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Why finance crashed?

Finance has special characteristics that make it inherently unstable

You would never buy a car without taking it for a test drive. Even when you buy TVs or refrigerators, you can return them if they malfunction in the first 30 days. But it is **not possible to road test financial products**.

The damage caused by a bad service experience at a restaurant or buying an apple that turns out to taste bad is limited. Besides, you can change your purchasing behaviour and avoid going to that same restaurant or buying apples from that shop. By contrast, the first time you realize that the insurance you bought is inappropriate is after your house has burnt down. By the time you find out that the pension you were going to live off will provide only half of what you expected, it is too late to change to another pension plan. **Finance has long-term consequences.**

The market economy is based on 'caveat emptor' or 'let the buyer beware' and this principle works well when buyers have repeated transactions with sellers. Good sellers get rewarded and those who do not offer good value go out of business. But because you cannot touch or try financial products, and because of the potential life-long consequences of financial decisions **trust is critical to finance.**

Competing shoe stores do not trade much with each other. If one of the three shoe stores on your high street fails, it is good for business for the two left standing. Unlike in the real economy, competing financial actors, especially banks, are often also counter-parties. For example, banks do not only take deposits from customers but also borrow and lend large amounts to each other in order to adjust the supply and demand for funds. That is why the failure of one bank can potentially inflict large losses on its competitors which are also its counterparties. This also applies to many other financial institutions. **The failure of a bank can be bad for other banks – this state of affairs makes finance systemic.**

When the price of most real goods increases, it drives demand down. The increasing price of an espresso will no doubt drive down consumption, first by students living hand to mouth and then as the price

increases further, by other less financially constrained actors. Now imagine that house prices have been increasing for a while. You look at the market and you think – I must try and buy a house while I can still afford it. Rising house prices may induce some people to bring forward their planned purchase. Moreover, if one expects prices to keep rising, speculators, who believe that can buy low now and sell high later, get attracted to the market. This additional demand arising from both actors with real economic motives and speculators will drive house prices up further. **Rising prices might drive up the demand for financial assets. Finance is procyclical.**

The fundamental value of financial assets supposedly reflects the cash flows they are expected to generate, discounted to present value. Since these cash flows cannot be known in advance they are merely long-term projections. Their expected value is quite volatile and depends on a large number of factors such as expectations of economic growth, degree of competition and demographic trends. The discount rates which depend on prevailing and expected interest rates are also volatile. Even very small changes in assumptions, economic circumstances and discount rates can have quite profound repercussions for the price of a financial security. For example, changing the discount rate by a factor of 1/10th may change the present value by as much as 20%. The fundamental value of assets is uncertain and this **uncertainty makes financial markets volatile.**

Seeing that Billy made a killing in the stock market might make you want to play the market. Since the 'real' value of financial assets is driven by a complex set of factors and because many financial actors are thought to know more about this real value than others such as retail investors, a rising price of financial assets can indicate that these other actors know something that you don't. So it might be good strategy to buy when these other actors who probably know something you don't buy and sell when they sell. There is thus a tendency for investors to buy when the price is rising and sell when the price falls. **Financial markets have a strong tendency to herd.**

The facts that financial markets have long-term consequences, depend on trust, are systemic, procyclical, uncertain and prone to herding makes the financial system inherently unstable.

Human psychological biases further amplify this instability

The inherent instability of finance is amplified by patterns of behaviour that human beings are prone to. Our proclivity to project the future from recent observations makes us susceptible to procyclical behaviour where upon seeing a security with a rising price we expect the rise to continue and may decide to buy it in a bid to profit from such a rise. This reinforces the price rise and leads to bigger fluctuations in the prices of assets than would otherwise be the case. **This trending bias amplifies procyclicality in the financial system.**

Human beings are optimistic animals and have a strong tendency to overrate their own ability. More than 80 percent of people in most surveys rank themselves as above average on a number of positive parameters such as driving skills, intelligence and fitness. While this positive attitude is helpful in enabling us to cope with the vicissitudes of life, it can be dangerous in financial markets. Traders often attribute successful trades to their own superior ability while bad bets are often explained away as being

down to bad market conditions. There is an asymmetric reinforcement of confidence – profits are put down to skill; losses to external factors. This unjustified faith in their own ability causes a whole range of financial market participants to take on more risk than optimal. **This attribution bias induces us to take excessive financial risks.**

Finance has changed

While new fangled complex financial products have often been fingered as having caused this crisis, the discussion above shows that finance has always been characterized by factors that make it inherently unstable. That is why the history of financial crises and instability is almost as old as the very origin of finance. The now well known Tulip Mania and South Sea bubble were only two out of many crashes that have afflicted the financial system over the centuries before the advent of complex derivative securities.

Nevertheless, evidence clearly points to the fact that the size, frequency and scope of financial crises has increased in recent decades with the ongoing financial crisis being almost unprecedented in size and scope. This trend towards increased financial instability has been driven by a number of factors that have changed the nature of the financial system almost beyond recognition. Two factors have been particularly important in driving and enabling these changes.

- 1) The deregulation of financial markets that started to take hold in the late 1970s and was driven by a growing belief in the self correcting nature of markets and that they would allocate resources efficiently. It was championed by the IMF and the World Bank, academics such as the Chicago School and politicians such as Margaret Thatcher and Ronald Regan. This included a gradual dismantling of the strict regulation that had characterized the financial sector since the Great Depression - a removal of capital controls and a lifting of restrictions on what financial institutions could or could not do.
- 2) The advent of telecommunication and computational technology made possible the development of complex financial products and the execution of financial strategies that even though allowed in the newly deregulated system would not have been possible in a world of hand held calculators and slow communications. Computers allowed derivatives and other complex products such as the Collateralized Debt Obligations, fingered in this crisis, to be priced quickly so they could be sold and a market could be established. The advent of cheap and reliable internet and telecommunication technology allowed connections between previously distinct market categories and geographies to be established.

Taken together these technological developments facilitated a massive expansion in the variety, scope, scale and speed of financial activities that would not have been possible without these tools and was not allowed before deregulation and the dismantling of capital controls took hold. Most changes to the financial system can be attributed to the confluence of these two developments. In fact, technological advances increased the confidence of regulators in supposedly 'sophisticated' risk management, pricing models and financial strategies and perhaps drove them to deregulate further than they would have in

the absence of technological advances. The two processes of deregulation and technological advances in finance reinforced each other.

Financial products do not have patents so are easy to copy - profit margins can be easily eroded. Banks came up with increasingly complex products partly to make them harder to copy. Highly complex products are difficult for non-specialist customers and investors to understand so banks can derive higher profit margins by exploiting this gap in understanding. This asymmetry in understanding also operates with regulators so banks gamed regulations by using complex products. The now notorious CDO squared required going through 1 billion pages in order to fully assess the associated risks. It is clear that no one, not even the banks, read those billion pages. The incentives of the financial system to sell ever more complex products combined with advances in technology that allowed them to churn these out in ever higher volume and increasingly exotic forms. **The financial system became more complex.**

Most regulations were focussed on banks which had to meet certain minimum standards of capital, had to meet high levels of disclosure and faced certain restrictions on behaviour. This was one of the factors that led to the growth of the shadow banking system comprising of financial institutions such as hedge funds and money market funds that did not face similar restrictions. Banks got into the game too by sponsoring the so called 'special investment vehicles' that lay 'off balance sheet' and thus outside the purview of bank regulation while at the same time de-facto being part of the banks. Importantly, these faced few if any capital or disclosure requirements so banks used them to make risky investments. By 2007, the shadow banking system in the US was worth \$5,900bn not significantly smaller than the banking system which registered a size of \$9,400bn.

Banks also started to increasingly trade in complex derivative securities that derive their value from financial or real economy indices such as shares or commodity prices. The simplest is a future where two parties agree to exchange a security such as a share for a set price on a set date. Others such as interest rate swaps where parties agree to exchange fixed and floating interest payment streams are more complex. Derivatives can be based on pretty much anything and structured in many different ways, as long as two parties are willing to trade risks and can agree on a price. There was a proliferation in such securities being traded bilaterally in the so called 'over the counter' derivative market. Such derivative exposures were kept off balance sheet, had lax capital requirements and almost no reporting and disclosure requirements whatsoever.

As banks increased the functional and geographic scope of their operations, they increasingly started using so called 'tax havens' that combined low taxes, low transparency and lax regulations in a bid to minimise tax and regulatory obligations, increase profits and reduce regulatory scrutiny. Citicorp alone now has 427 subsidiaries in tax havens with other large banks not far behind.

This combination of opaque products, the increasing size of the shadow banking system and off balance sheet entities and proliferation of tax haven subsidiaries significantly reduced the degree of transparency in the financial system. A Russian doll metaphor of layers of secrecy characterized by

opaque derivatives being held off balance sheet in a tax haven subsidiary describes the situation quite well. **The financial system has become increasingly opaque.**

The expansion and internationalization of financial markets is well-known. Between 1990 and 2008, for example, derivative markets expanded from about 10 times world GDP to about 55 times world GDP. Markets in stocks and bonds also exhibited rapid expansion as did markets in foreign exchange. This expansion in turnover was attributable to both an increase in the value of the underlying assets as well as the speed and frequency of transactions. The average holding period for large US shares, for example, has shrunk from more than two years to 2-3 months. A Financial Times report registered 90 trades and 72 price changes in the stock of Vodafone in less than a minute on a typical day. **Financial markets have not just expanded in size but have also seen a rapid increase in the speed and frequency of transactions.**

The expansion in the size of the banking system in general and some banks in particular was no less spectacular though it remains less widely known. The Bank of England has shown that the UK bank balance sheet to GDP ratio expanded from about 50% of GDP in the 1970s to more than 600% by the time the crisis hit. Before the 1970s the ratio had been nearly constant for almost a century. Banks such as Kaupthing of Iceland and UBS of Switzerland expanded internationally at almost an exponential pace. By 2007, Kaupthing had assets of 623% of the GDP of Iceland and UBS boasted a balance sheet that weighted in at 484% of Swiss GDP. The total assets held by the world's largest banks roughly doubled in the five years up to 2008. Another aspect of the growth and internationalization of banks was the rapid growth in their subsidiaries. Citibank operates in more than 100 countries and at last count boasted of 2,435 subsidiaries. Deutsche Bank which is far less international already clocks up 1,954 subsidiaries. **Both financial markets and financial institutions expanded to an unprecedented size and international presence.**

Banks and other financial actors took on excessive risks

Imagine that you have the possibility to invest \$100 in a project that will generate \$10 in profit annually and are able to borrow at an interest rate of 5%. One option for doing this is to not borrow at all but invest \$100 of your own money (zero leverage). You will generate a 10% return on your 'equity'. Now consider that you borrowed half of the \$100 so you put in \$50 of your own money and \$50 borrowed at 5% (leverage ratio 1). You will still earn \$10 but will have to pay $\$50 \times 5\% = \2.5 in interest. So you will earn a profit of \$7.5 on your \$50 investment or a return of 15%. Now imagine that you are able to borrow \$90 (leverage 9). Now your interest payment would be $\$90 \times 5\% = \4.5 . Your profit would then be \$5.5 giving you a return of 55% on the \$10 invested. As long as the rate of interest payable is lower than the intrinsic rate of return on your investment, you can potentially earn higher and higher rates of profits. If you had borrowed \$99 of the \$100 investment required your return on equity would have been a full 505%.

This magic of leverage which amplifies profit also amplifies losses. If you had borrowed \$50 and saw a loss of \$10 then your total loss would be $\$10 + 5\% \times \$50 = 12.5$ since the interest on the amount

borrowed needs to be paid whether you register a loss or a profit. Similarly for a leverage of 5, your loss would be $\$10 + 5\% \times \$80 = \$14$ which is 70% of the capital you had invested. At a leverage of 9 you are have already lost your capital and owe your creditors \$4.5.

In order to maximize profits in the form of rates of return on equity, banks across the world loaded up on leverage. In fact, immediately before the crisis hit, leverage ratios for banks such as UBS and Deutsche Bank exceeded 60 with other banks such as Barclays, SocGen, RBS and Credit Suisse all coming in over 30. Higher leverage more or less fully accounts for the rise in UK banks' returns on equity up until 2007 with average leverage doubling in the decade in the run up to the crisis. The leverage of UK banks, for example, increased by two thirds in the 5 years in the run up to the crisis.

Leverage is risky and yet banks and financial institutions around the world loaded up on it in order to try and maximize their profits and the bonuses paid to employees. Because the financial system had unprecedented amounts of leverage coming into 2007, even a small loss had the potential to wipe out financial institutions.

Lenders are willing to lend for short term at a lower interest rate than over the long term. This is because the longer the time between the loan being made and repayment, the greater the danger than something might go wrong and the money does not get repaid. For example, at prevailing interest rates, borrowing over a 2-3 year horizon costs almost 2% more than borrowing for less than 1 month. Let us say that a bank faces a choice between borrowing short term vs. borrowing medium term. Assuming that the bank would put the money to the same use, say making a ten year loan at 5%, it can make a significantly higher return borrowing over the shorter horizon. This model works well as long as banks can roll over their borrowing regularly but collapses when the short term funding dries up as it did during the crisis.

Historically, banks in the UK, for example, funded most of the loans they made through more stable customer deposits but increasingly in the run up to the crisis, more and more of these loans were financed by short term borrowing. Just before the crisis hit, more than 25% of customer loans made in the UK were funded by short term borrowing. The other way to earn a high spread is to increase the duration of the loans the institution makes. Banks also engaged in this on a large scale. In the UK, for example, the major clearing banks held around 30% of their assets in short-term liquid instruments in the 1970s. Today that liquid assets ratio is about 1%.

Increasing the maturity gap between the loans made and the sources of funds used to make those loans earned excess spreads for banks and higher bonuses for their employees but it came at the cost of making the institution as well as the system much more risky. **In the run up to the crisis, banks and other financial institutions were engaging in record levels of maturity mismatch between assets and liabilities that led to a significant increase in overall risk to the financial system from the sources of funds drying up.**

How the crisis unfolded?

In previous sections we have shown that we have had a financial system 1) that is inherently fragile 2) with this fragility enhanced by human psychological biases. 3) This system changed rapidly driven by the twin forces of deregulation and technological development and became 4) more opaque 5) and increasingly complex. Clearly such a system is very fragile and the high levels of complexity and opacity mean that any time something goes wrong with the system, trust, which we have shown is central to finance, can disappear rapidly. It was exactly this sudden loss of trust which led to the seizure of the short term funding markets that left many financial institutions without enough funds to meet their commitments and was the immediate cause of the failure of Lehman Brothers. Faced with uncertainty over complex but opaque risks that counterparties might be exposed to, financial entities made logical decisions to hold on to their funds and stop trading with other banks and lending to them. Central banks had to step in with unprecedented levels of support to fill this breach.

Technology and deregulation also facilitated the system becoming 6) larger, 7) more international and 8) faster than ever before. This ensured that if a financial shock were to hit, its impact on the real economy would be large and would be felt quickly internationally. This is exactly what happened. Because of the international nature of several financial markets and institutions, the impacts of the subprime losses were felt globally and the first and second order disturbances in financial markets were transmitted rather quickly across borders. The large size of the institutions involved almost guaranteed that the damage to the real economy would be substantial. It was the combination of the large size, international scope and the increased speed of financial markets and decisions by financial actors that turned what was a local problem in a small section of the US real estate market into a global crisis.

More recent trends, especially in the past decade or so, involved a significant increase in the degree of risk that financial actors in general and financial institutions such as banks in particular took. Leverage and maturity mismatches increased to unprecedented levels. The dependence on short term funding proved fatal when trust and confidence in the financial system broke down and short term borrowing could no longer be rolled over. Central banks needed to intervene at an unprecedented scale to support financial markets and provide trillions of dollars of short term funds.

High levels of leverage meant that even small losses were amplified in terms of the impact on capital and many financial institutions had to be recapitalized by governments because all of their negligible reserves of capital were eroded by these losses and they were effectively insolvent. The total costs of this liquidity and capital support now exceeds \$15 trillion or 25% of world GDP.