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Systemic Risk: A Review

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Abstract:
As the interlinking of financial markets continuously increases, regulators particularly in the banking industry are beginning to get alarmed about how systemic risk is affecting this sector. Systemic risk was seen as the main cause of the 2008 worldwide financial collapse. It thrives in an interbank market environment where the channels for shock transmission between banks are present and eventually cause banks to collapse. Consequently, many countries have developed mechanisms to measure and predict the levels of systemic risk so as to be able to mitigate it. However, being a new concept, many regulators and stakeholders have challenges and limitations in being able to tackle the problem both at a regulatory level and at an institutional level. Despite these challenges, it is widely acknowledged that Systemic Risk can cause serious harm to an economy and must be addressed at all levels.

Keywords: *Systemic risk, contagion, interconnectedness, financial crisis*

1. Introduction

Generally, systemic risk is the risk of combined default of a significant part of the financial system, causing great public costs. However, in the academic world systemic risk is considered not to have a clear or simple definition because of the differences in the choice of what embodies a system and in determining the factors that lead to this risk. Some scholars consider as a system only the set of institutions that make up the financial system (e.g. Adrian and Brunnermeier, 2016; Borri, Caccavaio, di Giorgio, & Sorrentino, 2014), whereas others recognize that the notion of a system must encompass all sectors of the economy (e.g., Bernal, Gnabo, & Guilmin, 2014; Drakos & Kouretas, 2015).

The recent financial crisis has exposed the destructive effects of a massive collapse in financial intermediation for banks. Through contagion, systemic risk is derived within the banking system. As a result of the sub-prime crisis of 2007–2009 and the sovereign debt crisis that followed, systemic risk in the finance industry has become a hot topic in academic and policy circles. This is because of the substantial damage a financial crisis may cause to the real economy (Varotto, 2018).

Systemic risk was seen as the main cause of this financial collapse around the world. It's origin being in the United states, many financial institutions felt the impact of this economic crisis. This area of systemic risk was not a well-researched area internationally and this changed after this financial crisis in 2008. Many institutions wanted to know how to prevent such a situation happening again and therefore find ways of reducing the possibility of systemic risk affecting their institutions or countries.

Interactions of risk between banks exist the size and geography of banks are also relevant. The larger size bank and more geographical proximity of a bank, the higher the correlation and less diversification of the bank corresponding (Ender and Wen, 2018). The collapse of the inter-bank market at the beginning of the financial crisis suggests that direct linkages between banks are a key channel of contagion across financial organizations.

One of the distinguishing features of the financial system is the interconnectedness among financial agents (e.g., market participants and institutions). This interconnectedness introduces diversification, which can reduce risk and improve financial stability, but it also presents systemic risk because an individual event (e.g., the failure of a greatly interconnected institution such as Lehman Brothers) can turn into a systemic event and endanger overall financial stability (Wang et al., 2017)

A second conduit that explains how shocks transmit through financial systems is information contagion (Chen, 1999). A third important channel is commonality of asset holdings. As banks have similar exposure to assets such as syndicated loans, a decline in asset prices can affect the banking system, because of direct exposure of banks to the same assets as well as fire sale externalities (Kiyotaki and Moore, 1997).

The continuous occurrence of financial crises and their repercussions has made many to conclude that the prevailing financial regulatory structure is not adequate to ensure the stability of the financial system in its entirety. The current regulatory framework is thought of as micro-based in nature with an aim at protecting individual financial institutions and ultimately keeping the whole system safe. However, academics and some regulators have debated for a while that by looking

at individual organizations in seclusion, risks are overlooked that are only noticeable at the system level. The 2007 global financial crisis emphasized some deficiencies of the current regulatory framework specifically its failure to address the stability of the financial system as a whole (Kahou and Lehar, 2017).

As the interlinking of financial markets continues to increase year by year, regulators especially in the banking industry are beginning to get concerned about how systemic risk is affecting this sector. The main concern would be that the concurring bankruptcy of some banks would result in the collapse of the banking industry in a country or a region (Lehar A., 2005). The occurrence of international financial crisis has resulted in stakeholders in the banking sector particularly those overseeing the banking sector having to comprehend the dangers systemic risk can pose and understand how to measure this risk and how to mitigate damage caused thereafter. It is also obligatory that banks be sufficiently capitalized to be able to absorb large economic shocks that would normally occur. A bank that is sufficiently capitalized would be able to bounce back quickly as the extra financial resources available would be able to absorb the losses suffered.

However, being adequately capitalized is not enough. A case in point was in the 2007 to 2008 financial crisis where problems in a small number of banks spread through to the financial system. The interbank lending system where banks lend each other money to buffer themselves from shocks in the financial market became an enabler for the spread of these problems and eventually caused some financial bank system crises.

Interbank lending is typically short term and allows banks that are facing liquidity shortages to cover their commitments and reserve requirements from by borrowing from banks that are sufficiently liquid. (Iori et al. 2004) The structure of the inter-bank market is determined by a combination of endogenous bank behavior and exogenous structure. The number of lenders and borrowers, their size and distribution, is determined endogenously by the supply and demand of funds and loan opportunities whilst the matching of lenders and borrowers is determined exogenously. (Ladley, 2013)

Systemic crises normally start in a single or a small group of institutions and spread to a larger portion of the financial sector, ultimately affecting the whole sector. Besides looking solely at individual financial Institutions it is necessary to identify contagion mechanisms and look at ways to stem the effects that systemic outbreaks provoke. (Stancato De Souza et al, 2015) For smaller systemic shocks, a well networked market provides an environment where the risk can be shared easily thus reducing the probability of contagious failure. However, for larger systemic shocks rather than alleviating risk, inter-bank lending and borrowing actually exacerbate the effects of failures, making the more networked markets the most exposed.

The impact of a banking crisis on the economy can be significant as past experience have shown that output falls by about twenty per cent of GDP during banking crisis periods. Despite these concerns about capital requirements, audit policies and deposit premiums, people do not consider bank interdependencies. (Hoggarth et al., 2002)

2. Contagion and Systemic Risk

2.1. Systemic Risk Features

Interbank markets play an essential role in a well-functioning integrated financial system through the provision of liquidity among banks. Financial Institutions lend or borrow money among themselves and make assurances of repayments at the due dates. If a financial Institution fails in their payment of its loans, its creditors may have trouble in honoring their debts, transmitting the effects of the original failure to other institutions, in a contagion process. Problems affecting one institution may spread to other ones and even to institutions across international borders. (Stancato et al., 2016)

The explanation of how this shocks spread from one institution to the next is further described. The key element in this definition of systemic risk, the systemic event, is composed of two important elements, shocks and propagation mechanisms. Following the terminology of financial theory, shocks can be idiosyncratic or systematic. In an extreme sense idiosyncratic shocks are those which, initially, affect only the health of a single financial institution or only the price of a single asset, while systematic (or widespread) shocks - in the extreme - affect the whole economy, e.g. all financial institutions together at the same time. An example of an idiosyncratic shock to a national financial system is the failure of a single regional bank due to internal fraud. Systemic risk measures the amount of resources/capital that a company must raise if stock market crashes to meet its regulatory responsibilities. The actual loss risk to a bank may be much higher. Financial institutions with the highest systemic risk are those that contribute the most to the market undercapitalization in a crisis. (De Brandt & Hartman, 2000)

Type of Initial Shock	Single Systemic Events (Affects One Organisation)		Wide Systemic Events (Affects Several Organisations or Markets)	
	Weak No Failures	Strong Multiple Failures	Weak No Failures	Strong Multiple Failures
Narrow Shock that spreads				
-Idiosyncratic shock	Yes	Yes (contagion)	Yes	Yes (contagion leading to systemic crisis)
-Limited systematic shock	Yes	Yes (contagion)	Yes	Yes (contagion leading To systemic crisis)
Wide systemic shock			Yes	Systemic crisis

Table 1: Systemic Events in the Financial System (De Brandt & Hartman, 2000)

American idiosyncratic shocks played a dominant role during the 2008 financial crisis that affected quite a number of countries. Countries in this group have a high level of global integration, are advanced and fairly large: including a host of European countries (Czech Republic, France, Greece, Italy, Malta, Norway, Poland, Portugal, and UK) as well as Japan and Chile. Since the banking fundamentals of these countries were generally strong (Chile, Japan, France, and Italy), and banks follow a traditional retail business model, these banking systems were relatively resilient to the crisis. Consequently, the large drop in banking sector returns. (Dungay & Gajurel, 2015)

Traditionally, many systemic banking panics have been associated with recessions and macroeconomic shocks (systemic risk in the broad. sense), but formal theories beyond individual bank run models have been scarce.

Temzelides (1997) develops a repeated version of the Diamond and Dybvig model where agents adjust their choices over time through learning from past experience with the banking system. It was designed to address the issue of the instability of single banks with fractional reserve holdings. Banks convert short term deposits into long term investments, with a liquidity premium, while depositors face a pay-off externality due to a consecutive service constraint. When depositors withdraw their deposits, a first come first serve rule applies and there is no market for investment or bank shares. A fraction of bank customers experience a liquidity shock and wish to withdraw their deposits early. The critical element is that the fear of early withdrawals by a huge number of depositors may activate a run on the bank. (Debandt & Hartmann, 2000)

In the second class of models depositor runs are instigated by the release of new information about the viability of bank investments, such as a leading business cycle indicator. Gorton (1985) shows how, under complete information, rational and efficient depositor runs can occur. Under incomplete information the noisy signal can occasionally trigger rational but disorganized runs. This model can be determined by adding a deferral of the withdrawal possibility to the deposit contract, so that banks can signal the mutually beneficial continuation of investments.At the European level, financial institutions with the highest systemic risk are BNP-Paribas, Deutsche Bank, Barclays, Credit Agriculture Group, General Society and Royal Bank of Scotland. Of these banks, the systemic risk reduced during the last quarter except for BNP Paribas (+7%) and Deutsche Bank (+3%).At the global level, the systemic risk is very high in Japan, China and the United States. The aggregate systemic risk of Japanese banks declined from 31% at the beginning of 2012 to only 8% of GDP in late 2014. For China, the systemic risk tripled between early 2012 and late 2014 (from 150 to 460 billion euros) but is down since the beginning of 2015. The systemic risk now accounts for 3% of GDP. The United States declined from 53% currently to steady at around 2%of GDP. Overall, the evolution of systemic risk seems to be going in the right direction, even if there are still efforts to be made in the coming years. (Derbali & Hallara,2016

Over the past quarter of a century, unlike the preceding twenty-five years, there have been many banking crises around the world. 69 documented crises in developed and emerging-market countries since the late 1970s. In a recent historical study of 21 countries, there has only been one banking crisis in the quarter of a century after 1945 but 19 since then. (Hoggarth et al, 2002

Before, it was generally accepted to measure the risk of financial institutions on a stand-alone basis. In the aftermath of the financial crisis, risk assessment of financial systems as well as their impact on the real economy has become increasingly important, as is documented by a rapidly growing literature.

2.2. Contagion Features

Banking has become more global over the recent two to three decades. This development can have beneficial effects, such as guiding financial wealth to their most fruitful uses such as improving consumption. However, it also raises a wide variety of questions. One of the major concerns is about cross-border connections in banking and their propensity of making countries more vulnerable to contagion risk.

Rochet and Tirole present a model of the interbank market, where peer monitoring among banks in this market solves the *moral hazard* problem between bank debt holders and bank shareholder-managers, but also induce contagion risk. In period 0 banks decide upon liquid reserves and invest available assets in risky projects (commercial loans.). In period 1 they are hit by a liquidity shock, which if exceeding reserves has to be met by raising debt from outside agents. If additional debt cannot be raised, the projects have to be liquidated and do not yield any return, which can lead to banks failures. Otherwise

the project is further executed in period 2 and, if successful, a positive return is realised and shared between shareholder-managers and debt holders. However, since debt holders cannot contract on the level of effort applied by shareholder managers in the execution of projects, a moral hazard problem emerges, increasing the likelihood of zero project returns. (Rochet & Tirole, 1996)

By assumption, under period-1 peer monitoring among the banks the private benefits from making a low effort become less important relative to the private costs of proper peer project monitoring, giving the right incentives against moral hazard. However, because of the existence of economies of scope between the execution of interbank peer monitoring and the effort in commercial lending in the model, the profitability and therefore the closure of the monitoring peers become intertwined with the profitability and closure of the monitored banks.

Allen and Gale's (2000) model of bank contagion also addresses the role of interbank lending; not by focusing on peer monitoring though, but rather by focusing on the physical exposures among banks in different regions and the real linkages between regions, as represented by the correlation of liquidity needs of the respective depositors. Since only symmetric equilibria are analysed by the authors, each of the four regions considered can be characterized by one representative bank, taking in period 0 retail deposits (insuring depositors against liquidity shocks), lending or borrowing in the interbank market and investing in (non-risky) short or long term projects of outside firms (loans).

In period 1 depositors whose region faces a negative liquidity shock withdraw. The bank can meet the withdrawals from maturing short-term investments, by liquidating interbank deposits it made previously in other regions, or as a last resort at a high cost, if the other two options are exhausted by liquidating long-term project lending. In period two long term projects mature, interbank and retail deposits are reimbursed, except for those banks that collapsed, since not all retail or interbank deposit withdrawals could be served. (Allen & Gale, 2000)

Contagion can take place through plenty of channels as summarized in table 2. However, one of the most common channels is direct effects due to losses on interbank loan exposures. There are quite a number of cases of authorities bailing out financial institutions in order to prevent failure by contagion.

Channel
Liability Side
Bank Runs
Multiple equilibria/fear of withdrawals
Common pool of liquidity
Information about Asset quality
Portfolio rebalancing
Fear of direct effects
Strategic behaviour of potential lenders
Asset Side
Direct Effects
Interbank Lending
Payment System
Security Settlement
FX Settlement
Derivative Exposures
Equity Cross-holdings
Indirect Effects
Asset Prices

Table 2: Possible Channels of Contagion in the Banking System (Upper, 2010)

The interest in contagion has clearly gained impetus during the global financial crisis, but it is not new. The sell-offs in emerging markets after the Mexican peso crisis in late 1994 and the Asian crunch in 1997 triggered a large amount of literature on contagion in financial markets. There has however been little empirical research done in this area. (Upper, 2010) The absence of solid empirical evidence on whether contagion is possible poses problems for central banks and other authorities in charge of maintaining the stability of the financial system.

Economists studying contagion have therefore resorted to simulation methods to test whether, given a particular set of exposures, failures could have knock-on effects. Initially such simulations were done on individual institutions to gauge whether these institutions could withstand contagion, and not whether an entire banking system could withstand contagion.

It is quite evident that contagion has a wide ranging effect as it not necessarily only affects the region where the crises begun but also other areas and as far out as other countries. Although the crisis is often seen as having origins in overheated housing markets and the associated mortgage backed securities market, we concentrate on the international transmission of this stress which is due to the financial intermediaries rather than the localized housing markets. There is significant evidence not only for the existence of contagion between banking sectors, but also for its role in promoting banking crises in regions

geographically removed from the crisis source. There is a growing body of literature examining the role of banks in the transmission of financial crisis of 2007–2009, most of whom find evidence of international transmission via the banking sector. Results provide evidence for the severity of the 2007–2009 crisis. Banking sectors across the world were disturbed by the crisis and were not immune to contagion effects. About 60 percent of the sample banking markets experienced a break in global systematic risk exposure, and about 60 percent of banking markets experienced idiosyncratic contagion originating from the US banking market. (Dungay & Gajurel, 2015)

In a widespread study of the US financial system, (Hautsch et al., 2015) show that it is largely the interconnectedness within the financial sector that escalates the risk of failure of the entire system, denoted as systemic risk (Hautsch et al., 2014). Interbank market contagion is more likely to occur in banking sectors that are highly dependent on wholesale financing (Hausenblas et al., 2015).

3. Measuring Systemic Risk

The most obvious way of finding out the prevalence of systemic risk is measuring the level of systemic risk in one's organisation. A few measures of systemic risk have been proposed in recent empirical studies. Among them (De Jonghe, 2017) uses the extreme-value analysis to measure the contribution of each single financial institution to systemic risk. Other methods include the CDS (Credit Default Swap), Portfolio credit risk measurement methods such as CoPod and CIMDo, Conditional Value at Risk (CoVaR) which captures how much the distress of one institution can affect another institution.

The systemic impact index is proposed to measure the expected number of bank failures in the banking system in the event of a single bank failing. The systemic impact index only focuses on how many banks are influenced when a particular bank fails, but it cannot provide adequate evidence in identifying the systemic importance of a particular financial institution in relation to another institution. (Zhou, 2010)

A widely cited systemic risk measure is the marginal expected shortfall(MES). It is an approximation of a bank's contribution to the system's total capital shortfall. It is a systemic fragility metric that can also be used to determine an optimal taxation policy based on systemic risk. (Panagiotis & Pasiouras, 2015). However, a limitation of this approach is that it implicitly assumes that the cost of recapitalization represents the total cost due to systemic risk. The Marginal Expected Shortfall (MES) of a bank's stock return in case of market tail losses is a popular indicator among several recent proposals to help to monitor banks' exposure to systemic risk. Since a fall in a bank's stock return dents its equity basis, the MES hints at future probabilities of default and can be used to gauge expected losses for banks' non-financial creditors.

These methods have limits because they measure a financial institution's loss only if the system is in a moment without crisis, and indirectly take into account the size, probability of default and the correlation of the financial institutions. So in normal times, institutions have sufficient liquidity to be able to ride out any instabilities in the sector however in turbulent times interbank markets can become a channel for liquidity contagion due to liquidity hoarding by banks and/or credit risk contagion due to credit losses on interbank exposures.

After looking at the threat of a banking crisis, we realise that the correlation between the values of bank's asset portfolios is the most important factor. In a banking sector with greatly correlated asset portfolios, the likelihood of multiple defaults is high, making positive correlation detrimental for regulators. However, bank fragility is also influenced by financial soundness, because well capitalized banks are able to absorb larger shocks, reducing the probability of failures. This is another angle of systemic risk measurement. Standard tools that regulators require banks to use for their internal risk management are applied at the level of the banking system to measure the risk of a regulator's portfolio. Using a sample banks one can estimate the dynamics and correlations between bank asset portfolios. To obtain measures for the risk of a regulator's portfolio, we model the individual liabilities that the regulator has to each bank as contingent claims on the bank's assets. An important feature of the portfolio approach is that one can estimate the probability of a systemic crisis, i.e., that a certain fraction of financial institutions (both in terms of numbers as well as in terms of size) will default over a given time horizon. (Lehar, 2004)

The approach outlined above allows an ongoing assessment of a regulator's total risk over time. Managers can identify periods of increased systemic risk before bank failures occur and can set suitable actions to protect the banking sector. The methodology is easy to implement and the necessary data are publicly available.

It thereby allows calculation of an individual bank's impact to the overall risk of the banking system, which can be used to identify system relevant banks.

When popular systemic risk indicators (e.g. SRISK, ΔCoVaR, and MES) as well as rSYR are standardised, their ability to predict bank distress may markedly improve. It is argued that regulators could draw more accurate insights into the multidimensional nature of systemic risk by merging traditional and standardised indicators. More generally, this combination could increase regulators' confidence in market-based measures which are currently excluded from official scoring models of systemic risk (Varotto & Zhao,2018)

4. Forecasting Systemic Risk

The prediction of financial crises has been the subject of a large number of studies. In one of the earliest contributions, Frankel and Rose (1996) study the determinants of currency crashes in 100 developing countries from 1971 to 1992.

The approach to identify systemic events can be seen as an extension of Eichengreen et al. (1995, 1996), who use an index of exchange market pressure to identify currency crises. Compared to Eichengreen et al. (1995, 1996) our Financial Stress Index is broader than the exchange market pressure index, because it includes also other market segments. This enables us to identify episodes that are truly systemic, in the sense that many market segments are affected, and not specific to a single market segment.

Existing literature on predicting financial crises in several ways is extended. Past systemic events are identified by using a composite index measuring the level of systemic tensions in the financial system of one country. Second, in predicting the identified systemic events, the joint role of domestic and global vulnerabilities is evaluated.

The empirical analysis covers a set of 28 emerging market and advanced economies with quarterly data since 1990. Our results highlight the importance of considering jointly various indicators in a multivariate framework, as we find that discrete choice models outperform the stand alone vulnerability indicators in predicting systemic events. It is found that combining indicators of domestic and global macro-financial vulnerabilities substantially improves the ability to forecast systemic events. In addition, considering interactions between domestic and global macro-financial vulnerabilities further improves the performance of the models.

Another model of forecasting involves attaining the systemic impact of financial institutions in interconnected systems. The approach can be used for timely systemic risk monitoring of large banks and insurance companies. A prediction of the firms' systemic significance as the marginal impact of individual downside risks on systemic distress. The so-called systemic risk betas account for a company's position within the network of financial interdependencies in addition to its balance sheet characteristics and its exposure towards general market conditions. Relying only on publicly available daily market data, time-varying systemic risk networks can be determined, and forecast systemic relevance on a quarterly basis. Thereafter empirical findings can reveal time-varying risk channels and firms' specific roles as risk transmitters and/or risk recipients (Hautsch et al., 2015).

5. Challenges of Monitoring and analysing Financial Systems

When implementing policy proposals, financial stability policymakers have faced a number of practical challenges. First among these is how best to monitor financial systems and the broader economy to detect signs of vulnerabilities that might lead to future bouts of financial instability. Normal prudential supervision clearly can be included in the set of possible interventions. Inappropriate mandates have constrained supervisors in some countries from taking systemic issues into account – forcing them to take a purely 'micro prudential' view. However, supervisors in at least several countries have shown a willingness to use the powers available to them in the interests of the stability of the whole system. (Arnold et al. 2012)
Policymakers find themselves relying on the experience of other countries, which might not be relevant to their own systems. There is very little theoretical or other comparative work on whether and where institutional differences can affect the optimal policy framework or setting for financial stability. In particular, there is nothing to suggest that 'one size fits all', and that there is one set of best practice that all countries should adopt.

Macroprudential capital requirements is defined as the fixed point at which a bank's capital requirement equals its contribution to the risk of the system under the proposed capital requirements. This is basically a regulatory requirement that require each bank to hold a buffer of equity capital that corresponds to the banks input to the overall risk of the system. This regulation is supposed to reduce the risk that can be created in the financial system. However, Macroprudential policy in isolation is likely to have ambiguous effects on financial fragility. It is thus rarely used alone. When interest rates are free to adjust in response to the Macroprudential shock, both the credit to GDP ratio and the financial ratio decline substantially, indicating an unambiguous reduction of financial fragility. This finding suggests that a combined monetary and Macroprudential approach to the pursuit of financial stability may be desirable. (Greenwood-Nimmo & Tarassow, 2016)

With actual experiences still limited, evidence on the effectiveness of specific tools is only slowly accumulating and comes with many (economic and econometric) caveats, making it difficult to determine which policies to use and when to tighten or loosen them. Furthermore, while addressing one distortion may reduce some manifestations of risks, it can also worsen overall financial stability. Also tools may not be able to reach some activities that can lead to systemic risks, and tighter regulations create stronger incentives for circumvention, risking vulnerabilities building up outside of the regulatory perimeter and policymakers' sight. Furthermore, institutional limitations may hamper the optimal deployment of instruments. Cooperation and coordination with micro prudential supervisory agencies and international organizations may be legally or institutionally difficult. Many of these issues will differ across countries, with developing countries for example expected to face more institutional and data hurdles as well as larger risks of discretionary policy implementations. Generally, the best approaches given specific country conditions and characteristics remain thus largely open questions. (Claessens, 2014)

While systemic- risk modeling and measurement is a promising research agenda, caution should prevail about the effect of model misspecification on the measurements and the consequences of those measurements. An important piece to this undertaking should be to assess and guard against adverse impacts of the use of measurements from inevitably artificial models. Complete success along this dimension is asking too much, otherwise we would just "repair" our models. Nonetheless, confronting the various components of uncertainty with some formality will help us to use models in sensible and meaningful ways.

6. Conclusion

Academic research has informed us more on Systemic Risk as we now understand more about financial stability than before the financial crisis. Systemic risk was seen as the main cause of this financial collapse around the world. It's origin being in the United states, many financial institutions felt the brunt of this economic crisis. The impact of a banking crisis on the economy can be substantial as research has shown that production falls by about twenty per cent of GDP during banking crisis periods.

Direct linkages between banks are a key channel of contagion across financial organizations as another conduit being information contagion that causes institutional collapse. It is apparent that contagion has a great effect as it not necessarily only affects the area where the crises begun but also other areas and as far out as other countries.

Noting the seriousness of the possible impact of Systemic Risk to banking sectors and even economies, many stakeholders have taken it upon themselves to do further investigations and analysis on how they can mitigate the effect of possible systemic risk. One characteristic of the banking system that seems to be the cause of systemic risk is the interconnectedness of the system. Economists studying contagion have therefore resorted to simulation methods to test whether, given a particular set of exposures, failures could have knock-on effects. Initially such simulations were done on individual institutions to gauge whether these institutions could withstand contagion, and not whether an entire banking system could withstand contagion.

One of the first things that is required in such an exercise is to measure the level of systemic risk and there are quite a number including Credit Default Swap (CDS), Marginal Expected Shortfall (MES), CoVaR (Conditional Value at Risk) amongst others. Methods of prediction of Systemic Risk(forecasting) have become quite a popular and effective way in managing systemic risk. These measures are quite important as they help regulators identify the level of systemic risk in an organisation and then be able to get a better picture into the nature of systemic risk. In addition, it is highly recommended that banks be adequately capitalized to be able to absorb huge economic shocks that would ordinarily occur.

However there still remain some challenges as this phenomenon of systemic risk is relatively new and stakeholders are still learning the ropes, many countries especially emerging and developing countries will have institutional and regulatory deficiencies in being able to understand fully the scope of the problem and how to deal with it. Nevertheless, despite these challenges, most stakeholders acknowledge the importance of addressing the matter of systemic risk as they know that failure to that a system collapse can occur and not only hurt the banking sector but a whole economy.

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