

10. Dealers: Liquid Security Markets

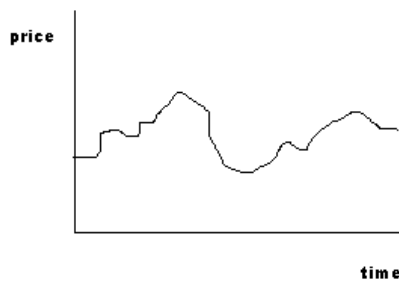
I said last time that the focus of the next section of the course will be on how different financial institutions make liquid markets that resolve the differences between qualitatively different kinds of credit into mere quantitative differences of price.

Liquid Markets and Inventories

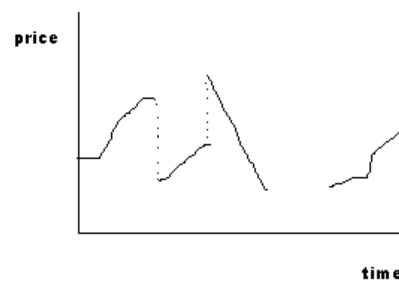
A **liquid market** is "one in which an individual transaction does not disrupt the continuity of the market". More specifically, it is a market in which you can buy and sell (1) quickly, (2) in volume, (3) without moving the price much. This feature of markets is absolutely crucial for the smooth operation of our economy, so crucial that it tends to be taken for granted. All of microeconomics revolves around the idea that suppliers and demanders are trying to find the optimal supplies and demands **given** the market price. They never consider whether they will actually be able to complete desired trades at that price.

One way of understanding the concept of liquid market is therefore as continuity in the time path of market price. There are no jumps or gaps as price evolves over time. The question is, what is the institutional basis of a liquid market?

Continuous Liquid Market



Discontinuous Illiquid market



Consider an example (inspired by Hicks, Market Theory of Money). When I pass the Westside market in the morning there is almost no one in the store, but the shelves are all stocked. When I pass the Westside market in the evening the whole world seems to be in there, and the shelves are in some places seriously depleted. And yet, despite these intraday fluctuations in the flow of demand, the price of the various goods remains the same, and we would be seriously surprised if it did not. The prices of goods fluctuate over time, across days and weeks and years, but not within the day. The Westside market is a liquid market.

My concern at the moment is not so much with why merchants find it useful and profit-maximizing to make liquid markets, as with how merchants manage to do it. A moment's thought reveals that the secret is inventories. Merchants take delivery of a large quantity of a particular good, set the price so as to ensure a profit on the load, and then proceed to supply individual demanders from the inventory until it runs sufficiently low that they make another order.

The answer is simple, but it is also deep, because when you think a little more you realize that Westside chooses its inventories on the assumption that it can get resupply and that resupply depends on inventories somewhere else in the system, and so forth all the way back to the factory or the original producer. The **continuity** of the market price for a particular good thus seems to depend on a hierarchical structure of inventories. Even so-called "just-in-time" production is best viewed as a very careful adjustment of the flow of ultimate supply to ultimate demand in order to minimize inventories. We are amazed at the Japanese just-in-time inventory system because this is really very difficult to do, but it does not eliminate inventories. Rather it pushes the ultimate inventory back before production into inventories of the parts and components held by suppliers.

Security Dealers and Market Makers

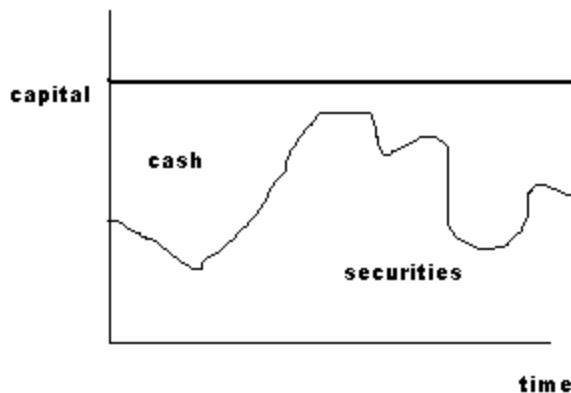
A security dealer is somewhat like Westside market, more so than might first appear. A security dealer who acts as an agent in a primary issue of corporate securities buys the securities from the corporate clients at one price and then sells them at a higher price to its retail clients. That's exactly what Westside market does. More generally, however, we are interested in two-sided dealers, who offer to sell retail but also to buy retail. Security dealers quote two prices--a lower **bid** (to buy) and a higher **ask** or offer (to sell). (In many markets prices are quoted as yields, so the bid is a higher number than the ask.) It is as if the Westside market was willing to buy or sell mangoes to retail customers.

In the securities market both bid and ask prices are retail prices, and wholesale (interdealer) prices are within the bid-ask spread. The one sided dealer (like Westside) only sells, so it only needs an inventory of the good that it sells. The two sided dealer also buys, and so it also needs an inventory of cash. We begin therefore by thinking of the dealer holding inventories of both cash and securities in order to be prepared to fulfill when bids are "hit" and offers are "lifted".

Hypothetical Dealer Balance Sheet (showing inventories)

Assets	Liabilities
securities	capital
cash	

The consequence from the point of view of retail trade is a liquid market, meaning the ability to buy or sell without moving the price. My hypothetical dealer has inventories of cash and securities, and uses those inventories to absorb fluctuations in demand and supply. Any increase in one inventory is matched by a decrease in another. The result is that imbalances in the time pattern of demand and supply show up as balance sheet changes, not price changes.

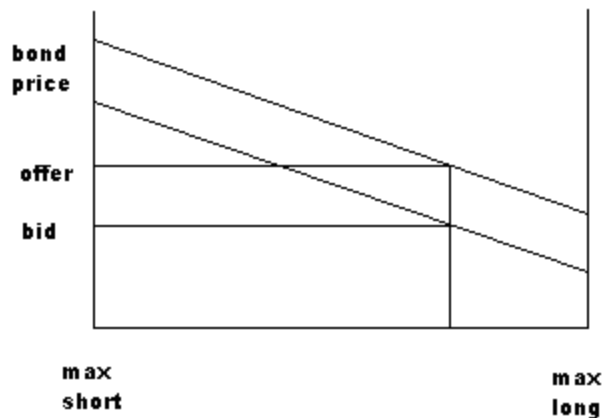


One way to appreciate what dealers do is to think about what would happen without them. Imbalances in supply and demand would cause prices to jump around, or force ultimate suppliers and demanders to wait for the opposite side. The security market would be like the housing market in which individual buyers have to find individual sellers and negotiate individual deals.

Instead, in the securities market, buyers and sellers only have to find a dealer, and the dealer takes the opposite side of their trade. The dealer makes liquid markets by buying when there is excess selling pressure, and selling when there is excess buying pressure. So he is buying at a price higher than would otherwise be (higher than if excess supply had to drive prices down far enough to attract demand), and selling at a price lower than would otherwise be (lower than if excess demand had to drive prices up far enough to attract supply). He has to pay attention to these prices if he is going to survive, and make sure that he is not paying too much or selling for too little. Dealers thus operate to smooth prices as well as to make continuous markets out of discontinuous order flow.

Economics of the Dealer Function

Now, the fundamental value of securities can and does change over time, and this is the major source of risk in the dealing business: “inventory risk”. Also there is the risk that a customer might know more than the dealer, so the dealer will be buying at too high a price and selling at too low a price: “adverse selection risk”. The Bid-ask spread compensates somewhat for this risk, and in times of high volatility (and for securities that have especially high volatility) we see dealers widen the bid-ask spread. Equally important, however, is the dealer’s ability to **change the price as inventories change**. Treynor offers the following model of the dealer function (my picture is a stripped down version of his, so refer to his for the full model):



Here the offer (or ask, or selling price) is above the bid (buying price), and the spread means that the dealer is always buying low and selling high. The level of both prices also changes with the inventory. By lowering the price at which he is willing to add to a large long position, he protects himself from the risk that price may fall. By raising the price at which he is willing to add to a large short position, he protects himself from the risk that price may rise.

Three key pieces make up this model. First, the position limits of the dealer. He has limited capital and limited credit (from his clearing bank) and perhaps also limited taste for risk. We capture all these in the position limits, max long and max short. Second, the “outside spread”, which is the price at which value based traders (the ultimate suppliers and demanders) are willing to buy and sell. This is a wide spread, maybe 20% below and 20% above fundamental value as estimated by the value based trader. When the dealer hits his position limits, the VBT becomes market maker of last resort. Third, the volatility of price and the prevalence of adverse selection risk.

We can think of the dealer as supplying liquidity because he is offering the option to trade. If you want to trade he is willing to trade at the quoted prices, either way, but if you don't want to trade that's okay too. It's up to you, not the dealer. He supplies liquidity and you demand it, whether you want to sell or buy.¹

¹ In fact, anyone who offers to trade, by placing a “limit order” is supplying liquidity to the market. Anyone can be a dealer in this respect, although it takes a lot of work and attention to make money at it. (Amateur day traders often supply liquidity until they run out of money.) This way of conceptualizing liquidity is developed in more detail in Larry Harris, Trading and Exchanges: Market Microstructure for Practitioners (2003).

Leverage

Actual dealers differ from my hypothetical dealer in one important respect. They actually hold almost no inventories of either cash or securities. (The balance sheet I showed you is actually more like the balance sheet of a value based trader who makes the outside spread.) Competition among dealers forces them to offer a very tight “inside spread”, so the profit on any one trade is very small. They compensate for this with leverage. One step toward greater leverage is to reduce cash inventories to a bare minimum and rely instead on borrowing, so the dealers balance sheet looks like this:

Assets	Liabilities
Securities	Loans

A dealer that looked like this would experience fluctuation in the size of his balance sheet as he bought more securities to absorb selling pressure, and then sold them off to absorb buying pressure. But a balance sheet like this is always net long securities and net short cash, and that involves risk exposure (to falling security prices) that is not necessary to the market making business. Ideally, the dealers would like to reduce inventories to zero, so they eliminate inventory risk, and they can do this only if they hold as many short positions as long positions. Typically real world dealers wind up net long, but they move as close as they can to the following ideal balance sheet:

Assets	Liabilities
Reverse	Repo

Outside the dealer balance sheet there are other people holding inventories of securities and cash. The dealer accesses the inventory of securities using reverse and the inventory of cash using repo. We can think of the repo as borrowing money to finance the dealer’s long security positions, and reverse as lending money (borrowing collateral) to finance the dealer’s short positions.²

In effect, the dealers have very good access to cash (repo market) and to securities (reverse market) when they need them, so they can behave as though they do have inventories even though the inventories are actually out in the market some place. In effect, dealers operate a just-in-time inventory system.

In a crisis, as we will see later, it matters where the inventories are. Ultimately access to cash comes from higher up in the hierarchy, from banks, and access to securities comes from lower down in the hierarchy, from security holders. So the dealer is in effect straddling layers of

² I remind you that I construct these balance sheets by “following the money”. Thus, what I have on the liability side is a money debt, a promise to pay money at a later date that is secured by security collateral. And what I have on the asset side is a money loan. This makes sense of the accounts, but you have to see the security flows as well in order to see what is happening as knitting together the layers of the hierarchy. The money debt is a security sold and repurchased later, and the money asset is a security purchased and resold later. See Stigum Table 10.1 (p. 434) for actual data on the balance sheets of security dealers.

the monetary hierarchy. Sometimes they get into trouble when they have to come up with securities they have reversed in and then sold. The more significant troubles come when the dealer has to come up with money they have repoed in and then spent.³ They are dependent on banks for refinance. Meanwhile, in normal times, the dealers make the market between cash and securities, standing ready to take the opposite side of trades that others may wish to make.

Arbitrage

The business of making markets is sufficiently competitive that profits are hard to come by. The real profit in the business comes from trading on the information one gets from knowing the state of the market better than anyone else, and from having privileged access to both money and securities in the repo and reverse markets which means the ability to put on a position more cheaply than anyone else.

Dealers take “positions”, which means they speculate on how prices will change in the future. They deliberately mismatch their book in the direction they think will be profitable. They may be net long securities if they are bullish on security prices, but mostly the trades are more subtle than that. They may be net long some class of securities and short another class, betting on the relative price between them. Sometimes this means betting on what the Fed will do, since the Fed influences the price of money in Fed Funds and all other markets key off that. Sometimes this means betting what the market will do, since spreads can change.

Example: yield spread arbitrage, in which the dealer identifies apparent mispricing at one segment of the yield curve, takes a position but hedges overall interest rate exposure by taking an opposite position at another segment of the yield curve. The initial distortion in asset prices that the dealer identified as offering an arbitrage opportunity can be understood as a (temporary) fluctuation in demand or supply. By taking advantage of the distortion, the dealer in effect spreads its impact into other markets, so reducing its impact, indeed counteracting the distortion. (Dealers engaged in arbitrage are acting as “porters” of liquidity from one market to another.)

This kind of arbitrage is important. The consequence is that markets for individual securities are in fact not separate, each with its own flow of supply and demand that causes price to fluctuate. Speculators are joining the separate markets into a single market, and in doing so they bring about a result that is no part of their intention, namely liquidity. Arbitrage and liquidity are in this sense two sides of the same coin.⁴

³ In this recent crisis, dealers have had problems of both kinds. So-called “fails”, meaning failure to receive back collateral that had been used to secure a loan, became so widespread that the Fed intervened using its Term Securities Lending Facility, lending its own inventory of Treasury securities to dealers. Also, access to cash became a problem as the repo market collapsed, so the Fed opened its Primary Dealer Credit Facility, essentially a lender of last resort facility for dealers.

⁴ A philosophical question: What is the relation between liquidity and asset prices? The modern theory of finance is built on the assumption of perfect liquidity, so that prices can be fully efficient. It is supposed to be arbitrage that creates perfect liquidity by entering to take advantage of even the smallest deviation. To say that liquidity is perfect is to say that liquidity is a free good.

But in a fully efficient market, arbitrage would not be profitable since all bets would be fair bets. So position takers would not make money. And if position takers do not make money, they will not compete so much for the market-making business. This seems to imply that

In financial theory, it is common practice to assume perfect arbitrage, and hence also complete liquidity. Assets are assumed to trade at their fundamental value since any other price would create an arbitrage profit opportunity. In effect, the world that the finance theorists imagine is a world in which the VBT outside spread is very very narrow, so there is no room and no need for dealers. In the real world, the outside spread is quite wide, dealers offer prices inside that spread but the prices can deviate very far from fundamental value. That is the world Fischer Black was talking about in his infamous presidential address to the American Finance Association when he said that he thought markets were efficient, meaning price was usually within a factor of two of true value.

We can understand what Black is saying by referring back to the Treynor model. Suppose that fundamental value is the price that dealers would quote if their inventories were exactly zero, so they are not exposed to any price risk. The Treynor model then shows how market making by dealers pushes price away from fundamental value, on one side or another, by more or less depending on the size of the outside spread and the dealer's maximum long and short position limits. Standard asset price theory abstracts from this effect, in effect treating the outside spread as collapsed around fundamental value, so there is no need for dealers. Some markets are close approximations to this, but others are not; some times are close approximations to this, but others are not.

markets would be less liquid--wider bid-ask and more volatile prices. Thus, in practice it seems that we must expect liquidity to enter into asset prices.