RISK CONTAGION AND WHAT COULD THE SAFETY DOMAIN LEARN FROM RISK GOVERNANCE IN THE FINANCIAL SERVICES INDUSTRY

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Abstract

Because of the interaction between system entities across a whole capability or between firms across a whole industry, there is great potential for risks that affect one project, area, firm or group of firms, to go on and affect the risk profile of the whole sector system. This is widely known in the financial world as contagion and it causes systemic risk. The liquidity crisis that started in 2007 and developed into the global credit crisis through 2008 and 2009 is now a classic example. The rest of this paper introduces the concepts of contagion, discusses the financial and other examples of contagion in various domains, and finally describes the principles of the risk management framework in the financial services industry intended to cope with contagion risk and how they may be considered and used by practitioners in the safety industry.

1 Introduction

Contagion theory is not new, but its application to the safety domain probably is. The theory itself goes back two centuries where it is an established explanation for the clustering and spread of human behaviour, disease and the properties of crowd actions [6]. In the social sciences contagion-based models have been used to develop understanding of evolutionary dynamics [ibid], and other similar subjects including political domino effects, power failure cascades and of course, financial market systemic risk.

The word ‘contagion’ itself is a noun meaning the communication of disease from body to body. It arises from the French word ‘tangere’ meaning ‘touch’ [12]. For our consideration contagion serves as a mechanism that exposes people, groups, and organizations to information, influence, attitudinal messages and the behaviours of other people and systems. Contagion theories seek to explain specific or emergent networks as conduits for these “infectious” attitudes and behaviours. A further description that may be a familiar phrase is ‘the domino effect’ – although this does have several specific meanings as I shall discuss in the next section of this paper.

2 Examples of Contagion

2.1 Political Contagion

There are two infamous examples of political contagion that led to catastrophic consequences in the twentieth century, some that are still being felt today.

As introduced above, the domino effect can be seen as an example of anticipated contagion that was used for political purposes. It became doctrine of U.S. foreign policy during the Cold War, according to which the fall of a non-communist state to communism would precipitate the fall of other neighbouring non-communist states. The theory was first enunciated by Pres. Harry Truman, who used it to justify sending U.S. military aid to Greece and Turkey in the late 1940s. Dwight D. Eisenhower, John F. Kennedy, and Lyndon B. Johnson invoked it to justify U.S. military involvement in Southeast Asia, especially the prosecution of the Vietnam War [2]. Despite the disaster of the Vietnam War, the domino theory was further resurrected by Ronald Reagan, who used it to justify military intervention in Nicaragua in the 1980s. A similar argument is currently being used as a component for the political position on intervention in the Middle East.

Secondly, what was intended as a strictly limited war - a brief war - between accuser and accused, Austria-Hungary and Serbia, rapidly escalated into something that was beyond the expectations of even the most warlike politicians. A contagion of open and secret political alliances fell in an unpredicted sequence to lead on to the catastrophic ‘Great War’. The sequence of events is summarised as follows;

28th June 1914, heir to the Austro-Hungarian Empire was assassinated by a Serbian nationalist secret society. Austria-Hungary's reaction to the death of their heir (who was in any case not greatly beloved by the Emperor, Franz Josef, or his government) was three weeks in coming. Arguing that the Serbian government was implicated, the Austro-Hungarians opted to take the opportunity to stamp its authority upon the

Serbians. Austria-Hungary's expectation was that Serbia would reject the remarkably severe terms of the ultimatum, thereby giving her a pretext for launching a limited war against Serbia. The following is a summary of the series of events that followed [3].

- Austria-Hungary, unsatisfied with Serbia's response to her ultimatum (which in the event was almost entirely placatory: however her jibbing over a couple of minor clauses gave Austria-Hungary her sought-after cue) declared war on Serbia on 28 July 1914.
- Russia, bound by treaty to Serbia, announced mobilisation of its vast army in her defence, a slow process that would take around six weeks to complete.
- Germany, allied to Austria-Hungary by treaty, viewed the Russian mobilisation as an act of war against Austria-Hungary, and after scant warning declared war on Russia on 1 August.
- France, bound by treaty to Russia, found itself at war against Germany and, by extension, on Austria-Hungary following a German declaration on 3 August. Germany was swift in invading neutral Belgium so as to reach Paris by the shortest possible route.
- Britain, allied to France by a more loosely worded treaty which placed a "moral obligation" upon her to defend France, declared war against Germany on 4 August. Her reason for entering the conflict lay in another direction: she was obligated to defend neutral Belgium by the terms of a 75-year old treaty. With Germany's invasion of Belgium on 4 August, and the Belgian King's appeal to Britain for assistance, Britain committed herself to Belgium's defence later that day. Like France, she was by extension also at war with Austria-Hungary.
- With Britain's entry into the war, her colonies and dominions abroad variously offered military and financial assistance, and included Australia, Canada, India, New Zealand and the Union of South Africa.
- United States President Woodrow Wilson declared a U.S. policy of absolute neutrality, an official stance that would last until 1917 when Germany's policy of unrestricted submarine warfare - which seriously threatened America's commercial shipping (which was in any event almost entirely directed towards the Allies led by Britain and France) - forced the U.S. to finally enter the war on 6 April 1917.
- Japan, honouring a military agreement with Britain, declared war on Germany on 23 August 1914. Two days later Austria-Hungary responded by declaring war on Japan.
- Italy, although allied to both Germany and Austria-Hungary, was able to avoid entering the fray by citing a clause enabling it to evade its obligations to both. In short, Italy was committed to defend Germany and Austria-Hungary only in the event of a 'defensive' war; arguing that their actions were 'offensive' she declared instead a policy of neutrality. The following year, in May 1915, she finally joined the conflict by siding with the Allies against her two former allies.

2.2 Industrial Contagion

The idea that the multitude of civil industry and infrastructure may be treated as a ‘Life Support Networks’ has been discussed since the 1990’s [11]. These life support networks have been grouped according to the following categories;

- Electricity (generation, transportation, distribution infrastructure, etc.)
- Natural gas and liquid fuels (storage, transportation, distribution infrastructure, etc.)
- Potable water and wastewater (collection, treatment, storage, transportation, distribution infrastructure, etc.)
- Telecommunications (broadcasting, cable transmission, distribution infrastructure, etc.)
- Transportation (road systems, public transportation systems, etc.).

Thus, these networks fulfil fundamental roles for the proper functioning of a society by ensuring essential services concerning the health and safety of populations and the proper functioning of the economy [ibid]. The origins of potential and historical contagion events appear to combine natural events with technical malfunctions and human intervention. In effect, not only are the life support networks subject to unforeseen natural turns of events, but equally the infrastructure that they are made up of are a poorly understood combination of industrial systems that differ in age, ownership, state, nature, and design.

There are multiple examples of industrial contagion that I am sure, the reader may already be familiar with;

November 2009: 7,000 megawatts abruptly disappear from the national energy grid in Brazil and Paraguay when Itaipu hydro-electric plant fails. A cascading ‘domino effect’ meant that Sao Paulo, Rio de Janeiro and other major cities across both countries were all left with no illumination for up to four hours [8].

August 2003: The Northeast Blackout of 2003 was a massive widespread power outage that occurred throughout parts of the North-eastern and Midwestern United States and Ontario, Canada. Electric commuter transport was shutdown; water systems lost distribution pressure; some TV and radio stations failed; hundreds of thousands of consumers lost power; most essential services appear to have survived on their local backup generators [9].

September 2000: Combination of tidal effects and extreme local rainfall cause the localised flooding and power failure of a pumping station, which in turn leads on to city-wide 1.5m floods of rainwater, seawater and sewerage. Local transport, communications and power supplies were heavily disrupted [5]

2.3 Social and Biological Contagion

Since the mid 1990s it has been speculated that emerging and re-emerging infectious diseases may also constitute a threat to international security, through their negative effects on sovereign states. Population health contributes directly to the endogenous prosperity and stability of a particular polity, to the consolidation and projection of sovereign power, and ultimately to the security of the state. The health of the body politic thus contributes directly to the functionality of the apparatus of governance. The profoundly destabilizing effects of social and biological contagion result from various manifestations of illness, including high levels of mortality and/or morbidity, the destruction of human capital, economic disruption, negative psychological effects, the consequent acrimony between affected social factions, and the deteriorating relations between the people and an often draconian state [10].

Again there are multiple examples of social and biological contagion dating back centuries and still looming over today's society.

2009 H1N1 Pandemic: Between January and December 2009 the 'Swine Flu' virus spreads slowly around the world causing mass hysteria, rational and irrational responses. June 2209 sees the virus classified as a Pendemic by the WHO and mass development of vaccines starts. Internet, television and the printed media 'hype' up the potential threat and cause cultural changes in business travel, holidays and even local social behaviours [7].

2003 SARS Epidemic: The SARS contagion resulted from the emergence of a coronavirus in China. The diffusion of both knowledge and fear via telecommunications media and ine internat led to undermining of social cohesion, international markets, and the irrational behaviour of many sovereign states in the face of a new pathogen [10].

1918 Spanish Flu: The "Spanish flu" epidemic of 1918 kills at least 50 million people worldwide. It is caused by an H1N1 virus which evolves directly from bird flu into a human flu. After a mild wave of infections in the summer, the epidemic goes global with returning soldiers from WW1: one-third of the population eventually get sick. Most deaths are actually caused by bacterial lung infections that move in after the virus [7].

2.4 Economic Contagion

Contagion is often seen as a contributory factor in economic and financial crises [4] whether national or international. The complex, often international, diversified network of portfolios used to protect against financial risk breakdown, or work in reverse rapidly spreading financial shocks based on unanticipated systemic risk.

The recent global credit crisis and following recession is becoming a classic example of this economic contagion. Banks were borrowing short-term to lend long-term, assuming that if they ever ran into trouble to the extent that depositors could not be repaid, banks would simply be able to borrow from other banks. It turns out that ALL the banks were acting on the same premise so there was not enough 'emergency' liquidity (credit) available when ALL the banks started to experience difficulties [1]. The network of arrangements for relatively small amounts of credit, enough for a single lender, were rapidly used up and withdrawn with banks refusing to lend to each other.

Financial contagion is not new with runs on banks going back several centuries. Research into examples from the twentieth century is limited due to the imposition of central banks as lenders of last resort preventing a full 'epidemic' within the financial domain [Schoenmaker]. However, there is plenty of evidence to suggest that the negative effects are felt in the social and cultural domains instead – a further but different case of intra-domain contagion. Other cases of international financial crisis where a contagion effect has been cited [4]

- ERM crisis – 1992 to 1993
- Devaluation of Mexican peso – Dec 1994
- Devaluation of Thai baht – July 1997
- Russian default – August 1998
- Hong Kong stock market crash – Oct 1998
- Brazil devaluation – Jan 1999
- Collapse of Argentine currency board – Dec 2001

3 Risk Management in Financial Services

3.1 Principles-based Regulation

In 1974 the Bank for International Settlement (BIS) established a forum for international co-operation on bank regulation called the Basel Committee. In 1988 the Basel Committee on banking supervision introduced a regulatory capital measurement system commonly referred to as the Basel Accord and in 1996 amendments were adopted leading to the Basel II Accord [1]. The key features of Basel II form three pillars of risk management, and it is interesting to see how these match up with risk management processes in other domains. The three pillars are;

- Minimum Regulatory Capital Requirements: This involves applying quantitative formulaic methods to determine the regulatory capital (risk exposure and mitigation) that a financial institution must maintain.
- Supervisory Review Process: This involves firms submitting information to enable regulators (ISAs) to assess the amount of capital that should be held.
- Market Discipline: A requirement that firms should publish documented information about the way they manage the risks they specifically face (safety case!).

Implementation of the Basel II Accord has no basis in law; it is up to the efforts of national governments and regulators.

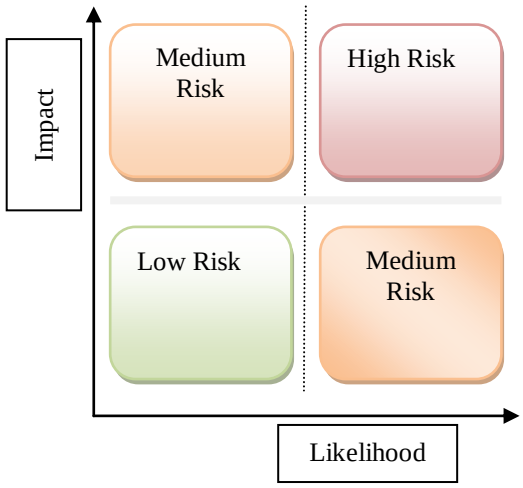
It is (currently) the responsibility of the UK FSA to implement the Basel II accord and it does this through principles-based supervision, requiring a financial firm to maintain arrangements to determine whether persons on whom requirements are imposed are actually complying with them [ibid.]. This should be seen as an easy para-phrase of the UK safety industry's use of goal-based requirements to ensure duty of care.

3.2 Financial Risk Management Function

Risk management in the financial industry is surprisingly familiar to risk management in many of the domains I have experience in – which I guess is somewhat reassuring. The following steps are followed;

- Risk Identification
- Risk Measurement & Assessment
- Risk Mitigation
- Risk Monitoring
- Risk Reporting
- Develop Operational Risk Policy

The risk ranking methodology as part of this sequence of processes is also somewhat familiar, once you see passed the differences in labelling. The ranking decision is dependent on two criteria: the likelihood of the risk being realised and the magnitude of the impact [ibid.]. The financial industry even has a risk ranking chart (= risk priority matrix!), typically as shown below.



Once risks have been identified and measured, the firm is in a position to take effective action to manage all risks and specifically address those risks which fall outside its risk tolerance. Four options are available;

- Reduce the likelihood of the risk occurring
- Reduce the impact of the risk, should it occur
- Transfer the risk to a third party better placed
- Avoid the risk – impose limits or withdraw

4 Foundations for Contagion

4.1 Foundations in the Financial Domain

The broad definition of contagion from the World Bank is as follows;

"Contagion is the cross-country transmission of shocks or the general cross-country spill-over effects" [cited in 4]

Contagion arises because debt, asset and impact transmission arises over and above the anticipated or expected links. The subsequent reaction is beyond what could have been reasonably expected beforehand. Sometimes the links are so complex in the temporal domain as well as the financial domain that prediction is almost impossible.

Contagion arises because investor actions do not reveal their private knowledge – indeed they are specifically trying to utilise their private information for financial gain – that is how capitalism works. This can lead to 'herding behaviour' where there is incomplete information about a country's fundamentals and investors operate in relatively free markets to choose when and how they make their transactions [ibid]. Herding behaviour can be rational where there is sound information available, but it can also lead to financially destabilising collective action.

Contagion arises because of international account liberalisation and inter-operability. The provision of bailouts to countries or industrial sectors causes massive transfer of debt across international borders. Some of this debt is likely to be toxic, there is unlikely to be much transparency or knowledge about the nature of the debt being transferred due to the speed with which it is usually required.

Contagion arises through industry and public association or 'contact' beliefs. For example, one bank goes bad, so the belief can be that all banks, even completely unrelated banks are bad. Alternatively, one part of a company goes bad and the belief is that all parts of the company – parent and subsidiary – are all bad. However, beliefs are very hard to measure let alone manipulate.

4.2 Foundations Translated into the Safety Domain

The author proposes that contagion risk will arise when the following aspects of a project or system are present;

- Combined complexity in the temporal and spatial domains.
- Lack of availability of information about the risks associated with the design and use of the system in the operating domain.

- There is a specific requirement for inter-operability between different service providers, new technologies and even different nations.
- There is poor understanding of the public, political and industrial-based risk beliefs associated with the system or project.

5 Financial Risk Governance Applied to the Safety Domain

The first governance issue is to be fully aware of the nature of risk in your specific domain. Test your project and system against the four contagion foundations identified in section 4.2 above. If you judge that there is a contagion risk, move on to apply the generic governance strategies derived from the financial domain that are developed below.

The specific risk governance strategies from the financial domain imposed through the regulatory framework associated with the Basel II accord can equally apply to risk governance in the generic safety industry domain. The bases of the principle-based financial risk management introduced in section 3.1 above, can be drawn out in more explicit terms and made relevant to any risk-based industry. Many sectors will probable already utilise some, many or fewer of the regime ideas, the author recommends that all are reviewed for potential application.

The overarching requirements for all authorised firms and approved persons or duty holders set out the fundamental obligations and foundations for sound risk governance may be developed as follows [developed from 1];

- Conduct business with integrity
- Conduct business with due skill, care and diligence
- Take reasonable care to organise, and manage the capability using adequate risk management systems
- Maintain adequate business resources for risk and safety management
- Conduct business in line with the standards of the domain you are in
- Pay due regard to all networked-stakeholder's interests and treat them fairly
- Pay due regard to the information needs of stakeholders and communicate with them in a way that is clear and not misleading
- Manage interoperation conflicts of interest fairly
- Take reasonable care to ensure the suitability and availability of full advice for any stakeholder who is likely to have to rely on its content
- Arrange adequate protection for identified valuable assets
- Deal with regulators and auditors in an open and co-operative way, and disclose anything which the regulators would reasonably expect notice of.

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