The Predictability of Futures Prices: A Comprehensive Study

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This paper tests the predictability of futures contracts based on the theory of normal backwardation versus forecasting theory in futures markets. The study examines the characteristics of price movements over 1994 to 2014. Empirical evidence from 29 futures markets, divided into four groups (agriculture, mineral, currency and financial) indicates that, both theories exist and the dominant mechanism varies in different markets. Despite the cross-sectional differences across futures markets, the prevailing mechanism in each market is quite sustainable across time. The majority of markets experience no change in the dominance of the functional mechanism over sample periods.

INTRODUCTION

There are two seemingly opposing theories proposed to explain the returns of traders in futures markets. The "theory of normal backwardation" (or "contango" in the opposite) views speculative returns as directly linked to the bearing of risk. On the other hand, the so-called "forecasting theory" argues that returns are determined by the ability of traders (in this case speculators) to forecast prices accurately. Hence futures prices are unbiased predictors of the subsequently developed spot price.

Though these two theories have been tested in the literature (e.g., Krehbiel and Collier (1996), Miffre (2000), Movassach and Modjtahedi (2005), etc.), the results are mixed. In addition, prior studies typically focus on some specific futures market over relatively short periods; and they do not analyze whether the change of market conditions would affect the application of the theories. In this study, we analyze various types of futures market separately using 13,920 semimonthly observations covering 29 markets for 20 years starting from 1994. This broader coverage makes possible much more conclusive inferences about the mechanism that determines the returns to traders and the futures costs of hedging. The results show that normal backwardation and forecasting theory may not be mutually exclusive even though they can be competitive. We present evidence on the extent to which each of these competing explanations may have been operative in futures markets from June 1994 to May 2014.

To investigate whether the mechanism would change over time in each market, we conduct the split sample analysis by analyzing the futures price movement in two subperiods. We show that the mechanisms show certain degree of sustainability. The dominant mechanism remains the same for the majority of markets. However, some markets do experience changes of the dominance of mechanisms over time.

We first define the theory of normal backwardation. In its simplest form, the theory assumes that speculators: 1) are net long; 2) require positive profits; and 3) are unable to forecast prices. Thus the theory predicts that futures prices rise on the average during the lives of each contract. Conversely, in contango case, the hedgers are net long and the futures price would lie above the expected future spot

price, and the price of the futures contract would fall over its life. If speculators are assumed to be unable to forecast prices, it is appropriate to consider all of their profits to be a reward for risk-bearing and none to be a reward for forecasting. Therefore, the profit flow between hedgers and speculators is analogous to the flow of insurance premiums between the insured and the insurer.

We then examine the different assumptions concerning the forecasting ability of speculators. The failure to find any consistent evidence of normal backwardation (or contango) implies the acceptance of the extreme alternative hypothesis that all important profit flows are to be explained in terms of the forecasting ability. The existence of a subset of speculators who can forecast price changes causes futures prices on the average to be an unbiased estimate of the ultimate spot price. The assertion that all important profit flows are to be explained in terms of forecasting ability implies the proportion of profits attributed to normal backwardation (or contango) is zero. However, it is possible to define two levels of forecasting skill: first, an elementary ability which is called basic forecasting skill; and the second, a more sophisticated ability which can be dubbed as special forecasting skill. Basic skill measures the ability of a group to be long in markets where prices rise over the total period of observation and short in markets where prices fall over the total period of observation. Special skill, therefore, measures a trader's ability to forecast price movements whose duration is shorter than the total period of observation. An examination of the results of this division of profit confirms the conclusion that it is the degree of forecasting ability which controls the flow of profits.

We use a non-parametric method to test the existence of the two theories in the futures markets, including agriculture, mineral, currency and financial markets. This allows us to avoid the bad model problem in prior literature. For each market, we study the semi-month price movement over the last 20 years. A strong upward or downward trend indicates the dominance of backwardation or contango. On the other hand, if we cannot identify any one-way direction, it supports the forecasting theory. The evidence shows that both backwardation/contango and forecasting exist in the futures markets. Interestingly, we find that while the theory of normal backwardation/contango may be valid for particular markets as mineral and currency futures markets, it is not adequate as a general explanation of the flow of profits in some commodity markets. Specifically, it is the forecasting ability and not the bearing of risk that determines the profits of speculators in the grain markets. On the other hand, in financial futures markets, the backwardation dominates.

The fact that the gross profits of small traders are zero means that they make substantial net losses after commissions. Note that small speculators do not require an ex post history of profits in order to continue trading. There are at least three possible explanations of this. Firstly, small speculators are either risk seekers and are consequently willing to lose money for the privilege of speculating. Secondly, they comprise a stable population of risk averters who are unable to forecast prices, but do not realize this. Or finally, they constitute a changing population of risk averters, in which the successful forecasters rise to become large speculators while the unsuccessful withdraw from the market and are replaced with new blood.

The existence of a subset of speculators who are able to forecast price changes causes futures price on the average to be an unbiased estimate of the ultimate spot price. This conclusion in a modified version readmits a question which the theory of normal backwardation was thought to answer: why are large speculators consistently net long, even when we consider sets of markets where there is clearly no tendency for prices to rise? Since large speculators own only a small fraction of all commitments, it is possible for them to be either net short or net long quite independently of the sign of net hedging commitments. The answer to this may be that even the more sophisticated speculators have an irrational preference for the long side. On the other hand, it may well be equally true that the distribution of price changes is asymmetric so that skewness and moments other than the mean influence the decision of speculators to be net long.

The futures prices, on the average, are unbiased estimates of ultimate spot prices. However, this does not follow that the result holds either for all markets or for all time periods within a market. As an example of the former, we show that livestock futures prices have exhibited a strong upward tendency in the last 20 years, consistent with the theory of normal backwardation. As an example of the latter, it can

be shown that if hedgers are net long, futures prices tend to rise. Of course, the results suggest that the evidence of bias is critically dependent both upon the markets selected and upon the special structural characteristics which determine any conditional price forecasts. In the meantime, the overall generalization from the date investigated here is that the futures price is an unbiased estimate of the ultimate spot price.

The remainder of the paper is organized as follows. We compare the forecasting theory and backwardation and discuss the specific aspects of forecasting in section 2 and section 3. We discuss our data and results in section 4. Section 5 concludes.

FORECASTING THEORY VS BACKWARDATION (OR CONTANGO)

The theory of normal backwardation predicts that under certain assumption it is necessary on the average for the price of futures contracts to rise. Two of the assumptions of the theory as originally stated by Keynes (1923) are that speculators be net long and be risk averters (that is, they require a positive history of profits if they are to continue trading). Under these circumstances, a rising trend in prices is the mechanism that rewards long speculators for the risks they bear. To Keynes, the possibility that speculators may be better forecasters than hedgers is a "dubious proposition". This contention appears to be reversed in later formulations of the theory of normal backwardation by Hicks (1953), and Houthakker (1957). Since forecasting ability, or its absence, can be a central theme of the argument. In Keynes' version of the theory, it is the speculators' inability to forecast accurately that makes them dependent upon the incidental, and probably unanticipated, rising price level to provide a positive history of profits. The unambiguous to interpret whatever profits they receive as a risk premium paid to them by hedgers and not as a reward for forecasting. The postulation of "no forecasting" ability, however, raises problems concerning the prediction that prices must rise (or fall). If the level of the net short position of hedgers is subject to variations, it is possible for speculators to have a positive history of profits without prices rising on the average. Note that the assumptions of the theory of normal backwardation (contango) are neither necessary nor sufficient for the prediction that prices rise (fall). The principal modification of the theory of normal backwardation made by Hicks and Houthakker is to assume that speculators are able to forecast prices. This distinction may be seen by contrasting the position of Keynes as stated above with that of Hicks in "Value and Capital" (1953).

One consequence of granting speculators even a modest amount of predictive ability is that it frees the backwardation hypothesis from counter example that involve speculators being net long during periods when prices fall in a "predictable" manner. For example, "hedging pressure" theories, where the direction of price change is directly related to the magnitude of short hedges, imply a lack of foresight by speculators who take positions early in the season that are inconsistent within the assumption of forecasting ability. Thus, the assumptions of the Hicks-Houthakker version of the theory necessarily imply that prices must rise on the average. However, this improvement in the logic of theory is gained at a cost. That is the returns of speculators may no longer be viewed unambiguously as a reward for bearing risk. Rather they represent a mixed payment for forecasting and risk bearing, the proportions of the mixture being determinable only by empirical investigation. The view held by Keynes that the returns of speculators may be interpreted as an insurance premium, will be valid only if the forecasting component of profits is relatively small.

So it would be interesting to measure a normal backwardation component of profits and then define the difference between this amount and the actual returns as the forecasting component. Now note a couple of problems which arise in defining an empirical estimate of normal backwardation. The first problem is the case of a contango when hedgers are net long rather than net short. The Keynes and Hicks formulations clearly assume hedgers to be net short. The second problem concerns with weights would be used in aggregating over individual contracts and commodities. There are at least three possibilities: 1) each contract may be given a weight of one; 2) each contract may be given a weight equal to the average value of the open interest in that contract; and 3) each contract may be weighted by the actual open interest existing on that date. The first alternative, unity weights, gives undue importance to inactive

contracts and commodities and need not be considered. The choice between options two and three is more difficult. Numerous arguments can be made for either side. The most important consideration would be protection against misleading results caused by changing market structure. We measure normal backwardation as the sum of the return on the total long open interest when hedgers are net short. We measure contango as the sum of the return on the total short open interest when hedgers are net long.

If this measure is to be used, what is its relation to the existing theories of normal backwardation? Normal backwardation describes the profits of marginal speculators who possess no forecasting ability. We may therefore conceive of normal backwardation (contango) as the return earned by a hypothetical speculator who follows a naive strategy of being constantly long when hedgers are net short (constantly short when hedgers are net long). The naive strategy may assume that the hypothetical trader adjusts the size of his positions to maintain them as a constant proportion of the total open interest. If normal backwardation is defined as the returns which a naive speculator earns by keeping his commitments long, in proportion to the total open interest when hedgers are net shot, then the rate of return on the total long open interest is closely related to the rate of normal backwardation. Likewise, the same can be said in case of contango when hedgers are net long.

FORECASTING SKILLS

The rates of return of net trading groups can be divided into two categories. One is a reward defined as the basic forecasting skill, the other is a residual component defined as the special forecasting skill.

Now let $V_m{}^L$ and $V_m{}^S$ be total value of trading group's long and short commitments, in a single market m, aggregated over time periods, let $R_m{}^B$ be the rate of return on the long open interest in that market. Then, any net trading group's rate of profit attributable to the basic forecasting skill is given by

$$R_m{}^B = \frac{R_m\left(V_m{}^L - V_m{}^S\right)}{V_m{}^L + V_m{}^S} \tag{1}$$

Denoting the groups actual rate of return by $R_m{}^A$, we then obtain the measure of the special forecasting skill as residual of $R_m{}^F = R_m{}^A - R_m{}^B$.
In the aggregate, we have

$$R^B = \frac{\sum_m R_m\left(V_m{}^L - V_m{}^S\right)}{\sum_m \left(V_m{}^L + V_m{}^S\right)} \tag{2}$$

and $R^F = R^A - R^B$.

The measure $R_m{}^B$ will be positive when R_m is positive and the group is net long on the average $(V_m{}^L - V_m{}^S > 0)$ or when R_m is negative and the group is net short on the average $\left(V_m{}^L - V_m{}^S < 0\right)$. So the measure discussed here defines the basic skill as the ability to be net long on the average in markets where prices rise on the average, and to be net short on the average in markets where prices fall on the average. This measures the long term ability of a trading group to stay on the profitable side of the market. In the meantime, the special forecasting skill measures the success with which a trading group varies its position, from period to period to profit from short run price trends. These forecasting skills should be necessary especially when backwardations or contangos are not evident in the price structures.

FUTURES PRICE STRUCTURES

Data and Methodology

All futures settlement prices from June 15, 1994 through May 30, 2014 are collected from Futures section in the Wall Street Journal (WSJ) and Investor's Business Daily (IBD). In order to make semimonthly data, we group data from the first day to 15th day of the month as one set and 16th day of the month to last day of the month as the other set. If the 15th day falls on holidays we use the closest day which gives two sets as equal as possible. Accordingly, for each futures contract, we have 480 data points. The first data point is recorded on June 15, 1994 (settlement price on June 15, 1994 minus settlement price on May 30, 1994), and the last one is obtained on May 30, 2014 (settlement price on May 30, 2014 minus settlement price on May 15, 2014). Then we count how many times the price is increased, and how many times the price is decreased during that semimonthly period over last 20 years.

For each futures market, we report the prices of the start point and end point and calculate the change in price during the period. Price changes are based on the most actively trading months. The average annual percentage price change of the contract during the period is obtained by:

$$\text{Annual percentage price change} = \frac{(P_{end} - P_{start}) / P_{start}}{\text{Number of Years}} \times 100 \tag{3}$$

We then count the number of the semiannual periods where there have been price increases and calculate the fraction of the number of increase periods to the total number of periods.

To investigate the evolution of the mechanisms in futures markets, we split the overall sample into two subsamples over 1994 – 2004 and over 2004 – 2014 respectively. Each sub-period sample has 240 data points. In doing so, we want to analyze whether dominance of one mechanism in each futures market is stable and sustainable over time.

Our methodology generates the following predictions:

> *H1. If the fraction of the number increase periods to total number of periods is greater than 50%, the market moves upwardly for the majority of time. This indicates that the backwardation has happened and long positions are actually profitable during those periods. The mechanism of backwardation suggests the demand for seller hedging.*
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> *H2. If the fraction of the number increase periods to total number of periods is less than 50%, the market moves downwardly for the majority of time. This indicates that the contango has happened and short positions are actually profitable during those periods. The mechanism of contango suggests the demand for buyer hedging.*
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> *H3. If the fraction of the number increase periods to total number of periods is close to 50%, it rejects the possibility of backwardation while supporting the forecasting argument. The mechanism of forecasting suggests that the profit is determined by trader's forecasting ability.*

Results

Table 1, 2, and 3 report futures contracts and markets, period of observation, numbers of semimonthly observations, change in price level during the period, annual percentage change, and number of semimonthly periods with price increases over the overall sample period and two sub-periods, respectively. The last column shows the number of the semiannual periods where there have been price increases. The percent value in the parentheses report the fraction of the number of increase periods to the total number of periods. If the ratio is within the one percentage points around 50% (that is, 49% - 51%), the forecasting theory dominates; if the ratio is greater than 51%, the backwardation dominates; if the

ratio is less than 49% the contango dominates. Table IV presents the frequency of the dominance of each mechanism for all the future markets.

Cross-Sectional Heterogeneity

The results show that there exists heterogeneity across markets. Backwardation (contango) and forecasting mechanisms coexist in futures markets. Table 4 shows that backwardation, contago and forecasting account for 48.28%, 31.03% and 20.69%, respectively. During the last two decades, overall around half of the contracts show the existence of the sellers' hedge, one third of the contracts indicate buyers have incentive to hedge, but one in five contracts does not reveal future price directions. In the following we analyze each market in detail and discuss the implications behind the functional mechanisms.

Quite contrary to *a priori* belief that the grain markets may show sellers hedging (farmer's incentive to hedge), corn contracts show the buyers' (e.g., grain processors) incentive to hedge outweighs that of the sellers. Only soybeans market exhibits backwardation, and wheat contracts are hard to predict indicating the traders forecasting ability may determine their profits (Forecasting Theory). The remaining agriculture markets demonstrate evidence of both backwardation and contango. In the livestock sector, live cattle and feeder cattle contracts display ranchers' incentive to hedge (54% and 53% respectively), in the meantime it's hard to tell who would pay premiums in lean hogs market. The study uncovers the "contango" (less than 49%) in so called "soft" commodities such as coffee, cocoa, cotton and orange juice. This implies last 20 years selling in futures contracts on the average may have given us higher probability of making profits in these markets. For some reason, the buyers (e. g., coffee brewers like Starbucks) have strong incentive to buy in this market to hedge their risk.

Energy markets in general show backwardation. It looks like oil producing countries (e.g., OPEC members) are willing to pay premium to hedge their risk. Industrial commodities like copper, silver, platinum, all show backwardation during the period we studied. This implies last 20 years buying in the futures contracts on the average may have given us higher probability of making profits in these markets. Even with a phenomenal surge of price during the period, gold shows mild form of contange (48.5%). That means short positions might have given a better winning percentage during that period.

It is rather shocking to find that most extreme backwardation and contango happen in the financial futures. Obviously, financial futures markets should be most efficient markets in part because they have most trading volumes and open interests. But S & P 500 futures contacts show the severest form of backwardation (59%) in the futures markets along with the T-bond futures contracts (57%). The backwardation in interest futures markets (Eurodollars and T-bonds) suggests a high level of premiums to be paid to buyers from sellers. For example, the U.S. Treasury department has a strong incentive to pay insurance premium to sell government securities. Why is that? Note that last two decades we have witnessed that the general interest level has been falling. Falling interest rates (or increasing bonds prices) seem to be related with the normal backwardation in these markets. Foreign exchange markets are mixed. British pound slightly gives an edge in buying but Japanese yen favors sellers. Japanese yen is rather interesting. Even though the Japanese yen have been generally appreciated last 20 years, the right strategy might have been selling in the yen futures markets.

Time-Series Sustainability

In addition to analyzing the overall sample, we make the subsample analysis to test the time-series sustainability of the functional mechanisms in each market. The results show that the mechanisms show certain degree of sustainability in futures market. The mechanism remains the same (for pre- and post-2004 periods and overall period) for more than half of markets (16 out of 29). One of the distinct trends is that last two decades the contango mechanism is slowly but surely moving into the forecasting realm (3 markets: Corn, Meal, and Cotton) or into the backwardation (7 markets: S-Oil, P-Bellies, OJ, Gold, Silver, Crude Oil, and Swiss Franc), but none of the commodities have switched into the contango structure. This implies that the futures prices reflect more and more of the sellers needs for hedge, as futures markets are originally intended. Gold and Silver markets experience dramatic changes of the

dominance of mechanisms over time from extreme forms of contango (39% and 42% respectively) to the other extremities of backwardation (58% and 60% each). A buyer dominance (supposedly speculators large and small) has turned into a seller dominance (probably large hedgers like mining companies). In the currency market, Swiss Franc shows the same kind of changes. We observe stronger forecasting factor in British Pound in the post-2004 period, changing from backwardation in the pre-2004 period. On the other hand, Canadian Dollar and Platinum markets change from forecasting dominance to normal backwardation in the post-2004 period. Though many detailed explanations can be offered to account for the changes, the conclusion should be interpreted with caution.

As we see in Table IV, despite the cross-sectional differences across futures markets, the prevailing mechanism is quite sustainable across time. The majority of markets experience no change in the dominance of the functional mechanism over sample periods. However, we find during the last two decades the contango mechanism is slowly but surely disappearing and switching into the forecasting theory or backwardation structure. This implies that the futures prices are getting more unpredictable. Also it indicates that futures prices reflect less of the buyers needs and more of sellers needs for hedge, as futures markets are originally intended.

CONCLUSIONS

This study finds that neither normal backwardation (or even contango) nor forecasting is a general characteristic of futures markets. Each market is unique. The appealing argument that futures prices are on the average unbiased estimates of ultimate spot prices does not necessarily imply that it holds for all markets or for all time periods within a market. For example, it's quiet astonishing that we cannot find any coherent farmers' incentive to hedge their risk in the form of backwardation in grain and live stock markets. Not all of these markets show a strong upward tendency during the period that is quite consistent with the theory of normal backwardation. Speculators who employed naive trading strategy of long positions believing that the risk premiums were paid to them might have been failed in many of these markets at least last 20 years.

We do find behaviors of some futures prices quite consistent with a priori expectations. For example, the backwardation or contango in some agriculture and mineral markets indicate strong incentives of producer or buyer hedging. However, one of the distinct trends this study finds indicates that last two decades the contango mechanism is slowly but surely disappearing and moving into the backwardation structure. This implies that the futures prices reflect more and more of the sellers needs for hedge, as futures markets are originally intended. Despite the cross-sectional differences across futures markets, we find that the prevailing mechanism is quite sustainable across time. The majority of markets experience no change in the dominance of the functional mechanism over sample periods.

Another surprise comes from the financial futures contracts where the extreme forms of backwardation and contango are very pronounced, whereas many may believe that forecasting skills are most needed in these markets. Why financial futures markets exhibit strong form of backwardation or contango? Why interest instruments contracts show sellers incentive to hedge? Why stock index futures prices are backwardated? Further research should shed more light on these issues.

TABLE 1
DESCRIPTION AND PRICE LEVEL: 1994 - 2014

Commodity and Markets	Period of Observation		# of semi-monthly observations	Price change		Annual Percentage Price Change	# of Obs Price was up (%)
	From	To		Start	End		
Agriculture							
Com, CBOT	6/94	5/14	480	242.0	457.5	+ 4.45	227 (47%)
Beans, CBOT	6/94	5/14	480	654.75	1424.5	+ 5.58	253 (53%)
Meal, CBOT	6/94	5/14	480	191.9	473.9	+ 7.35	250 (52%)
S-Oil, CBOT	6/94	5/14	480	26.38	38.61	+ 2.23	234 (49%)
Wheat, CBOT	6/94	5/14	480	242.0	660.5	+ 8.65	241 (50%)
F-Cattle, CME	6/94	5/14	480	74.67	197.05	+ 8.19	260 (54%)
L-Cattle, CME	6/94	5/14	480	64.15	138.60	+ 5.80	253 (53%)
Hogs* CME	6/94	5/14	480	61.3*	124.80	+ 5.18	240 (50%)
P-Bellies, CME	6/94	5/14	408	37.22	121.0**	+ 16.04	202 (50%)
Cocoa, CSCE	6/94	5/14	480	1305	3070	+ 6.76	232 (48%)
Coffee CSCE	6/94	5/14	480	191.60	179.90	- 0.30	222 (46%)
Sugar CSCE	6/94	5/14	480	11.68	18.19	+ 2.79	241 (50%)
Cotton NYCE	6/94	5/14	480	71.63	77.47	+ 0.40	229 (48%)
OJ NYCE	6/94	5/14	480	88.95	161.50	+ 4.08	236 (49%)
Mineral							
Copper CMX	6/94	5/14	480	108.25	311.55	+ 9.39	275 (57%)
Gold CMX	6/94	5/14	480	387.3	1246.7	+ 11.09	233 (49%)
Platinum NYM	6/94	5/14	480	408.0	1453.0	+ 12.81	252 (53%)
Silver CMX	6/94	5/14	480	542.5	1871.9	+ 12.25	243 (51%)
Crude Oil NYM	6/94	5/14	480	19.37	101.98	+ 21.32	270 (56%)
Heating Oil NYM Unleaded	6/94	5/14	480	.5052	2.8936	+ 9.42	260 (54%)
Gasoline*** NYM	6/94	5/14	480	.5359	2.9380	+ 22.41	284 (59%)
Lumber 1 CME	6/94	5/14	480	343.2	312.5	- 0.45	204 (43%)
Currency							
Japanese Yen CME	6/94	5/14	480	1.0211	.9840	- 0.18	211 (44%)
Canadian Dollar CME	6/94	5/14	480	.7202	.9199	+ 1.39	246 (51%)
British Pound CME	6/94	5/14	480	1.5424	1.6750	+ 0.43	249 (52%)
Swiss Franc CME	6/94	5/14	480	.7506	1.1185	+ 2.45	233 (49%)
Financial							
Eurodollar CME	6/94	5/14	480	94.64	99.76	+ 0.27	260 (54%)
T-Bonds CBOT	6/94	5/14	480	101.07	137.15	+ 1.78	275 (57%)
S & P 500 CME	6/94	5/14	480	445.05	1913.9	+ 16.50	286 (60%)

* Live Hogs (Prior to Dec 1996) were based on conversion factor of .74 of lean hogs.
** As of 5/11.
*** NY Harbor Gas Blend was used since November 2006.

TABLE 2
DESCRIPTION AND PRICE LEVEL: 1994 - 2004

Commodity and Markets	Period of Observation		# of semi-monthly observations	Price change		Annual Percentage Price Change	# of Obs Price was up (%)
	From	To		Start	End		
Agriculture							
Com, CBOT	6/94	5/04	240	242.0	299.75	+ 2.39	105 (44%)
Beans, CBOT	6/94	5/04	240	654.75	775.0	+ 1.84	123 (51%)
Meal, CBOT	6/94	5/04	240	191.9	247.0	+ 2.87	123 (51%)
S-Oil, CBOT	6/94	5/04	240	26.38	27.55	+ 0.44	113 (47%)
Wheat, CBOT	6/94	5/04	240	242.0	370.5	+ 5.31	111 (46%)
F-Cattle, CME	6/94	5/04	240	74.67	107.20	+ 4.36	126 (53%)
L-Cattle, CME	6/94	5/04	240	64.15	88.62	+ 3.81	124 (52%)
Hogs* CME	6/94	5/04	240	45.35*	73.95	+ 6.31	121 (50%)
P-Bellies, CME	6/94	5/04	240	37.22	109.55	+ 19.43	126 (53%)
Cocoa, CSCE	6/94	5/04	240	1305	1472	+ 1.28	103 (43%)
Coffee CSCE	6/94	5/04	240	191.6	87.6	- 5.43	109 (45%)
Sugar CSCE	6/94	5/04	240	11.68	7.32	- 3.73	122 (51%)
Cotton NYCE	6/94	5/04	240	71.63	59.02	- 1.76	110 (46%)
OJ NYCE	6/94	5/04	240	88.95	58.05	- 3.47	105 (44%)
Mineral							
Copper CMX	6/94	5/04	240	108.25	126.75	+ 1.71	123 (51%)
Gold CMX	6/94	5/04	240	387.3	394.9	+ 0.20	94 (39%)
Platinum NYM	6/94	5/04	240	408.0	822.2	+ 10.15	122 (51%)
Silver CMX	6/94	5/04	240	542.5	612.8	+ 1.30	98 (41%)
Crude Oil NYM	6/94	5/04	240	19.37	39.71	+ 10.50	138 (58%)
Heating Oil NYM							
Unleaded	6/94	5/04	240	.5052	1.0069	+ 9.93	129 (54%)
Gasoline** NYM	6/94	5/04	240	.5359	1.2400	+ 13.14	145 (60%)
Lumber 1 CME	6/94	5/04	240	343.2	370.8	+ 0.80	105 (44%)
Currency							
Japanese Yen CME	6/94	5/04	240	1.0211	.9093	- 1.09	98 (41%)
Canadian Dollar CME	6/94	5/04	240	.7202	.7312	+ 0.15	121 (50%)
British Pound CME	6/94	5/04	240	1.5424	1.8156	+ 1.77	127 (53%)
Swiss Franc CME	6/94	5/04	240	.7506	.8014	+ 0.68	104 (43%)
Financial							
Eurodollar CME	6/94	5/04	240	94.64	94.01	- 0.07	139 (58%)
T-Bonds CBOT	6/94	5/04	240	101.07	110.01	+ 0.88	131 (55%)
S & P 500 CME	6/94	5/04	240	445.05	850.6	+ 9.11	141 (59%)

* Live Hogs (Prior to Dec 1996) were based on conversion factor of .74 of lean hogs.
** NY Harbor Gas Blend was used since November 2006.

TABLE 3
DESCRIPTION AND PRICE LEVEL: 2004 - 2014

Commodity and Markets	Period of Observation		# of semi-monthly observations	Price change		Annual Percentage Price Change	# of Obs Price was up (%)
	From	To		Start	End		
Agriculture							
Com, CBOT	6/04	5/14	240	299.75	457.5	+ 5.26	122 (51%)
Beans, CBOT	6/04	5/14	240	775.0	1424.5	+ 8.38	130 (54%)
Meal, CBOT	6/04	5/14	240	247.0	473.9	+ 9.19	127 (53%)
S-Oil, CBOT	6/04	5/14	240	27.55	38.61	+ 4.01	121 (50%)
Wheat, CBOT	6/04	5/14	240	370.5	660.5	+ 7.83	130 (54%)
F-Cattle, CME	6/04	5/14	240	107.20	197.05	+ 8.38	134 (56%)
L-Cattle, CME	6/04	5/14	240	88.62	138.60	+ 5.64	129 (54%)
Hogs* CME	6/04	5/14	240	73.95*	124.80	+ 6.88	119 (50%)
P-Bellies, CME	6/04	5/14	168	109.55	102.9**	- 0.61	76 (45%)
Cocoa, CSCE	6/04	5/14	240	1472	3070	+ 10.86	129 (54%)
Coffee CSCE	6/04	5/14	240	87.6	179.90	+ 10.54	113 (47%)
Sugar CSCE	6/04	5/14	240	7.32	18.19	+ 14.85	119 (50%)
Cotton NYCE	6/04	5/14	240	59.02	77.47	+ 3.13	119 (50%)
OJ NYCE	6/04	5/14	240	58.05	161.50	+ 17.82	131 (55%)
Mineral							
Copper CMX	6/04	5/14	240	126.75	311.55	+ 14.58	152 (63%)
Gold CMX	6/04	5/14	240	394.9	1246.7	+ 21.57	139 (58%)
Platinum NYM	6/04	5/14	240	822.2	1453.0	+ 7.67	130 (54%)
Silver CMX	6/04	5/14	240	612.8	1871.9	+ 20.55	145 (60%)
Crude Oil NYM	6/04	5/14	240	39.71	101.98	+ 15.68	132 (55%)
Heating Oil NYM							
Unleaded	6/04	5/14	240	1.0069	2.8936	+ 18.74	131 (55%)
Gasoline*** NYM	6/04	5/14	240	1.2400	2.9380	+ 13.69	139 (58%)
Lumber 1 CME	6/04	5/14	240	370.8	312.5	- 1.57	101 (42%)
Currency							
Japanese Yen CME	6/04	5/14	240	.9093	.9840	+ 0.82	113 (47%)
Canadian Dollar CME	6/04	5/14	240	.7312	.9199	+ 2.58	125 (52%)
British Pound CME	6/04	5/14	240	1.8156	1.6750	- 0.77	122 (51%)
Swiss Franc CME	6/04	5/14	240	.8014	1.1185	+ 3.96	129 (54%)
Financial							
Eurodollar CME	6/04	5/14	240	98.22	99.76	+ 0.16	121 (50%)
T-Bonds CBOT	6/04	5/14	240	105.07	137.15	+ 3.05	144 (60%)
S & P 500 CME	6/04	5/14	240	1119.6	1913.9	+ 7.09	145 (60%)

* Live Hogs (Prior to Dec 1996) were based on conversion factor of .74 of lean hogs.
** As of 5/10.
*** NY Harbor Gas Blend was used since November 2006.

TABLE 4
FREQUENCY OF THE DOMINANCE OF MECHANISMS

	1994 – 2014		1994 – 2004		2004 – 2014	
	No. futures	%	No. futures	%	No. futures	%
Forecasting	6	20.69	4	13.79	7	24.14
Backwardation	14	48.28	13	44.83	18	62.07
Contango	9	31.03	12	41.38	4	13.79
Total	29	100	29	100	29	100

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