TECH TALK

Predicting the timing of commodity price booms and busts: a scientific approach

By
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EXECUTIVE SUMMARY

Accurate prediction several years in advance of commodity price busts would help resources industry better position itself. The large falls in commodity prices during 2014 came as a surprise to many people. Yet my econophysical analysis published in 2011 predicted a high probability for much lower commodity prices by 2014-15.

I showed that demand/supply and economic health have little influence on the underlying trend of commodity prices; instead the direction for commodity prices is inversely related to US Dollar valuation changes. In 2010, my probabilistic approach predicted the 5-year valuation range for the US Dollar, the inverse of which gave the trend for commodity prices. In 2010 when commodity prices were high and rising, a high probability was predicted for a significant fall in commodity prices by 2014-15. This has now come to pass.

The same econophysical modelling approach is now applied to the outlook for US Dollar valuation and hence commodity prices for 2015-20. The statistical prediction indicates a high probability that USD valuation will remain strong for 2-3 years; is not likely to fall markedly until 2018-20 at which time commodity prices are expected rise significantly.

This scientific modelling approach allows a rational prediction, several years in advance, of commodity price booms and busts. Astute resources industry management and investors should position their commodities exposure accordingly to benefit from those who blindly extrapolate the current trend.

2010 COMMODITY PRICE FORECAST & RESULT

In 2010 when commodity prices were high and rising, I predicted there was a high probability that by 2014-15 prices should be much lower: for example oil in $50-60 /BBL range; gold around $500-600 oz. The prediction is shown in Figure 1, taken from Moriarty (2011). The scientific basis – the output of a mean reversion algorithm for valuation of the United States Dollar (USD) – for the prediction of a significant fall in commodity prices is discussed in the next section.

Subsequent 2011-14 USD valuation and commodity prices, including the RBA base metals index and iron ore and further examination of commodity prices, are shown in Figure 2.

OBSERVATIONS:

- my scientifically based prediction of the USD valuation, which in 2010 was near an all-time low value, indicated in the next five years a high probability of a major strengthening of the USD, despite the then prevailing gloom about the health of US and world economies
- USD valuation statistical behaviour during 2011-14 was consistent with mean reversion expectations; the 2011-14 USD valuation has been mostly around the P50 prediction
- the 13% USD valuation increase during 2014 was one of the strongest years on
empirical evidence for the supposed cause of commodity prices would examine the price trends for commodity prices since 1980 (Moriarty 2011) – and standard statistical fluctuation, not a consequence of end of Quantitative Easing (see Moriarty [2011] for a review of what does/does not affect the USD valuation). The recent strengthening is regarded as a statistical fluctuation, not a consequence of oil price. The inverse relationship between USD valuation and commodity prices is thought to be a consequence of commodity producers who, when the USD is at a low (high) valuation, raise (lower) the price of commodities in order to get a stable return in their own currency. While it is not a new proposition that the USD has an inverse relation to commodity prices, what was new is the scientific forecasting approach for the USD based on an econophysical algorithm. Econophysics is a relatively new field in which physicists apply proven statistical techniques suited to complex non-linear systems with positive feedback (see Moriarty 2011 for references). In contrast, economic theory largely pre-supposes a linear financial world, hence its predictions prove to be often wrong.

Further support for concept that commodity price trend is inversely related to USD valuation is demonstrated in Figure 5 (USD valuation 1973-2015) and Figure 6 (USD valuation and commodity prices since 1980). Figure 5 shows the USD mean value – the declining valuation is consistent with the decreasing proportion the US represents of the world economy (Moriarty, 2011) – and standard deviations. From this analysis, we can...
identify the periods when the USD was statistically overvalued (for example 1982-86, 1998-2003) and undervalued (for example early-mid 1990s, 2009-12).

Figure 6 shows commodity prices in USD since 1980 (left axis) together with USD valuations (inverse right axis) from Figure 5. Observe the USD valuation does have a strong influence on the trend for commodity prices [the disconnect during 2009-14 was a consequence of the excessive optimism regarding China’s modernisation]. For the time being, reality has now set in for commodity prices.

The next section considers how to apply, using statistical mean reversion modelling, this concept to predict the trend of commodity prices for the next five years.

2015-20 FORECAST FOR COMMODITY PRICES

This section presents a predicted trend for commodity prices during 2015-20, based on the same modelling approach as for the 2010-14 prediction (see Moriarty, 2011 for details). In brief, USD valuation is treated as a time series that can be modelled with a statistical mean-reversion algorithm. Such an approach predicts in advance timing and probability of major turning points in the time series [note econophysical approaches are being successfully used by physicists such as Sornette (2003) for stock market predictions].

If we accept that the USD valuation does control the trend for commodity prices, how do we predict when the USD is likely to weaken? Also, how quickly will it weaken and what is the outlook for commodity prices?

Figure 7 shows USD valuation since 1973. The recent strengthening of the USD is not likely to continue – it has now exceeded one standard deviation above mean valuation. Since there have only been two previous times the USD strengthened above one standard deviation, statistical prediction cannot be as precise as the 2010-14 modelling was for mean reversion when the more frequent one standard deviation below mean has occurred (refer Figure 5).

Accepting there is limited data for well above average valuation of the US dollar, mean reversion modelling for the next five years predicts the USD is likely to stay strong for about two years, peaking around the start of 2017, falling quickly during 2018-20 (Figure 8). Possible P90 and P10 ranges are also shown, but there is considerable uncertainty in these projections, given the limited data for reversion from an above mean position.

If this prediction holds, commodity prices will continue to have downward pressure for the next two years. One small point of comfort in this prediction is that the majority of the fall in prices has likely occurred, since the USD valuation now is very high.

My statistical prediction indicates that commodity prices are not expected to have significant upward pressure until around 2019-20 when the USD valuation is likely to fall markedly. To examine the implications of this on commodity prices, Figure 8 also shows the oil price (inverse right axis). During 1998-2002, when the USD was very high, there was little change in the low oil price. Only when USD weakened during 2003-2014 was there excellent inverse correlation between the weakening USD valuation and the rising oil price.
Now the outlook is similar to the 1998-2002 period—a strong USD and sustained low commodity prices for around two years. Given the subsequent impact of inflation, it is unlikely the oil price will fall to $20 this time, likely will bottom in the range $30-40 per barrel. The prices of most commodities priced in USD are not expected to increase until 2018 and after.

**CONCLUSIONS**

The usual approach for forecasting prices of freely traded commodities does not have an empirical scientific basis or use proven statistical techniques. In contrast, econophysical techniques can accurately predict in advance the timing and probability of major turning points in a time series. I have demonstrated there is a reliable inverse correlation between the USD valuation and the trend for commodity prices. Commodity prices are expected to remain low, with no upward pressure until 2018-20. Astute resources industry management can use this scientific approach to positon portfolio exposure in advance of commodity price booms and busts, which are inevitable since the USD valuation will continue cycling.

I contend that it is possible to have a scientific basis for forecasting volatile time series (not just commodity prices, but also financial series such as stock markets). Firstly, an observer has to gather empirical data to decide which variables matter, discarding those which do not. Mean-reversion statistical techniques can predict the probability and associated outcome range for the next 1–5 years. Having a rationally derived probability goes a long way in evaluating not only when to invest but also how much. This provides an important advantage over the majority of the public who have an incorrect understanding of what is controlling the commodity price changes.

Sadly, the outlook for commodity prices (and investing in resources companies) is not bright for a couple of years. Yet down times have happened before and the resources industry has recovered—a turning point for the better is coming. Smart investors take positions around or just before the turning point, informed by a scientific forecasting methodology, and later sell to uninformed investors after prices have risen significantly.

**BIOGRAPHY**

Noll Moriarty’s M.Sc.(Hons) qualification is in geophysics and during 1982–99 was employed in the petroleum industry. In 2000, he founded Archimedes Financial Planning which provides financial advice with a scientific basis to resources industry personnel around the world. Noll has been a PESA member since 1982.