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How to Time the Commodity Market

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1. INTRODUCTION

Investing in commodities has been gathering momentum, particularly with hedge and even pension funds having being attracted to this asset class. Much of the attraction appears to be the fact that a diversified portfolio of commodities seems to produce equity like returns with low or negative correlation with equities. Recent academic research by Gorton and Rouwenhorst (2006) comes to this conclusion and finds considerable evidence for inclusion of commodities in a portfolio. This research was widely reported by the media and was regarded by the media and investors alike as a major discovery in the search for return. There has been some dissent from the academic community, with Harvey and Erb (2006) pointing out that it is important to avoid naive extrapolation of historical returns and to strike a balance between dependable sources of return and possible sources of return. A major issue arising is whether the Gorton and Rouwenhorst paper and subsequent investor behaviour have changed the outlook for commodity investment.

This viewpoint seems to have a number of prominent proponents within the investment industry. For example, Bill Miller of Legg Mason Capital Investment notes in his April 2006 Market Summary "The reason to own commodities may be that one believes they provide equity-like returns with little correlation with equities. The time to own commodities is (or at least has been) when they are down, when everybody has lost money in them, and when they trade below the cost of production. That time is not now. The data showing the returns of commodities will look very different if you start measuring just after prices have tripled.... I can't help but be skeptical of the advice to start or increase a position in commodities AFTER the biggest bull move in 50 years." Events of the last few weeks appear to have validated some of his concerns.

In this paper we observe that it appears possible to time commodity markets by observing the (lagged) actions of various classes of market participants. We construct long-only dynamically managed strategies that would have allowed a portfolio manager to time this commodity boom, and indeed exit the market before the recent price falls. Our findings are similar in spirit to Harvey and Erb (2006) who show that some security characteristics (such as the term structure of futures prices) and some portfolio strategies involving commodities have historically been rewarded with above-average returns. We focus on the linkages between spot and futures markets and use hedging pressure as our key predictive variable. We ask if a long-only portfolio manager investing in an equity index could have moved into copper and oil around mid 2000 just before the bursting of the "dot.com" bubble. We then examine the performance of this strategy as well of strategies initiated around 2002, until May 2006. Our base assets are the S&P, copper and oil, and we use the 1 month CD as a conditionally risk-free asset, that is the safe asset. The predictive variables are commercial hedging pressure and nonreportable hedging pressure which have been shown to work for for timing the market (Basu, Oomen and Stremme 2006), and non-commercial hedging pressure for both copper and oil. Non commercial hedging pressure represents the positions of large speculators such as hedge funds and as such could provide valuable evidence as to where the market for the commodity is headed. Our data are at a weekly frequency from October 1992 to May 2006.

2. COMMITMENT OF TRADERS REPORT

When a reportable trader, that is, one whose positions are above a minimum threshold level, is identified to the CFTC, the trader is classified either as a commercial or non-commercial trader. A trader's reported futures position is determined to be commercial if the trader uses futures contracts for the purposes of hedging as defined by CFTC regulations. Specifically, a reportable trader gets classified as commercial by filing a statement with the CFTC (using the CFTC Form 40) that he is commercially engaged in business activities hedged by the use of the futures and option markets. However, to ensure that the traders are classified consistently and with utmost accuracy, CFTC market surveillance staff in the regional offices checks the forms and reclassifies the trader if they have further information

about the trader's involvement with the markets. A reportable participant may be classified at the CFTC as non-commercial in one market and commercial in another market but cannot be classified as both in the same market. Having said this a multi-functional organization that has multiple trading entities may have each entity classified independently in a derivative market. For instance, a financial institution trading Treasury Notes might have a money management unit whose trading positions are classified (and agreed by the CFTC) as being non-commercial but the banking unit may be classified as commercial. Non-reportable positions (NRPs) represent the participants whose position levels are beneath the reporting threshold and may be regarded as small speculators. The NRP participants share of the total open interest is arrived at by subtracting total long and short reportable positions from the total interest. The CFTC estimates that these positions represent 10-30% of the total open interest.

3. METHODOLOGY

We begin this section by explicitly characterizing the managed portfolio that attains the maximum Sharpe ratio when the predictive information is used optimally, and is thus unconditionally mean-variance efficient. We first estimate a predictive regression of the form

$$(R_t - r_f\, 1) = (\mu - r_f\, 1) + BZ_{t-1} + \in_t$$

and we assume that $\sum_{\in}$ the covariance matrix of the residuals is constant. To specify a dynamically managed trading strategy, we denote by $\theta_k^{t-1} = \theta^k(Z_{t-1})$ the fraction of portfolio wealth invested in the k-th risky asset at time t-1, given as a function of the vector Z_{t-1} of (lagged) predictive instruments. The return on this strategy is given by,

$$r_t(\theta) = r_f + \sum_{k=1}^{n}(r_t^k - r_f)\theta_k^{t-1}$$

The efficient weights for a given mean are given by

$$\frac{w - r_f}{1 + H_t^2}\Sigma_\epsilon^{-1}(\mu_{t-1} - r_f 1)$$

where *w* depends on the mean. From the expression for the weights, it is clear that the conditional Sharpe ratio *H* plays a key role in the behavior of the optimal strategy. Moreover, the maximum (squared) *unconditional* Sharpe ratio $\lambda_*^2 = E(H^2)$ and it is thus variation in the conditional Sharpe ratio which leads to increases in the unconditional Sharpe ratio. The goal of dynamic asset allocation in this setting is to find predictive instruments that lead to large amounts of variation in the conditional (squared) Sharpe ratio.

4. RESULTS

We perform two out-of-sample experiments. The first estimates the predictive regression until April 2000 and then uses the estimates as inputs to run the dynamically managed strategy. Over the period May 2000-May 2006, the S&P had a negative annualized return (-0.79%) while copper and oil had annualized returns of 34% and 24% respectively, with Sharpe ratios of 1.31 and 0.52, indicating that returns on oil were much more volatile than copper.

A long-only manager who intended to form a fixed weight portfolio of these assets, using historical estimates of means and volatilities of these assets and none of the predictive variables, would have only generated a mean of 1.39% with a volatility of 10.13% leading to a negative Sharpe ratio of -0.14. In contrast the long-only manager using the predictive variables would have achieved a return of 16.76% at a volatility of 10.32% leading to a Sharpe ratio of 1.23, close to that of copper. The strategy has a

high annualized alpha of 13.94% and a low CAPM beta of 0.1. The cumulative returns and weights of this strategy are shown in Figure 1. It is clear from the figure that the strategy is primarily conservative with a significant fraction invested in the risk-free asset much of the time. It weathers the collapse of the "dot.com" bubble by remaining fully invested in the risk-free asset. It then trades off the S&P against copper, keeping a relatively stable position in oil. Interestingly around the beginning of 2005, the weight on copper drops to zero and it invests larger and larger fractions in the S&P. Finally, in May 2006 it drops investment in all the base assets to zero and becomes fully invested in the safe asset and seems to avoid sustaining any losses. It seems that the strategy follows the advice of Bill Mason!

To check the robustness of our results we conduct the same experiment over the May 2002-May 2006 period. All the risky assets have returns considerably greater than the conditionally risk-free assets with Sharpe ratios of 0.27 for the S&P, 1.99 for copper and 0.85 for gold. The performance of the long only fixed weight strategy now improves with a mean of 7.33% and a Sharpe ratio of 0.45. The dynamically managed strategy's performance also improves with the mean return increasing to 18.51% with a Sharpe ratio of 1.64. The alpha increases to 15.81% and beta decreases to almost zero. The cumulative return and weights are shown in Figure 1, and are very similar to those in Figure 2. Our strategies thus seem to work well in both bull and bear markets.

We thus conclude that dynamic asset allocation using hedging pressure would have helped a long-only portfolio manager time the commodity boom and would also have told him to exit before the market experienced a significant correction.

4.1 How do the strategies work

In order to further analyze how these strategies work we examine the correlations between the weights on the various base assets and the various predictive instruments, for our strategy from June 2000-May 2006. We first consider the S&P and its predictive instruments commercial and non-reportable hedging pressure. There is positive correlation between the weight on the S&P and commercial hedging pressure (0.39) indicating that increases in commercial hedging pressure lead the strategy to increase investment in the S&P. However, the reverse is true for non-reportable hedging pressure, where the correlation is negative and larger (-0.66), which indicates that this variable is a reliable contrarian indicator; that is, it tells us when to get out of the market. Non-commercial hedging pressure on both copper and oil are positively correlated with the weight on its asset (0.44 and 0.57). Non-commercial hedging pressure represents the activities of large speculators such as hedge funds, and increases in their long positions lead to investments of greater amounts in the corresponding commodity. Finally, we consider the correlations between commercial and non-reportable hedging pressure on the S&P and the sum of weights on copper and oil. We find that non-reportable hedging pressure has a considerable positive correlation with this sum (0.55) indicating that not only does it provide a signal to exit the S&P, it also provides a signal to move into the commodities rather than move into the safe asset. The correlation with commercial hedging pressure is low (-0.12).

It is also interesting to note that the strategy exits copper around the second half of 2005 which coincides with a drop in non-commercial hedging pressure for copper. In fact, hedging pressure for copper was between 0.7-0.8 until May 2005, after which it remained mostly in the 0.5-0.6 range. The strategy moves completely into the safe asset in May 2006 most likely due to a rise in S&P non-commercial hedging pressure. The behaviour of the strategy will become clear as more data points are added with the passage of time.

5 CONCLUSION

We show that exploiting the linkages between the spot and futures markets could have enabled a long-only portfolio manager to successfully time the commodity boom. The key predictive variables are various kinds of hedging pressure, which summarize the activities of various classes of market

participants. Our dynamic strategy exited copper in mid-2005 and switched completely into the risk-free asset in May 2006, thus avoiding the latest market downturn. It will be interesting to see how this strategy continues to evolve in the coming months.

6 REFERENCES

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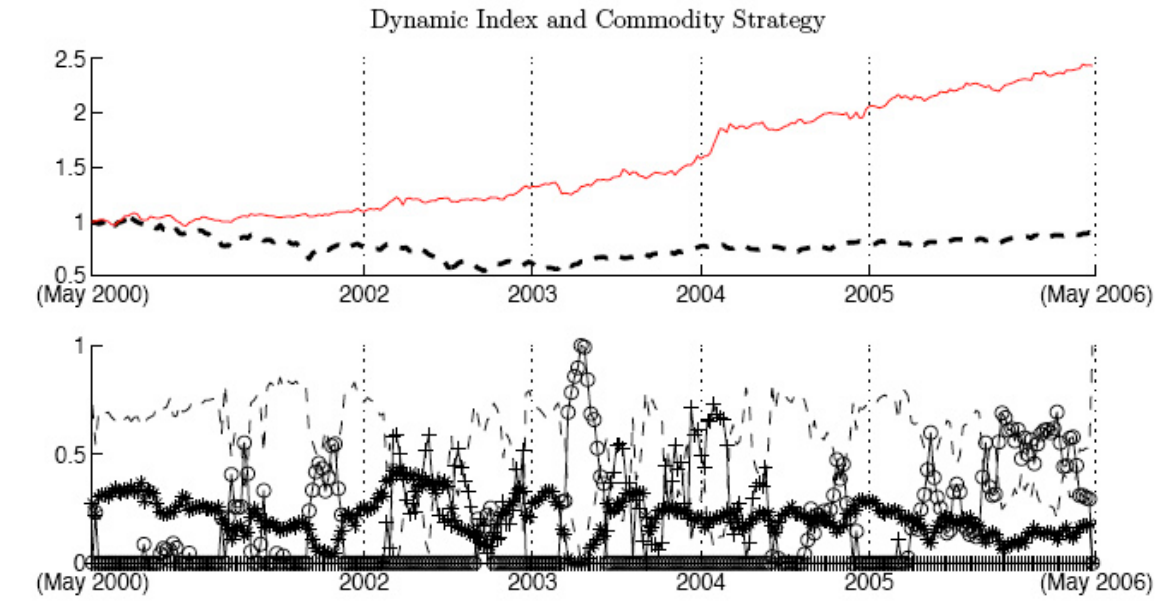

Figure 1: Out-of-Sample Performance (May 2000 - May 2006)

These graphs show the performance and portfolio weights of our dynamically managed long-only strategy during the period following the collapse of the "dot-com" bubble (from May 2000 until May 2006). The top graph shows the cumulative return of the long only maximum-return strategy (solid line) and the market index (dashed line), normalized to have unit value in May 2000. The bottom graph shows the portfolio weights on the risk-free asset (dashed line), the market index ("±"), and copper ("+"), and oil ("x")respectively. The predictive variables are commercial and non-reportable hedging pressure on the S&P and non-commercial hedging pressure for copper and oil.

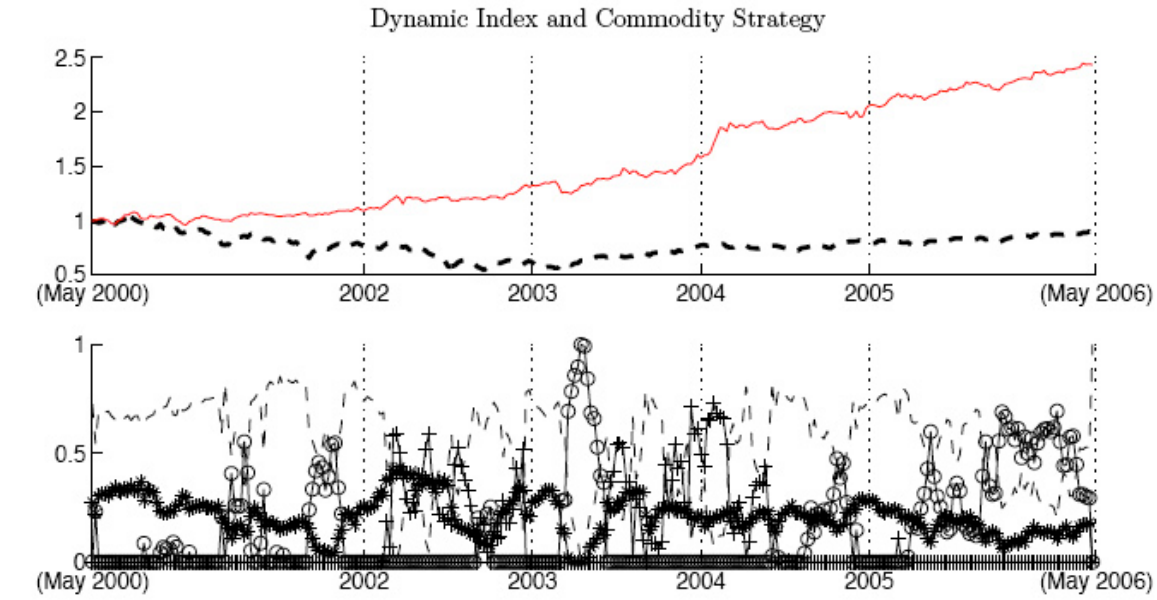

Figure 2: Out-of-Sample Performance (May 2002 - May 2006)

These graphs show the performance and portfolio weights of our dynamically managed long-only strategy during the period during the bull run after the collapse of the "dot.com" bubble (from May 2002 until May 2006). The top graph shows the cumulative return of the long only maximum-return strategy (solid line) and the market index (dashed line), normalized to have unit value in May 2002. The bottom graph shows the portfolio weights on the risk-free asset (dashed line), the market index ("±"), and copper ("+"), and oil ("x")respectively. The predictive variables are commercial and non-reportable hedging pressure on the S&P and non-commercial hedging pressure for copper and oil.