How does the Australian PCI® line up with official data?

This research note examines the statistical relationship between the Australian PSI® and various Australian Bureau of Statistics (ABS) data series that are relevant to the construction industry. There is a strong statistical relationship between the Australian PCI® and the relevant ABS data for various segments of the construction industry. The relationships are strongest for the residential building sector.

Since 2005, Ai Group has compiled and published Australia’s leading performance index for the construction industry, the Australian Industry Group/Housing Industry Association Australian Performance of Construction Index (Australian PCI®). The Australian PCI® is constructed from a monthly national survey of construction businesses, representing the four construction sub-sectors: engineering, commercial, apartments and house construction.

The Australian PCI® is a ‘diffusion’ index, calculated from a weighted composite of five key activity indicators including activity, new orders, employment and supplier deliveries. These indicators are weighted (derived from ABS data), combined into the headline index and indexes for each sub-sector, and seasonally adjusted.

An index reading in the Australian PCI® above 50 points indicates activity is, on balance, expanding; below 50, that it is declining. The distance from 50 points indicates the strength of the expansion or decline. Survey respondents are asked to specify whether their activity for each indicator (e.g. new orders) has increased (“up”), decreased (“down”) or remained the same (“no change”), relative to the previous month.

Our detailed statistical analysis found a ‘leading’ margin for a number Australian PCI® series in addition to the headline results, including:

- between the Australian PCI® Houses New Orders and the number of ABS private sector house approvals;
- between the Houses Activity sub-index and the quarterly value of ABS construction work done for private new houses;
- between the Apartments New Orders sub-index and the number of ABS other residential dwelling approvals (i.e. exclude houses and apartments in a four-storey or higher block);
- between the Commercial Activity sub-index and annual growth in the value of ABS non-residential construction work done;
- between the Selling Prices sub-index and annual growth in ABS output prices for building construction; and
- between the Employment sub-index and the movement in the ABS total hours worked per week per construction employee.

In most cases, the relationship between the Australian PCI® and these ABS data appears to be concurrent rather than leading (that is, the changes in the PCI data series occur simultaneously with the ABS data, rather than one or two time periods ahead). The earlier release dates for the Australian PCI® however, give it a ‘lead’ on the ABS data, even where the statistical relationship appears to be wholly concurrent.

These relationships are examined in turn in the charts and text below. Their statistical correlation values are summarised in Table 1 below.

This note adds to earlier Ai Group research which investigated the relationship between the Australian PMI®, PSI® and PCI® and official GDP output measures (see Correlations of Ai Group Performance Indices with Official Economic Data, 2010).

It also complements Ai Group’s detailed analysis of the Australian PMI® and Australian PSI® and their relationship with relevant ABS data (see How does the Australian PMI compare to ABS data?, 2014 and What does the Australian PSI tell us about ABS data?, 2014).
Changes in the **Australian PCI®** new house orders (three-month moving average) are closely aligned with the number of private sector house approvals in ABS’ monthly *Building Approvals* release. This is to be expected, since these two series are conceptually very similar.

A simple linear regression model using data from 2006 to 2015 suggests that an **Australian PCI®** house new orders sub-index reading (3mma) of 50.0 points is equivalent to around 9,000 new private sector houses approved for the same month.

The model suggests that a 1.0 point increase in the **Australian PCI®** house new orders sub-index (3mma) each month is equivalent to around 74 new private sector houses approved in the same month.

Both the **Australian PCI®** new house orders sub-index and the ABS private sector house approvals show that the Australian housing construction market slowed sharply following the 2008-09 Global Financial Crisis (GFC), with a prolonged dip from 2010 to 2012. Private house approvals strengthened from late 2013 and have remained elevated, reflecting demographic trends and historically low interest rates.

### Australian PCI® Houses Activity Sub-index vs ABS Construction Work Done for Private New Houses

Changes in the **Australian PCI®** new houses activity (three-month moving average, six months lead) are well aligned with the value of construction work done for private new houses in the ABS’ quarterly *Construction Work Done, Preliminary* series. These two data series more or less measure the same thing, therefore they have a reasonably close correlation.

A simple linear regression model using data from 2006 to 2015 suggests that an **Australian PCI®** houses activity sub-index reading (3mma) of 50.0 points at the end of a quarter is equivalent to about 4.2% p.a. growth in the value of quarterly construction work done for private houses, two quarters ahead.

The model also suggests that a 1.0 percentage point increase in the **Australian PCI®** houses activity sub-index (3mma) at the end of each quarter is equivalent to around 0.5 percentage point increase in the annual growth rate of private house construction work done, six months later.

Both the **Australian PCI®** houses activity sub-index and the ABS private house construction work done data show that Australian housing construction activity decelerated sharply in 2008-09, with a more prolonged dip between 2010 and 2013. Growth rates subsequently recovered in late 2013 and have been solid since then, assisted by very low interest rates.
Changes in the **Australian PCI®** apartments new orders (three-month moving average) are closely aligned with the number of other residential dwelling approvals (i.e. non-house and exclude apartments in a four-storey or higher block) in the ABS monthly *Building Approvals* release.

The **Australian PCI®** apartments new orders sub-index closely tracked the ABS ‘other dwelling approvals’ until 2013. Since then, strong growth in approvals for apartments in blocks of four-stories or higher has meant that the total number of units approved has increased more sharply than the **Australian PCI®**, due to its diffusion index methodology. The **Australian PCI®** therefore tracks better to ‘other dwelling’ approvals when these four-storey-plus apartment blocks are excluded.

A simple linear regression model using data from 2006 to 2015 suggests that an **Australian PCI®** apartments new orders sub-index reading (3mma) of 50.0 points is equivalent to just over 3,000 ‘other dwelling’ units approved, three months ahead.

The model also suggests that a 1.0 point increase in the **Australian PCI®** apartments new orders sub-index (3mma) each month is equivalent to around 32 ‘other dwelling’ units approved 3 months ahead (exc. four-storey apartment blocks).

These series both show that the Australian housing construction market picked up from 2013, after a prolonged period of weakness between 2010 and 2012.

Changes in the **Australian PCI®** commercial activity sub-index (three-month moving average, three months lead) are well aligned with annual growth in the value of non-residential construction work done across all sectors in the ABS quarterly *Construction Work Done, Preliminary series*.

A simple linear regression model using data from 2006 to 2015 suggests that an **Australian PCI®** commercial activity sub-index reading (3mma) of 50.0 points at the end of a quarter is equivalent to about 7.5% p.a. growth in the value of quarterly non-residential construction work done, one quarter ahead.

The model also suggests that a 1.0 percentage point increase in the **Australian PCI®** commercial activity sub-index (3mma) at the end of each quarter is equivalent to around a 0.6 percentage point increase in the annual growth rate of non-residential construction work done, three months later.

Both the **Australian PCI®** commercial activity sub-index and the ABS non-residential construction work done show that Australian commercial construction activity fell sharply in 2008 and again between 2010 and 2013. Growth rates recovered in late 2013 but remain relatively fragile.
Changes in the Australian PCI® selling prices sub-index (six-month moving average, three months lead) are well aligned with annual growth in output prices for building construction in the ABS quarterly Producer Price Index (PPI).

A simple linear regression model using data from 2008 to 2015 suggests that an Australian PCI® selling prices sub-index reading (6mma) of 50.0 points at the end of a quarter is equivalent to about a 2.5% p.a. increase in the prices for building construction output, one quarter ahead.

The model also suggests that a 1.0 percentage point increase in the Australian PCI® selling prices sub-index (6mma) at the end of each quarter is equivalent to 0.14 percentage point increase in the annual growth rate of building construction output prices, three months later.

Both the Australian PCI® selling prices sub-index and Australian building construction output prices decelerated in 2008 and again from 2010-11. Selling prices for the building construction industry recovered in late 2013, reflecting stronger demand for residential building construction activity.

Changes in the Australian PCI® employment sub-index (three-month moving average, six months lead) are indicative of movement in the average hours worked per employee per week in the construction industry, as published in the ABS Labour Force Detailed, Quarterly series.

A simple linear regression model using data from 2006 to 2015 suggests that an Australian PCI® employment sub-index reading (6mma) of 50.0 points at the end of a quarter is equivalent to an average of about 38.4 hours of work per week per construction employee, two quarters ahead.

The model also suggests that a 1.0 percentage point increase in the Australian PCI® employment sub-index (6mma) at the end of each quarter is equivalent to around a 0.02 hour increase in the weekly average work hours of construction employees, six months later.

Both the Australian PCI® employment sub-index and the ABS data on weekly hours of work per construction employee indicate that labour demand in the Australian construction industry appears to have returned to pre-2008 levels, following a period of weakness between 2009 and 2012.
Table 1: Australian PCI® statistical correlations

<table>
<thead>
<tr>
<th>PCI Indexes² (x)</th>
<th>ABS (y)</th>
<th>Time Period³</th>
<th>Correlation</th>
<th>Simple linear Regression⁴</th>
<th>R²; adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houses New Orders (3mma)</td>
<td>Total number of new private sector houses approved in the month, seasonally adjusted (Cat. 8731.0)</td>
<td>August 2006 to August 2015</td>
<td>0.88</td>
<td>y = 5.363*** + 74.0***x</td>
<td>0.77; 0.77</td>
</tr>
<tr>
<td>Houses Activity (3mma, 6 months lead)</td>
<td>Value of work done during the quarter, private sector new houses, chain volume measure, seasonally adjusted, % p.a. (Cat. 8755.0)</td>
<td>September 2005 to June 2015</td>
<td>0.68</td>
<td>y = -20.9*** + 0.5***x</td>
<td>0.47; 0.45</td>
</tr>
<tr>
<td>Apartments New Orders (3mma, 6 months lead)</td>
<td>Total number of new other residential dwelling units approved (excl. apartments in a block of 4-storey or more), 3-month moving average, original (Cat. 8755.0)</td>
<td>August 2006 to September 2015</td>
<td>0.53</td>
<td>y = 1.451*** + 32.9***x</td>
<td>0.28; 0.27</td>
</tr>
<tr>
<td>Commercial Activity (3mma, 3 months lead)</td>
<td>Value of work done during the quarter, non-residential all sectors, chain volume measure, seasonally adjusted, % p.a. (Cat. 8755.0)</td>
<td>September 2005 to June 2015</td>
<td>0.56</td>
<td>y = -23.3*** + 0.6***x</td>
<td>0.31; 0.29</td>
</tr>
<tr>
<td>Employment (6mma, 6 months lead)</td>
<td>Construction Hours Actually Worked in All Jobs per Employed Person, 4-quarter moving average, original (Cat. 6291.0)</td>
<td>September 2005 to August 2015</td>
<td>0.38</td>
<td>y = 37.56*** + 0.02***x</td>
<td>0.15; 0.12</td>
</tr>
<tr>
<td>Selling Prices (6mma, 3 months lead, unadjusted)</td>
<td>Building Construction Output Prices – Producer Price Index, original, % p.a. (Cat. 6427.0)</td>
<td>January 2008 to September 2015</td>
<td>0.63</td>
<td>y = -4.66*** + 0.14***x</td>
<td>0.40; 0.37</td>
</tr>
</tbody>
</table>

Sources: Ai Group; various ABS publications.

1 Alternative moving averages and lags were also tested during this study. The table only includes those results that are most relevant and representative.
2 Seasonally adjusted unless indicated otherwise.
3 For monthly readings of the Australian PCI® sub-indexes and sub-sector indexes, the relevant quarter-end data are used to compare to the relevant ABS series for the corresponding quarter. For example, for the 2015 March quarter, the 3-month-moving-average for the Australian PCI® commercial activity sub-index for March 2015 is compared to the annual growth rate of the ABS value of non-residential work done for the June quarter (as this Australian PCI® sub-index leads the relevant ABS series).
4 *** indicates P-value is less than 1%; ** indicates P-value is less than 5%; * indicates P-value is less than 10%.
Ai Group / HIA Australian PCI®: a quick history

2005 Commenced as a monthly data series.
2006 New sub-indexes added.
2008 New sub-indexes added.

Typical sample size: between 150 and 200 companies answer the Australian PCI® each month.
Average business size: around 80-100 employees per business.

The Australian PCI® uses an internationally standardised ‘diffusion index’ methodology.

The Australian PCI® is part of a network of directly comparable surveys that are conducted globally by various organisations. These are compiled into a ‘Global Construction PMI’ each month by Markit Economics. For more information about international PMI surveys and the Global PMI for services, see www.markiteconomics.com.

This note adds to earlier Ai Group research which studied the relationship between the Australian PCI® and the growth rates for various Australian construction output measures (see Correlations of Ai Group Performance Indices with Official Economic Data, 2010).

<table>
<thead>
<tr>
<th>Australian PCI®</th>
<th>Date commenced, monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity sub-indexes (a)</td>
<td>September 2005</td>
</tr>
<tr>
<td>Activity</td>
<td></td>
</tr>
<tr>
<td>- Housing activity</td>
<td>Sep 2005</td>
</tr>
<tr>
<td>- Apartments activity</td>
<td>Sep 2005</td>
</tr>
<tr>
<td>- Commercial activity</td>
<td>Sep 2005</td>
</tr>
<tr>
<td>- Engineering activity</td>
<td>Sep 2005</td>
</tr>
<tr>
<td>New Orders</td>
<td></td>
</tr>
<tr>
<td>- Housing activity</td>
<td>Aug 2006</td>
</tr>
<tr>
<td>- Apartments activity</td>
<td>Aug 2006</td>
</tr>
<tr>
<td>- Commercial activity</td>
<td>Aug 2006</td>
</tr>
<tr>
<td>- Engineering activity</td>
<td>Aug 2006</td>
</tr>
<tr>
<td>Employment</td>
<td>Sep 2005</td>
</tr>
<tr>
<td>Deliveries</td>
<td>Sep 2005</td>
</tr>
<tr>
<td>Capacity Utilisation (unadjusted)</td>
<td>Jan 2008</td>
</tr>
<tr>
<td>Price sub-indexes</td>
<td></td>
</tr>
<tr>
<td>Input Prices</td>
<td>Sep 2005</td>
</tr>
<tr>
<td>Selling Prices (unadjusted)</td>
<td>Jan 2008</td>
</tr>
<tr>
<td>Wages</td>
<td>Jan 2008</td>
</tr>
</tbody>
</table>

(a) ANZSIC 2006 classifications and annual average (2007-08) industry weights.

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What is the Australian PCI®? Performance of Construction Index (Australian PCI®) in conjunction with the Housing Industry Association is a seasonally adjusted national composite index based on the diffusion indexes for activity, new business, deliveries and employment with varying weights. An Australian PCI® reading above 50 points indicates construction activity is generally expanding; below 50, that it is declining. The distance from 50 is indicative of the strength of the expansion or decline. For further economic analysis and information from the Australian Industry Group, visit http://www.aigroup.com.au/economics. For further information on international PCI data, visit http://www.markiteconomics.com or http://www.cipsa.com.au.

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