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ENERGY FUTURES PRICE FORWARD CURVES: HOW HAVE THEY EVOLVED AND DO THE CONDITIONS FOR NORMAL BACKWARDATION HOLD?

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The concept of backwardation was introduced into the economist's lexicon by Keynes (*A Treatise on Money*, 1930), and Kaldor (1939) and Hicks (*Value and Capital*, 1946) provide additional clarity. The form of backwardation put forward by these influential writers is often referred to as normal backwardation, and this may be distinguished from the current common usage of the stand-alone term, backwardation.

Normal backwardation refers to the relationship between the *current* futures price for a commodity to be delivered at some future time, T, and the current *expected* future spot price at T. Normal backwardation would be said to hold if the *current* futures price for delivery at time T was below the currently *expected* future spot price for time T. This is distinct from the current usage where backwardation is said to hold when the *current* futures price for a commodity to be delivered anytime in the future is lower than the *current* spot price. This distinction also holds when one constructs a discounted forward curve, taking into consideration the time value of money over the term structure. The relationship between the discounted forward curve and the current spot price falls into the same category as the current interpretation of backwardation, since the spot price of interest is the current spot rather than the expected future spot.

The fundamental idea behind *normal* backwardation is the assumption that hedgers are typically net short in the futures contract for their commodity and speculators are therefore net long. Being net long, it is argued that the current futures price for delivery at time T will be below the spot price expected to hold at time T, so that the speculators who are providing a risk mitigation service may *expect* to earn a positive return.

The current paper will diverge from the typical paper related to backwardation, and its alternative contango, and seek to determine whether or not the fundamental condition for normal backwardation has or has not held. That is, this paper will examine the distribution(s) of the net shorts and longs for hedgers and speculators. The specific commodity to be examined is crude oil, and the forward curves to be examined are those for the futures contracts traded on the New York Mercantile Exchange (NYMEX). The data to be employed for this analysis is drawn from both NYMEX futures price data and the Commitment of Traders (COT) database collected and published by the Commodity Futures Trading Commission (CFTC). The COT database contains information on the open interest positions of large traders, which have been partitioned into commercial and non-commercial trader categories. The CFTC data are reported weekly, and they are date-matched to the forward curves for each of the NYMEX energy futures contracts.

The analysis evaluates the relationship between the net long and short open interest positions of these large traders and the shape of the forward curve over the period from January 1995 through mid-August 2006. The forward curve for crude oil has gone through what may be deemed the extremes of contango and backwardation structures over the period since 1995 (employing the current-spot price definition). For the first couple days of

January 1995, the forward curve was in full contango; presumably a carry over from conditions at the end of 1994. This condition shifted to a “U-shaped” forward curve, with initial backwardation. The curves remained generally in this shape until near the end of 1997, with length of the backwardated segment stretching shrinking. For 1998, the forward curves were generally in a contango configuration, but reversed again to backwardation before mid-year 1999. Backwardation then held generally until 2004. By the middle of November, 2004 the curve evolved into a humped shape (an inverted “U-shape”), characterized by contango in the near future and backwardation in the tail. This overall humped shape persisted through August, 2006 (and beyond, even though I do not have the data to graph it), with the main evolution being that the peak of the hump shifted further into the later-dated maturities. In late January, 2007, the curve shifted once more into full contango, on a non-discounted basis, but only temporarily. [For example, the forward curve for April 30, 2007 exhibits a strong hump, with the “peak” on the November and December 2008 contracts at roughly \$6.00/bbl above the near month (Jun-07) contract price.]

This paper will examine the net long and short positions of hedgers, as characterized by those large traders with a commercial interest in the traded commodity, to determine both whether or not the fundamental assumption held by Keynes and Hicks has been met over the 1995-2007 period and how these distributions of open interest positions relate to the observed evolving changes to the forward curves for crude oil.