Problem set 2: answers
266: Fi. Markets and Institutions
Spring 2010
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Answers

Directions. You are to do this problem set alone.

Due date/time. Your work is due by beginning of class (1:30 PM) May 6 (Note: I've pushed this back to the last day of class). You can hand the work in to me at the beginning of class. If you put the work under my office door or in my mailbox, it must be in before I leave for lecture at about 1:20pm. If you have an electronic version of your work, you can email it to me. The time stamp must be no later than 1:30pm.

Note: Many of these answers are more complete than you would have needed to give. The extra information is for your information.

1 Brief answer/definition: Derivatives and money market.

1.1 Futures contract

> **Answer:** A futures contract is a particular type of derivative instrument and is an agreement between a buyer and seller to exchange an asset at a specified price (the futures price) at a specific time in the future (the settlement date or delivery date). The item which is bought/sold (the "underlying") may be an agricultural or industrial good (the contract is then a "commodity future") or a financial instrument such as stocks or currency (the contract is then a "financial future"). A futures contract is distinct from an options contract, which is also a derivative, in that the futures contract is a commitment to buy or sell, whereas an options contract grants the owner of the option the *right, but the not obligation* to buy or sell.

1.2 Strike price (for option)

> **Answer:** The strike price of an option is the agreed upon price at which the buyer of the option contract can buy or sell the underlying asset from/to the seller/writer of the option contract. Another word sometimes used is "excercise price." This strike price is for an *option* and should not be confused with the strike price for a *stop order* (for example, on the NYSE), where the strike price is the price at which the stop order becomes a market order.

1.3 American vs. European style option

Answer: An American-style option is one in which the owner can excercise their right to buy or sell the asset at any time until the option expires, while a European-style option allows the owner to buy or sell the asset only on the expiration date.

1.4 Notional value of credit default swap

Answer: The notional value of a credit default swap is the value of the underlying asset. More intuitively, it is the face value of the asset which you are insuring with the CDS. It is referred to as *notional* because that amount of money may never change hands (that is, if you don't collect on the insurance because the asset never defaults, you don't get paid the value of the CDS). It is important, however, as it is typically used to determine the periodic payments (swap premia) paid by the buyer of the CDS (intuitively, the purchaser of the insurance) to the seller, in exchange for the protection/insurance.

1.5 What is the difference in counterparty risk between an exchange traded derivative and an over-the-counter derivative?

Answer: Recall that counterparty risk is the risk that the other participant in a contract (a derivative contract, here) will not "hold up their end of the bargain." In the case of over-the-counter derivatives, the the derivative contract is privately traded between the buyer and seller/issuer, so that there is a direct relationship between the counterparties. The participants are exposed to significant counterparty risk. In the case of exchange traded derivatives, the exchange itself acts as a counterparty and garauntor to all derivatives on the exchange. Thus, traders on the exchange need only trust the company that operates the exchange and not every company with which they trade the derivatives. In the absence of the exchange, every time a trader bought or sold a derivative, he would have to understand and trust the particular company he happened to be trading with. Thus, the exchange reduces counterparty risk. In one sense, the exchange serves a function to derivatives traders similar to the function served by a commercial bank to lenders/depositors.

1.6 Repo (repurchase agreement)

Answer: In a repurchase agreement, one party sells a financial asset to another (today) in exchange for cash, with the agreement that the seller will "buy back" the asset at an agreed upon future date at a specific price. A repo can be thought of as a sale paired with a futures contract or as a collateralized loan ("You give me cash today and you get to keep my asset/collateral. Then I pay you back with interest in the future and you give back the asset.") This is a main way in which the Federal Reserve manages the money supply. The Fed buys Treasury bonds from its primary dealers via a repo,

and the primary dealer buys it back later (usually within a week or less). If the Fed initially sells the bond and then buys it back, the transcation is referred to as a "reverse repo." By buying and selling government securities in this way, the Fed is able to control the supply of money/bank reserves over the very short term.

1.7 Commercial paper

Answer: Commercial paper is a short-term corporate debt instrument that is not backed by collateral (that is, it is "unsecured") and represents a promise to repay the face value of the note to the holder of the note at the maturity (that is, it is a "promissory note"). It generally has a maturity of 270 days or less (most often 30 to 50 days) and is sold at a discount: that is, it does not pay coupon payments like many bonds do; it is sold at a price below the face value of the note and the return to holders of commercial paper is the difference between the purchase price and the payment at maturity (face value). Because it is unsecured, it is typically issued only by major companies that investors feel that they can trust.

2. Governance of the Fed See `http://www.federalreserve.gov`.
Also see the the intro, history section, and conclusion of an article of mine linked here: `http://e105.org/e266/download/xx27.pdf`

2.1 Who serves as Governors of the Federal Reserve Board? How are they selected? What are their terms? What are the main qualifications of the current Governors?

> **Answer:** Governors of the Federal Reserve Board (seven in number) are typically selected from other parts of the Federal Reserve System, academia, other policy organizations (such as the Council of Economic Advisers), or the banking and finance industry. By law, they are chosen to give a "fair representation of the financial, agricultural, industrial, and commercial interests and geographical divisions of the country." They are appointed by the President of the United States with the approval of the US Senate to serve fourteen year terms, with one of the seven terms ending on 31 January of each even-numbered year. They may not be removed from their appointment for their views on policy (to insulate them from political pressures), cannot serve multiple terms, and no two of the governors can be from any one of the twelve Reserve Bank districts. Currently, two governors' seats are vacant (vacancies are common), so there are only five Governors of the Federal Reserve Board. The current governors are Benjamin Bernanke (Chairman), Donald Kohn (Vice-Chairman), Kevin Warsh, Elizabeth Duke, and Daniel Tarullo.
>
> - Chairman Bernanke has a Ph.D. in economics from MIT, was a Professor of Economics at Princeton University, and had previously served as both a Governor of the Federal Reserve Board (2002-2005) and as Chairman of the President's Council of Economic Advisers (2005-2006).
> - Vice-Chairman Kohn has a Ph.D. in economics from the University of Michigan and has worked in various positions within the Federal Reserve System throughout his career.
> - Kevin Warsh has a J.D. from Harvard Law and has served in government as Special Assistant to the President for Economic Policy and as Executive Secretary of the National Economic Council and in the finance industry as Vice President and Executive Director of the Mergers and Acquisitions Department at Morgan Stanley.
> - Elizabeth Duke has an MBA from Old Dominion University and has worked in the finance industry as an executive officer of several banks, including Wachovia, and as member/boardmember/president of several bankers associations. She also served as a boardmember of the Federal Reserve Bank of Richmond (1998-2000).

- Daniel Tarullo has a J.D. from the University of Michigan and has served in a variety of senior positions in the Clinton Administration, worked in other areas of government (including DoJ), has practiced law, and was a professor at Harvard Law (1981-1987) and Georgetown Law.

For more, go here.

2.2 How are the presidents of the Federal Reserve Banks chosen? What is their main role in monetary policymaking?

Answer: The presidents of the twelve Federal Reserve Banks are chosen by the board of directors of the respective bank with the approval of the Board of Governors. They serve five year terms. The primary way in which Reserve Bank presidents are involved in monetary policymaking is through the Federal Open Market Committee. At any given time, five of the twelve Reserve Bank presidents are voting members of the FOMC, with the presidents rotating through the four voting seats other than that of the New York Fed (the New York Federal Reserve Bank's president has a permanent voting seat).

2.3 What is the term of the Chairman of the Fed? How are the terms of the President of the U.S. and the Chairman of the Fed Related? When does the current Chairmans term expire?

Answer: The Chairman of the Fed serves a four year term. He must also be a governor (either incumbent or newly appointed) of the Federal Reserve Board during his tenure as Chairman, and governors' terms are fourteen years long. The term of the President of the United States and the Chairman are staggered. The Chairman's term begins 31 January of the year following a President's inauguration (or of the second year after the President's election) and ends four years later, in the second year of the next Presidential term. The current Chairman, Benjamin Bernanke, is serving a term as Chairman that will expire 31 January 2014, having begun this past January (his fourteen year term as a *governor* will expire 31 January 2020).

2.4 Famous economists James Tobin and Milton Friedman (who disagreed on most issues) look at the issues raised by 2.1-2.3 and argue that the Federal Reserve is a profoundly anti-democratic institution. Why in a democratically-oriented country such as the U.S. do you suppose such an institution came into being?

Answer: The goal in the framing of the Federal Reserve was to create an institution that would effectively act in the best interest of the public, which generally means to encourage a stable, growing economy. Arguably, to achieve this goal, the Federal Reserve needs

independence from political and public pressure. Broadly, there are undesirable outcomes that could be expected to arise if the Fed were not so independent. For example, incumbent US Presidents may want the Fed to use expansionary policy to stimulate growth (which raises inflation, as a byproduct) in the period leading up to an election, since a healthy economy apparently improves the incumbent's chance of reelection. But then, the Fed would have to engage in contractionary policy later to control inflation (inducing a recession, as a byproduct). This is clearly not a desirable path for monetary policy. Alternatively, there appears to be a bias in public and in Congress toward high inflation as a way to redistribute wealth from the financially wealthy (who have assets which will lose value with inflation) to the financially poor (who tend to have more debts, the value of which would decline with inflation). This sort of redistribution could itself be called anti-democratic. And again, this is not a desirable oucome.

Thus, aware of these problems, framers of the Federal Reserve attempted to create an independent central bank, which would be more likely to provide the monetary policy most in line with the good of the public and stable economic growth. See also the Faust (1996) paper cited above.

2.5 According to the linked summary, what does the reform bill in the Senate propose regarding selection of Fed presidents? What do you think of the idea of removing conflicts of interest? Bill summary: `http://banking.senate.gov/public/_files/FinancialRefor` (Note: the bill is under change currently, so this question refers to the linked summary which may no longer be what is in the Senate.)

Answer:

Currently, member-companies of the Federal Reserve Banks vote for the Banks' directors (who are drawn from the banking community itself and the public at large) and the directors in turn choose the Banks' presidents. The bill proposes that companies that are supervised by the Federal Reserve cannot vote for the directors of the Reserve Banks, nor can current or former employees of the companies serve as directors. The bill also proposes that the president of the New York Federal Reserve Bank would be appointed by the President of the United States, with the approval of the US Senate.

There are definitely potential conflicts of interest. The idea behind the bill is that the Federal Reserve Banks oversee and regulate the banking sectors in their districts, so there is an obvious incentive for the member-companies to elect directors who will be light-handed in their regulation. Given the current crisis, there is the widespread belief that the US government needs to be more aggressive in regulating the banking sector, so the conflict of interest embodied in

the fact that member-companies (in some sense) "choose their own regulators" is potentially serious.

On the other hand, "removing conflicts of interest" is quite naive. The Fed as currently structured was built to balance conflicting interests because there was no hope of eliminating conflict in this area.

The following by your prof. will appear on the Wall Street Journal Website on Monday:

The financial crisis has provided, among other things, a civics lesson about the Federal Reserve. Some people have been surprised to learn that 5 of 12 votes on the Fed's main policy committee–the Federal Open Market Committee (FOMC)–are cast people who are not politically appointed. The 7 politically appointed Fed Governors vote on the FOMC, but the remaining 5 votes are rotate among the Reserve Bank Presidents, who are chosen by the Board's of the Reserve Banks. People on those Boards are, themselves, mainly chosen by the member banks of the Federal Reserve System. Senator Dodd's reform bill attempts to fix this problem.

This supposed fix is dangerously naive and ignores the lessons of the last great financial crisis.

The bill as reported states: "To eliminate potential conflicts of interest at Federal Reserve Banks, the Federal Reserve Act is amended to state that no company, or subsidiary or affiliate of a company that is supervised by the Board of Governors can vote for Federal Reserve Bank directors. . . "

The current arrangement of the FOMC was framed as a response to the Great Depression. The framers viewed the conflicts of interest over Fed policy as fundamental and saw no way to eliminate them. Historical precedent suggested (and still suggests) that political control of a central bank leads to lack of discipline and inflation. But complete absence of political influence is also inappropriate in a Democracy.

Thus, the FOMC's framers looked to the uniquely American solution of checks and balances. In particular, they called upon two widely despised groups during the depression-bankers and politicians-to balance each other's worst impulses.

Representative Glass and Senator Steagall, of Glass-Steagall fame, fought tenaciously over the balance. Steagall proposed that only the politically-appointed governors would vote on the FOMC. Glass responded that Steagall was "without peer in his advocacy of inflation." After heated debate, Congress arrived at the 7 to 5 split we have today. Senator Glass summarized the reasoning, "[The vote on the FOMC] will stand 5 to 7 giving the people of the country, as contradistinguished from private banking interest, control by a vote

of 7 to 5. . . " There can be no doubt that the Congress sought to achieve a balance of fundamentally conflicting interests.

I am not arguing that Congress got the balance right, and the recent crisis is certainly reason enough to re-visit what the correct balance would be. But naively fiddling with the balance in the name of eliminating conflicts of interest misses the real civics lesson from the founding of the Fed's FOMC.

2.6 Some argue that section 13.3 of the Federal Reserve Act is particularly troubling from a democratic perspective. What is section 13.3 and why has it been important recently? Note: you might want to read a brief piece Bob Barbera and I wrote on this: `http://www.voxeu.org/index.php?q=node/3244`

Answer: Section 13.3 of the Federal Reserve Act gives the Federel Reserve the authority to lend to essentiall any private entity under very few restrictions (the loans must, vaguely, be "secured to the satisfaction of the Federal Reserve bank") if circumstances are deemed "unusual and exigent" (which requires the votes of five of seven of the governors of the Federal Reserve System). Many people find the act troubling because they feel it essentially gives the government the authority to give loans to almost anyone that it feels deserves a loan, which seems inherently un-democratic to many. For example, see this article.

This section of the Federal Reserve Act has been important recently because it is the law that has given the Fed the authority to "bail out" many of the companies it has assisted in the crisis. The largest case is the bail out of AIG, in which the Fed gave emergency loans to the failing company, with a variety of terms and conditions attached. Thus, the Fed has determined that the current crisis constitutes "unusual and exigent circumstances."

All quotes here are from Section 13.3 of the Federal Reserve Act.

3. Bank reserves

3.1. What are reserves of a commercial bank? Required reserves? Excess reserves? In what form can reserves be held?

> **Answer:** The total reserves of a commercial bank are composed of required reserves and excess reserves, and are essentially just a very liquid asset. Required reserves are reserves that a bank must hold by law. They are a certain fraction of deposits (where the fraction varies depending upon the type of deposit/liability and the size of the bank). Any reserves the bank holds over and above that required by law is called excess reserves. Reserves can be held in one of two forms: vault cash (currency held in storage at the bank itself) and deposits at one of the twelve Federal Reserve Banks. Previously, reserves held at the Fed did not earn interest, but during the crisis, the Fed began paying interest (at a low rate).

3.2 Using monthly data, plot excess reserves of commercial banks against time. Note: The data can be obtained from the St. Louis Fed. FRED data on the web. Hand in the plot.

Answer:

3.3 Two events in the Fall of 2008 explain the sharp rise in excess reserves, what are these?
Note: You may want to read the N.Y. Feds discussion of the payment of interest in there annual report for 2008 on Fed operations. http://www.newyorkfed.org/markets/annual_reports.ht

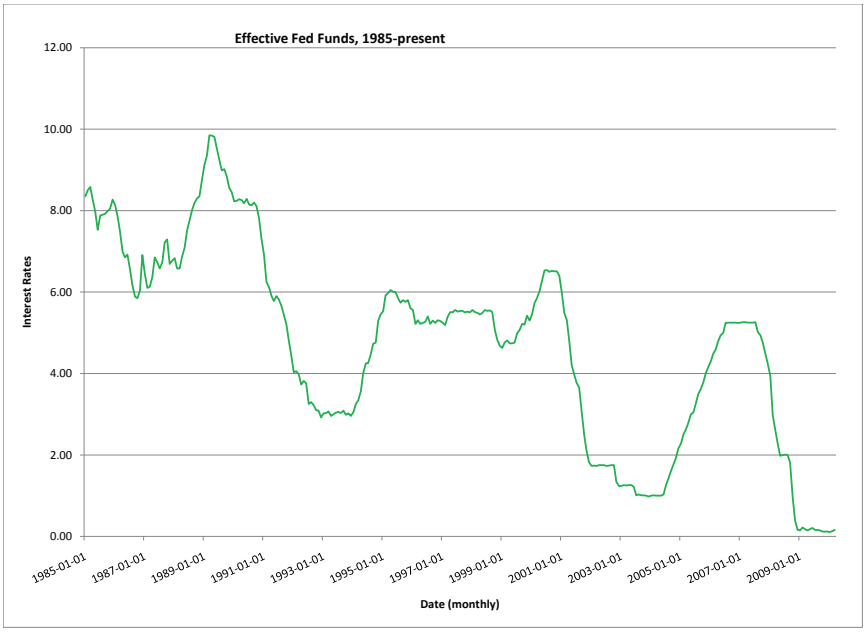
Answer: The following three are all reasons:

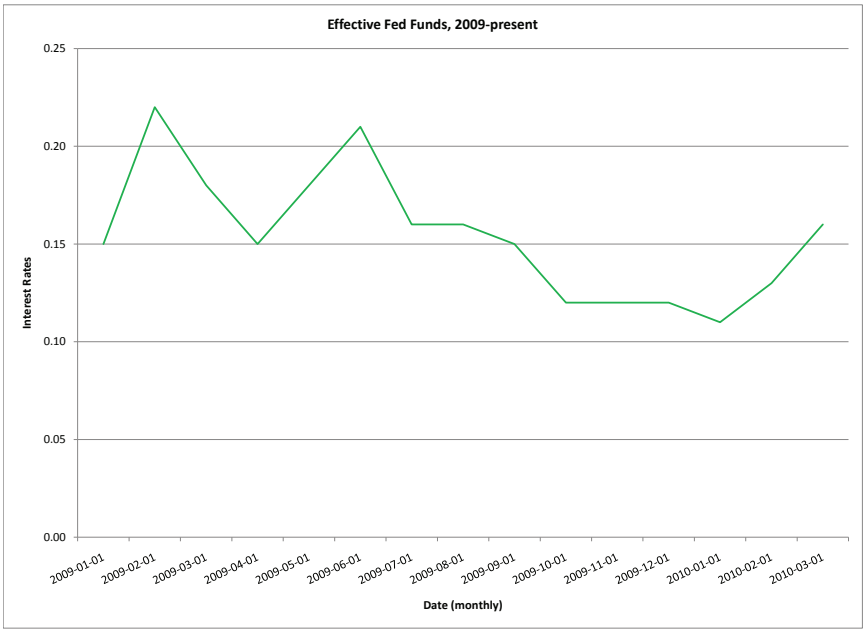
- The Fed began paying interest on reserves held at the Fed, reducing the opportunity cost of holding reserves.
- The financial crisis, especially following Lehman and AIG, caused banks to shift to safer and more liquid assets to protect themselves against runs and, more generally, financial losses associated with the crisis.
- Very low interest rates prevailing in the market also reduced the opportunity cost of hold reserves.

4. Monetary policy in normal times. By normal times, we mean recent times. I mean that the main way policy is conducted is by setting and attempting to hit a target for the federal funds rate. With the rate at effectively zero lately, other methods have been used, but we will presumably return to more normal times in the near-ish future.

4.1 Plot monthly data for the effective federal funds rate since, say, 1985. (Once again, this can be done in FRED and should be handed in.). Create a graph over a shorter period, say 1 year or so. How does this differ from the graph of most market interest rates?

> **Answer:**Note the low level of interest rates in the second graph. Compared to most other interest rates (especially longer term interest rates), the effective fed funds rate is currently very low. It is also nearly a step function, being nearly constant for long periods before moving. Other rates are much more volatile.





4.2 Suppose that the market is pushing the fed funds rate below the Feds target. What would the Fed do to get the rate back to target?

> **Answer:** The Fed should begin shrinking the supply of reserves by selling Treasury securities. Intuitively, this reduces the supply of bank reserves and so, by basic economic reasoning, raises their price (which is the fed funds rate).

4.3 Explain why, so long as the Fed lends freely through the discount window at the Feds discount rate, the discount rate should put a ceiling on the highest rate at which banks will exchange funds in the Fed funds market. (Note: This presumes that banks see no stigma in going to the window.).

> **Answer:** This places a ceiling on the fed funds rate because banks seeking to borrow funds would not choose to borrow at a rate higher than the discount rate, since they could get a lower rate by using the discount window (since both the fed funds market and the discount window are sources of short term funds).

4.4 The Fed recently began paying interest on reserves that banks hold at the Fed. Explain why the interest rate on reserves should put a floor on the lowest rate at which banks will exchange funds in the federal funds market.

Answer: This places a floor on the fed funds rate because banks seeking to lend funds would not choose to lend at a rate lower than the rate paid on reserves, since they could risklessly earn a higher rate by depositing the money at the Fed (since both the fed funds market and deposit accounts at the Fed are liquid mechanisms for short-term savings).