

Predicting booms and busts in commodity prices



Noll Moriarty

NollM@ArchimedesFinancial.com.au

The accurate prediction, some years in advance, of commodity price busts would help the resources industry, and its personnel, to be better positioned to manage downturns. For most people in the resources industry the large fall in commodity prices during 2015 was a surprise, yet four years ago a scientific prediction using an econophysical approach (Moriarty 2011) indicated a high probability of low commodity prices by 2014–15. This successful prediction prompts consideration as to what an econophysical approach would now predict for when commodity prices will increase.

In the April 2015 issue of *Preview* (Moriarty 2015), I asked whether a scientist (or a geophysicist in my case) could predict commodity price fluctuations. Most people would answer

‘no’. This is because the common (post event!) explanation for a large fall in commodity prices is that there was a significant oversupply. I argued that the empirical evidence does not support this assertion. While there was significant oversupply of commodities, particularly oil, in the past few years and a 70% fall in commodity prices did occur, this association does not necessarily imply causation. In the past when there have been similar periods of oversupply commodity prices have not always collapsed. Conversely, commodity prices have not always risen by 50–70% when there have been periods of significant under-supply. The actual correlation between supply/demand and commodity price is near zero.

I proposed that the valuation of the US dollar (USD) has a major inverse impact on commodity prices – when the USD valuation is high commodity prices have downward pressure. This was not a new proposition. What was new was the scientific approach for forecasting the probabilistic 5-year range for the USD. In 2010–11, while the USD valuation was low and falling, I forecasted a high probability of a major increase by 2014–15. This has now come to pass, associated with the large fall in commodity prices.

The next question to ponder is when will commodity prices bottom, and how quickly will they rise? This requires a scientific analysis of the USD valuation – when was it weak or strong? The econophysical technique described in Moriarty (2011) results in the valuation assessments shown in Figure 1.

Figure 1 shows the USD valuation – a 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 2 shows commodity prices in USD since 1980 (left axis) together with USD valuations (inverse right axis) from Figure 1. Observe the USD valuation does have a strong inverse influence on the trend for commodity prices (the disconnect during 2009–14 was a consequence of the excessive optimism regarding China’s modernisation). The current analysis indicates that gold is still overvalued.

The next section considers how to use statistical mean reversion modelling to predict the trend of commodity prices for the next five years.

2016–20 forecast for commodity prices

This section shows a predicted trend for commodity prices during 2016–20, 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. Using this methodology, we can predict in advance the timing and probability of major turning points in the time series (I note econophysical approaches are being

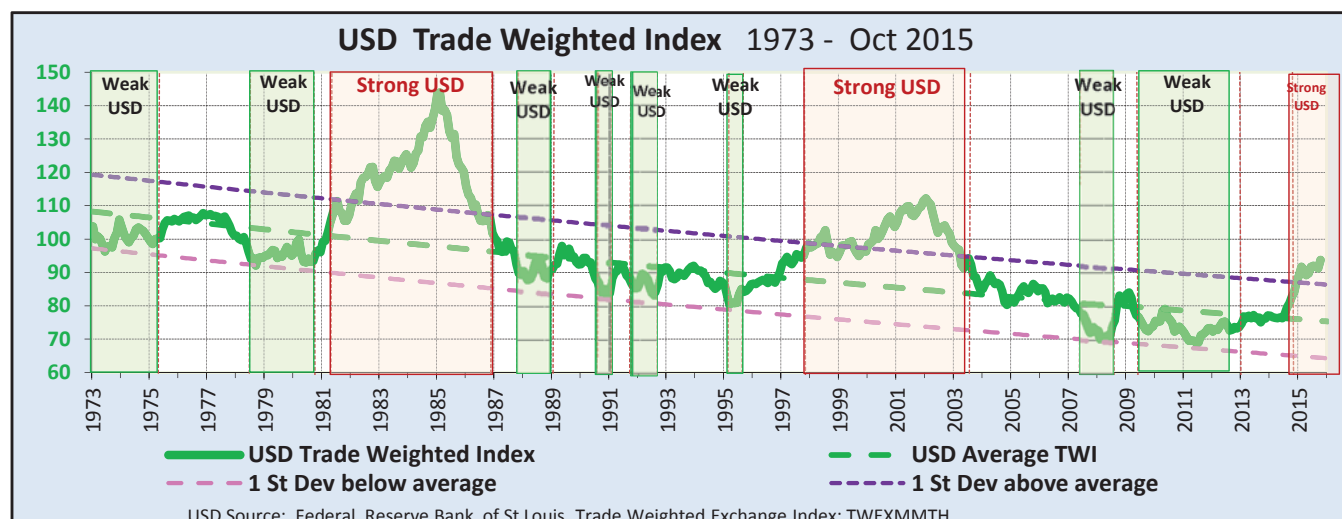


Figure 1. Monthly values for US dollar valuation, showing the declining mean value and standard deviations, based on the statistical analysis of Moriarty, 2011. The chart also shows periods when US dollar valuation was strong or weak.

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 3 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 one standard

deviation below mean occurred (refer Figure 1).

Accepting there is limited data when USD valuation is above 1 standard deviation, mean reversion modelling for the next five years predicts that the USD is likely to stay strong for about two years, peaking around the start of 2017 falling quickly during 2018–20 (Figure 4). Possible P90 and P10 ranges for the USD are also shown, but there is considerable uncertainty in these projections given the limited data for reversion from an above-mean position.

Figure 4 also shows the West Texas Intermediate oil price (inverse right axis). During 1998–2002, when the USD valuation was very high, the oil price stayed low (in the \$10–20 BBL range).

Only when USD weakened during 2003–14 did the oil price rise; observe the excellent inverse correlation between the weakening USD valuation and the rising oil price. The P50 prediction for the oil price low point is around \$20–30 BBL by 2016–17.

Figure 5 shows the USD valuation during 1997–2015 and the RBA Base Metals Price Index (right axis). The latter, being a composite of metal prices – 40% aluminium; 35% copper; 10% lead; 10% zinc; 5% nickel – will not have price volatility of a single metal. Even so, an inverse relationship is apparent between USD valuation and the Index, particularly during 2003–15.

If this prediction for the USD valuation holds, commodity prices will continue to

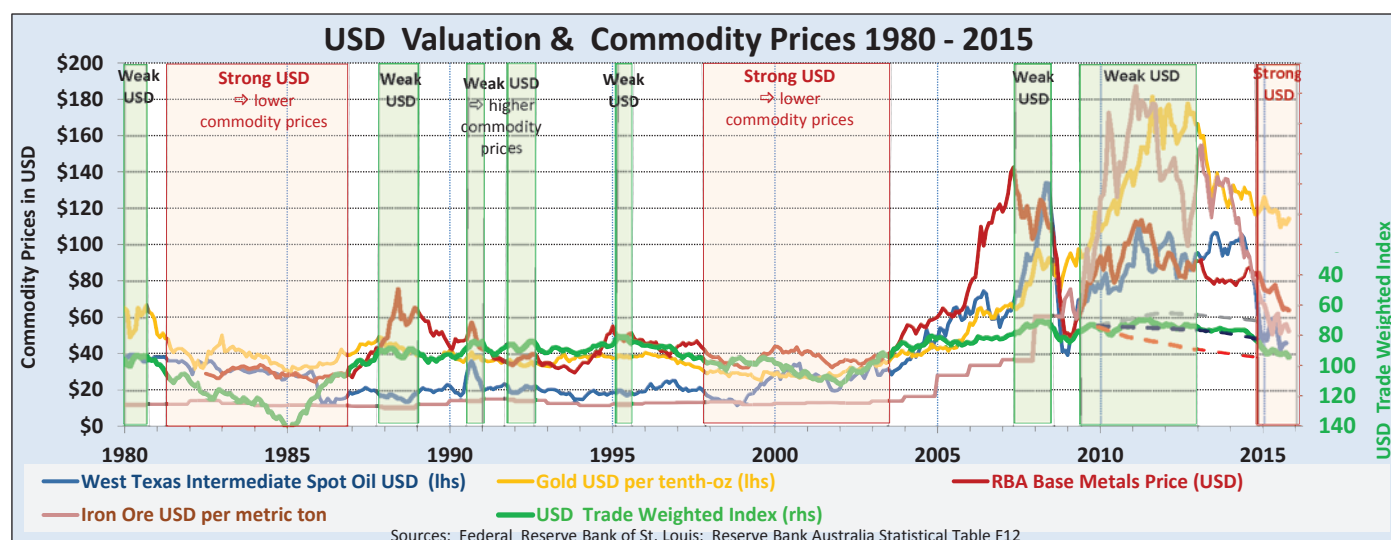


Figure 2. Monthly values for US dollar strong/weak valuation and commodity prices. A consistent inverse relationship exists – when the US dollar is strong, commodity prices are low, and vice-versa.

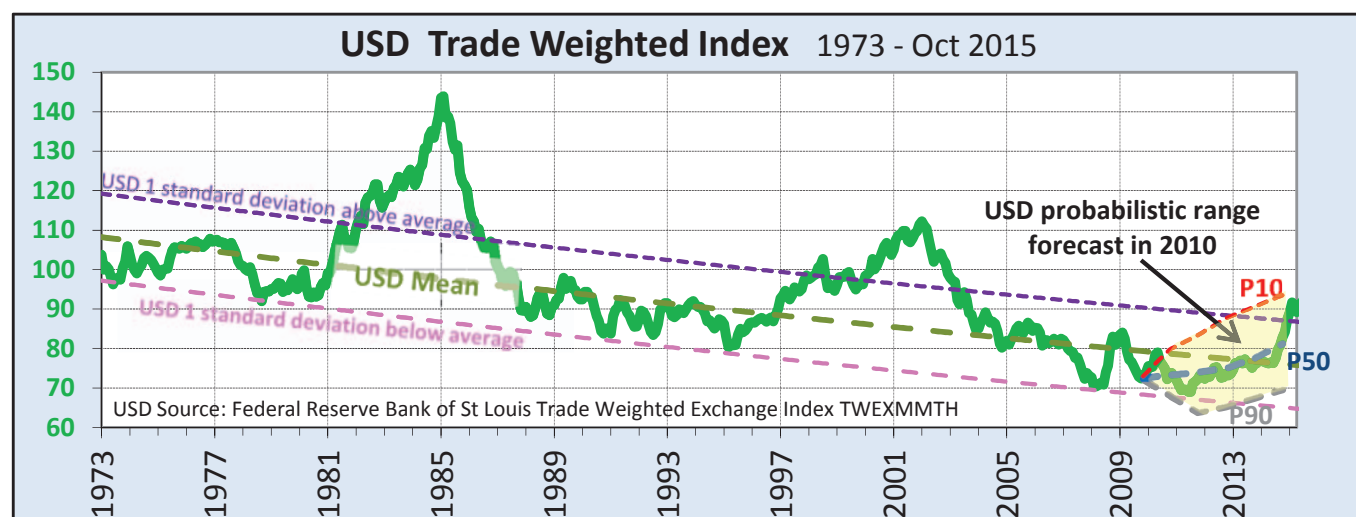


Figure 3. Monthly values for US dollar valuation since 1973. In 2010 when the US dollar was very weak, an econophysical mean reversion algorithm predicted a strong rebound was likely in the next 5 years.

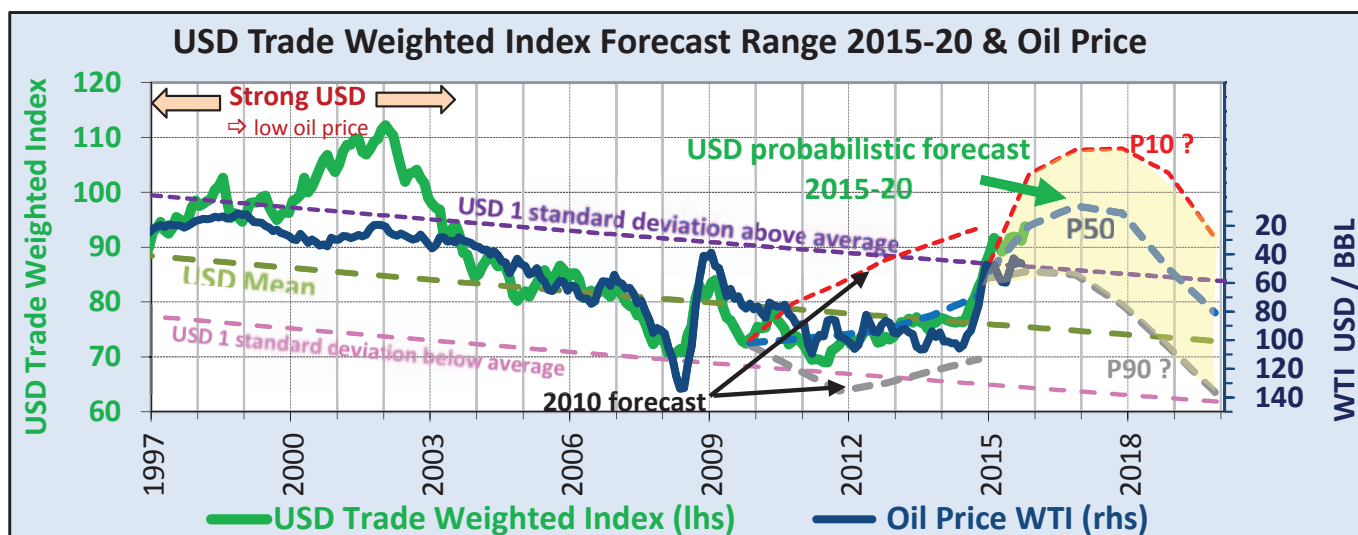
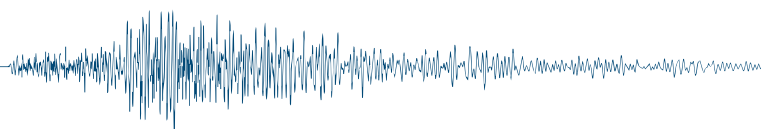


Figure 4. Monthly values for US dollar valuation since 1997 (starting when USD was very strong), together with 2015–20 predicted range; oil price on inverse right axis. The US dollar is likely to remain strong until 2017, keeping downward pressure on oil price; from 2018 US dollar likely to weaken resulting in higher commodity prices.

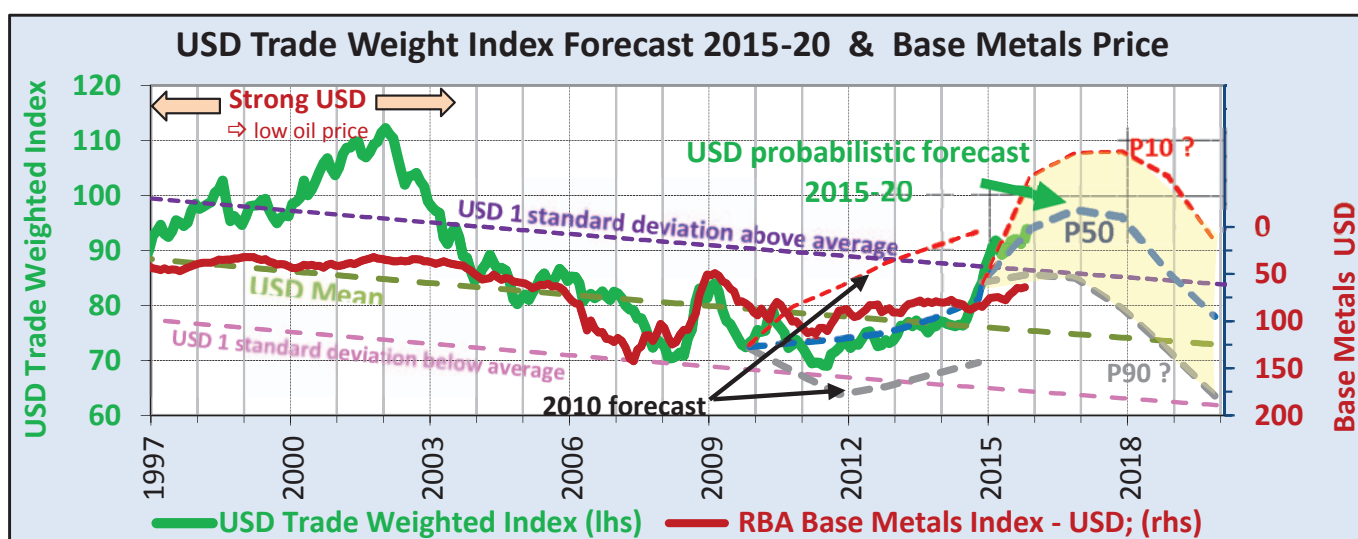


Figure 5. Monthly values for US dollar valuation since 1997 (starting when USD was very strong), together with 2015–20 predicted range; base metals price index on inverse right axis. The US dollar is likely to remain strong until 2017, keeping downward pressure on base metals price.

have downward pressure for the next two years. One small point of comfort in this prediction is that the majority of the decrease in prices has occurred, since the USD valuation now is well above average.

My statistical prediction indicates commodity prices are not expected to have significant upward pressure until around 2018–20 when the USD valuation is likely to fall markedly.

Commodity price forecast for the next 20 years

The research presented in this paper contends that USD valuation can be

successfully modelled using a statistical mean reversion technique. The consequence is that no-one is actually in control of the USD valuation, instead the valuation is an output of the probabilistic distribution of monthly changes and serial correlation. While this observation is unsettling for people who prefer to believe humans must be in control, for rational minds it opens up the opportunity to predict the future, not with certainty but with a probability based on scientific principles.

To elaborate on this contention, I show a conceptual USD valuation for the next 20 years based on mean reversion and serial correlation (Figure 6). The prediction is

for mostly below-average valuations during the 2020s and consequently high commodity prices and the next boom. Somewhere around 2030, the US dollar could rise to an above-average valuation at which time the next commodity price bust would occur. Naturally there is considerable uncertainty about how long the boom and bust last, but the import is that statistical nature of the US dollar is the key.

Conclusions

The usual approach for forecasting prices of freely traded commodities priced in US dollars does not have an empirical

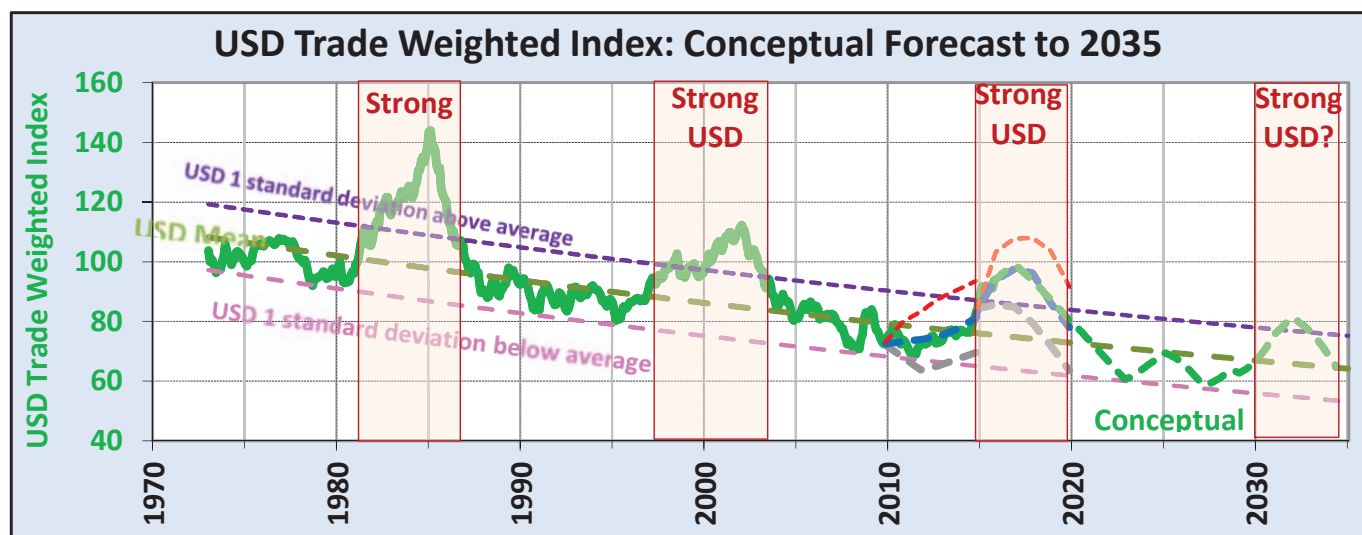


Figure 6. A mean reversion conceptual prediction for the US dollar indicates below-average valuation during the 2020s (= higher commodity prices), followed by an above-average valuation around 2030 (= next commodity price bust).

basis or use proven statistical techniques. In contrast, econophysical techniques can accurately predict in advance the probability and timing of major turning points in a stationary 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 around 2018. Astute resources industry management can use this scientific approach to position 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. This is now happening with predicting share market movements – refer Weatherall, 2013). Firstly an observer has to gather empirical data to

decide which variables actually matter, discarding those which do not. Mean-reversion statistical techniques can accurately 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 changes in commodity price.

Take heart those working in the resources industry – 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.

References

Moriarty, N., 2011, Oil price forecasting using a probabilistic

projection of the United States dollar: *APPEA Journal*, 2011, 411–422.

Moriarty, N., 2015, Are commodity price fluctuations predictable? *Preview* April 2015, pp. 44–46.

Sornette, D., 2003, *Why stock markets crash: critical events in complex financial systems*. Princeton: Princeton University Press.

Weatherall, J. O., 2013, *The physics of finance: predicting the unpredictable: How science has taken over Wall Street*. Short Books.

Noll Moriarty's M.Sc. (Hons) qualifications are in geophysics; during 1982–99 he applied seismic acquisition, processing and interpretation skills in petroleum exploration and development projects for Delhi Petroleum and Origin Energy. In 2000, he founded *Archimedes Financial Planning*, which now provides financial advice with a scientific basis to resources industry personnel around the world.