FINANCIAL INTRUMENTS AND CAPITAL MARKETS (EC247)

The liquidity problems affecting money markets in 2007-08 have been described as "a run on repo". Describe in detail how a bank run arises. Explain the liquidity problems that affected the money markets in 2007-08, drawing analogies between these and a traditional bank run. Throughout your essay take care to explain the nature of the financial instruments and markets you discuss.

Around the period of 2007-2008, the world faced a horrifying financial catastrophe which many countries today are still trying to recover from. This has been extensively compared to the Great Depression of the 1930's. It is vital for such comparisons to be made as there could be trends that lead to such economic disasters which could possibly be noted and avoided in the near future. The crisis was a run on financial institutions. Brunnermeier (2009) suggests that a state of low interest rates in the United States prior to the crisis resulted in the bursting of the housing bubble thereby forcing banks to write down several hundred billion dollars in bad loans caused by mortgage delinquencies. This implies that banks and other lending institutions did not effectively assess the individual's borrower's ability to repay their long term liabilities. Hence, the subprime mortgage markets have been underlined as one of the key triggers. Partly the banking system is to blame. If more caution was taken when issuing out loans regardless of the level of demand for mortgages, the world may not have been in this tragedy. Although others may blame it on the regulators for keeping interest rates too low. According to Brunnermeier (2009), it was during the time when interest rates were low and a burst in the internet bubble occurred that the banking system underwent transformation. This crisis has had a profound impact on a number of financial institutions and markets. A bank is an example of a financial institution that was greatly affected. It is a place where people save and borrow money. The bank uses a fraction of the people's deposits to make loans which cannot be easily sold at high prices.

On the other hand, banks issue out demand deposits that allow depositors to withdraw their assets at any time. The ease with which an asset can be used for transactions is known as liquidity. Diamond (2007) further suggests that the mismatch in which banks liabilities (deposits) are more liquid than their assets (loans) is the ultimate cause for bank runs. A bank run is a situation where all the depositors withdraw their deposits at the same time with the expectation that the bank will fail. This can be triggered by many factors but mainly speculations. Bank runs can be extremely contagious and dangerous. This was the case in the period of 2007-2008 when the world's famous banks, Lehman Brothers in the United States and Northern Rock of the UK were faced with such an unfortunate crisis. During this period, instead of a bank run getting driven by the withdrawal of deposits, it was driven by the withdrawal of repurchase (repo) agreements, hence being described as a run on repo (Gorton & Metrick, 2012).

Diamond and Dybvig (1983) argue that the creation of liquidity is an important function of banks (cited in Diamond, 2007). Why is liquidity so important? As a result of uncertainties of when depositors will want to consume their assets, having an asset that can be used at any time is vital for them. However, when financial institutions such as banks fail to create liquidity the implications that come with it can be severe. For example, the money market, which is a segment of the financial market in which instruments with high liquidity and very short maturities are traded, will be extremely affected.

Diamond (2007) explains how a bank can create liquidity even though it invests in an illiquid asset$(R = 1, R_2 = 2)$. Diamond in this example assumes a mutual bank with no equity. I am going to further assume that at T_0 there are 100 depositors that come in two types; Type 1

depositors consume at T_1 and type 2 depositors consume at T_2, for simplicities sake. 100 deposits are made (each making a deposit of 1 unit). The bank offers $r_1 = 1.25$ per unit to those who withdraw at T_1 and Of the 100 depositors 55 withdraw at T_1. Meaning the bank liquidates $35 \times 1.25 = 43.75\ units$ at T_1, the bank then remains with $(100 - 43.75) = 56.25 units$ which at least are guaranteed to mature at T_2.Note that; at T_1, the bank's portfolio is worth $100 \times 1 = 100\ units$. At T_2 the bank's portfolio is now worth $56.25 \times 2 = 112.50$ and the remaining 45 depositors need to be paid. Each depositor receives $r_2 = \frac{(100-43.75)2}{65} = 1.73\ (to\ 2\ decimal\ places)$ per unit which depends on the remaining investments of 56.25 at date 1. From this observation, we can conclude that depositors prefer liquid assets than keeping them under a mattress. This is because they make a positive return on deposits as noted. In addition the bank offers demand deposits for all depositors. Hence these are the major, If not the only reasons why people make deposits with the bank.

With the increased demand for liquidity, people make thousands of deposits from which the bank uses a fraction of those deposits to make loans. The remaining fraction not used for loans is kept in a reserve. This is what is referred to as fractional reserve banking. For simplicities sake let's assume depositors make their deposits at the same time, known as T_0. The bank then uses the deposits to make loans that will mature at a time T_2. The value of the loan on the maturity date is normally greater than the present value of the loan. The difference in value when the loan has matured is the banks income R (which is normally the interest rate). At T_0 the depositors have no knowledge of what type they will be, they only get to know what type they are at T_1. This is because the type 1 depositor will withdraw at T_1 and the type 2 depositor waits until T_2. This is a situation that is referred to as a good equilibrium. However, a bad equilibrium (a bank run) occurs if both the type one and type 2

depositors withdraw at T_1 mainly because the type 2 depositors are expecting everyone else to do so (Diamond, 2007). Note that banks are never certain of when each depositor will withdraw but expect people not to withdraw at the same time (a situation that is referred to as a bank run).The fact that only depositors and not banks have knowledge of when each depositor will withdraw is a huge disadvantage to the banking system.

A numerical example of a bank run is explained using Diamond and Dybvig (1983) model (cited in Diamond, 2007) Project returns are given by: $R_1 = 1, R_2 = 2$. With 100 depositors and a deposit of 1 unit each, the bank has 100 units at t_0. It offers $r_1 = 1.2$ to those who withdraw at t_1. The return at $t_2(r_2)$ depends on the remaining investments. 55 depositors withdraw at t_1, the bank pays $55 \times 1.2 = 66\, units$. At t_2 the yield is $(100 - 66) \times 2 = 68$, giving $r_2 = \frac{68}{45} = 1.511$. Type 2 depositors are rational to wait if possible. This is a good illustration of a good equilibrium. On the other hand, keeping fixed the number of depositors and the returns, 75 depositors withdraw at t_1, the bank liquidates $75 \times 1.2 = 90\, units$. At t_2 the yield is $(100 - 90) \times 2 = 20$, giving $r_2 = \frac{20}{25} = 0.8\, per\ unit$. All types of depositors will choose to run at t_1. However, the bank cannot afford to pay$100 \times 1.2 = 120\, units$ and it defaults. This is because it only has 100 units in its portfolio at date 1. This is a good illustration of a bad equilibrium (bank ran).The bank offers the type 1 depositor r_1 and the type 2 depositor r_2 on their respective liquidation dates t_1 and t_2 respectively. The proceeds are normally greater than the initial investment because the bank pays interest on the investments made by the depositors.

A type 1 depositor is normally the one who has emergency financial commitments such as bills at $t_1$and has no other financial means to deal with the commitments. In a bank run situation, Both the type 1 and type 2 depositors can be forced to withdraw at the same time, t_1(bank run) if they are made to believe a negative rumour about the banks position such as "the bank is going through financial difficulties and is likely to fail" which can be spread using the media. Such a predicament eventually comes to pass because all depositors withdraw their assets from the bank even though it was in a good position. Even if the rumour is not true majority of depositor may assume other depositors will believe the news, hence to be on the safe side they too decide to withdraw. Another reason that can trigger such an event could be Long queues in banks and at cash points lasting long hours. This sends out the wrong message and may appear as though the bank has not got enough resources to pay its depositors. This can prompt other people to also withdraw. In order to avoid such tragic events from happening, several new measures and policies have been put in place. For example, the governments have introduced deposit insurance schemes to protect all depositors (Diamond, 2007). Nothing said by officials of the bank to convince people that their savings are safe and the bank is safe will make them change their mind. This was the case with Northern rock, when the bank of England stepped in as the lender of last resort and the former UK chancellor of Exchequer, Made a statement on national television to assure everyone that their deposits are safe. However, people still didn't believe him (see BBC News 2008).

In 2007 Northern Rock was one of the first UK banks to have experienced a bank run. According to Alistair Darling, Northern rock was a small bank that used aggressive policies to expand market share. He further stated that the bank did not have enough deposits to meet

the demand for loans, Hence it went to the American wholesale markets which were largely funded by doggy financial instruments (BBC News, 2012). In 2007 when people in America panicked, the market was forced to liquidate its assets and northern rock run out of money. It was visited by long queues and determined depositors that where ready to withdraw all their assets. Failure to reinstall confidence in the people during the run, the bank was later nationalised by the government in the year 2008. This was a measure taken to save the bank from becoming non-existence.

Based on observations, a credit boom is always followed by a crisis. Prior to the recent economic crisis, a boom in the subprime mortgage market may have influenced banks decisions to finance their long term illiquid assets with short term liquid assets. This was mainly as a result of lack of sufficient deposits held to make more loans to meet the demand of borrowers. Gorton & Metrick (2012) have expressed how the credit boom took the form of an increase in the issuance of asset-backed securities which are related to the development and function of the shadow banking system. In the shadow banking system off-balance sheet finance was the main product and these were mainly financed by private collateral. Securitization was a response used when the traditional banking system started becoming unpopular among money market participants. This was the case with Northern Rock. The money market which deals in short term debts and highly liquid assets, was the number one target as demand for liquidity increased.

The recent economic crisis is characterised with a run on securitization, mainly repos, which are associated with shadow banking. According to Gorton & Metrick (2012), the traditional banking model was seen to be less profitable in the face of competitions from the money

market mutual funds. Levinson (2014) describes a money market mutual fund as an entity of the money market that pools securities in the money market, allowing investors to spread risk among the various company and government securities held by the fund. A traditional bank run involves the run on insured demand deposits by depositors as a result of fear of losing their assets if the banking system is not appearing stable. The deposit insurance in this type of a model is intended to eliminate any incentives to withdraw, but with uncertainties and shocks in the banking system runs can still occur. On the other hand, a run on collateral that mainly takes the form of repo agreements is what is associated with securitization. A repo is an agreement between two agents in which one buys an asset from the other for a certain amount, with the asset sold as collateral, and promises to repurchase the asset at a later date for a given price which includes the original price purchased for plus an additional amount. The additional amount is referred to as a haircut. Gorton & Metrick (2012) define a haircut as the value of the underlying asset less the amount of the deposit which is lower than the assets value. Northern rock was one of the banks that suffered largely by involving itself in wholesale markets in the US where it got obtained finance and used the mortgages it made as collateral. This back fired on the bank when the subprime market started to shake in 2007.

According to Blinder et al (2012), "the secured nature of the repo agreements in which lenders gave loans that were less than the asset value of the collateral received gave firms and regulators confidence that runs were unlikely". However, the unexpected seemed to have shocked everyone. During the crisis, with the turn of events from the subprime markets and uncertainty in the banking system as bank balance sheets begun to depreciate, haircuts were seen to have risen reaching an unbearable level causing investment in the repo market

to fall as assets became more risky to deal with. This was a measure that acted in the best interest of the investors. However, borrowers may have found this expensive. The level of risk was too high that some investors opted not to make any further investments which can be concluded from a drop in lending. This rise was enforced by investors mainly because of the fear of having to be forced to sale the collateral obtained in the repo agreement in a more illiquid market if the borrower defaults. Blinder et al state how forced sales of assets resulted in a drop in asset prices, volatile asset prices and weakened the financial position of all holders of such assets. Hence, reselling the assets held as collateral was not that rewarding for asset holders. Buyers were probably not willing to pay the requested amount from the sellers in a problematic economy. The amount of funds available to fund transactions in the market began to fall, resulting to increased concern about its solvency. Gorton & Metrick (2012) stated that reselling collateral drives the assets price down which then reinforces the cycle; lower prices , less collateral, more concerns about solvency, and ever increasing haircuts. The diagram below shows repo-haircut rates in each of the years beginning 2007-2009 (Gorton & Metrick, 2012).

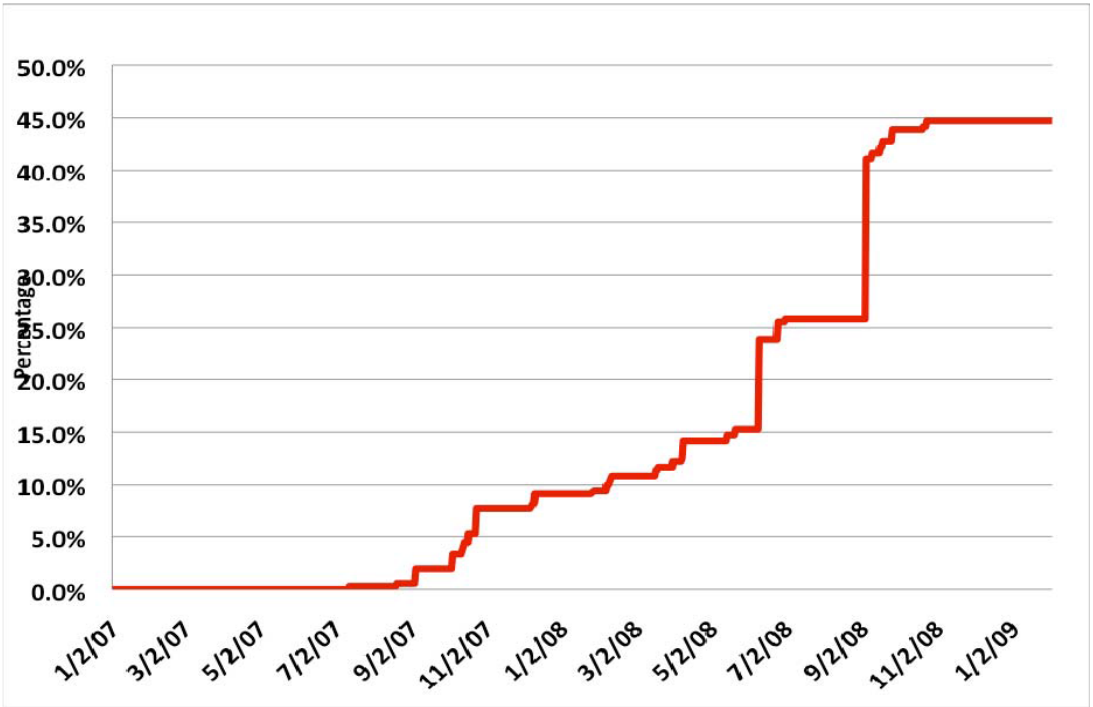

Fig 4: The repo-haircut index is the equally-weighted average haircut for all nine asset classes included in Table I, Panel D.

From the figure, the rate at which the haircuts were rising demonstrated that there was serious damage in the market by the year 2009. From these results we can conclude that confidence was lost and borrowing became difficult as it became more costly with the increased haircuts.

Commercial papers are another instrument that the banking sector and other financial institutions use to finance their long and short term liabilities. Banks and other financial intermediaries used this method to finance long term liabilities in which the debt was known as the asset-backed Commercial Paper (ABCP). In this market banks bundle up mortgages and other loans into off-balance sheet vehicles. It is considered to be a cost effective market as it is not regulated so long as the assets mature within a period of nine months. These were

highly liquid markets which were on high demand prior to the crisis even though they have been in existence for a while. As a market that had exposure to high risk subprime- related securities, it too got affected when the subprime market started experiencing difficulties. Structure investment vehicles and many other asset backed programmes were unable to roll over their commercial paper as investors pulled back, and the programmes were forced to draw on liquidating lines from banks or to sell assets (Gorton & Metrick, 2012). This meant that banks had to pay off debts owned by a defaulted borrower as an initial agreement made between the bank and the borrower. Interest rates on the papers increased as some investment corporations like American Home Mortgage Investment corp. failed to pay its liabilities and declared bankruptcy in 2007. Such events caused for concern and money market participants became reluctant to lend to each other (Brunnermeier, 2009) and the market risked insolvency.

In addition, the inter-bank lending was another method used during the crisis and still use to this day to finance themselves. The LIBOR standing for London inter-bank offered rate places a huge role in this instrument. Banks usually lend loans to each other that are unsecured and short term. They usually agree on an interest rate. However, the LIBOR is an average rate at which banks should lend to each other as stated in (Brunnermeier, 2009). In times of uncertainties interest rates at which banks lend to each other are higher which are reflected in the rise of the LIBOR. This was the case during the financial crisis when institutions started facing problems. Faced with uncertainties, banks became reluctant to lend to each other causing a fall in money circulation.

With the panic that took over the financial markets, central banks stepped in as lenders of last result and help prevent some financial institutions from failing. Policies have since been implemented by the government and central banks to ensure financial institutions operate in a more safe but productive manner. The fact that in securitized banking there is no borrowing from central banks puts institutions in a worse position unlike traditional banking.

In conclusion, the 2007-2008 crisis was a run mainly driven by repurchase agreements because it is the largest and fastest growing market. However, other money market instruments played a role in escalating the crisis. We can see how financial markets can be affected if one market has trouble. With runs in the financial markets, financial institutions should take more care to avoid them from happening by carrying out strict and well monitored operations.

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