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Disciplines

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Are Speculators Informed?

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Introduction

The Commodity Futures Trading Commission (CFTC) requires large participants in futures markets to report their positions each week, and whether they are commercial (hedgers) or non-commercial (speculators). The main distinction that the CFTC makes in defining these two types of positions is whether or not the futures position is used to offset an underlying business activity. In this way, futures markets allow a natural decomposition of traders into these two types. The aim of this study is to understand the relationship between investors' positioning and equity index futures returns.

I use a novel approach—the announcement effect of positions releases—to examine the relationship between positions and returns for equity futures and specifically to test the theory of asymmetric information among participant types. Anecdotal market evidence has long indicated that information is gleaned from positioning data releases, but this idea has yet to be formally tested. Several papers have looked at the predictive relationship between positioning and returns, but these have largely focused on commodity futures markets and on explaining risk premia. Keynes (1930) conjectured that futures market risk premia should be related to positions because hedgers use futures markets to buy insurance. Some evidence for the Keynesian hedging pressure theory has been found in the context of commodity futures, and this paper explores whether this holds for financial futures as well.

To summarize the main results, I find a significant and positive *contemporaneous* relationship between net non-commercial positioning changes and returns. Moreover the relationship sticks – the subsequent periods' returns are not negatively correlated with positions in the current period.

A potential explanation for this is that non-commercial participants have private information. I find a significant market reaction to the public release of information about positions that supports the hypothesis of asymmetric information among trader types. Finally, I find evidence *against* the hypothesis that futures market risk premia result from hedging pressure.

The plan for the remainder of this paper is as follows. In Section 1, the features of the futures price data and positioning data are described. In Section 2, a strong contemporaneous relationship between futures returns and changes in positioning is documented. I further explore causality in this relationship and the extent to which the effect is sustained or reversed. An effect that is reversed indicates a temporary liquidity pressure, whereas a sustained effect is consistent with information asymmetries. In Section 3, I adopt a novel "event-study" approach by looking at the announcement effect in a small window of returns around the public release of positioning data by the CFTC. Section 4 contains the predictive regressions and Section 5 concludes.

1. Data

Two categories of data are used in this study: price data for equity futures contracts which are available in real-time to market participants, and positions for different types of futures traders that are collected by the CFTC and reported to the public on a weekly basis.

1.1. Price Data

Equity index futures contracts are cash-settled: both sides to a contract agree to a futures price, and if at expiration the index is above the futures price at which the trade was settled, then those with short positions are obligated to pay those with long positions a multiple of the difference between the index level and the futures price, and vice-versa. Not all financial futures contracts are cash-settled. For instance, bond futures are settled by delivery of pre-specified securities.

Daily and tick-by-tick price data were obtained for the futures and E-mini futures contracts for four equity indices from Price-Data and Tick Data. The eight contracts considered are as follows: (1) the Dow Jones Industrial Average (2) the Dow Jones Industrial Average E-mini, (3) the Nasdaq 100, (4) the Nasdaq 100 E-mini, (5) the Russell 2000, (6) the Russell 2000 E-mini, (7) the S&P 500, and (8), and the S&P 500 E-mini. End-of-week S&P 500 dividend yield data were obtained from Pinnacle Data Corporation. The data start in October 1992 for the S&P 500, February 1993 for the Russell 2000, June 1998 for the Dow Jones Industrial Average and the S&P 500 E-mini, July 1998 for the Nasdaq 100, June 1999 for the Nasdaq 100 E-mini, May 2002 for the Dow E-mini, and August 2002 for the E-mini Russell 2000. The data end in June 2010 for all futures contracts, except the Russell 2000 contract, which ceased trading in December 2008.

A rolling futures price series for each contract series is created, using the front contract (closest to expiry) of each contract type. The contract is rolled over when the open interest in the expiring contract falls below that of the next contract in the cycle, typically 8 days prior to the contract expiration date. Daily futures returns are end-of-day observations. The last observation in each minute is extracted from the tick data to form a minute-by-minute series of futures returns.

1.2. Futures Participant Types and Positioning Data

The CFTC was created by an act of Congress in 1974 to regulate futures market trading. With this level of oversight and an aim to prevent collusion amongst traders and manipulation in futures markets, the CFTC requires futures market participants with positions above a certain level to report open interest on a weekly basis.[2] Data are collected by the CFTC each Tuesday, and reflect positions on that day. Then on Friday, the information collected three days prior is released to the public.[3] In October 1992 the CFTC began to collect positioning data on a weekly basis (previously it was collected semi-monthly and monthly). This study only covers the period since position releases became weekly.

The reported statistics include the number of positions held and the direction of these positions (long or short) for each contract. Reporting market participants must also identify whether the contracts were used for commercial (hedging) or non-commercial (speculative) activity.[4] Non-reportable positions are the residual total open interest not accounted for by reportable positions. CFTC positioning data are obtained directly from the CFTC.

The CFTC's distinction between commercial and non-commercial participants is straightforward, depending on whether the futures position is motivated by underlying business needs. In equity futures, a corporate pension fund or a mutual fund are examples of a market participant that may be classified as commercial, while a CTA (commodity trading advisor) is an

[2] Any open position that at market close equals or exceeds 1000 contracts for the S&P 500 futures contract and 200 for the other equity index futures contracts is considered reportable. These levels are periodically reviewed by the CFTC, based on each contract's trading history, with an aim to have 70 to 90 percent of the market required to report.

[3] Timing of the release may be adjusted for holidays.

[4] A single market participant can be classified as commercial in certain contract type and non-commercial in others. Within a single contract type, the entire position across contracts holds a single classification. However, an organization with various trading entities can classify each arm separately.

example of a participant that is most likely classified as non-commercial. Economically, a hedger holds futures to offset price risk, and may be willing to pay a premium for this protection. In financial futures, an example of this is a fund manager that might short futures to hedge event risk, such as an earnings announcement, instead of selling the underlying asset. Speculators, on the other hand, aim to solely produce revenue from futures positions and their positions are not motivated by underlying business activity. This means that a speculator can earn excess returns by providing a hedging service, a liquidity service, or perhaps by better forecasting future prices.

This paper focuses on the effect of non-commercial (speculative) positioning rather than commercial (hedging) or non-reporter (small trader) effects. The reason for this is that the CFTC's trader classifications are a broad label, and the non-commercial category provides the narrowest definition of trader type. Small traders are not required to classify the nature of their activity, and thus it is difficult to attribute an economically meaningful explanation to the effect of their transactions. Within the large trader types, commercial participants in index futures can include dealers, pension funds, hedge funds, and corporations. Traders classified as commercial can have lower initial margins than non-commercial participants and regulators keep a closer eye on non-commercial activity as potentially destabilizing to the market. Thus, large traders have a motive to classify their positions as commercial, if possible.[5] Some of these traders classified as commercial may well in fact be speculators from an economic point of view. A non-commercial participant, on the other hand, is most likely to be unequivocally not involved in hedging activity of the underlying asset. In this paper, I will refer to non-commercial participants as "speculators" and commercial participants as "hedgers," respectively.

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[5] The CFTC cross-checks reported classifications with the exchanges. Also, reporting firms are subject to on-site audits by the CFTC. Thus, reported positions and classifications are likely to be quite accurate.

1.3. Participation by trader type

Panel A of *Table I* shows a breakdown in the share of trader type relative to total outstanding positions by equity index. More than 80 percent of total open interest is accounted for by participants that are required to report the nature of their futures activity (for classification as either a commercial or non-commercial investor). Commercial and non-commercial participants comprise roughly three-fifths and one-quarter of total open interest, respectively.

[Table I]

Let $long_t^i$ and $short_t^i$ denote the total long and short positions of trader type i at time t. The net position of each investor type is defined as

$$q_t^i = \frac{long_t^i - short_t^i}{\sum_j long_t^j + \sum_j short_t^j}$$

This normalization accounts for the tendency of open interest to increase over time. Also, it bounds the units between -1/2 and 1/2 for any trader classification, so the regression coefficients will have the same interpretation across the different trader categories. Also, splits in futures contracts, such as occurred with the S&P 500 contract in 1997, will not affect this measure. *Figure I* shows net non-commercial and commercial positions for the S&P 500 contract over time. Net non-commercial positions are often close to zero.

[Figure I]

The last three columns of *Panel A* in *Table I* show that on average over the sample period, all three classifications of participants are very close to net neutral. Commercial participants, which may represent speculators and hedgers (Ederington and Lee, 2002), are likely investing in equity index futures contracts to protect against price increases as well as price declines. *Panel B* of *Table I* shows the total number of long, short, and net contracts for each trader type and for each index. The Dow Jones, the Nasdaq, the S&P 500, and the Russell 2000 contracts trade in units of $10, $100, $250, and $500 times the respective index. For instance, an average of 390,855 total long S&P 500 contracts implies an average of $98 billion outstanding. The E-mini contracts trade in units that are one-fifth the size of their non-mini counterparts, except the E-mini Dow contract, which is half the size of the regular Dow contract. *Panel B* shows that, adjusting for contract size, open interest in the Dow and Dow E-mini contracts is by far the lowest of the eight contracts shown.

2. Price discovery in the futures market

In futures markets, every long position is offset by a short position, so aggregate positions are in net zero supply. The sum of the net long positions across all trader categories (commercial, non-commercial, and non-reporters) must be zero by construction. Clearly, there can be no relationship between aggregate net positions and returns. But positions within each trader category do not necessarily sum to zero. For instance, a net long speculative position can be offset by a net short hedging position. So, the net long or short position *within* a certain trader category could be correlated with returns.

The relationship between net positioning and returns is conceptually analogous to the order flow literature, where market participants are classified according to their participation in a transaction; either active or passive. The order flow literature considers a limit order book, where parties post quotes to buy or sell, which are binding, and then others choose whether or not to accept those offers. The parties accepting offers are the active participants. Total purchases plus sales across all participants must sum to zero, although the active parties may be buying more than they are selling or vice versa. Order flow is defined as net purchases of the active participants, and is found to be positively associated with returns in many markets, including equity, bonds, and foreign exchange. One popular interpretation of this relationship is that the active participants have superior information, which is what motivates them to initiate the transaction.

Futures positioning data similarly decompose participants into two groups based on their motivation for participation in the futures markets—hedging or speculation. The contemporaneous relationship between net positioning of a trader category and futures returns may tell us something about the nature of price discovery in the futures market. However, contemporaneous regressions are complicated by questions of the direction of causality: positioning could affect returns as trader activity pressures prices, or returns could affect positioning as traders adjust positions in response to market developments.

The contemporaneous regressions that I study are all nested within the model:

$$r_{t,t+1} = \beta_0 + \beta_1 q_{t+1} + \beta_2 \Delta q_{t,t+1} + \varepsilon_{t,t+1} \quad \textbf{(1)}$$

where $r_{t,t+1}$ is the return (log change in futures price) from week *t* to week *t+1* and $\Delta q_{t,t+1} = q_{t+1} - q_t$ is the change in net positions from week *t* to week *t+1*. The aim of estimating this regression is to differentiate among various views on what drives futures markets prices:

(i) For non-commercial participants, a positive estimate of β_1 or β_2 would be consistent with *trend chasing* behavior. Under this hypothesis, rising prices induce speculators to immediately add to their long positions. Trend chasing is most common at short horizons in financial markets. This form of "positive feedback" speculative behavior is considered by De Long et al. (1990), but is at odds with the view of the stabilizing speculator of Friedman (1953). Friedman hypothesized that speculators perceive price movements as likely temporary and will typically take the other side of the trade, dampening price volatility.

(ii) A positive estimate of β_2 could reflect a *temporary liquidity pressure*. If for instance there is a demand shock that does not contain any new information about the fundamental value of asset prices, then the price should be temporarily elevated. But, the effect should not stick. For instance, if a commercial participant desires to quickly short contracts ahead of event risk, non-commercial participants may earn a liquidity premium from the commercial participant's price concession to transact with immediacy.

(iii) A positive estimate of β_2 would also be consistent with speculators having *private information*. In other markets, Evans and Lyons (2002) found a positive contemporaneous correlation between order flow and exchange rate movements and interpreted this as evidence that the party placing the order has private information. In the same way, a positive coefficient β_2 would be consistent with speculators having an information advantage which is impounded into asset prices by the act of trading (changing their positions). This could be because speculators have private information about the macroeconomy and the overall direction of the market, and prefer to exploit this information in index futures markets rather than in other markets, for reasons discussed further at the end of *Section 3*.

Scholes (1972) makes the distinction that the effect on prices resulting from liquidity pressure will later reverse, while asymmetric information causes a permanent price change. The absence of much predictive power of positioning on future returns would mean that a positive coefficient β_2 does not simply represent a transitory liquidity effect. I will look at predictive regressions in *Section 4*.

The debate that this study aims to shed light on – the interpretation of the relationship between futures market positioning and returns – is similar in spirit to the microstructure literature studying the relationship between order flow and returns. Empirical studies generally find a relationship, but it could either represent a temporary effect that one might think of as coming from liquidity, or a permanent effect representing the active party in the transaction having superior information. The relationship between futures market positioning and returns addresses exactly the same question, except that it treats the speculators as the potentially informed investors, rather than the parties executing market orders. Within this order flow literature, results are mixed and sensitive to the precise market, sample period and definition of order flow considered. Authors such as Berkman, Brailsford and Frino (2005) argue that order flow has a statistically significant permanent effect on futures prices. Brandt, Kavejecz and Underwood (2007) find that Treasury futures order flow helps predict permanent price changes in the Treasury futures and cash markets. The alternative view, that order flow has no permanent effect on futures prices, is argued by Locke and Onayev (2007) (for S&P futures) and Frino, Kruk and Lepone (2007) (for several Australian financial futures).

(iv) Finally, a positive estimate of β_2 could also be consistent with returns and position changes being affected concurrently by the flow of public information. News could simultaneously change the hedging behavior of market participants and affect stock prices.

2.1. Existing literature on contemporaneous pricing pressures

Klitgaard and Weir (2004) ran a regression of returns on contemporaneous speculative positioning changes for currency futures:

$$r_{t,t+1} = \beta_0 + \beta_2 \Delta q_{t,t+1} + \varepsilon_{t,t+1} \quad \textbf{(2)}$$

They found β_2 to be positive, which they interpreted as evidence for either private information or for trend chasing of speculators.

Gorton, Hayashi and Rouwenhorst (2007) ran the regression in equation (2) and found the same results for non-financial futures as Klitgaard and Weir found for currency futures. Gorton, Hayashi and Rouwenhorst also ran the regression of returns on contemporaneous speculative positioning levels for non-financial futures alone:

$$r_{t,t+1} = \beta_0 + \beta_1 q_{t+1} + \varepsilon_{t,t+1} \tag{3}$$

They found β_1 to be positive and significant and interpreted this as evidence of trend-chasing behavior.

2.2. Pricing pressure results

Results for equation (1), in *Table II*, show a much stronger relationship between the *change* in positioning and returns than for the *level* of positioning and returns. This result holds even when controlling for the other variable. Furthermore, as might be expected, the results are most consistent in the non-commercial trader category, shown in *Panel A* of *Table II*. The coefficient on the change in positions, $\Delta q_{t,t+1}$, is always positive and it is significant for six out of eight contracts, whereas the sign of the coefficient on the level of positions, $q_{t,t+1}$, is negative for some contracts. As an illustration, *Figure II* shows a scatterplot of weekly S&P 500 returns against position changes. A mild positive relationship, that does not appear to be the result of outliers, is visible. The magnitude of the coefficients from equation (1) shows that, for instance, a one percent change in non-commercial positioning implies a 19 basis point increase in the Nasdaq futures contract, which is economically significant. There were many weeks with changes in non-commercial positions as large as one percent over the sample.

[Table II]

[Figure II]

Additional results and robustness checks for estimating equation (1) and subsequent empirical results in this paper are available in an appendix on the author's website. In particular, MM estimation (an outlier-robust method introduced by Yohai (1987)) shows that the coefficient on position changes is most consistently positive and significant for non-commercial participants. Also, the results are similar when considering a sub-sample from 2003-2010.

Panel A of *Table II* also shows that the coefficient on the level of positions, q_{t+1} is significantly different from zero for only one of the eight contract types for non-commercial participants. *Panel B* and *Panel C* show that results are somewhat mixed for the commercial and non-reporter trader categories, respectively.

Since the direction of causality from equation (1) is still not clear, the interpretation remains open as to whether the positive relation between returns and the changes in the positions of non-commercial participants represents a liquidity premium earned, an advantage attributable to private information, a residual of positive feedback, or the simultaneous effects of public information on returns and position changes. Non-commercial positions present the most well-defined trader category, as described in Section 1.3, and so the following sections will focus on results for the non-commercial category.

2.3. Test of Trend-Chasing Hypothesis

To explore evidence of trend chasing, I test for Granger causality between position changes and returns. Each Tuesday, a snapshot of participants' positions is reported to the CFTC. First, I regress the change in positions from week to t to week $t+1$ on one lag of the position changes and one lag of returns:

$$\Delta q_{t,t+1} = \beta_0 + \beta_1 r_{t-1,t} + \beta_2 \Delta q_{t-1,t} + \varepsilon_{t,t+1} \tag{4}$$

If the contemporaneous relationship shown in *Table II* reflects trend chasing, then it makes sense that β_1 should be positive and significant. This would mean that there is a relationship between past returns and future position changes, even after controlling for the effect of past position changes on future position changes. Results in *Panel A* of *Table III* show that the coefficient estimate on past returns is significant for only one of the eight futures contracts, which is negative, suggesting that trend chasing is not the explanation for the relationship shown in *Table II*. A caveat, though, is that positive feedback trading could contribute to the contemporaneous relation between returns and position changes, but that it takes place at such high frequencies that it cannot be detected in weekly data. Kurov (2008) shows that positive feedback trading in index futures markets occurs at intraday frequencies.

[Table III]

2.4. Test of Temporary Liquidity Hypothesis

The second Granger causality equation regresses returns on lagged returns and lagged position changes

$$r_{t,t+1} = \beta_0 + \beta_1 r_{t-1,t} + \beta_2 \Delta q_{t-1,t} + \varepsilon_{t,t+1} \tag{5}$$

The aim of this regression is to determine whether there is a reversal in the effect of net position changes on returns in the subsequent period, above and beyond the effect of past returns on future returns. A true liquidity shock should not represent a change in the fundamental value of a futures contract, and so the effect of pricing pressure should be temporary, implying a negative relationship between returns and lagged position changes and so a negative value of β_2 in equation (5). However, results in *Panel B* of *Table III* show that coefficient estimates on the lagged net position change are not significant for any of the eight futures contracts, suggesting that the new price level holds, supporting the view that the contemporaneous pricing pressures documented above do not reflect temporary liquidity effects either.

2.5. Lead-Lag Relationships between Returns and Position Changes

It is, in principle, possible that the effect from past net position changes to future returns extends beyond one period. *Figure III* shows a cross-correlogram between weekly net non-commercial positions and returns over 20 periods of leads and lags for the S&P 500. The middle bar at 0, showing a 0.13 correlation, evidences the strong contemporaneous relationship between position changes and returns. The dashed horizontal line at ±0.07 denotes the cutoff value for a sample correlation to be significantly different from zero at the 5 percent level (using the fact that if a population correlation is zero, its sample counterpart is asymptotically *N(0,1/T)* where *T* denotes the sample size). There is little pattern evident in the relationship between returns and leads or lags of positions. If trend chasing held from one week to the next, then the bar to the right of 0 would be positive and significant, but it is in fact close to 0. If there were a temporary liquidity pressure from net changes in positions, then the bar to the left of 0 would be positive and significant, but it is also close to 0. So, it appears that the price change sticks and is not reversed in subsequent periods.

[Figure III]

3. Positioning Announcement Effect and the Private Information Hypothesis

This section proposes a new test of the private information hypothesis. If speculators have private information, then news revealing their positions will be informative to investors more broadly; none of the other interpretations for the contemporaneous relationship between position changes and returns has this implication. The CFTC releases information about investors' positions weekly on Fridays at 3:30 p.m. with a lag of a few days from the collection date (typically Tuesdays). Under the private information story, there should be a significant market reaction to this news upon its release to the public.

Using standard market efficiency arguments, only the unexpected component of the positioning data released by the CFTC should matter—the expected portion of the data should already be priced into the futures quotes. The announcement expectation is not observed, so it is proxied by running an augmented autoregression of positions (Tuesday at *t*) on lagged positions (Tuesday at *t-1*) and lagged returns (from Friday *t-1* to *t*) as follows:

$$q_t = \mu + \rho_{t-1} q_{t-1} + \gamma r_{t-1,t} + \varepsilon_t \tag{6}$$

The regressions are run recursively, so that a different regression is run each week, using only data available at the time of the expectation formation (Friday *t*)—the history of positions through the previous week (Tuesday *t-1*) and returns through the week of the release (Friday *t-1* to Friday *t*). The unexpected change in net positions is defined as the difference between the realized net position at time *t* and the predicted value of the net position as of Friday *t*, as shown in equation (7):

$$q_t - E_{t-1}q_t = q_t - (\hat{\mu} + \hat{\rho}_{t-1}q_{t-1} + \hat{\gamma}r_{t-1,t}) \qquad \textbf{(7)}$$

To test the hypothesis that non-commercial participants have some private information that has not yet been impounded into prices by the release date, I regress the futures return from a 5-minute window around the release on Friday *t* on the unexpected component of the change in positioning collected the prior Tuesday *t* (3 days earlier).

$$r_{t,win} = \beta_0 + \beta_1(q_t - E_{t-1}q_t) + \varepsilon_{t,win} \qquad \textbf{(8)}$$

where $E_{t-1}q_t$ denotes the *ex-ante* expectation of the announcement. If in fact market participants take direction from net positioning of non-commercial participants, then the coefficient estimate β_1 will be significant and positive.

Results from the regression in equation (8) show a significant and positive reaction to event windows around the report release time for four out of the eight indices, seen in *Table IV*. The R-squared values are small, ranging from 0.01 to 0.04. Anecdotal evidence further supports the idea that non-commercial participants have private information which helps to forecast futures returns. Market participants frequently analyze the COT data, honing in on the net non-commercial positions as an indicator of market sentiment. According to a 2006 market participant survey report by the CFTC, futures traders pointed to non-commercial positioning as indicative of market strength and direction. The web-appendix to this paper includes robustness checks for the estimation of equation (8), MM estimation, restricting the sample period to post-

2003, varying the model for estimating expected positions, and changing the event window size. The results hold under these robustness checks. The effect is significant at only a short horizon, however. With a larger event window, the effect of the positioning announcement is apparently swamped by other shocks hitting the equity index futures market.

[Table IV]

It seems reasonable that many of the speculators would be informed traders. Their profits depend on successful speculation as participation in the market is not motivated by some other underlying business need. There are several reasons that an informed trader may prefer to transact in the futures market instead of the cash market. First, the notional contract amount does not need to be paid up front. A much larger futures position can be taken than in the cash market with the same amount of funding. Second, a security does not need to be borrowed before a short is established, streamlining the establishment of a short position. Third, there is minimal credit risk in a futures position. The clearinghouse of the exchange is the counterparty to all transactions. Thus, counterparty risk is not dependent on the participant that takes the offsetting side of a contract. The 2007-2009 financial crisis underscored the importance of this last point—counterparty credit risk to cash transactions—amid a rash of financial institution failures.

4. Theories of futures market risk premia

In this section, I consider the relationship between positioning and future expected returns in financial futures markets. As a futures contract has no up-front cost, the expected return on a futures position is the risk premium. Predictive regressions allow measurement of futures risk premia over various horizons.[6] To study the determinants of futures risk premia, I look at a predictive regression of equity futures returns on predictor variables that include positions.

Let $r_{t,t+h}$ denote a futures return from t to $t+h$, let q_t denote the net-long speculative position in a particular futures market at time t and let dy_t denote the dividend yield, which is often found to be useful for forecasting financial returns more generally.[7]

The predictive regressions that I study are all nested within the model:

$$r_{t,t+h} = \beta_0 + \beta_1 q_t + \beta_2 \Delta q_{t-1,t} + \beta_3 dy_t + \varepsilon_{t,t+h} \qquad \textbf{(9)}$$

where $\Delta q_{t-1,t} = q_t - q_{t-1}$ denotes the change in net-long speculative positions. Alternatively, Δq_t could be replaced by the unexpected change in net-long speculative positions, formed by fitting an AR(1) to q_t as described in the previous section. The expected return at time *t*, or futures risk-premium, is given by $\beta_0 + \beta_1 q_t + \beta_2 \Delta q_{t-1,t} + \beta_3 dy_t$.

The aim of estimating this predictive regression is to differentiate among a number of views of what drives risk premia in futures markets:

(i) Keynes' *hedging theory* rests on the assumption that speculators do not earn excess returns from superior forecasting abilities, but rather from simply taking on the price risk of the

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[6] Since I am focusing on equity futures markets where there is no cost of storage, the theory of inventory behavior and storage of Kaldor (1939), Deaton and Laroque (1992) and others is not relevant.
[7] The S&P 500 dividend yield is used – the one-quarter rolling dividend divided by the price.

underlying instruments. Keynes (1930) maintained that a producer will hedge future production and thus be net short the underlying. Speculators will take a long position to exploit this hedging need and to earn the risk premium associated with taking on the hedgers' risk. Speculators are in effect providing insurance in exchange for positive expected returns. The greater is the hedging demand of producers, the larger a risk premium the speculators demand.

The argument does not rely on hedgers being producers of the commodity (which would not make sense in a financial futures contract). The argument is simply that speculators are providing insurance to hedgers, and expect the price to move in their favor (up or down) as compensation for this insurance. Thus the net long non-commercial position should be positively correlated with future returns and so β_1 should be positive. This explanation accounts for the futures risk premium in terms of a downward sloping demand for the insurance services provided by speculators. In the cash market total equities outstanding are in fixed but positive supply. But, in the futures market, contracts are in net zero supply; an increase in long futures positions by one market participant implies an increase in short futures positions by another market participant. If speculators are thought of as providing a service to hedgers then their service is not in net zero supply. Hedgers have a demand for hedging. The speculators provide a service, the supply of hedging. The equilibrium return, which is the risk premium, is determined by supply and demand.

(ii) Hardy (1940) postulated that speculators enjoy *gambling* in futures markets and are willing to pay money, on average, for the privilege. In this case, the net long speculative position should be negatively correlated with future returns and β_1 in equation (9) should be negative.

(iii) A temporary *liquidity* or price-pressure effect could be created by hedging demand. This is different from the Keynesian hedging pressure view in that an increase in short hedging demand drives the futures contract price down, but only temporarily. In the next period, the price then rebounds, and the greater hedging demand has no effect on subsequent expected returns. The hedger has to give a price concession to the speculator to get the trade done immediately. An increase in the short hedging demand between *t-1* and *t* causes the price to fall from *t-1* to *t*, to induce the speculator to take a long position, but then to rebound from *t* to *t+1*. Under this scenario, the coefficient β_2 should be positive.

(iv) The explanations for futures risk premia under (i) - (iii) all use positioning in the futures market alone. An alternative view is that futures risk premia should not depend on positions at all, but rather on an asset pricing model such as the Sharpe-Lintner CAPM considered by Dusak (1973). Bailey and Chan (1993) find that variables that are useful for forecasting excess stock and bond returns (dividend yields and corporate risk spreads) are also useful for predicting commodity futures returns. Any predictive power of positioning for futures returns might be spurious—the result of correlation between positioning and the more standard proxies for equity market risk premia. The inclusion of the dividend yield, a standard predictor for future equity returns, is meant to control for this possibility. The coefficient β_3 is expected to be positive, and its inclusion in the regression might weaken or reduce the significance of the other regression coefficients.

The main difference between explanations (i) and (iii) (downward sloping demand curves versus price pressure) is that the demand curve suggests a certain relationship between a quantity and a price whereas pricing pressure suggests that it is the *change* in quantity that affects prices. The latter hypothesis can be more precisely identified as either a temporary liquidity pressure or a consequence of better forecasting ability of speculative investors.

4.1. Existing literature on futures market risk premia

De Roon, Nijman, and Veld (2000) estimate a special case of the predictive regression in equation (9). Their most general regression is

$$r_{t,t+1} = \beta_0 + \beta_1 q_t + \beta_2 \Delta q_{t-1,t} + \varepsilon_{t,t+1} \qquad \textbf{(10)}$$

For non-equity financial futures and non-financial futures, they obtain positive and significant coefficient estimates for both β_1 and β_2, which they explain as evidence of hedging and price pressures in futures markets. For stock futures, their estimates of β_1 are not significantly different from zero, while the estimates of β_2 remain significantly positive. The findings of de Roon, Nijman and Veld have two possible interpretations: one is price pressure, the other is that speculators have better forecasting abilities than the hedgers.

Gorton, Hayashi and Rouwenhorst consider a still simpler predictive regression

$$r_{t,t+1} = \beta_0 + \beta_1 q_t + \varepsilon_{t,t+1} \qquad \textbf{(11)}$$

and consider only non-financial futures. Their results contradict those of de Roon, Nijman and Veld as the coefficient estimate for β_1 is not significantly different from zero. They interpret this as evidence against the Keynesian hedging hypothesis.[8] For money market futures, Piazzesi and Swanson (2008) find a positive and significant coefficient in a regression of the form of equation (11), but find that significance disappears when business cycle indicators are added.

4.2. Results on one-period predictive regressions

First, I regress returns during the week following the collection of positions data (Tuesday *t* to Tuesday *t+1*) on the net long non-commercial level of positions on Tuesday *t* alone, as in equation (11). The top of Panel A in *Table V* shows that this regression yields a negative coefficient that is statistically significant for 2 out of 8 equity futures contracts, the Nasdaq and the S&P 500. This result is surprising in that it goes in the opposite direction of that predicted by the Keynesian hedging hypothesis and is, rather, consistent with the view of Hardy (1940).

[Table V]

This result remains true when controlling for the change in positions and the dividend yield, as shown in the middle and bottom portions of Panel A in *Table V*. Overall, these results provide very little evidence of predictability in futures returns, at least at this very short (one week) horizon. It argues against the Keynesian hedging hypothesis and is consistent with the findings of Gorton, Hayashi and Rouwenhorst and Wang (2003). Gorton, Hayashi and Rouwenhorst did

[8] De Roon, Nijman and Veld. and Gorton, Hayashi and Rouwenhorst use hedgers' positions instead of speculators' positions in their tests.

not consider any financial futures, but they did note that they were unable to replicate the results of de Roon, Nijman and Veld, and they suggested that the regressions run by de Roon, Nijman and Veld were in fact contemporaneous rather than predictive.[9]

4.3. Results on longer-horizon predictive regressions

I also ran longer horizon predictive regressions to test the relationship between positions and returns further in the future. Panel B of *Table V* shows the results of a regression of eight-week cumulative returns on variables at the start of the holding period, i.e. the estimation of equation (9) with h=8 (Newey-West standard errors are used to control for the overlapping error structure). Results for $h=4$ are included in the web appendix. These regressions present potential problems of statistical inference, as both the left- and right-hand side variables are persistent. Nevertheless, only one of the eight contracts in estimation of equation (11) with $h=8$ shows a significant and positive relationship between positions and future returns. As in the case of the one-period forecasting, the predictive relationship for the other significant coefficients goes in the *opposite* direction of that predicted by Keynesian hedging pressure.

5. Conclusion

This paper studies the relationship between positioning of different types of participants (hedgers and speculators) and returns in equity index futures markets. Both contemporaneous and predictive regressions are considered. I find a strong contemporaneous relationship between returns and position changes: when speculators add to their net long positions, returns are high. There are a number of possible explanations for this finding, including private information,

[9] In footnote 14 of Gorton, Hayashi and Rouwenhorst.

liquidity, or positive feedback effects. I propose a new test of the private information hypothesis that is based on analyzing the effect of public announcements about futures positions on prices. Intradaily price data show that investors systematically react to announcements about investor positioning, which supports the private information view and is consistent with anecdotal market evidence that market participants take some direction from the positioning profile of large speculators. Meanwhile, from predictive regressions of returns on futures positions, I find little evidence that hedging pressure explains equity futures risk premia, as Keynes (1930) had hypothesized.

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Table I

Summary Statistics for CFTC Positioning Data

Panel A

Index	Share of Trader Type *i* relative to Total OI across types $\frac{long_t^i + short_t^i}{\sum_j long_t^j + \sum_j short_t^j}$			Net Position of Trader Type i relative to Total OI $\frac{net_t^i}{\sum_j long_t^j + \sum_j short_t^j}$		
	Non-Com	Comm	Non-Rep	Non-Com	Comm	Non-Rep
DJIA	0.26	0.53	0.21	-0.01	0.05	-0.04
E-mini DJIA	0.34	0.45	0.21	0.00	0.05	-0.05
Nasdaq	0.19	0.62	0.19	-0.02	0.01	0.01
E-mini Nasdaq	0.32	0.54	0.15	0.01	-0.04	0.03
Russell	0.11	0.76	0.13	-0.03	-0.03	0.06
E-mini Russell	0.22	0.70	0.08	-0.10	0.10	0.00
S&P	0.09	0.69	0.22	-0.04	0.01	0.04
E-mini S&P	0.24	0.50	0.27	0.00	-0.09	0.09
Mean	0.24	0.58	0.18	-0.02	0.01	0.02

Number of Long and Short Contracts by Trader Category

Panel B

	Non-Commercial			Commercial			Non-Reporter		
Index	Long	Short	Net	Long	Short	Net	Long	Short	Net
DJIA	7854	7421	433	16338	16257	81	6402	6915	-514
E-mini DJIA	23872	21995	1877	33192	30542	2651	11910	16437	-4528
Nasdaq	7857	8565	-708	25621	25652	-30	8836	8098	738
E-mini Nasdaq	71186	73548	-2362	140698	143793	-3094	34377	28920	5457
Russell	1482	3119	-1637	14171	13480	691	3206	2260	946
E-mini Russell	38724	95896	-57172	261321	198677	62644	15630	21103	-5473
S&P	28361	39977	-11616	270060	278754	-8694	92434	72124	20310
E-mini S&P	180688	204689	-24001	613119	665506	-52387	180637	104249	76388
Mean	25,162	35,091	-9,928	81,890	71,400	10,490	13,393	13,956	-562

Notes: The first three columns of Panel A describe the share of open interest for trader type *i* (commercial, non-commercial, non-reporter) relative to total open interest of all contracts for each index. Open interest shares by trader type will fall in the interval between 0 and 1. The last three columns of Panel A describe the net position (total long minus total short contracts) for trader type *i* relative to total open interest for each index. Net position by trader type will fall between -0.5 and 0.5. Panel B details the mean number of contracts for each classification of contract and trader type. Contract multipliers are as follows: \$10 for the DJIA, \$5 for the E-mini DJIA, \$100 for the Nasdaq, \$20 for the E-mini Nasdaq, \$500 for the Russell 2000, \$100 for the E-mini Russell 2000 (prior to February 2002, the E-mini Russell 2000 multiplier was \$50), \$250 for the S&P 500, and \$50 for the E-mini S&P 500.

Table II

Effect of Positioning on Contemporaneous Returns

$$r_{t,t+1} = \beta_0 + \beta_1 q_{t+1} + \beta_2 (q_{t+1} - q_t) + \varepsilon_{t,t+1}$$

	Contract	DJIA	E-mini DJIA	Nasdaq	E-mini Nasdaq	Russell	E-mini Russell	S&P	E-mini S&P
	Panel A - Non-commercial								
(1)	q_{t+1}	-0.15	0.01	-0.18	1.12	**0.65**	2.30	-2.01	0.38
	Std Err	0.83	0.53	1.38	1.35	0.68	0.78	1.79	0.83
	R^2	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
(2)	$\Delta q_{t,t+1}$	**6.13**	0.48	**17.87**	3.10	**7.63**	**5.85**	**19.71**	**3.53**
	Std Err	2.74	1.81	3.18	3.03	2.63	2.10	5.78	1.38
	R^2	0.01	0.00	0.04	0.00	0.01	0.02	0.01	0.01
(3)	q_{t+1}	-0.53	-0.03	-1.99	0.68	0.35	**1.91**	-3.04	-0.33
	Std Err	0.84	0.55	1.43	1.33	0.68	0.81	1.74	0.88
	$\Delta q_{t,t+1}$	**6.39**	0.49	**18.85**	2.75	**7.48**	**4.93**	**21.18**	**3.69**
	Std Err	2.80	1.85	3.33	3.06	2.65	2.21	5.67	1.46
	R^2	0.01	0.00	0.05	0.00	0.01	0.03	0.02	0.01
	Panel B - Commercial								
(1)	q_{t+1}	0.20	**1.39**	1.74	-0.51	-0.28	**-2.07**	1.56	-0.65
	Std Err	0.44	0.49	1.01	1.04	0.53	0.52	0.83	0.61
	R^2	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00
(2)	$\Delta q_{t,t+1}$	0.58	**3.68**	2.75	**-7.48**	**-5.73**	**-4.35**	**-9.04**	**-2.83**
	Std Err	1.89	1.16	3.14	2.17	1.99	1.63	4.60	1.43
	R^2	0.00	0.02	0.00	0.03	0.01	0.02	0.01	0.01
(3)	q_{t+1}	0.18	**1.02**	1.58	0.63	0.01	**-1.67**	**1.81**	-0.29
	Std Err	0.43	0.49	1.03	1.08	0.55	0.54	0.84	0.62
	$\Delta q_{t,t+1}$	0.50	**3.21**	1.96	**-7.80**	**-5.73**	**-3.53**	**-9.94**	-2.69
	Std Err	1.88	1.18	3.19	2.21	2.04	1.72	4.64	1.47
	R^2	0.00	0.03	0.00	0.03	0.01	0.04	0.01	0.01
	Panel C - Non-reporter								
(1)	q_{t+1}	-0.49	**-3.66**	**-2.96**	-0.31	-0.64	**3.66**	-2.04	0.41
	Std Err	0.82	0.80	1.15	1.31	1.02	0.98	1.37	0.67
	R^2	0.00	0.03	0.01	0.00	0.00	0.02	0.00	0.00
(2)	$\Delta q_{t,t+1}$	**-7.49**	**-9.17**	**-18.07**	**8.14**	3.21	**5.63**	-2.99	-0.33
	Std Err	2.53	2.31	3.78	2.91	2.08	1.89	5.68	1.39
	R^2	0.02	0.06	0.06	0.02	0.00	0.02	0.00	0.00
(3)	q_{t+1}	0.12	**-2.59**	-0.86	-1.76	-1.06	**2.90**	-1.97	0.48
	Std Err	0.80	0.77	1.15	1.33	1.06	1.01	1.41	0.69
	$\Delta q_{t,t+1}$	**-7.56**	**-7.91**	**-17.63**	**9.03**	3.72	**4.18**	-1.99	-0.56
	Std Err	2.50	2.35	3.85	2.99	2.18	1.98	5.81	1.42
	R^2	0.02	0.08	0.06	0.03	0.00	0.03	0.00	0.00
	n	629	420	625	574	826	405	926	629

Notes: Table II shows results from time series regressions of returns onto position levels and position changes, where $r_{t,t+1}$ is the return from Tuesday t to Tuesday t+1 to capture the period for which positions are reported, and q_{t+1} is the *level* of positions on the collection date (Tuesday t+1), and $\Delta q_{t,t+1}$ is the *change* in positions since the previous collection date (Tuesday t). Bold denotes significance at the 5 percent level. White standard errors are used.

Table III

Granger Causality Regressions for Non-Commercial Category

(1) $\Delta q_{t,t+1} = \beta_0 + \beta_1 r_{t-1,t} + \beta_2 \Delta q_{t-1,t} + \varepsilon_{t,t+1}$

(2) $r_{t,t+1} = \beta_0 + \beta_1 r_{t-1,t} + \beta_2 \Delta q_{t-1,t} + \varepsilon_{t,t+1}$

Panel A : Coefficients in (1)

Contract	DJIA	E-mini DJIA	Nasdaq	E-mini Nasdaq	Russell	E-mini Russell	S&P	E-mini S&P
$r_{t-1,t}$	0.001	-0.001	0.000	0.001	0.001	-0.001	0.000	**-0.003**
Std Err	0.001	0.002	0.000	0.001	0.001	0.001	0.000	0.001
$\Delta q_{t,t-1}$	-0.065	**-0.091**	-0.042	**-0.157**	-0.061	-0.082	-0.052	**-0.221**
Std Err	0.042	0.045	0.073	0.061	0.059	0.057	0.055	0.045
R^2	0.008	0.010	0.003	0.029	0.006	0.008	0.005	0.065

Panel B: Coefficients in (2)

Contract	DJIA	E-mini DJIA	Nasdaq	E-mini Nasdaq	Russell	E-mini Russell	S&P	E-mini S&P
$r_{t-1,t}$	-0.063	-0.200	**-0.116**	**-0.117**	-0.062	-0.032	**-0.103**	**-0.108**
Std Err	0.049	0.110	0.052	0.053	0.043	0.051	0.042	0.048
$\Delta q_{t,t-1}$	-0.704	0.184	-2.913	-3.199	-2.146	-2.828	-0.945	-1.434
Std Err	2.817	1.880	3.344	2.257	3.909	1.610	4.239	0.980
R^2	0.004	0.040	0.017	0.018	0.005	0.005	0.011	0.014
n	628	419	624	573	825	404	925	628

Notes: Table III shows the results of (1) time series regressions of returns from the positioning data collection period onto a lag of returns and a lag of position changes, and (2) a regression of changes in positions onto returns over the prior collection period and changes in positions from the previous collection date. Here, $r_{t,t+1}$ is the return from Friday t to Friday t+1, capturing the period for which positions are reported, $\Delta q_{t,t+1}$ is the change in positions from Tuesday t to Tuesday t+1 (the position reporting date). Bold denotes significance at the 5 percent level. Newey-West standard errors are used with a lag length of 10.

Table IV

Announcement effect of positioning data release

$$r_{t,win} = \beta_0 + \beta_1 (q_t - E_{t-1} q_t) + \varepsilon_{t,win}$$

Contract	DJIA	E-mini DJIA	Nasdaq	E-mini Nasdaq	Russell	E-mini Russell	S&P	E-mini S&P
Coeff	-0.04	0.06	**1.15**	-0.12	**0.86**	**0.74**	-0.17	**0.18**
Std Err	0.20	0.12	0.46	0.14	0.30	0.29	0.48	0.09
R^2	0.000	0.001	0.034	0.002	0.010	0.024	0.000	0.006
n	452	360	417	495	279	346	850	562

Notes: Table IV shows results of time series regressions of returns in a 5-minute window around the positioning announcement release onto the surprise components of positions announcements. Results are shown for non-commercial positions. Bold denotes significance at the 5 percent level. White standard errors are used.

Table V

Effect of positioning on future returns (t to t+h)

$$r_{t,t+h} = \beta_0 + \beta_1 q_t + \beta_2 \Delta q_{t-1,t} + \beta_3 dy_t + \varepsilon_{t,t+h}$$

Panel A (h=1)

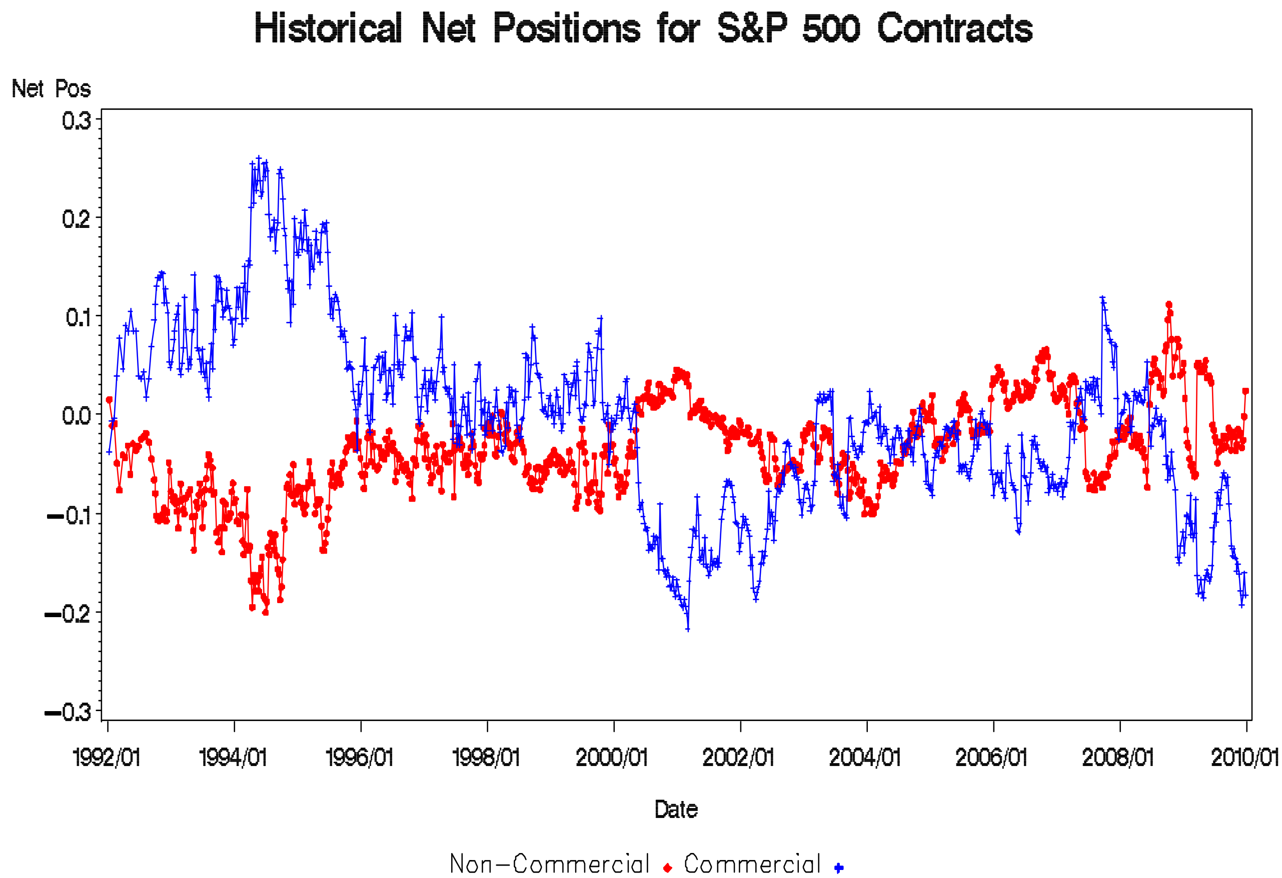
	Contract	DJIA	E-mini DJIA	Nasdaq	E-mini Nasdaq	Russell	E-mini Russell	S&P	E-mini S&P
(1)	q_t	-1.13	0.13	**-3.91**	-0.34	-0.28	1.26	**-4.93**	-0.77
	Std Err	0.84	0.56	1.49	1.27	0.69	0.84	1.62	0.87
	R^2	0.004	0.000	0.011	0.000	0.000	0.004	0.010	0.001
(2)	q_t	-1.10	0.14	**-3.59**	0.33	-0.15	1.59	**-4.27**	-0.40
	Std Err	0.85	0.61	1.52	1.31	0.70	0.87	1.68	0.92
	$\Delta q_{t,t-1}$	-0.41	-0.17	-3.27	-4.22	-3.21	**-4.08**	**-9.53**	-1.95
	SE	2.74	1.86	3.22	2.54	2.92	1.72	4.40	1.37
	R^2	0.004	0.000	0.012	0.006	0.002	0.012	0.015	0.004
(3)	q_t	-0.99	0.50	**-3.64**	0.37	-0.10	1.26	**-4.18**	-0.48
	Std Err	0.88	0.66	1.52	1.32	0.71	0.91	2.05	0.95
	$\Delta q_{t,t-1}$	-0.55	-0.21	-3.17	-4.12	-3.22	**-3.91**	**-9.08**	-1.94
	Std Err	2.77	1.86	3.22	2.55	2.89	1.68	4.49	1.36
	dy_t	-0.12	-0.44	-0.07	0.11	-0.31	-0.34	0.01	-0.19
	Std Err	0.35	0.41	0.42	0.46	0.29	0.61	0.16	0.37
	R^2	0.004	0.006	0.013	0.006	0.005	0.015	0.015	0.006
	n	628	419	624	573	825	404	925	628

Panel B (h=8)

	Contract	DJIA	E-mini DJIA	Nasdaq	E-mini Nasdaq	Russell	E-mini Russell	S&P	E-mini S&P
(1)	q_t	-8.12	-1.70	**-24.22**	10.60	0.42	**10.54**	**-27.55**	-5.75
	Std Err	4.41	2.53	8.89	9.30	4.96	4.12	9.76	4.56
	R^2	0.026	0.003	0.055	0.017	0.000	0.039	0.044	0.010
(2)	q_t	-7.85	-2.03	**-25.08**	12.77	0.91	**10.66**	**-27.03**	-6.40
	Std Err	4.47	2.60	9.39	9.89	5.18	4.23	10.12	4.95
	$\Delta q_{t,t-1}$	-4.57	3.80	8.82	**-13.78**	-12.52	-1.56	**-7.50**	3.35
	SE	7.09	3.71	8.80	5.78	9.94	5.47	11.54	3.17
	R^2	0.027	0.005	0.056	0.024	0.004	0.039	0.044	0.012
(3)	q_t	**-9.30**	-1.36	**-24.76**	13.41	0.95	**11.16**	-21.04	-6.17
	Std Err	4.49	2.81	9.17	10.03	5.31	4.04	12.95	5.09
	$\Delta q_{t,t-1}$	-4.18	3.46	8.49	**-13.96**	-12.55	**-1.87**	**-9.42**	3.27
	Std Err	7.46	3.49	8.56	5.99	10.01	5.46	11.92	3.17
	dy_t	1.21	-0.84	1.99	3.70	-0.26	0.51	1.22	0.56
	Std Err	2.42	2.71	2.55	2.77	1.55	3.26	0.92	2.30
	R^2	0.033	0.008	0.062	0.046	0.004	0.040	0.058	0.013
	n	621	412	617	566	818	397	918	621

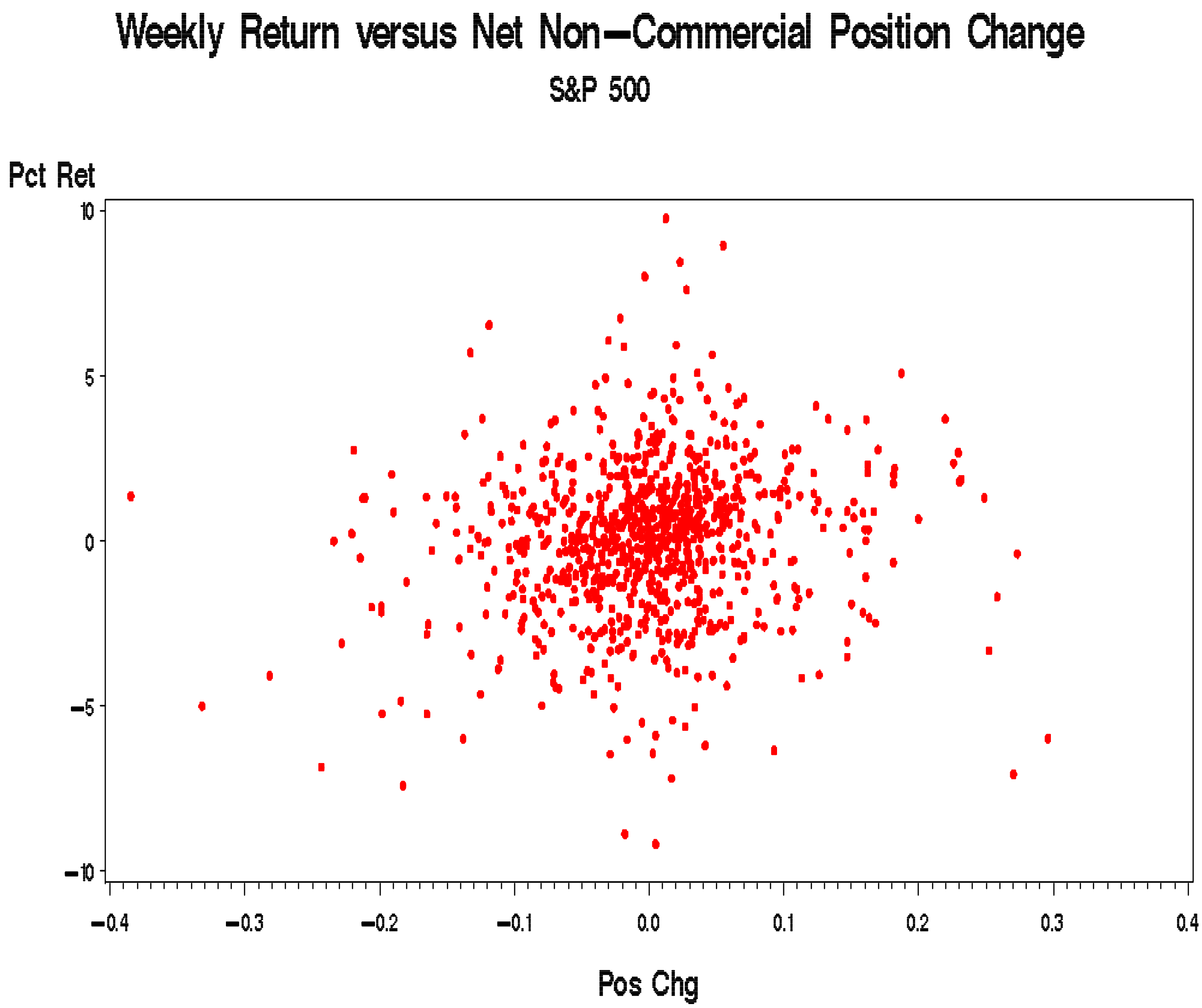
Notes: Table V shows results for time series regressions of weekly returns $(r_{t,t+h})$ onto the level (q_t) and change ($\Delta q_{t-1,t}$) in positions and the dividend yield (dy_t). Results are shown for non-commercial positions. Bold denotes significance at the 5 percent level. White standard errors are used for the case *h=1* while Newey-West standard errors with a lag truncation parameter of 8 are used for the case *h=8* to take account of the overlapping error structure.

Figure I



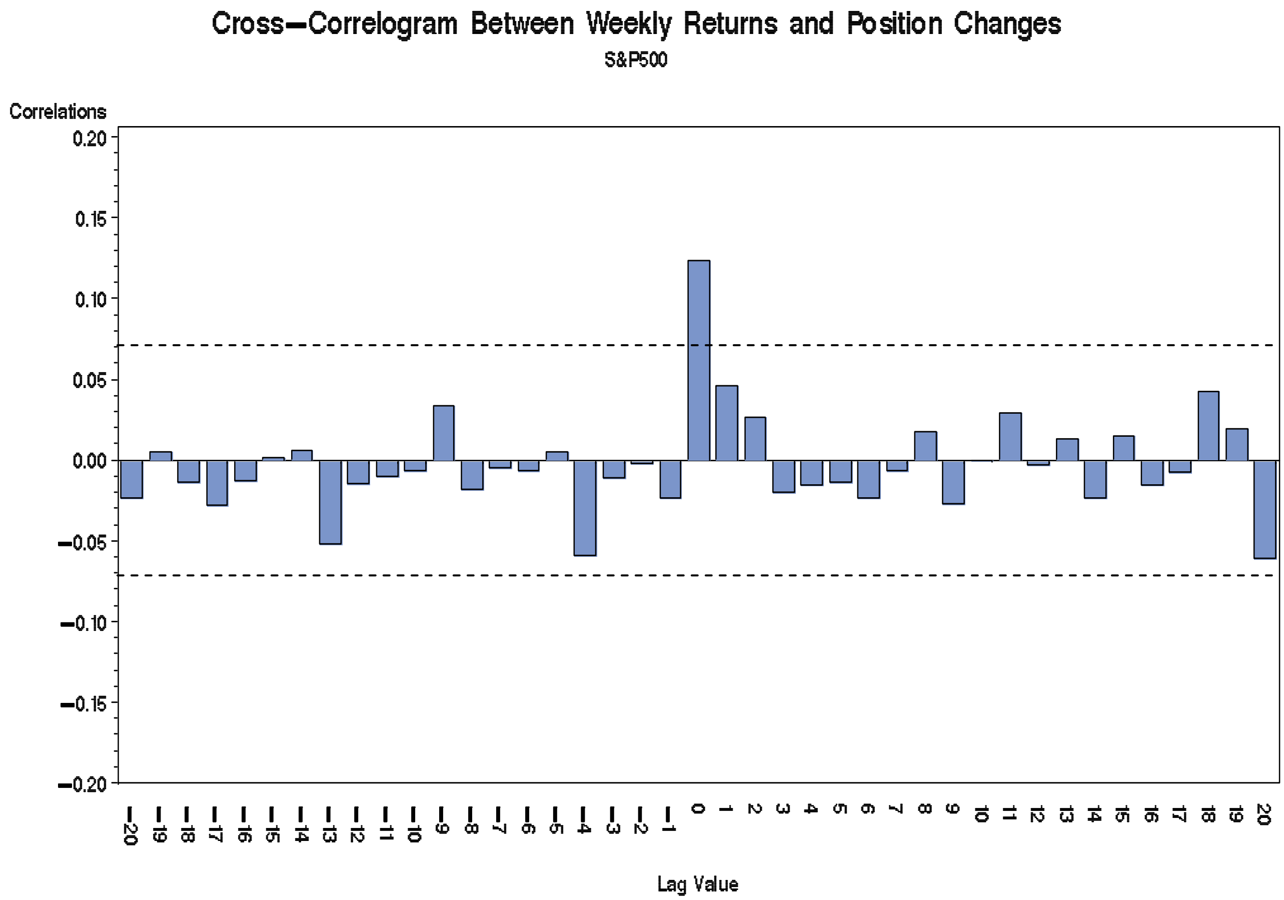
Notes: Figure I shows weekly net commercial and non-commercial positions for S&P 500 futures contracts as reported to the CFTC.

Figure II



Notes: Figure II shows a scatter plot of weekly net non-commercial positions for S&P 500 futures contracts as reported to the CFTC.

Figure III



Notes: Figure III shows the correlation coefficients between weekly returns for S&P 500 futures and net non-commercial position changes for these contracts. Values to the left of zero denote correlations between returns and lags 1-20 of position changes, and values to the right of zero denote correlations between returns and leads 1-20 of position changes. The horizontal lines show the minimum absolute sample correlations that are required for the hypothesis that the population correlation is equal to zero to be rejected, using the fact that if a population correlation is equal to zero then the corresponding sample correlation in a sample of size *T* is asymptotically *N(0,1/T)*.