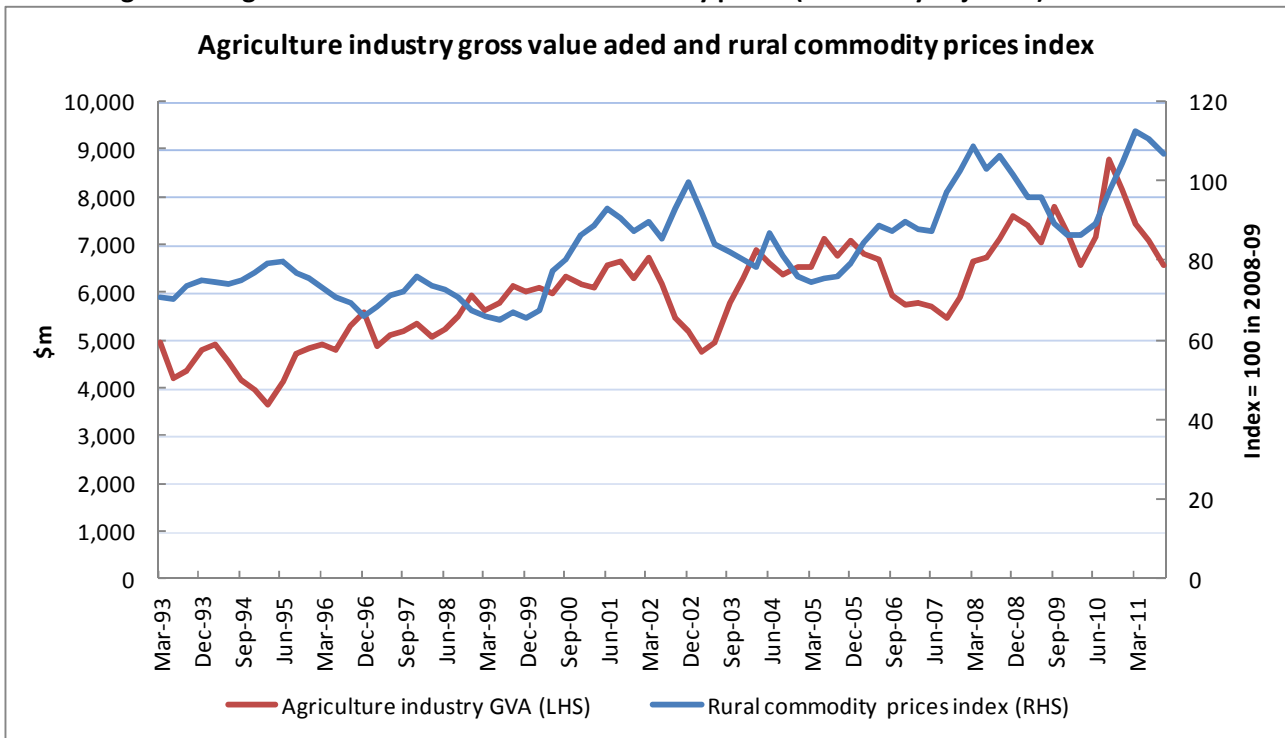
Commodity prices data

Chart 3 presents the quarterly level of mining industry gross value added with the quarterly average metals commodity prices index. Apart from the steep rise and fall in metals commodity prices around 2006-08, the two series do not exhibit marked differences in volatility or trend. The correlation coefficient for the entire sample is 0.72 indicating a positive association between the two series and the correlation coefficient is statistically significantly different from zero.

Chart 3: Mining gross value added and metals commodity prices (seasonally adjusted)
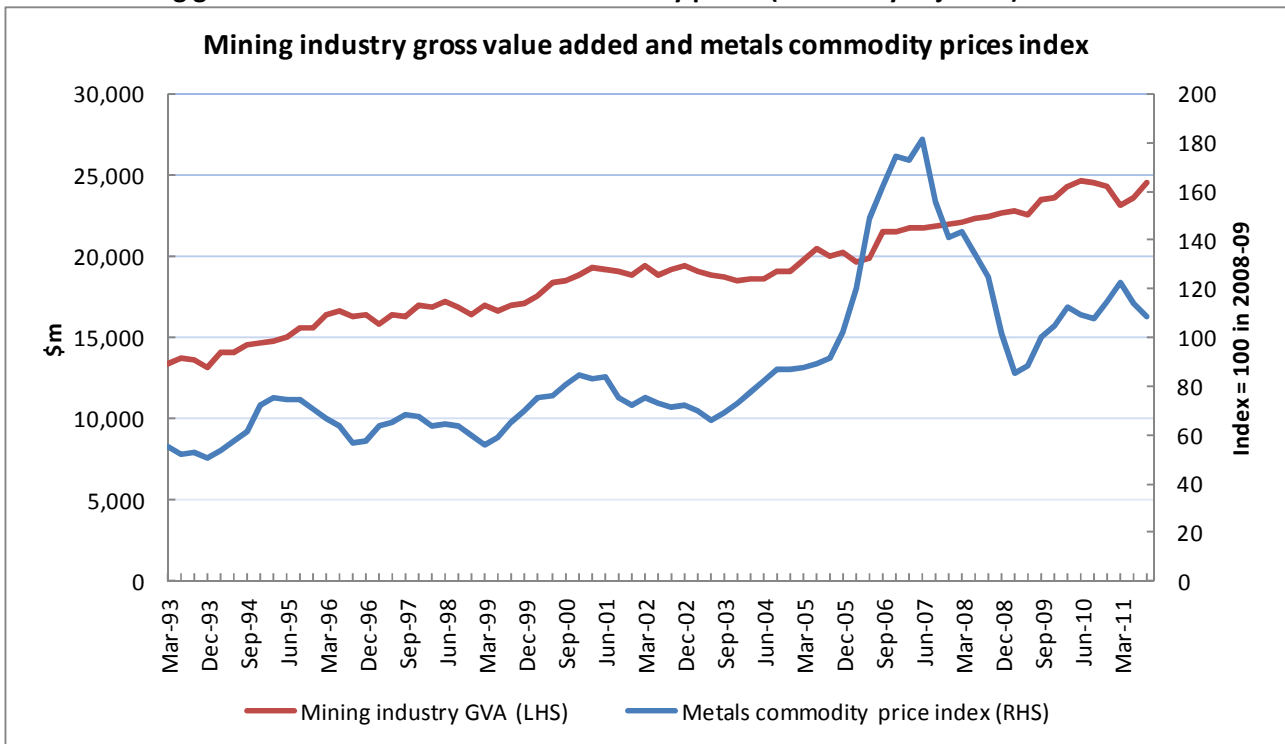
Source: ABS National Accounts and RBA Commodity Prices data.

Chart 4 presents the quarterly level of agriculture industry gross value added with the quarterly average rural commodity prices index. The rural commodity prices index is less volatile than the metals commodity price index but appears to move in opposite directions to agriculture gross value added over some parts of the sample. This is evidenced by the correlation coefficient between the two series of 0.55, indicating a positive association between the two series (but less so than between the two mining related time series). The correlation coefficient is also statistically significantly different from zero.

Chart 4: Agriculture gross value added and rural commodity prices (seasonally adjusted)

Source: ABS National Accounts and RBA Commodity Prices data.

## Methodology to incorporate the new data for a composite index

One way of incorporating the data outlined above is to take a measure of the deviation of each series from its longer-term trend and take this as the analogue of the deviation of the existing performance indices from the neutral 50 point mark. That is, if the series is above its long-term trend then this is interpreted as the equivalent of saying this is an indication of an expansion in economic activity and vice versa for when the series is below its long-term trend.

One way of disaggregating a given series into a trend component and a cyclical component (representing the deviation from trend) is to use a Hodrick-Prescott filter. The general idea behind this a filter is that a time series, say the rural commodity price index outlined in Chart 4 above, consists of a trend component and a cyclical component which can be separately identified.

The Hodrick-Prescott filter is applied to the quarterly average metals and rural commodities price indices with the cyclical component for each series (deviation from a trend, which is interpreted to represent a neutral position) presented in Chart 5 below. It is immediately obvious that the cyclical component of the base metals component is more volatile than that of the rural commodity prices index. Each series represents a point deviation from the underlying trend component of each series, so that, for example, in May 2007 the base metals index of 18.4 (3-month moving average) was 36.8

points above its underlying trend value for that month. Similarly, Chart 5 shows in February 2010, the series was 34.3 points below its underlying trend value for that month.

Chart 5: Cyclical components of commodity price indices (seasonally adjusted)

Chart title: **Cyclical components of commodity price indices**
Y-axis: Point deviation from trend for each series
Legend: Rural, Base metals
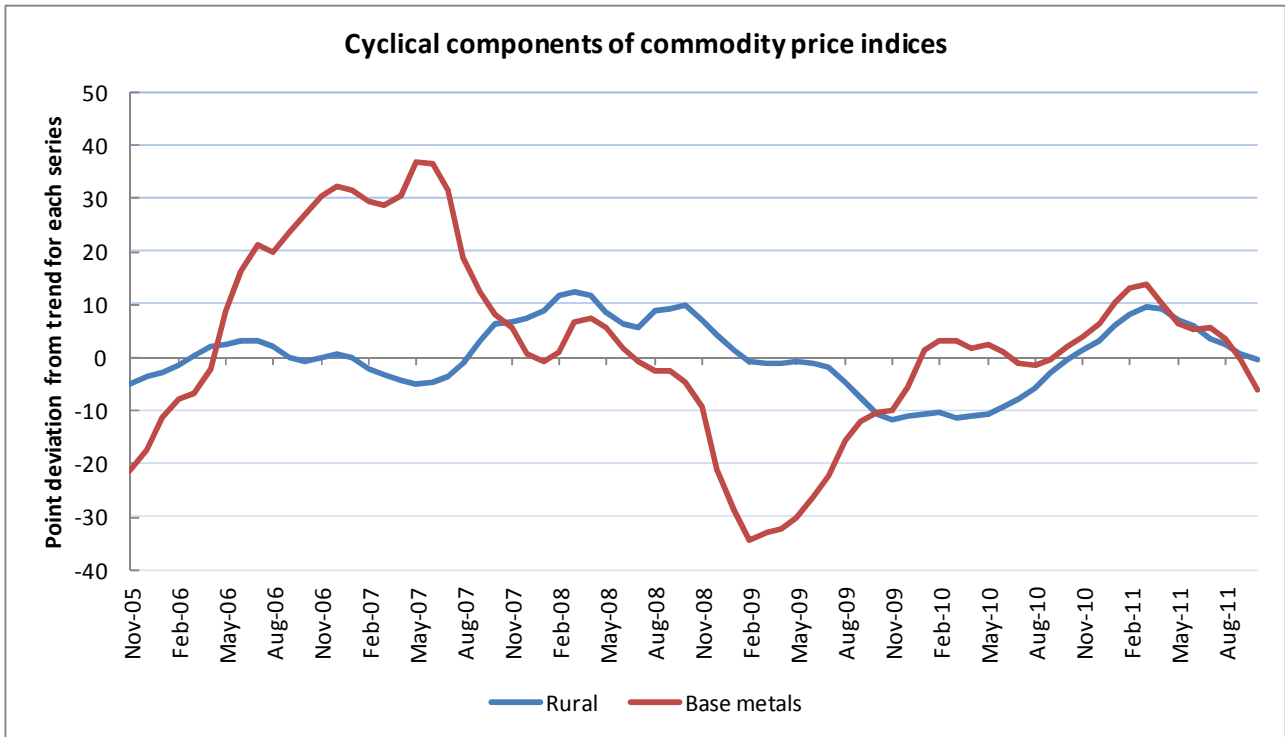
In order to smooth out the volatility of the cyclical components and to ensure that the deviations from trend are 'anchored' around 50 (analogous to the existing Ai Group performance indices diffusion indices where 50 represents a neutral level of economic activity), the cyclical component series is transformed into a percentage point deviation from its headline value (that is, the cyclical component value given in Chart 5 for any given month is divided by the respective series values given in Charts 3 and 4) and then this value is expressed as a deviation from 50 to develop an index that mimics the existing Ai Group performance indices centred around 50. The resulting series are presented in Chart 6 below.

We can see from Chart 6 that there was a contraction in the base metals commodity price index during the global financial crisis after a period of benign growth during 2007 and an expansion before that period (during 2006).

In comparison the rural commodity price index did not exhibit the same decline during the global financial crisis period and only contracted in the latter period during 2010 before making a slight recovery.

**Chart 6: Rural and base metal indices (seasonally adjusted, 3-month moving average)**
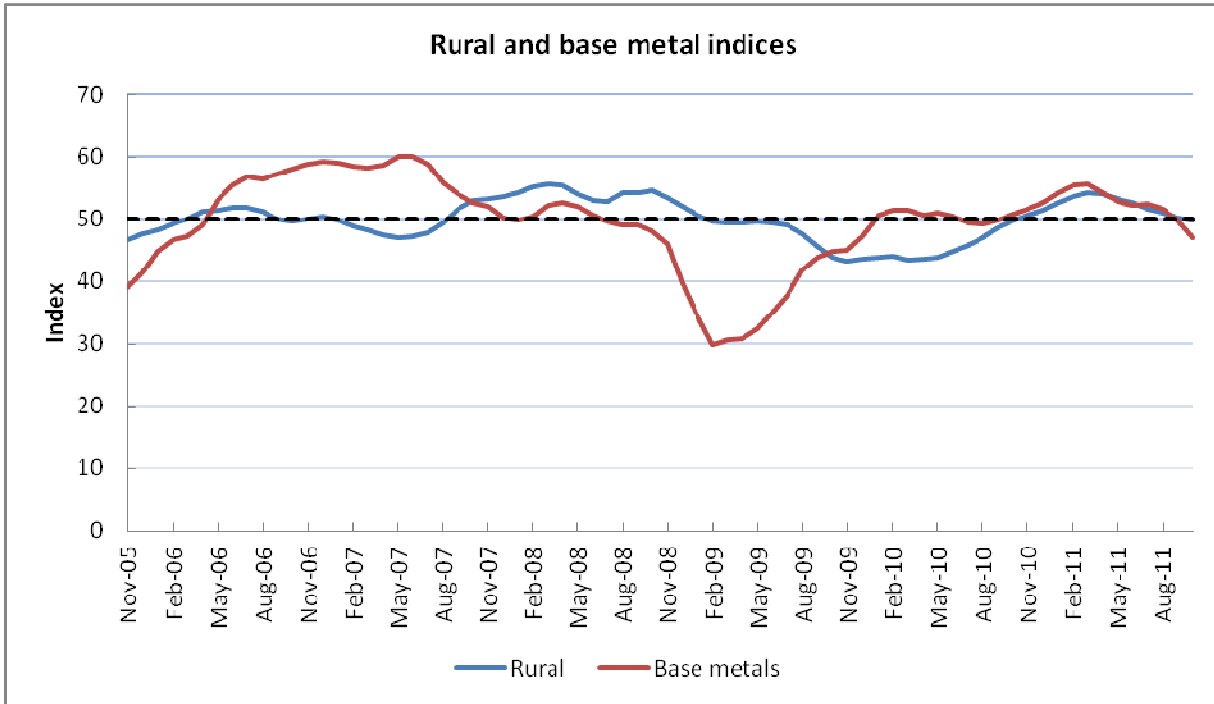
Now combing the three Ai Group performance indices with the two indices given in Chart 6 gives us a composite index of economic activity. The weighting given to each index is assigned based on a moving average of gross value added shares (since, for example, the share of mining has continued to rise) as follows:

Sector:	Manufacturing	Services	Construction	Rural	Mining	Total
Average share:	0.11	0.68	0.08	0.03	0.11	1.00

The resulting composite index is provided in Chart 7. A number of features stand out:

- Comparing the composite index to the individual Ai group performance indices (Chart 1) shows that the trough in the composite index during the global financial crisis period is less severe than for the Australian PMI and the Australian PCI.

- Generally given the addition of the mining and rural sectors, the composite index smoothes out the peaks and troughs evident in the Australian PMI and Australian PCI since 2009.

- The composite index suggests that the economy has been generally in a slight contractionary phase in recent months, consistent with benign official data in recent months for gross domestic product, dwellings construction, employment and retail sales.

Chart 7: Composite index of economic activity (seasonally adjusted, 3-month moving average)
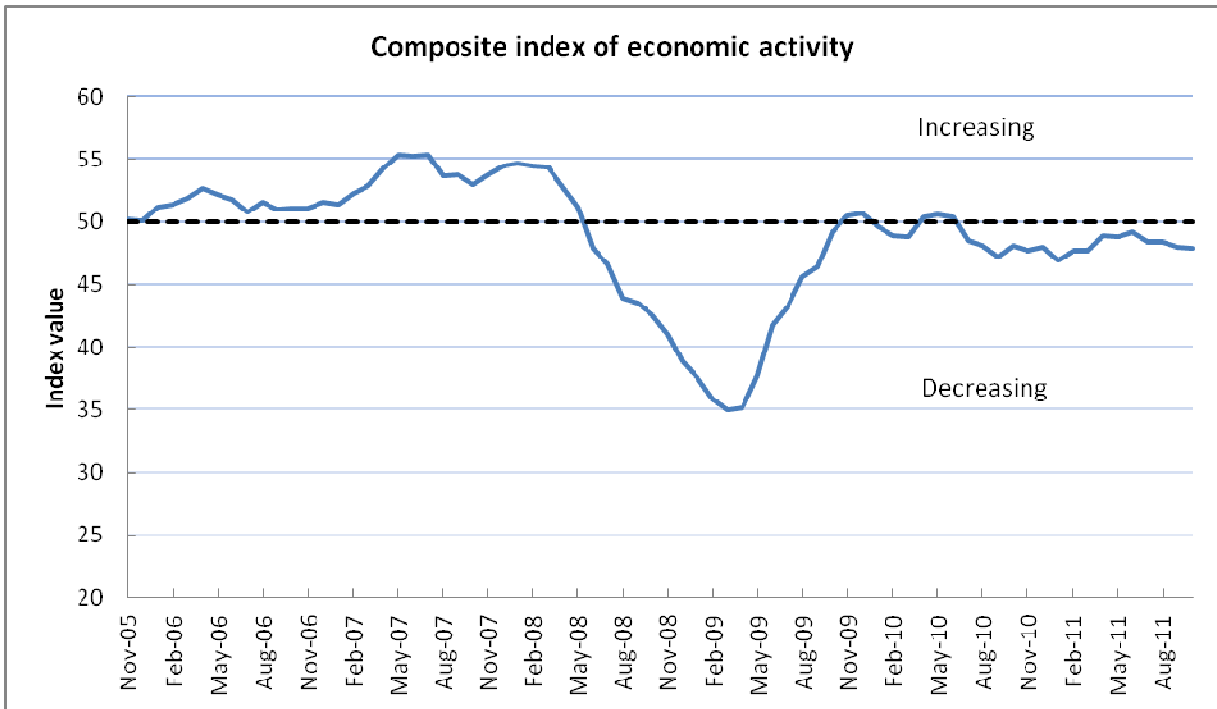
Conclusion

This Note has examined the feasibly of developing a composite index of economic activity using the three existing Australian Industry Group performance indices with non-survey data for other sectors. The availability of timely (monthly) and consistent (methodological) data for other sectors of the economy is limited. Given the data limitations, a simple 'proxy' approach is taken using available monthly data on commodity prices for the rural and mining sectors as proxies of economic activity within these sectors.

A further conceptual and methodological challenge is how to use this additional data to construct series that are consistent with the diffusion indices represented by the existing Ai Group indices, which indicate the monthly degree of contraction or expansion in economic activity within a sector from a neutral point. A simple approach applied here has been to filter the commodity prices series into its trend and cyclical components and interpret the cyclical component as a measure of expansion or contraction from the neutral level.

On this basis, a simple weighted composite index covering the three Ai Group performance indices sectors as well as the rural and mining sectors is developed, showing that the economy has been generally in a slight contractionary phase in recent months, consistent with benign official data.

Contact
Phillip Chindamo, Chief Economist, Ai Group Economics and Research Unit, http://www.aigroup.com.au/economics.