# Will mining investment fall off a cliff?

National Australia Bank

- **The recent capex and exploration expectations data suggest that mining investment may be approaching a turning point. A decline is inevitable: the question is when and how fast.**
- **On the basis of past engineering construction commencements, there are reasons to believe that there is a risk of a decline in 2014 big enough to take 2% points off GDP growth in that year unless another "mega" project starts soon. Lower levels of bulk commodity prices are also likely to be negative for the underlying trend in mining project commencements.**
- **If mining investment retreats spectacularly in 2014, non-mining investment will need to fill the gap quickly if employment growth is to be maintained.**

## Soft landing for mining?

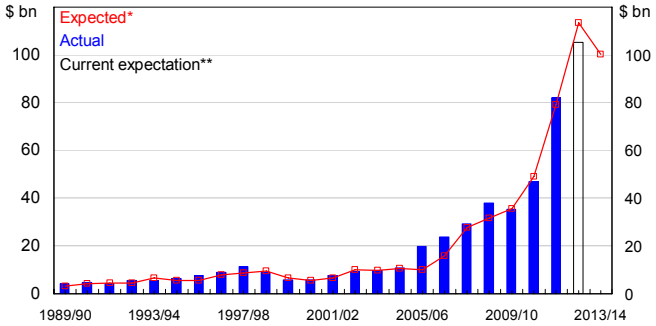
Many commentators have expressed a relatively sanguine view about the likely course of mining investment over the remainder of 2013. For example, in its most recent Statement on Monetary Policy, the Reserve Bank wrote that '… given the magnitude of resource projects already committed, particularly liquefied natural gas (LNG) projects, mining investment is expected to remain at an elevated level for a couple of years.'

However, current investment levels look unsustainable. Commencements have been trending down (albeit from extremely high levels) since 2009/10 (see Chart 3).

Chart 1: Capex expectations tanking

**Capital survey year-ahead expectations and actuals**

Mining industry, financial year




* Estimate 1: 12 months expectation as reported in Jan-Feb survey of previous financial year
** First 6 months are actuals, second 6 months are expections from estimate 5
Source: ABS 5625.0

The timing and size of the inevitable decline is important for the domestic economy. First, it is unlikely that non-mining investment will quickly fill the gap created by any sudden decline in mining investment. Private investment outside the mining and housing sectors has been seriously squeezed by mining sector investment for some years and many industries have been under severe pressure (manufacturing, retail, wholesale). Public investment is likely to remain constrained by efforts to achieve a public sector surplus. The timing of the slowdown in mining investment will be an important influence on GDP forecasts. Second, mining construction is relatively labour-intensive and a mining investment decline will be important for aggregate employment. As mining investment translates into export capacity, there will be offsetting effects on GDP but not necessarily on employment because the operational phase of most mining projects is much less labour-intensive than the construction phase.

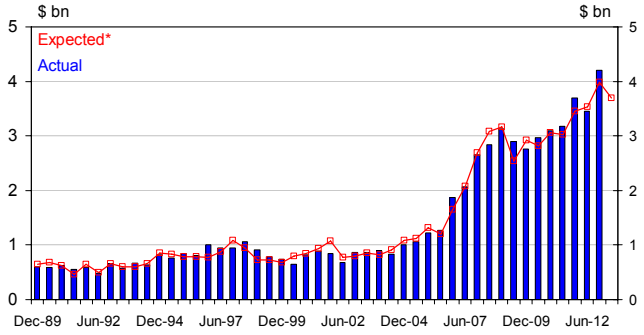
With this in mind, the capex release last Thursday provided the first long-term expectations reading for mining investment in 2013/14. This was clearly down on the expectation for 2012/13 made a year ago which, in turn, is not likely to be achieved (see Chart 1). After adjustment for average "realisation ratios" (between actual and expected), the expectations suggest that mining investment may rise, but these ratios need to be treated with caution: there have been some spectacular errors around turning points. Neither the sharp upsurge in mining investment in 2006 nor the 1982 recession were anticipated by the survey.

On the following Monday the ABS published its latest estimates of mineral and petroleum exploration including half-yearly expectations data, and these appear to have moderated (Chart 2).

Chart 2: Exploration expectations levelling off

**Exploration 6mth-ahead expectations and actuals**

Minerals & petroleum, half-yearly data



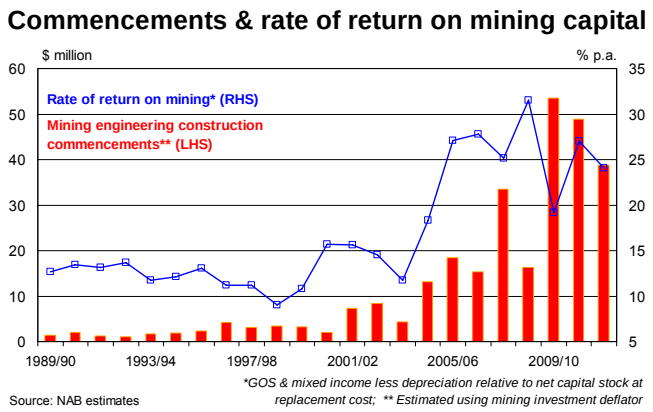

* 6-month-ahead expectation adjusted by ABS
Source: ABS 8412.0

## Commencements and investment

Another way of predicting mining investment is to use the information contained in past commencements data. Mining investment, as measured in the national accounts as gross fixed capital formation, comprises buildings, machinery & equipment and intellectual property products (R&D, exploration and software). The buildings consist of engineering construction (essentially below ground level) and structures (above ground). Data on commencements of engineering construction work for "oil, gas, coal and other minerals" are available from the ABS and may be a useful forward indicator of mining investment activity because (1) engineering construction is one of the earliest activities in most mining projects (after exploration), (2) commencements can be expected to influence activity for long periods of time, especially for large projects, and (3) engineering construction represents as much as 45% of total mining investment.

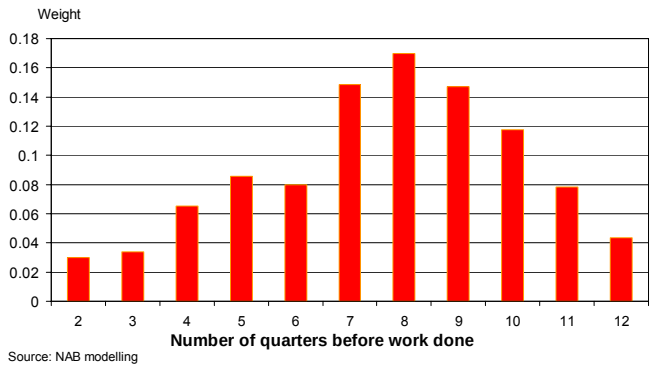
Commencements appear sensitive to commodity prices and costs through their impact on mining profitability. A simple measure of the overall rate of return on mining capital, net operating surplus relative to the capital stock at replacement cost, suggests that the outlook for commencements is currently less favourable than at any time in the past seven years outside the GFC period (Chart 3).

Chart 3: Returns to mining declining

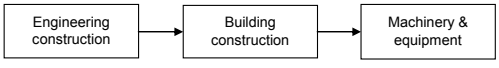



Econometric estimation (see Appendix and Chart 4 below) indicates that commencements continue to feed into engineering construction for at least three years. In fact, more than two-thirds of engineering work in the current quarter (that is, over one-third of total mining investment) can be attributed to commencements that occurred more than six quarters earlier. Consequently, we can predict engineering construction in the current quarter from commencements data for the past three years using the weighting pattern in Chart 4.

Chart 4: Weights cover three years of past projects




To the extent that much building construction and machinery & equipment investment cannot occur on a mining site until some of the engineering work has been done, it is likely that the potential information in the commencements data is even more important than these figures suggest. Mining industry building construction can be related to recent engineering construction and mining industry machinery & equipment investment can be predicted using past building construction (see Appendix).



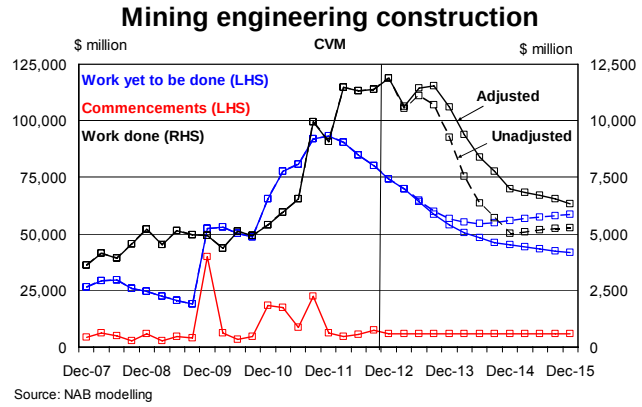

A word of caution should be sounded about this analysis. The length of time over which commencements continue to affect investment depends on the gestation period of the projects that are commenced. The gestation period implied by Chart 4 is a maximum of three years. There are several mega projects at the feasibility stage according to BREE's last report on major projects in October:

| *Project* | *Location* | *$bn* | *Start up* |
|---|---|---|---|
| Arrow LNG trains 1 & 2 | Gladstone | 24 | 2017+ |
| Browse LNG | Off Broome | 36 | 2017+ |
| Gorgon train 4 | Barrow Island | 12 | 2017+ |
| Scarborough Gas | Off Onslow | 12 | 2017+ |
| Sunrise Gas | Off Darwin | 12 | 2014 |

These generally appear to have gestation periods of four years or longer, compared with our estimate of three years for the average project. The commencement of mega projects with above-average gestation periods may mean that the predictions from our method overstate near-term investment and understate long-term investment. From an alternative perspective, of five mega LNG projects under way at present, only two are due to startup after 2015. It is important to study the predicted path of the pipeline of projects that have been started but not yet completed to ensure that the projections of work done are plausible.

Assuming commencements remain at their recent average level and using the method described above the projected paths of engineering work done and the pipeline are shown in Chart 5 (see the dashed lines labelled "unadjusted"). Because work done declines rapidly below commencements (note that Chart 5 uses different scales), the pipeline begins to lengthen in late 2014, suggesting the equation is shifting too much work done into the earlier quarters of the projection. To adjust for this, we have added around 5% to the level of work done predicted by the equation through 2013 and 2014 and subtracted a similar amount over the next five years (see the solid lines labelled "adjusted"). These adjustments generate a projected path for the pipeline that continues to decline for much longer than the unadjusted path.

Chart 5: Engineering construction to decline sharply in 2014



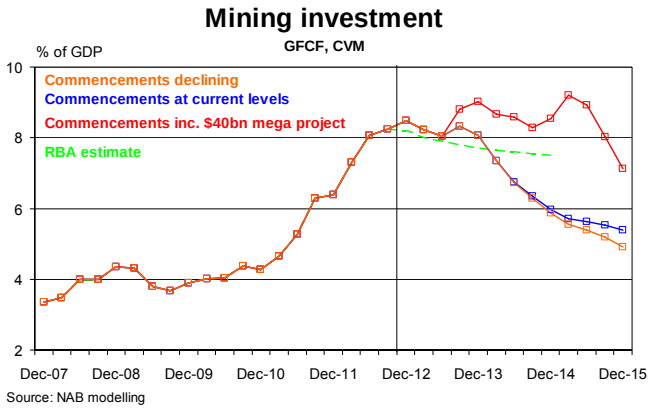

Applying this pattern of future engineering construction yields an aggregate picture in which overall mining investment is maintained at close to current levels until the end of 2013 after which it declines quite rapidly. Translating these forecasts into financial year numbers implies a year-average increase of 20% in mining investment in 2012/13 (mostly reflecting the run-up that has already occurred) but a decline of 6% in 2013/14 and a more serious fall of 21% in 2014/15. This is sufficient to reduce mining investment from an estimated peak of 8.5% of GDP in 2012Q4 to 8.1% in 2013Q4 and then to 6.0% in 2014Q4 (Chart 6). The decline through 2014 would be equivalent to removing more than 2 percentage points from GDP growth in that year.

The commencement of another mega LNG project would alter these atmospheric: for example, a mega project arbitrarily commencing in 2013Q1 with an indicative construction cost of

$40 billion, would be sufficient to maintain mining investment into 2014, possibly delaying the decline until late 2015, that is, by 18 months. The RBA prediction for mining investment looks to be somewhere between these two scenarios (see Chart 6).

Finally, we include a worst case scenario that has no more mega projects and a decline in commencements by 50% over the next three years. Because of the lags between commencements and work done (Chart 4), this would not seriously worsen the outlook for mining investment until late 2014 (Chart 6).

Chart 6: Without more mega projects mining investment collapses




Source: NAB modelling

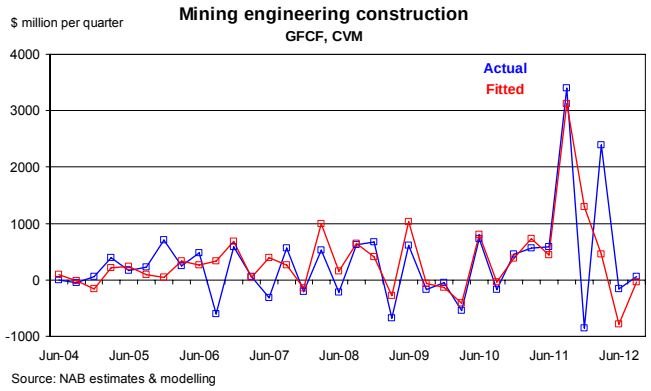
## Implications

What is interesting about this analysis is the potential for mining investment to decline precipitously once existing projects have been completed. This "mining cliff" could appear as early as the first quarter of 2014. The commencement of new mega projects could delay the cliff for 18 months or longer. On the other hand, a decline in commencements in response to declining commodity prices and rising costs is unlikely to affect mining investment until well into 2015 in view of the typical gestation period for projects.

Any sharp decline in mining investment in 2014 would be highly detrimental to growth without an offset. Some of that will come from increased mining exports as new projects continue to come on stream. However, employment is likely to struggle unless non-mining investment fills the breach.

## Appendix

Chart 7: Explaining mining engineering




Source: NAB estimates & modelling

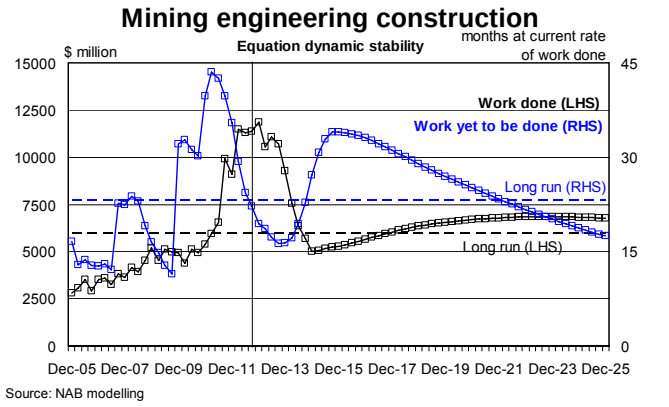
The relationship between engineering work done (IOBE) and commencements (ECOM) assumed in this paper uses the changes in both in the following form:

$$\Delta IOBE = \sum\alpha(t).\Delta ECOM(-t) + \beta 1.\log(IOBE(-1)/ECOM(-1)) + \beta 2.[\log(WYD(-3)/IOBE(-2)) - \beta 3],$$

where the weights on commencements are constrained to sum to unity ensuring that the change in work done eventually equals the change in commencements. The second term is a growth rate error correction effect ($\beta 1<0$): when lagged construction exceeds lagged commencements, construction declines and vice versa, ensuring that the levels of construction and commencements eventually equalise. However, while this is sufficient to stabilise the pipeline of work yet to be done, it need not stabilise it at a sensible level. The third term is a level error correction effect ($\beta 2,\beta 3>0$): when the pipeline of work yet to be done is high relative to work done, construction increases and vice versa so that the pipeline eventually returns to a "normal" level relative to current construction, given by $\exp(\beta 3)$. The explanatory performance of the equation is shown in Chart 7.

The equation appears to generate stable forecasts of the level of engineering work done. In Chart 8, commencements are assumed to remain at current levels indefinitely (equal to the "long run" value) and the equation is simulated over a 12-year period. The equation predicts that work done will initially decline rapidly, but not sufficiently to arrest the decline in the pipeline (in terms of months of work yet to be done) that began at the start of 2011. However, the level of work done soon declines below the level of commencements, leading to a lengthening of the pipeline from early 2014 (the "long run" value of the pipeline is also shown).

Chart 8: Simulating mining engineering




Source: NAB modelling

This rapid decline in work done (and the rebound in the pipeline) may reflect the ongoing effects of several mega projects. Building construction (IOBB) is assumed to depend on engineering construction and the NAB business survey index of mining capital expenditure expectations:

$$\Delta IOBB = \gamma 1.\Delta IOBE(-1) + \gamma 2.NAB\_CAPEX(-1).$$

Machinery & equipment investment (IPE) is assumed to depend on past building construction:

$$\Delta IPE = \sum\theta(t).\Delta IOBB(-t) + \gamma 3.NAB\_CAPEX(-1).$$

Overall mining investment is the sum of engineering and building construction and machinery & equipment investment, plus an allowance ($\lambda >1$) for investment in intellectual property (mainly exploration):

$$IB = \lambda.(IOBE + IOBB + IPE).$$

An alternative model that explains overall mining investment in terms of lagged engineering commencements produces forecasts that are broadly similar to the multi-equation approach.

Chain volume measures for engineering work done and commencements were estimated using a mining sector deflator. Annual national accounts estimates of mining GFCF were interpolated to quarters using quarterly capex data.

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