

On the Nature of Trading: Do Speculators Leave Footprints?

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Abstract

The paper describes how two types of traders, marketmakers and speculators, establish their positions and manage their risk exposure. We show that balance sheets are insufficient to determine whether a trader is a marketmaker or a speculator. On the other hand, trading records describing the evolution of a position over time can identify what trading strategy was pursued. Knowing the trading strategy helps to evaluate contract compliance, risk exposure, and capital requirements of trading firms. Understanding and verifying trader behavior is especially important because leveraged trading firms, and individual traders, have traditional incentives to mask their risk-taking activities. Without proper monitoring, traders can substitute risky speculation for less risky marketmaking to reap potential payoffs.

Introduction

Trading is a risky business. How risky it is depends on exactly what traders do to make money. The first part of this paper identifies two types of traders: (1) Speculators, sometimes referred to as proprietary traders, who earn money trying to anticipate the direction of future price movements; (2) Customer-based traders, usually called marketmakers, who earn money on the bid / ask spread without speculating on future prices. Customer-based trading is less risky than speculation. Thus, assessing a trading firm's risk exposure, and the implications for specifying appropriate capital requirements, depends, in part, on distinguishing high-risk speculators from low-risk marketmakers.

Separating speculators from marketmakers is difficult in practice. The problem is speculators sometimes have customers, allowing them to masquerade as marketmakers. And marketmakers sometimes become speculators despite their regular access to customers. The second part of this paper explains how an outsider, such as a potential merger partner or a regulator, can verify the trading profile of a firm. In particular, we will show how trading records describing the evolution of a position over time can discriminate between marketmakers and speculators.

Understanding and verifying trader behavior is important because leveraged trading firms, and individual traders, have traditional incentives to mask their risk-taking activities (See Jensen and Meckling [1976]). Without proper monitoring, traders can substitute risky speculation for less risky marketmaking to reap potential payoffs. This is best illustrated by two examples.

Risk Assessment

The value-at-risk (VAR) approach to measuring risk exposure combines the amount of a security on the firm's balance sheet with the security's variability of returns to calculate the likely losses on a position¹. We will see that the time period over which the variability of returns should be measured depends, in part, on whether a position is traded by a marketmaker or a speculator. Thus even though the balance sheet does not reveal the trader's intent in establishing the position, the proper application of VAR in measuring risk should distinguish between speculators and marketmakers.

Consider, for example, an options trading firm whose balance sheet shows that it is long out-of-the money 6-month calls on IBM and short the 'right amount' of out-of-the money 3-month calls on IBM. It is impossible to tell, from the balance sheet alone, whether this is a marketmaker's position or a speculator's. But a marketmaker's tendency to close out positions quickly means that the likely losses on the position will be smaller under a marketmaker's strategy compared with a speculator's.

Lower prospective losses means that a marketmaking trading firm (or trading division within a firm) can safely operate with less capital than a trading firm with a speculator's strategy. If marketmakers are rewarded with lower capital requirements than speculators, traders will try to misrepresent themselves as marketmakers, unless they can be prevented from doing so by proper monitoring.

¹ See Anthony Saunders [2000, Chapter 10] for a discussion of alternative calculations of VAR.

Contract Enforcement: MAC Clauses

Merger agreements typically contain a clause prohibiting any ‘material adverse change’ in a company’s business until the merger is completed by stockholder vote. Understanding and verifying the nature of a trading business can be important in determining whether a material change has or has not occurred in mergers involving companies, such as investment banks or deregulated gas and electric utilities, where trading activities play an important potential role in profitability.

Consider, for example, a firm that entered into a merger agreement with a company representing itself as a low-risk customer-based trading company. Suppose that following the signing of the agreement but before the closing of the merger, the trading firm shifts from marketmaking to speculation and loses a lot of money. Case law suggests that successfully invoking the MAC clause depends, in part, on whether the acquirer could have reasonably expected the loss given the nature of the target’s business.² Thus the acquirer can invoke the MAC (material adverse change) clause to terminate the merger only if it can show: (1) The trading company made an adverse change in the nature of its business by shifting from low-risk marketmaking to risky speculation; (2) As a consequence, it lost much more money than the acquirer could have reasonably expected in the normal course of business. Thus the acquirer must be able to verify that

² Arthur Fleischer, Jr. [2002] cites two cases where the nature of the business mattered. In *Bear Stearns v. Jardine Strategic Holdings*, the court denied Jardine’s motion for summary judgment by refusing to invoke the MAC clause, as a matter of law, to void Jardine’s agreement to purchase a 20 percent interest in Bear Stearns, a publically traded securities firm. Although Jardine agreed to a purchase price on September 30, 1987, immediately prior the stock market crash of October 19, 1987, the court held that the loss incurred by Bear Stearns during that episode was not a MAC, as a matter of law, because “Jardine understood and knew the volatility and riskiness of the securities business.” In the case of *Allegheny Energy, Inc. v. DQE* the court also analyzed materiality in light of the size and nature of the transaction and the nature of the parties’ business.

the trading company behaved as a marketmaker before the merger agreement and as a speculator afterward.

These examples indicate the importance of distinguishing between marketmakers and speculators for risk assessment and contract enforcement of trading firms. We will show that trading records detailing how a position evolved through time can overcome the shortcomings of balance sheets in identifying the footprints of speculators versus marketmakers. Given the right information we can determine whether, for example, the options trading firm described above violated any contractual rules against speculation and exposed itself to more risk than if it were a marketmaker.

Nature of Trading

Both marketmakers and speculators (collectively referred to as traders) expect to earn a profit by committing capital to buying and selling assets, usually in leveraged transactions. Taking on price risk by committing capital is what distinguishes traders from sales people and brokers. Leverage means that, unlike investors, traders cannot theoretically wait forever to unwind a position; they face bankruptcy risk if they lose too much money. But within this framework trading can be carried out in a variety of ways and with a wide range of risk.

Substantive differences in behavior turn on whether a trader's profitability *requires* a change in the equilibrium price of the underlying asset. Marketmakers can earn profits without changes in the equilibrium price while speculators must try to anticipate equilibrium price changes in the underlying asset.

In particular, marketmakers earn profits by quoting bids and offers to provide immediate execution for their customer's market orders. Marketmakers can earn the bid / ask spread, referred to as the cost of immediate execution or the price of liquidity services, even with an unchanged equilibrium price. On the other hand, speculators (who do not have customers) earn profits by successfully anticipating equilibrium price movements. Despite its limitations, which will be discussed below, this distinction between customer-based trading and speculation is a useful point of departure.

Customer-based Trading

Customer-based trading, as its name implies, involves buying and selling assets while accommodating customer purchase and sale orders. The concept of customer-based trading applies to marketmaking in financial assets, in commodities, as well as in contracts for future delivery of any asset. Somewhat more broadly, a customer-based trader commits capital to make a consistent 'mark-up' on the price of the asset while avoiding the risk exposure associated with unanticipated equilibrium price changes. In fact, customer-based traders take specific efforts to minimize their exposure to changes in the equilibrium price of the asset that they trade.

One way customer-based traders reduce their exposure to equilibrium price movements is to minimize the length of time that they hold the asset. For example, when an investment bank manages a public offering of stock it charges a mark-up called "an underwriter's spread," which is the difference between the price paid to the company issuing the stock and the price the public pays for the shares. To avoid the risk associated with unanticipated equilibrium price changes in the stock, the investment bank will try to

identify likely buyers of stock in the pre-offering period to minimize the length of time the stock remains in inventory. This is a low-risk, inventory-minimizing, strategy that is typical of customer-based trading.

It is often impossible for customer-based traders to avoid temporarily holding an “open” position—either holding an asset in inventory (being long the asset) or having an obligation to deliver an asset in the future that is not currently owned (being short the asset). Since the goal of customer-based trading is to capture the mark-up without speculating on the direction of equilibrium price movements, customer-based traders engage in a number of practices to minimize their risk exposure when they have open positions. Such practices include hedging away price exposure and imposing limits on the magnitude (and dollar risk) of open positions.

A common form of hedging for a trader who has an obligation to deliver an asset in the future is to secure a future supply of that asset. Securing that supply at a fixed price locks in the profit. For example, a heating oil trading company that commits to deliver its product at a fixed price over the next year would eliminate its risk exposure to increases in the price of heating oil by locking in the price it pays to suppliers. Failure to hedge, that is, not locking in the price, leaves the heating oil company exposed to future changes in the equilibrium price of heating oil. If the equilibrium price of heating oil rises, the trading company loses money because it will have to pay a higher price for oil that it has committed to deliver at a fixed price. On the other hand, it makes money if the price of heating oil falls because it pays a lower price for the oil it has contracted to deliver at a fixed price.

A second form of hedging is “cross-hedging,” or taking an offsetting position in a related asset. For example, suppose a trader has assumed the obligation to deliver heating oil at a fixed price one month from now, but does not yet own the heating oil. The trader is ‘short’ heating oil and is exposed to the risk that the equilibrium price of heating oil will rise before it is purchased. The trader can hedge that risk exposure by buying a ‘related’ commodity, crude oil. As long as the prices of crude oil and heating oil move together, that is, as long as price changes are correlated, the cross hedge will reduce the trader’s aggregate risk exposure. For example, if the equilibrium price of heating oil increases before the trader covers the short position, then the price of crude oil will also tend to rise, and the trader will be able to sell the crude oil at a profit to offset the higher cost of the heating oil.

The trader might choose the strategy of cross-hedging heating oil with crude oil, rather than buying heating oil directly, because the crude oil market is more liquid than the heating oil market. In fact, the trader could have hedged by buying heating oil, even though it is less liquid, as long as the trader spent some time searching for a trading partner. But during the search for a price-compatible trading partner the position would have been unhedged. Thus, hedging in a ‘related’ liquid asset reduces risk exposure while searching for the best price of a less liquid asset.

In addition to hedging, a company engaged in customer-based trading can minimize its exposure to unanticipated price movements by imposing quantitative limits on open (unhedged) inventory positions. The role of such ‘position limits’ is best illustrated by examining the behavior of a stock trader at a brokerage firm. The typical trader in over-the-counter stocks at broker/dealer firms is a marketmaker. The trader will

buy stock at a quoted bid price (e.g., \$20.25) from investors and then try to sell that stock at their offer price (e.g., \$20.50) to other investors. Their objective is to capture the spread between the bid and offer prices. Between the time it takes for the trader to sell at the offer price what was bought at the bid, the stock remains in inventory. This exposes the firm to inventory risk if the stock remains unhedged.

The firm can control its risk exposure by placing limits on the size of the unhedged inventory. For example, if a trader holds 10,000 shares of a stock in inventory and the stock declines by \$1, then the net worth of the trader's firm declines by \$10,000. The firm can limit its risk exposure to unanticipated price changes by placing size limits on the magnitude of a trader's open position. Thus, if the firm restricted open positions to 1000 shares, its maximum risk exposure is one-tenth the size of a firm that has a 10,000 share limit on similar unhedged inventory.

Speculation

In contrast to customer-based trading, speculation can be defined as trading in anticipation of future price changes. In particular, traders who speculate are trying to profit on the direction of future equilibrium price movements. For example, a trader who is a speculator and believes that gold prices will fall can enter into an obligation to deliver gold at a fixed price at some future date and will not cover that position immediately. The trader is waiting for the price of gold to decline but is exposed to the risk that gold prices will go up rather than down.

Speculators are in the business of taking on the risk of unanticipated equilibrium price movements in order to earn profits. This risk exposure is precisely the risk that the

customer-based trading business tries to limit or avoid by maintaining hedged inventory positions and by imposing quantitative limits on open positions.

Fingerprinting the Speculators

Separating speculators from marketmakers seems trivial in light of the discussion so far: Traders without customers must be speculators and traders with customers must be marketmakers. The problem with this simple solution is twofold. Speculators sometimes try to boost their profitability by providing liquidity to public investors, just like marketmakers. And marketmakers often transform their customer-initiated trades into speculations. An example of each follows.

Speculators can provide liquidity by placing limit orders rather than market orders. A limit order is an order to buy or sell at a fixed price (e.g., \$20.25) and a market order is an order to buy or sell *immediately* at the best price prevailing in the market. When the speculator submits a limit order, he or she sacrifices immediate execution for the opportunity to capture at least part of the bid / ask spread, in addition to speculating on future changes in the equilibrium price. In the process, the speculator's limit orders offer immediate execution (liquidity) to other market orders, just like marketmakers.³

Marketmakers become speculators when they establish positions based on information extracted from customer order flow. For example, a marketmaker who sees

³ Note that speculators who place limit orders do not perfectly mimic marketmaker behavior. Most marketmakers continuously try to quote a two-sided market, both a bid and an offer, so they gain a reputation for providing liquidity services. Speculators place limit orders only when they are opening or closing a speculative position. Moreover, they usually place only a bid or an offer, depending on what position they want. Thus, they contribute liquidity to the marketplace, just like marketmakers, on an irregular basis.

buy orders from many different customers may actively try to accumulate a long position. In this case, the marketmaker's profitability hinges on whether he or she correctly anticipates future price changes, just like a speculator.

Whether or not a trader maintains an 'open position' is another possible way to discriminate between speculators and marketmakers. An unhedged long or short position obviously means that unanticipated changes in the equilibrium price of the asset affect the trader's profitability. Moreover, we noted above that traders can control their level of risk exposure by imposing quantitative limits on open positions. Marketmakers will hold smaller open positions than speculators, all else the same, as they try to avoid equilibrium price volatility.

There are, however, two shortcomings of using 'open positions' to separate marketmakers from speculators. First, marketmakers temporarily have open positions in their normal course of business, between the time a bid is hit and an offer is lifted. Thus they look just like speculators for that time interval, even though a marketmaker's open position conveys lower risk exposure and should require less capital as a safety net, compared with a speculator. Second, speculators frequently engage in 'relative-value' trades that may look just like hedged positions on a marketmaker's balance sheet. We elaborate on each of these points.

Value-at-Risk (VAR) Calculations for Speculators versus Marketmakers

The value-at risk (VAR) approach to risk measurement illustrates the importance of not equating all open positions with speculation. VAR utilizes the size of an open position *combined* with a measure of volatility, such as the standard deviation of returns, to assess the riskiness of an open position on the balance sheet. The standard deviation of returns increases with time, i.e., a one-hour standard deviation of returns is smaller than a one-day standard deviation, which is smaller than a one-week standard deviation. Thus, VAR should use a standard deviation over a shorter time horizon to measure the risk of a marketmaker's open position compared with a speculator's. This follows from a marketmaker's propensity to eliminate open positions quickly, either by offsetting (buy or sell) transactions or by hedging, based on the marketmaker's objective of earning the bid / ask spread while avoiding equilibrium price volatility.

The implication of this discussion is that regulators, and managers within trading firms, who use VAR to specify capital requirements to guard against losses that threaten bankruptcy, should require more capital for a trading firm with a speculator's strategy compared with one that follows a marketmaking strategy⁴. This also means that VAR requires some indicator of speculation versus marketmaking, other than open positions, to measure properly a trading firm's risk exposure and to specify appropriate capital requirements for trading firms.

⁴ Regulators and supervisory agencies, such as the Bank for International Settlements (BIS), do not distinguish between marketmakers and speculators when setting capital requirements for financial institutions. Thus financial institutions that are primarily marketmakers are penalized relative to those with more speculative strategies. Anecdotal evidence suggests that manager's at trading firms do set different capital requirements for marketmakers compared with speculators (See Silber [1984, p.943]).

Relative-Value Trades versus Hedged Positions

The behavior of the hedge fund, Long-Term Capital Management, illustrates the second shortcoming of identifying speculation with open positions, i.e., why the absence of open positions does not necessarily imply the absence of speculation. Long-Term Capital's trades almost always involved offsetting positions in securities whose price spreads were expected to narrow. The classic example of these 'relative value' trades occurred in 1994 when Long-Term Capital sold short the most recently issued ('on the run') 30-year Treasury bond and bought the 'old' 30-year bond, with 29 ½ years to maturity (called 'off the run'). The most recently issued bond in any maturity category (in this case, 30 years) has the narrowest bid / ask spread and the most liquidity. In 1994, investors bid up the price of the 'on the run' 30-year in a 'flight to liquidity' as the Federal Reserve tightened credit. By establishing the 'spread position' of selling the expensive 'on the run' bond and buying the cheap 'off the run' bond, Long-Term Credit speculated that this 'flight to liquidity' would be temporary. They would profit when the relative prices returned to normal. (See Lowenstein, [2000, p.43ff]).

Long-Term Capital's balance sheet would be indistinguishable from the balance sheet of a Treasury bond dealer who bought 'off the run' Treasuries from one of its customers at its bid price and then hedged its price level exposure by shorting the more liquid 'on the run' issue that was closest in maturity. In fact, using a liquid asset to cross hedge price level risk is precisely how a customer-based trader reduces its risk exposure while trying to earn the bid /ask spread.

How Trading Records Separate Speculators from Marketmakers

Detailed trading records describing how a position was opened, how it evolved through time and how it was closed, are much more informative than balance sheet records in distinguishing between speculation and marketmaking. Using the 1994 'relative value position' as an example, we could rule out marketmaking as the motivating force if we knew that the illiquid 29 ½ year bonds were bought on the offer side of the market. There is no normal circumstance in which a marketmaker would open a position by lifting the offer on an illiquid security.⁵ Even if the marketmaker sold the 'on the run' 30-year on the offer side, he or she would never hedge the price risk of that bond by lifting an offer on the illiquid 'off the run' 29 ½ year bond. That would mean providing liquidity where the bid /ask spread is narrow and consuming liquidity where the bid / ask spread is wide.

Is it possible to tell whether a security was purchased on the bid side or on the offer side of the market? Traders usually do not record such information, but knowing the time of the trade as well as the prevailing quotes in the marketplace would make it possible.⁶ For example, assume the prevailing bid on the 29 ½ year bond was 108 and the offer 108 ¼ . If the bond was purchased at 108 ¼ the case against marketmaking is clear.

⁵ A marketmaker might *close* a position in an illiquid security by lifting an offer (or hitting a bid) if reducing risk exposure by cross hedging is not practical or is too costly.

⁶ Most inter-dealer brokers in the government bond market record whether a trade occurred on the bid or offer side of the market. The New York Stock Exchange 'Trade and Quote' data base records bid / ask quotes as well as transactions prices.

If the 'off the run' 29 ½ year bond were purchased at 108, the bid side of the market, we need more information to determine whether speculation played a role in the overall position. Most important is how long the position remained unhedged. As described above, a marketmaker's instinct is to eliminate price level risk associated with a position in an illiquid asset by taking an offsetting position in a liquid asset. If the long position in the 29 ½ year bond were left unhedged for a considerable time, that would imply a speculative component to the trade. It is difficult to say exactly what a 'considerable length of time' means since that depends on the equilibrium price volatility of the security. But we do know that a trader is exposed to greater equilibrium price volatility the longer a security is held. Thus the marketmaker is anxious to hedge the position quickly.

The marketmaker's natural anxiety over price risk leads to the following curious result regarding the 30-year bond serving as the cross hedge: If the 'on-the run' 30-year were sold on the offer side of the market, which is exactly what a marketmaker would like to do, the probability that there was a speculative component to the trade increases. This follows from the fact that the marketmaker could hedge *immediately* by hitting the bid in the 'on the run' 30-year bond. Selling the 30-year on the offer side means either that the marketmaker was lucky (an incoming order to buy the 30-year at the offer occurred simultaneously with the dealer's purchase of the 29 ½ year bond), or the dealer posted an offer in the marketplace and waited for incoming buying interest in the 30-year. Luck is a less likely explanation, hence selling the 30 year at the offer is indicative that the marketmaker waited to hedge, producing a speculative component to the trade. The lesson: Beware of the marketmaker who *always* looks like a marketmaker.

Now we can turn to the position described at the beginning of the paper. Can we tell whether the options trader who is long 6-month out-of-the money IBM calls and short the ‘right (delta neutral⁷) amount’ of 3-month out-of-the money IBM calls was speculating or marketmaking? Note that the most liquid options in most markets are the ‘at-the-money’ front-month options. In this case, that would be one-month at-the-money IBM puts and calls. Thus we can assume that both of the trader’s options are relatively illiquid.

We can try to rule out marketmaking behavior the same way we did for the government bond trader -- by determining whether the options were bought and sold on the bid or offer side of the market. For example, if the long position in the 6-month calls were purchased on the offer side and the short position in the 3-month calls were sold on the bid side, then this position surely was not generated by a marketmaker, since the trader paid the bid / ask spread in each case. It must be a speculator’s ‘relative value’ trade, betting that the 6-month calls are cheap relative to the 3-month calls.

Now turn to the other extreme. Suppose the long position in the 6-month calls were purchased on the bid side of the market and the short position in the 3-month calls were sold on the offer side. This is precisely the desired circumstance of a marketmaker since he or she is in a position to earn the bid / ask spread on both sides of the position. However, as we saw in the case of the government bond trader, unless there was an unusual amount of luck involved, capturing the bid and offer on *both* positions makes the

⁷ Hedging price risk in options requires an estimate of the delta of an option. Delta is the amount by which the value of the option changes per dollar change in the underlying asset price. An options position is called delta neutral if the value of the position is unaffected by price changes in the underlying asset.

marketmaker look 'too good'. It is likely that he or she waited to execute the 'hedging side' of the trade. Therefore, the trader speculated during the time the position was left unhedged. To paraphrase the lesson from above: Even marketmakers should occasionally consume liquidity.

The time sequence of the trader's position can resolve the charge of speculation in one of two ways. First, the 'long 6 month - short 3 month' position might have been initiated by a counterparty as a 'spread trade'. This means that both 'legs' of the trade were done simultaneously, without any unhedged exposure time. Although this is a reasonable possibility, it is unlikely that a spread trade would have been done on such favorable terms to the marketmaker (and such unfavorable terms to the customer). More than likely, the spread would have been done 'inside' the maximum bid / ask spread. This occurs because 'spreads' have order flow of their own (as opposed to the individual 'legs') and order flow combined with competition narrows the quotes on a 'spread trade'.

A second possibility is that the two components to the position were done sequentially, with an intermediate hedging step between the two 'legs' of the final position. The trader would be a pure marketmaker if the trading records show that after purchasing the 6-month calls, he or she hedged by selling liquid at-the-money one-month calls (or IBM stock) and then bought back those 'hedging' trades after selling the 3-month calls. A marketmaker's imprint would be clearer if the sale of the 'intermediate hedge' occurred at the bid price and the subsequent purchase occurred at the offer, implying that the hedges were probably executed immediately.

Conclusion

Our discussion of customer-based trading and speculation provided a framework for determining how traders established their positions and managed their risk exposure. We showed that balance sheets are insufficient to determine whether a trader acted as a marketmaker or as a speculator in setting up a position. On the other hand, trading records combined with market conditions, such as the prevailing bid /ask quotes at the times when trades were executed, can identify what trading strategy was pursued. Knowing the trading strategy helps to evaluate contract compliance, risk exposure, and capital requirements of trading firms.

Two provisos are important. First, trading records do not always resolve the issue. Second, many traders combine elements of marketmaking and speculation so that their record is not clean. Nevertheless, the analysis presented here shows how to track trader behavior. Sometimes the footprints are clear and sometimes blurred. But that is the nature of trading.

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