27 August 2009

Financial Intermedation

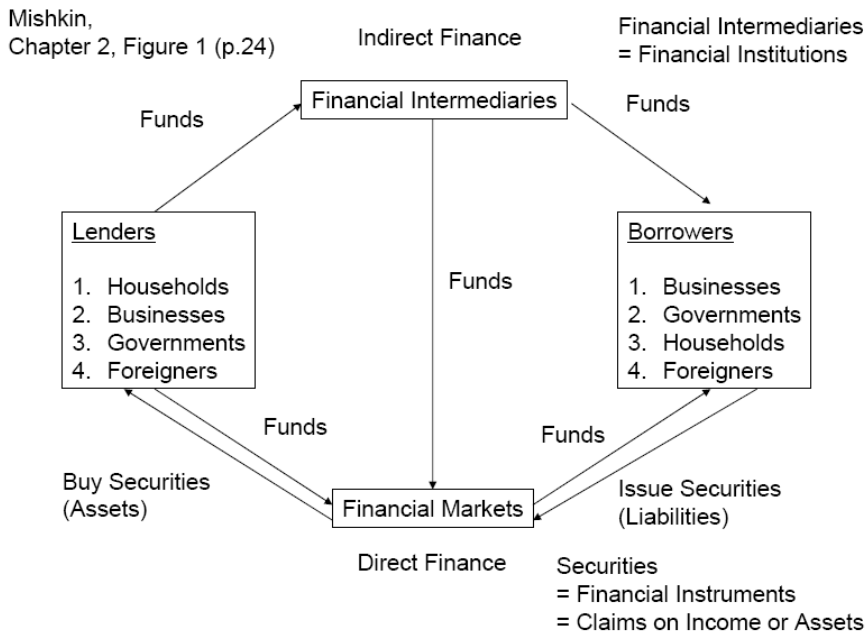
Financial intermediation consists of ***"channeling funds between surplus and deficit agents"***

A **financial intermediary** is an entity that connects surplus and deficit agents. The classic example of a financial intermediary is a bank that transforms bank deposits into bank loans

Through the process of **financial intermediation**, certain assets or liabilities are transformed into different assets or liabilities

As such, financial intermediaries channel funds from people who have extra money (savers) to those who do not have enough money to carry out a desired activity (borrowers)

In the U.S., a financial intermediary is typically an institution that facilitates the channeling of funds between lenders and borrowers indirectly. That is, savers (lenders) give funds to an intermediary institution (such as a bank), and that institution gives those funds to spenders (borrowers). This may be in the form of loans or mortgages. Alternatively, they may lend the money directly via the financial markets, which is known as financial disintermediation.



Contents

Forms of intermediation

There are 2 forms of intermediation:

- **Direct**- lenders and borrowers make agreements and channel funds directly among them (fewer options)
- **Indirect**- funds are channeled by financial institutions (intermediaries)

Lenders and borrowers have conflicting needs

- Most lenders prefer lending short-term
- Most borrowers prefer borrowing long-term

That is why most intermediation is done indirectly, where intermediaries understand and reconcile the different needs of lenders and borrowers.

Financial intermediaries play a special role in the economy.

Financial intermediaries take advantage of economies of scale to reduce transaction costs, how financial institutions assist in the process of risk sharing and diversification, and how financial institutions overcome the problems of adverse selection and more hazard.

Functions performed by financial intermediaries

Financial intermediaries provide 3 major functions:

1. Maturity transformation

Converting short-term liabilities to long term assets (banks deal with large number of lenders and borrowers, and reconcile their conflicting needs)

2. Risk transformation

Converting risky investments into relatively risk-free ones. (lending to multiple borrowers to spread the risk)

Risk Sharing and Diversification

Risk = uncertainty about the returns investors will receive on any particular asset.

By purchasing a large number of different assets issued by a wide range of borrowers,

financial intermediaries use diversification to help with risk sharing.

Example: by lending to a large number of different businesses, a bank might see a few of its loans go bad; but most of the loans will be repaid, making the overall return less risky.

Here, again, the bank is taking advantage of economies of scale, since it would be difficult for a smaller investor to make a large number of loans.

3. Convenience denomination

Matching small deposits with large loans and large deposits with small loans

Transaction costs = the time and money spent in carrying out financial transactions.

Financial intermediaries help reduce transaction costs by taking advantage of economies of scale.

Example: a bank can use the same loan contract again and again, thereby reducing the costs of making each individual loan.

4. Adverse Selection and Moral Hazard

Financial intermediaries also use their expertise to screen out bad credit risks and monitor borrowers.
They thereby help solve two problems related to imperfect information in financial markets.

Adverse Selection = refers to the problem that arises before a loan is made because borrowers who are bad credit risks tend to be those who most actively seek out loans.

Financial intermediaries can help solve this problem by gathering information about potential borrowers and screening out bad credit risks.

Moral Hazard = refers to the problem that arises after a loan is made because borrowers may use their funds irresponsibly.

Financial intermediaries can help solve this problem by monitoring borrowers' activities.

Advantages of financial intermediaries

There are 2 essential advantages from using financial intermediaries:

1. Cost advantage- over direct lending/borrowing

2. Market failure protection- the conflicting needs of lenders and borrowers are reconciled, preventing market failure

The **cost advantages** of using financial intermediaries include:

- **Reconciling conflicting preferences of lenders and borrowers**

- **Risk aversion**- intermediaries help spread out and decrease the risks

- Economies of scale- using financial intermediaries reduces the costs of lending and borrowing
- Economies of scope- intermediaries concentrate on the demands of the lenders and borrowers and are able to enhance their products and services (use same inputs to produce different outputs)

Types of financial intermediaries`

Financial intermediaries include:

- Banks
- Building societies
- Credit unions
- Financial advisers or brokers
- Insurance companies
- Collective investment schemes
- Pension funds

Summary & conclusion

Financial institutions (intermediaries) perform the vital role of bringing together those economic agents with surplus funds who want to lend, with those with a shortage of funds who want to borrow.

In doing this they offer the major benefits of maturity and risk transformation. It is possible for this to be done by direct contact between the ultimate borrowers, but there are major cost disadvantages of direct finance.

Indeed, one explanation of the existence of specialist financial intermediaries is that they have a related (cost) advantage in offering financial services, which not only enables them to make profit, but also raises the overall efficiency of the economy. The other main explanation draws on the analysis of information problems associated with financial markets. [4]

A Transactions Cost Approach to the Theory of Financial Intermediation Author(s): George J. Benston and Clifford W. Smith, Jr. Source: The Journal of Finance, Vol. 31, No. 2, Papers and Proceedings of the Thirty-Fourth Annual Meeting of the American Finance Association Dallas, Texas December 28-30, 1975 (May, 1976), pp. 215-231

IN OUR OPINION, a proper framework has yet to be developed for the analysis of financial intermediation. The traditional macroeconomic analysis views financial intermediaries as passive conduits through which monetary policy is effected.' Even when a more micro view is taken, though, the analyses often are restricted to studying the effect on the rate of change and allocation of money and credit of required and desired reserve ratios, ceiling rates imposed on loans and deposits,.

Essentially, we view the role of the financial intermediary as creating specialized financial commodities. These commodities are created whenever an intermediary finds that it can sell them for prices which are expected to cover all costs of their production, both direct costs and opportunity costs.

We see the demand for these financial commodities as a derived demand. Individuals derive utility from consumption, consumption today and consumption in the future. By acquiring financial commodities, inter-temporal and intra- temporal transfers of consumption may be achieved. Of course, there are many financial commodities other than those produced by financial intermediaries. The raison d' etre for this industry is the existence of transactions costs.

Several forms of financial intermediation have arisen to reduce these costs. The most basic form of financial intermediary is the market maker. He simply provides a market-place where potential buyers and sellers come together, thus lowering relevant

information costs. An example of this form of intermediary is the New York Stock Exchange. It does not create assets, it only furnishes a physical location for buyers and sellers to transact. Without this intermediary, the task of locating a potential seller (much less the potential seller with the lowest reservation price) would be much more expensive. A somewhat more sophisticated form of financial intermediation is provided by a dealer who also takes a position at his own risk in the asset transacted. A market specialist on a securities exchange exemplifies this form of intermediation.

A more complex form of financial intermediation is one in which new financial commodities are produced. This form of financial inter- mediary is exemplified by mutual funds, banks, and consumer finance companies. Thus, mutual funds allow individuals to purchase shares in diversified portfolios of securities, in odd amounts, for indefinite lengths of time, generally at a much lower transaction cost than could be achieved through the direct purchase of the underlying securites. This intermediary has a comparative advantage over a stock exchange in serving a particular group. Therefore, it exploits the returns to scale implicit in the structure of the transactions costs of a stock exchange by purchasing large blocks of securities, packaging those securities in a form that is demanded by some individuals, and selling the package at a price which covers all its costs. These examples illustrate the essential feature of financial intermediation reduction of the transactions costs of effecting inter- and intra-temporal consumption decisions.'

II. DEMAND A basic problem in the analysis of financial intermediaries may be the lack of an appropriate analytical framework within which to analyze the demand for the financial commodities produced by intermediaries. In the general analysis of consumer demand, individuals are assumed to possess an endowment and act according to the dictates of a utility function. The endowment is expended to purchase consumption goods in such a way as to maximize utility. We assume that individuals derive utility only from consumption, where by consumption we mean consuming different goods at many points in time, allowing for different states of the world. (Note that if this restriction were not imposed, any observed activity could be trivially deduced by an appropriate insertion of that phenomenon into the utility function, thus rendering the analytical apparatus empty.)

One point about the aggregate supply of the financial commodities created by financial intermediaries should be noted: it is always identically zero. The total long position in mutual fund shares held by the public is exactly offset by the short position in those shares taken by the fund itself. Similarly, the total long position in the installment loan

market held by the customers of a consumer finance company is exactly offset by the short position in that market assumed by the finance company itself. This general proposition, that the supply of financial commodities created by financial intermediaries is identically zero, should highlight the fact that the increase in social welfare engendered by this industry comes about only through a reduction in the relevant transactions cost.

The individual's endowment may consist of securities plus his human wealth, the present value of his earnings. If the individual's preferred inter-temporal consump- tion pattern differs from his time-profile of earnings, he may rearrange his con- sumption pattern to achieve a more desired pattern. He does so by directly or indirectly acquiring a long or short position in assets (e.g., by purchasing equities or the financial commodities issued by financial intermediaries). Therefore, an indi- vidual's asset holdings do not yield utility in themselves. Assets are held for the inter- and intra-temporal rearrangement of consumption possibilities afforded by their holding.5 The foregoing explains, in part, why assets are held. We now turn to the question of which assets are held, or what the motivation is for holding the financial commodities created by financial intermediaries. It should be obvious that in a perfect market, a market with no frictions such as transactions costs, information costs, or indivisibilities, financial intermediaries would not exist. This argument focuses explicitly on the rationale for the existence of financial intermediaries-market imperfections.

The market price of a financial commodity is a function of the total cost of producing the financial commodity. We begin to examine the price charged by the firm by considering the behavior of an unregulated firm. (The impact of government regulation is considered in Section V.)

The price of any financial commodity in an efficient, competitive market can be conceptually separated into three parts:

1. **one part depends only on the pure riskless rate (what in a two period world would correspond to the marginal rate of substitution between current and future consumption),**
2. **one represents a premium for risk, and**
3. **one is a compensation for the administration, monitoring, and processing costs imposed on the producer. To examine the first two parts, it is convenient to employ the analogy suggested by Black and Scholes [1973] between the valuation of a call option and the valuation of equity.' Black and Scholes demonstrate that in a frictionless world without taxes and bankruptcy costs that the value of equity (E) and debt (D) (defined as pure discount bonds) are functions of the value of the underlying assets**

(V), the face value of the debt (D*), the time to maturity of the debt (T), the riskless rate of interest (r), and the variance rate on the assets σ.

$$V = E(V, D^*, T, r, \sigma^2) + D(V, D^*, T, r, \sigma^2) \quad (1)$$

where

$$\frac{\partial E}{\partial V}\frac{\partial E}{\partial T}\frac{\partial E}{\partial r}\frac{\partial E}{\partial \sigma^2} > 0 \qquad \frac{\partial E}{\partial D^*} < 0$$

$$\frac{\partial D}{\partial V}\frac{\partial D}{\partial D^*} > 0 \qquad \frac{\partial D}{\partial T}\frac{\partial D}{\partial r}\frac{\partial D}{\partial \sigma^2} < 0$$

Models in Relation to the Financial Crisis

Akerlof (1970) lemons model.

Asymmetric information about product quality can lead to a breakdown of the market.

Elements of this story seem to account for the illiquidity of financial markets, particularly mortgage backed securities markets and markets for commercial paper.

Diamond-Dybvig (1983) bank run model.
Self-fulfilling expectations can give rise to a bank run.

Elements of this story seem to account for demise of some investment banks (Lehman Brothers, Bear Stearns).

Brunnermeier (2009) "Deciphering the Liquidity and Credit Crunch 2007-2008," *Journal of Economic Perspectives*

Over past several years there was an unprecedented growth in credit.

Increases in securitization meant that banks originating loans were able to package and sell off loans, so that they did not bear the risk of the loans.

Prime Example: Pooling groups of mortgages, ranking them based on perceived risk, then selling off in *tranches* as collateralized debt obligations (CDOs). Highest tranches

believed to have very little risk (AAA).

Investors also able to buy credit default swaps: pay a fee in exchange for payment in event of default. Counterparty risk perceived to be small.

At same time, interest rates remained low for prolonged time, providing cheap access to funds.

While securitization reduced risk of individual loans for the banks, it also reduced incentives for prudent lending. This led to vast expansion of credit, in particular the growth of the subprime mortgage sector.

The expansion of credit helped to fuel rapid growth in housing prices.

Pricing models for mortgages and related mortgage-backed securities based on historical data. Post-WWII US had not experienced nationwide decline in housing prices.

Previous housing downturns had been regional, so pooling mortgages across regions was believed to reduce default risk.

Trigger was an increase in subprime mortgage defaults, starting in Feb. 2007. This led to large increase in the cost of credit default swaps.

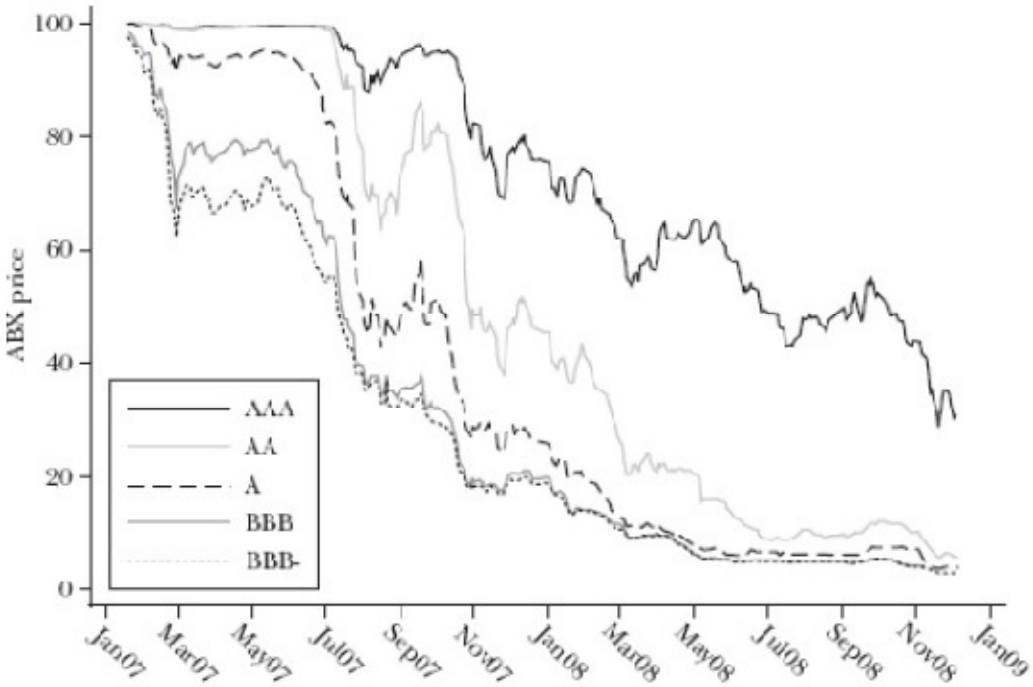
Throughout summer of 2007 a number of hedge funds announce large losses, rating agencies downgraded CDOs. Concerns about liquidity of banks, uncertainty about how to price assets led to a huge reduction in volume of lending in short-term money markets, such as asset-backed commercial paper.

Also drove up costs of bank lending, as seen in spread between interbank unsecured loan rate (LIBOR) and US T-bill rate, known as the TED Spread.

Figure 1

Decline in Mortgage Credit Default Swap ABX Indices

(the ABX 7-1 series initiated in January 1, 2007)

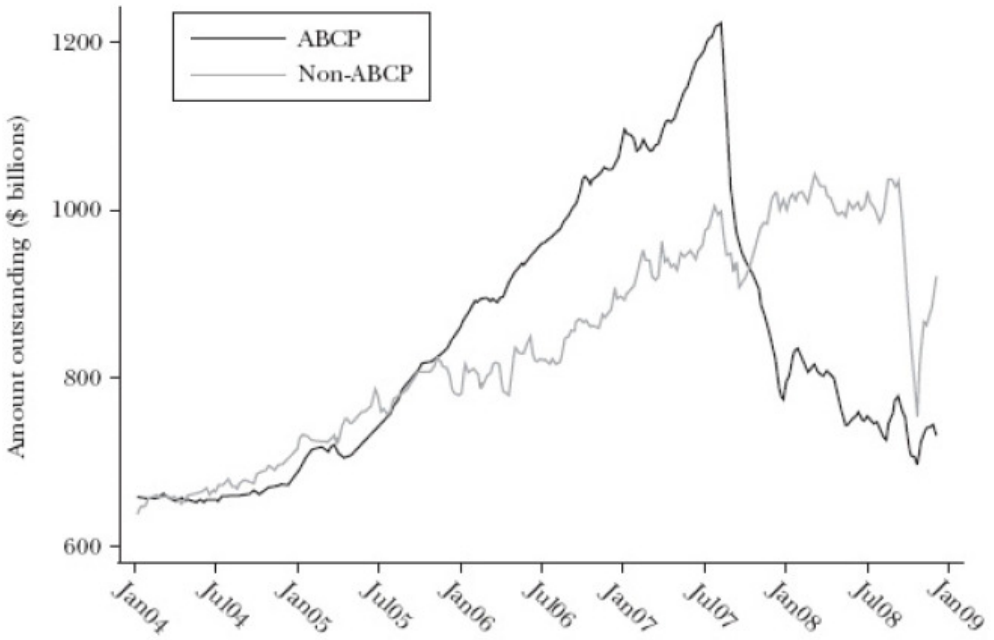


Source: LehmanLive.

Note: Each ABX index is based on a basket of 20 credit default swaps referencing asset-backed securities containing subprime mortgages of different ratings. An investor seeking to insure against the default of the underlying securities pays a periodic fee (spread) which—at initiation of the series—is set to guarantee an index price of 100. This is the reason why the ABX 7-1 series, initiated in January 2007, starts at a price of 100. In addition, when purchasing the default insurance after initiation, the protection buyer has to pay an upfront fee of (100 – ABX price). As the price of the ABX drops, the upfront fee rises and previous sellers of credit default swaps suffer losses.

Figure 2

Outstanding Asset-Backed Commercial Paper (ABCP) and Unsecured Commercial Paper



Source: Federal Reserve Board.

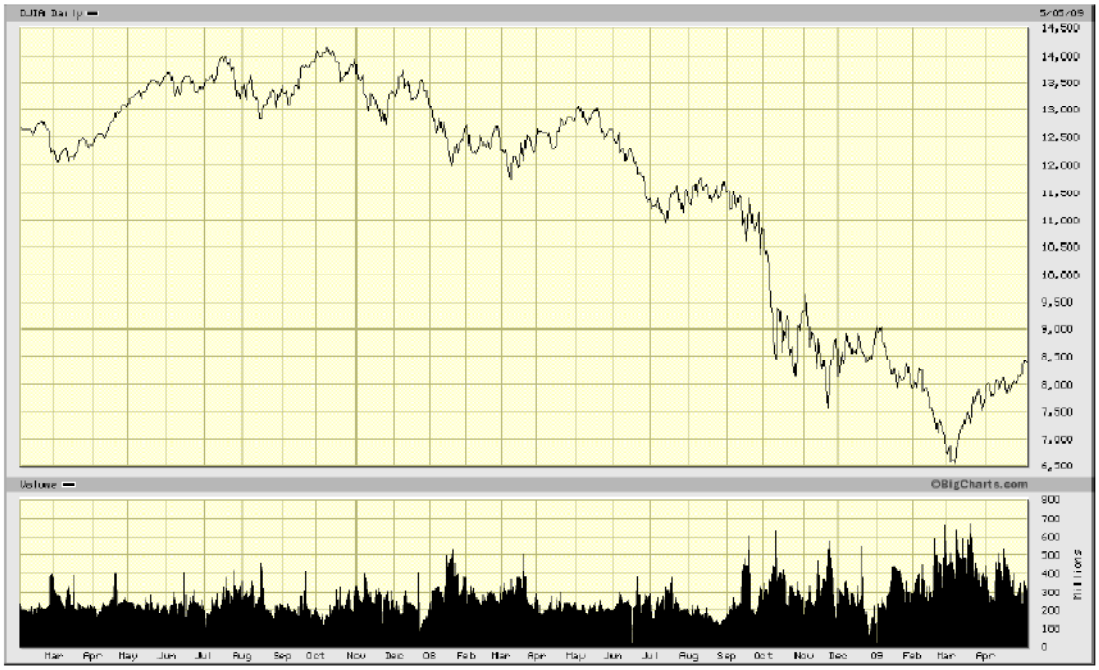
Throughout fall of 2007 banks continued writedowns, realizing losses. These proved to be broader than anticipated.

By early 2008, losses had spread to insurance companies, government sponsored agencies (Fannie Mae, Freddie Mac) who securitized the loans, investment banks (Bear Stearns).

A major accelerating factor was the failure of Lehman Brothers in September 2008. This lead to further declines in commercial paper market, increases in spreads, further decline in stock market prices.

All of this further reduced lending, accelerating the broader overall slowdown in housing market, and led to the reductions in overall economic activity.

Dow Jones Industrial Index, 2/07-Present



Why did the market for mortgage-backed securities dry up when only a small portion of mortgages (subprime) were initially affected by defaults?

Similarly, why did the market for commercial paper dry up when only a fraction of firms in this market faced losses from housing sector?

Problem: Asymmetric information on locations of risks. Market participants did not know which securities were affected by default risk, which firms held bad loans.

Classic model to illustrate these effects due to Akerlof (1970).

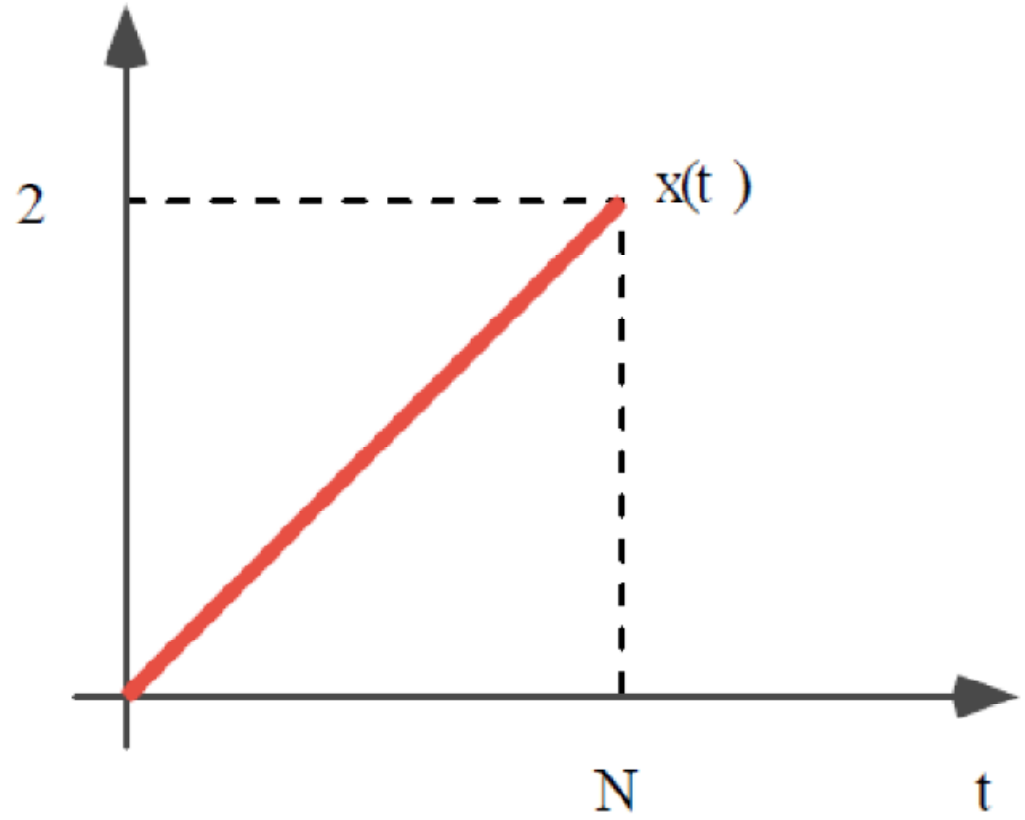
Akerlof's example was the market for "lemons": poor quality cars. Assumed sellers know quality, buyers don't. Sellers: have N cars of varying quality x, uniformly distributed on [0, 2]. Consume y of other goods, have preferences over cars and goods, where n is car sales:

$$u(y,n) = y + \int_n^N x(t)\,dt$$
$$= y + N - \frac{n^2}{N}$$

using $x(t) = \frac{2t}{N}$ and integrating.

- Note that sellers sell off lowest quality first, retain highest.

Distribution of Quality



Supply of Lemons

- Sellers income $y = pn$, so given p choose n:

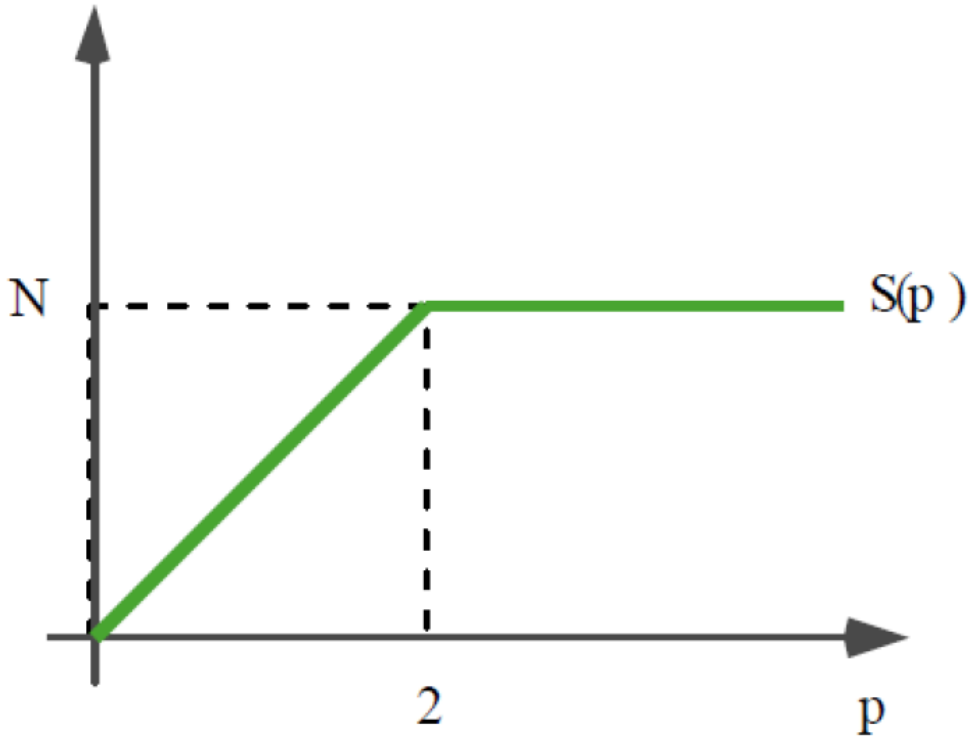
$$\max_n pn + N - \frac{n^2}{N}$$

- First order condition: $p = \frac{2n}{N}$.
- Solve for supply curve: $S(p) = \min\left\{\frac{pN}{2}, N\right\}$.
- Average quality supplied at price p:

$$\mu(p) = \frac{\int_0^{\frac{pN}{2}} x(t)dt}{\frac{pN}{2}} = \frac{p}{2}$$

If $p > 2$ then $S(p) = N$ and $\mu(p) = 1$.

Supply Curve



Buyers

- Buyers have no cars, income m. Place greater utility weight on cars:

$$U(y,n) = y + \frac{3}{2}\int_0^n x(t)dt = y + \frac{3}{2}\mu n$$

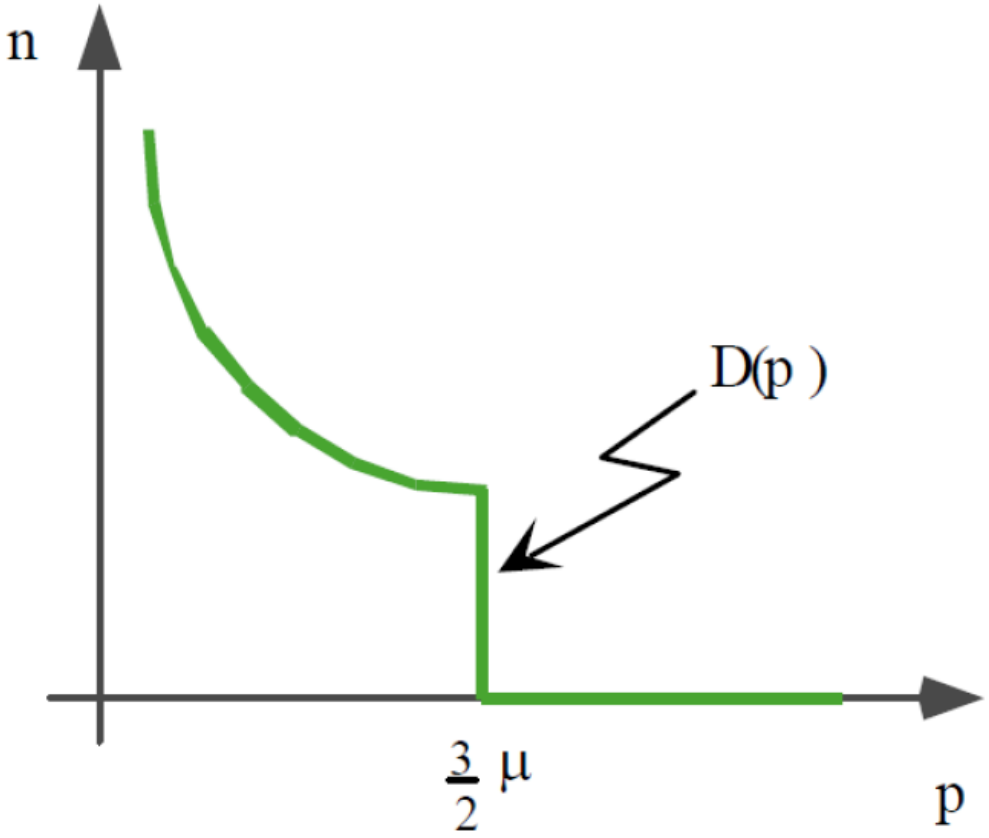
- Buyers' problem:

$$\max_n y + \frac{3}{2}\mu(p)n \text{ s.t. } y + pn = m$$

- Linear indifference curves (perfect substitutes), so demand curve is:

$$D(p) = \begin{cases} 0, & p > 3/2\mu \\ \left[0, \frac{m}{p}\right], & p = \frac{3}{2}\mu \\ \frac{m}{p}, & p < \frac{3}{2}\mu \end{cases} \quad (1)$$

Demand Curve



Breakdown of the Market

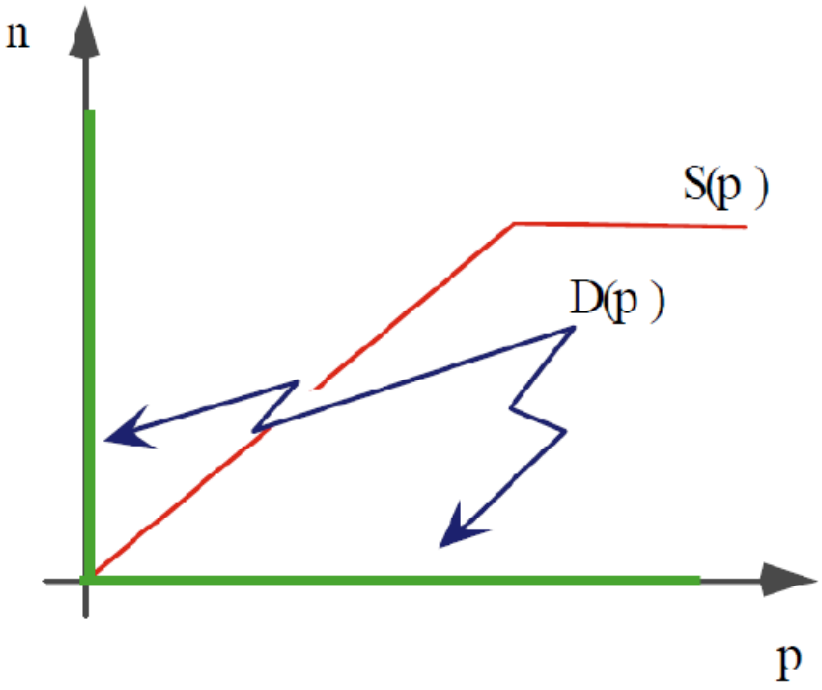
- Note that we have:

$$\mu(p) = \frac{p}{2} < \frac{2}{3}p$$

- So there is no p such that $p \leq \frac{3}{2}\mu$ and thus demand is zero for all $p > 0$.
- The market breaks down even though at any given price between 0 and 3 there are sellers who are willing to sell their cars at a price which buyers are willing to pay.
- The asymmetric information leads to a market breakdown. Any price which is attractive to sellers of good cars is even more attractive to sellers of lemons. So cars on market are biased toward low quality – adverse selection.
- The uncertainty about the locations of risks, both of individual mortgages in the securitized assets and of individual firms in the commercial paper market, may have contributed to the liquidity problems.

Demand Curve

Figure: Market Failure



Why did Bear Stearns and Lehman Brothers suddenly collapse, when their positions were not noticeably worse than any investment banks which survived?

Perhaps this was due to self-fulfilling beliefs. Investors became concerned that they would fail, and so withdrew assets (or were reluctant to lend).

This in turn caused the banks to sell off assets at a loss to meet funding needs, which exacerbated the troubles and led to beliefs to come true.

Basic model of this: Diamond-Dybvig (1983) bank run model.

Diamond-Dybvig Model

- Three periods: $0, 1, 2$. Large number N consumers, each endowed with 1 unit of good in period 0.
- Production technology converts 1 unit of good at 0 into $1 + r$ at date 2. If technology interrupted at date 1, only returns 1 and nothing is produced at date 2.
- Two types of consumers: early (want to consume in period 1) and late (consume in period 2).
- At date 0 agents don't know their type, only know that there is probability t they will be early consumer.
- Expected utility $= tU(c_1) + (1 - t)\,U(c_2)$.

Role of Banks

- If no banks: all agents invest, then if early consumer $c_1 = 1$, if late $c_2 = 1 + r$.
- Banks: agents deposit at 0, receive c_1 at 1 or c_2 at 2. If agent withdraws, randomly allocated to place in line, whether early or late consumer.
- Free entry in banking means in equilibrium banks earn zero profits. The banks set deposit contract to maximize depositor utility.
- If only early consumers withdraw at 1, bank must interrupt a fraction x of projects, where: $Ntc_1 = Nx$.
- This leaves remaining fraction to pay out to late consumers at 2: $N(1 - t)c_2 = (1 - x)N(1 + r)$.
- Eliminate x and rearrange:

$$c_2 = \frac{1 + r}{1 - t} - \frac{t(1 + r)}{1 - t} c_1$$

Deposit Contract

- Note $c_1 = c_2$ is feasible. Here:

$$MRS = \frac{tU'(c_1)}{(1-t)U'(c_2)} = \frac{t}{1-t}$$

- But for optimal contract, bank chooses:

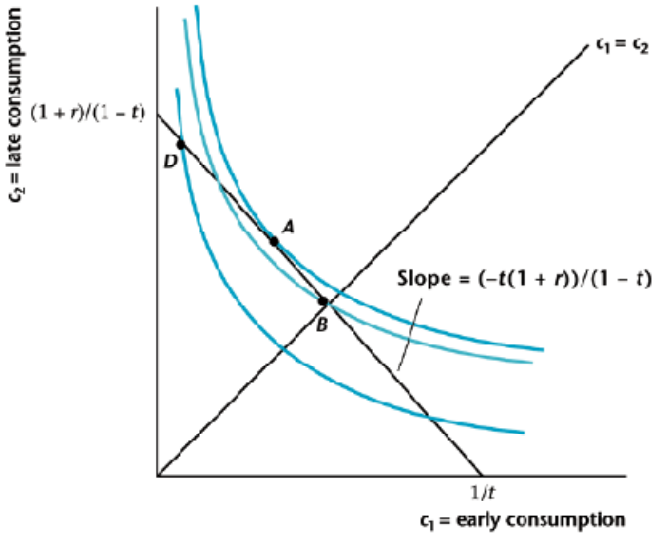
$$\max_{c_1, c_2} tU(c_1) + (1-t)U(c_2) \text{ s.t. } c_2 = \frac{1+r}{1-t} - \frac{t(1+r)}{1-t}c_1$$

- At optimum:

$$MRS = \frac{tU'(c_1)}{(1-t)U'(c_2)} = \frac{t(1+r)}{1-t} > \frac{t}{1-t}$$

So $U'(c_1) > U'(c_2) \Rightarrow c_1 < c_2$.

Figure 15.8 The Equilibrium Deposit Contract Offered by the Diamond–Dybvig Bank



Deposit Contract Equilibria

- The no-bank allocation $c_1 = 1$, $c_2 = 1 + r$ is also feasible. Assume $U'(1) > U'(1 + r)(1 + r)$.
- Then at no-bank allocation:

$$\frac{tU'(1)}{(1-t)\,U'(1+r)} > \frac{tU'(1+r)(1+r)}{(1-t)\,U'(1+r)} = \frac{t(1+r)}{1-t} = \frac{tU'(c_1)}{(1-t)\,U'(c_2)}$$

  So $c_1 > 1, c_2 < 1 + r$.
- Deposit contract provides more consumption smoothing than no-bank allocation.
- There is a good equilibrium where early consumers withdraw at 1, consume $c_1 > 1$. Late consumers withdraw at 2, consume $1 < c_2 < 1 + r$. Late consumer has no incentive to withdraw early.

Bank Run Equilibria

- However suppose that a late consumer believes that all other late consumers will withdraw at 1. If bank liquidates all of its assets it gets N, cannot meet withdrawal demands $(N - 1)c_1 > N$. (Since N large, $c_1 > 1$.)
- So each late consumer has the options:
  - Go to bank at 1, hope to be at start of line and get c_1.
  - Wait until period 2, get zero.
- So anticipating that all other late consumers will withdraw at 1 makes it optimal for any individual late consumer to also withdraw at 1.
- The bank run is an equilibrium. Belief that others will withdraw is self-fulfilling, leading to bank failure.
- There is FDIC insurance for deposits at deposit banks, but no insurance at investment banks and investment funds.