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Woodhall's Direct Equity Portfolios

Ron Bewley PhD, FASSA

Construction and Operation

- **Sector and market forecasts are based on consensus broker forecasts**
- **Market entry and exit signals are based on sector forecasts**
- **Flagship portfolio bends High Yield, High Conviction and cash with time varying weights**

The Woodhall offering

This document is designed to give a reasonably detailed – but high level – understanding of how we construct portfolios at Woodhall. Other documents and presentations are being produced on a continuing basis to drill down further.

The whole portfolio process is based on Dr Ron Bewley's experience at the Commonwealth Bank creating portfolios for high net worth clients and 40 years experience researching and developing relevant tools and theory in an academic environment. Ron is both a retired Professor of Econometrics (UNSW) and a retired CIO at CBA.

Our suite of portfolios may suit investors who wish to own direct equities in ASX 200 companies and also wish to understand the broad principles of how their portfolios have been constructed. An accompanying Woodhall service publishes quantitative and qualitative commentary on matters relating to investors of ASX 200 stocks and the index.

None of our papers, reports, presentations and verbal commentary takes any individual's personal circumstances or needs into account. As such, these materials only constitute 'general advice'. Interested persons should seek advice from a licensed professional to see if any of our offerings are suitable for them.

Classification of portfolio construction types

Portfolio construction is often classified as either being bottom up or top down. A bottom up approach typically involves detailed analyses of company accounts and related materials in isolation. Selected companies are then aggregated into a portfolio.

A top down approach focuses more on the macro and regulatory framework drawing on companies that are involved in those sectors and subsectors that show the most promise.

A second classification distinguishes between quantitative and non-quantitative portfolio construction methods. Quantitative usually refers to a set of rules – or algorithms – that trawl through data sets to pick stocks and buy/sell decisions. Few investors are able to understand how the portfolios would react in different situations as the rules are so complex and often proprietary.

Another common criticism of fully quantitative strategies is that many different quantitative funds use related methods so when things turn bad – as the world did during the GFC – many of the funds are running for the same exit at the same time and big losses and underperformance can ensue. Non-quantitative funds involve a large discretionary or human element so that again the investor might not be reasonably informed about the whole process.

Portfolio principles

The Woodhall approach attempts to draw on the strengths of each of these four construction methods (quant/qual by top down/bottom up) and attempts to avoid the weaknesses. In particular, there are four guiding principles for our approach:

1) It is easier to predict the performance of a group of companies that make up a sector than it is to predict the performance of a single company. Sometimes the success of one company is to the detriment of another in that sector.
2) No one individual or broking house can beat the consensus view of brokers for extended periods of time.
3) Broker recommendations are biased against 'sell' signals and there might be no reasonable basis for comparison of a recommendation for one company with that of a recommendation for an unrelated company in another industry. However, 'similar' companies such as Rio Tinto and BHP Billiton, which are both in the Materials sector, are much easier to compare. Indeed the same analysts in a broking team often cover more than one stock in a given sector – but often not in different sectors.
4) That data – such as market volatility – often seem to fluctuate around a fixed mean over time – known as mean reversion – but occasionally that mean shifts for an extended period of time. An assumption of mean reversion, when indeed the 'mean' has changed, can lead to poor decision making.

Components of construction

Our construction method is rule-based, but transparent. However, we do not consider our portfolios to be solely quantitative. Rather, we use appropriate quantitative measures to assist in trawling through broker-based forecasts. We also use transparent manual overrides.

1) Broker forecasts of dividends and earnings are collected by Thomson Reuters and are available from their 'Datastream' data delivery service. We use these consensus views of dividends and earnings over the next three years (where available) to construct capital gains' and dividends' forecasts for each of the 11 major sectors of the ASX 200 and the broad index.
2) We used a sophisticated machine learning tatistical method to determine any changes in the 'mean' levels of volatility for each sector – as measured using relative changes in the S&P/ASX 200 sector accumulation indexes (that include reinvested dividends) – and we model the fluctuations around these possibly changing 'means'. We forecast volatility for each sector and the correlations between these sector returns to produce a 'risk matrix' for the portfolio.
3) We specify the maximum deviations – or tilts – from market capitalisation weights for each sector and optimise our portfolios using standard mean-variance methods with the expected returns from 1) and the expected risk matrix from 2). These tilts depend on the 'style' of the portfolio, such as Yield or High Conviction, and the sector.
4) The number of stocks to be allocated to each sector depends upon the size of the sector and the 'risk-adjusted return forecasts' derived from 1) and 2). The main principles are that a) we want to avoid excessive single-stock exposure and b) we allocate more stocks to sectors with better prospects. It is better not to go too far down the relevant list of stocks – in terms of the preferred characteristics (or quality) on which the stocks are classified – in a sector with poorer prospects. As a result, the number of stocks in a sector – and the aggregate portfolio – can vary across style and over time. Usually, the number of stocks in a portfolio will be between 15 and 25. If we deem that there are insufficient stocks of sufficient quality to produce a 'true-to-form' portfolio for a given style, we will not produce that portfolio.
5) A list of stock exclusions is also drawn up. That is, Woodhall chooses to avoid certain stocks – in a qualitative fashion – because of a number of factors. This list will change over time. For example, we currently exclude airlines and some insurance companies as we believe that even the best run companies in these subsectors still face more downside risk than we wish to take on board. Companies that are experiencing 'unusual' conditions – that we are aware of – such as impending mergers and acquisitions, major predicted changes in commodity prices, perennial historical problems, etc can also be excluded. Under 'normal' conditions, we expect consensus recommendations to include such relevant information but, sometimes, we believe the

consensus is too slow to react. We provide a list of the excluded stocks for each portfolio but not the reasons for exclusion. Exclusion should not be construed to be a comment on expected returns for the stock or the quality of the management but only on our perceived downside risk for our portfolios.

6) A hierarchical list of stocks in each sector and style is drawn up that comply with our filters such as market capitalisation, consensus recommendation, yield and exclusions. The sectors of the portfolios are then populated with the number of stocks derived in 4) subject to minimum levels of the selected characteristics being met. Thus, it is possible that a sector should be allocated stocks under 3) but there are no stocks that pass our tests. In such cases, that sector weight is distributed to the other sectors in proportion.

How it all works

No construction method is without limitations. We have attempted to reduce adverse impact on performance using the following propositions:

1) We rely on consensus recommendations – but only above a certain threshold which means that the collective wisdom of hundreds of analysts does not disagree with a particular stock's inclusion. Of course, that also means we are not striving for 'big ideas' perceived by one or two analysts with perceived better prospects. That is, we have opted for a more conservative approach than one following any individual's opinion or assessment. We have opted for a quality opinion based on highly qualified analysts from the big international banks, domestic banks and others.
2) At no point do we use a direct comparison of recommendations (e.g. buy, sell, hold) for stocks across different sectors. In that way, we are only using rankings of broadly similar companies in our decision making. We believe that this imposed limitation for comparison reduces the impact of any inherent biases in the recommendation process.
3) The quality of broker forecasts of dividends and earnings is enhanced by the continuous disclosure principle that forces companies to disclose material information to the ASX in a timely fashion. Companies often give profit guidance that further helps analysts in forming opinions and specific forecasts.
4) The mean-break procedure we use in forecasting volatility was published in a leading (peer-reviewed) international academic journal [Yang and Bewley (2007) A Hybrid Forecasting Approach for Piece-wise Stationary Time Series, *Journal of Forecastin*g, 25, 513-527]. The theory was developed over more than a decade of theoretical research and has been used in practical applications for over 15 years.
5) The current portfolio construction method has evolved gradually over a decade of research and application except that the approach underwent a material upgrade in 2010. The principles in the upgrade remained the same but we developed better quantitative methods to apply our principles. While past performance is not a reliable indicator of future performance, outcomes to date have been encouraging and are discussed in a related document. The portfolio system and software has been under rigorous testing since January 2014.

Operational matters

A new suite of portfolios is constructed each month (normally on the first trading day) with an investment horizon of 6 months. The portfolios are 'optimised' for a six-month period but, under normal circumstances these portfolios should have a life of up to 12 months enabling investors to better manage capital gains events.

There is no intention that our portfolios would be rebalanced or rolled over each month. Portfolios are created each month to allow for a more timely entry point – and as a cross-check on legacy portfolios.

Since the portfolios are rebalanced after six months, there are six 'live' portfolios at any one time – after the process has settled in. Since it is common for each new portfolio to contain broadly similar stocks in successive months, the averaging out over six parallel portfolios allows for a transparent updating process for the stock weights.

Also, the consensus recommendations might take some time to take effect. Experimentation with 3-, 6- and 12-month rebalancing suggested 6-months to be the best – although 12-month rebalancing is only moderately inferior.

Woodhall produces certain proprietary indexes such as 'exuberance', 'fear', sector and market forecasts, volatility measures and forecasts – and comparable

indicators for the US market. We believe exuberance and fear can be used to help in entering a new portfolio and rebalancing an existing portfolio.

Exuberance is our measure of mispricing for a sector or the broader index. For example, a reading of -4% is interpreted that temporary market conditions suggests that the sector is 4% cheaper than longer-run conditions indicate. Similarly +4% implies the sector is quite expensive. In normal conditions values such as -4% mean that it is reasonable to expect a 'bonus' to returns and values such as +4% would be expected that overpricing might take away from future expected returns. These mispricing measures are index and sector-based. Since exuberance measures average mispricing in a sector, it does not represent all stocks in a given sector to the same extent. However, common sector 'drivers' suggest sector-based exuberance measures can be helpful in aiding stock entry and exit.

Exuberance is not a trading indicator. Rather, the intended use of exuberance is to help in *avoiding* the purchase of stocks in sectors that are materially overpriced and *help* in selecting stocks for buying in 'cheap' periods. The major reasons that it is not useful in a trading strategy are that a) an overpriced sector may not fall in price but rather trade sideways until the fundamentals improve to erode the overpricing; b) sectors and markets can stay cheap for extended periods of time.

Our fear index is a measure of 'realised', 'excess' volatility on the ASX. Excess volatility is our concept that volatility on a given day – outside of what appears to be represented by just the open and closing prices – shows abnormal uncertainty. Markets live off 'normal' volatility but we have found that our measurement of excess volatility can produce useful signals. Fear can be low when traditional market volatility is high and *vice versa*.

Realised volatility is measured using actual behaviour of market changes on the ASX 200. The CBOE VIX index – commonly known as the 'fear' index – uses information based on option pricing taken on the S&P 500. When people think that the market is more likely to fall, options prices – representing insurance against stock market falls – increase and the volatility 'implied' by these prices constitutes the VIX. The VIX is high when people expect a market fall. There is a similar 'VIX' index for Australia but it was introduced several years after we devised our indicator. Of course, we also take note of the VIX-type indexes but we do prefer our own.

We believe that our fear indexes tend to lead (turn up or down) before the implied volatility (VIX) indexes because investors react to actual events as they happen and then they – and others – take out insurance. Either way, we believe that fear and exuberance (as measured by us) interact in the following manner.

Fear exaggerates market reactions. A fearful, overpriced market is likely to fall sooner and more sharply than a market that is not fearful. When a market is cheap and fearful, investors are reluctant to 'catch the falling knife' and so cheap, fearful markets are likely to stay cheaper for longer.

After an extensive study of exuberance for the 11 sectors of the ASX 200 and the 10 sectors of the S&P 500 – together with the two broader indexes – we conclude that using +6% as a rule to indicate material mispricing is useful. That is, +6% can be used as a rule that a market or sector may correct – or move sideways for an extended period of time.

When a significant amount is to be invested in a Woodhall portfolio, its exuberance and fear indexes can be used to attempt to gain an extra edge in performance. An investor with a lesser amount to invest might find it more convenient and cost-effective to 'buy' a whole portfolio in one instruction or a set of contemporaneous buys on a platform, or buys with an on-line broker.

By breaking up a total investment into several portions, each portion can be allocated only to those sectors that are currently cheap and holding cash until other sectors are either sufficiently cheap or only moderately overpriced. This method can be used stock by stock or even within a stock's allocation using the dollar-cost averaging concept.

When rebalancing a portfolio, this procedure might take place over a number of weeks – first selling stocks in overpriced sectors and then buying those when they are deemed to be cheap – holding cash in the interim if it cannot reasonably be deployed at the time.

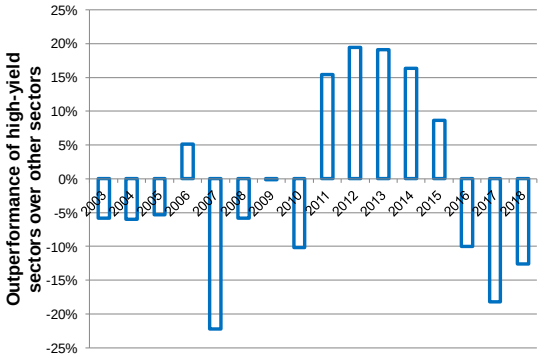
When a portfolio receives cash from dividend payments (or small injections from other sources), one strategy which we consider is to invest that cash in any cheap sectors rather than necessarily in investing in the stocks that generated the dividends. This procedure does (temporarily) unbalance the portfolio – but not by any great extent. Waiting for a rebalancing date for a full reallocation can significantly reduce trading costs and possibly resulting in gains from taking advantage of perceived underpricing.

Flagship portfolio

Because different styles of portfolios – such as yield, growth, conviction tend to outperform the benchmark at different times, our flagship portfolio blends the High Yield and High Conviction portfolio – together with cash.

Chart 1 shows the outperformance of an index of the four high-yield sectors against an index of the 'other' seven sectors using total returns (i.e. including dividends being reinvested) since the data were made available by S&P.

Chart 1: Outperformance of the High-Yield Sectors



Source: Thomson Reuters Datastream; and Woodhall Investment Research. Data to May 18th 2018

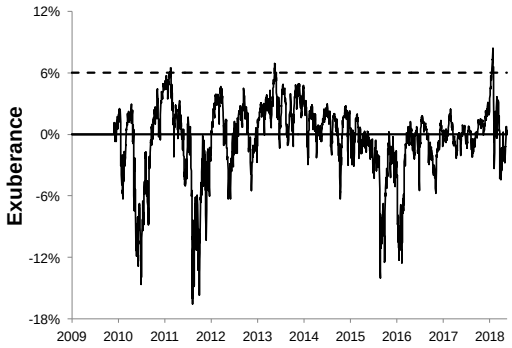
It is clear that 2011 – 2015, inclusive was a very strong period for the high-yield sectors. Of course this was a time of emergency interest rates and many investors sought the yield from equities.

We produced our first portfolios from 1st February 2014 and allocated a weight of 100% to the High Yield portfolio. From 1st February 2017 we allocated weights of 50:50 to the Yield:Conviction styles. From 1st December 2017, we reduced the weight on High Yield to 25%. From 1st February 2018, the weight for High Conviction (at least to the time of writing) was set as 100%.

It has not yet been deemed necessary to take the portfolio to cash. The exuberance of the S&P 500 did breach the 6% trigger on 17th January 2018 (Chart 2) but a qualitative decision was made that the underlying economies would not make it worthwhile going to cash. The level of exuberance for the ASX 200 was only +0.2% on 17th January 2018 (Chart 3).

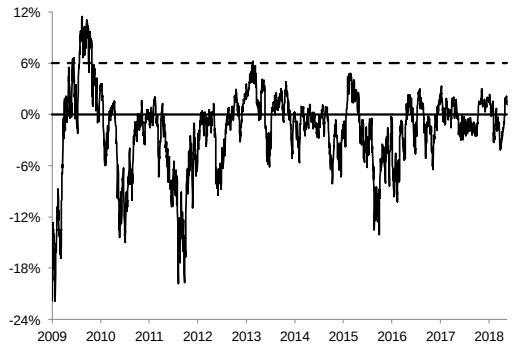
Had we had cash to invest from January 17th 2018 in the US, we would have held off until exuberance was at least close to 0%.

Chart 2: Exuberance for the S&P 500



Source: Thomson Reuters Datastream; and Woodhall Investment Research. Data to May 18th 2018

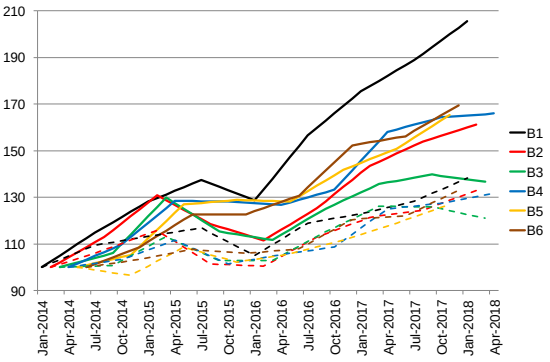
Chart 3: Exuberance for the ASX 200



Source: Thomson Reuters Datastream; and Woodhall Investment Research. Data to May 18th 2018

In Chart 4 we show the total returns indexes for the six portfolios starting in February 2018 to July 2018, inclusive. Each portfolio is rebalanced into the new flagship portfolio after six months. Each portfolio comfortably beat its benchmark shown as dotted lines. The average outperformance is over 7% pa as at 1st May 2018.

Chart 4: Performance of the flagship portfolios



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