

## The emergence of financial innovation and its governance - a historical literature review

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**Abstract.** This paper reviews the literature from diverse disciplines in order to trace historically, the emergence of financial innovation and its governance. It starts with a charting of the occurrence of financial innovations throughout history, followed by a chronological mapping of the introduction of mechanisms to govern these innovations. It then discusses findings from the review in order to shed light on the extent to which financial innovation governance approaches used throughout history were sufficiently robust to ensure the emergence of responsible financial innovation. Findings show changing drivers of financial innovation across history with no evidence of specific governance mechanisms for the process of financial innovation itself. What exists are mechanisms for governance of the financial sector, in the form of legal frameworks, policies and self-regulatory mechanisms that place emphasis on regulation of the products of financial innovation after these have been developed and implemented. The paper is concluded with a brief discussion on implications for theory.

**Keywords:** Financial innovation, Innovation governance, Regulation, Self-regulation, Responsible innovation.

### 1 Introduction

Following the financial crisis of 2007/2008 the assumption that innovation contributes positively to finance and welfare has been challenged (Sánchez, 2010; Corsi, et al., 2016; Fostel & Geanakoplos, 2016), and the balance of risks and benefits of financial innovation to society questioned (James, 2015; Beck et al., 2016). Financial innovation has received various criticisms from the media, the public, policy makers and top economists in society (Litan, 2010). Thus actors (e.g. Armstrong et al., 2012, Asante et al., 2014) have become interested in finding ways to preserve the benefits of financial innovation, while at the same time limiting the impacts and risks of financial innovations that have the potential to be harmful. This begs the question of how financial innovation occurs, how it is governed, and how adequate current mechanisms, including regulation, for governing financial innovations are in predicting and managing their wider impacts before they occur; questions that this study hopes to address. Answers to these questions could shed light on the context within which innovators in the financial sector must understand and frame any conceptualisation of responsible financial innovation.

Allen and Gale (1997), Goetzmann and Rouwenhorst (2005) and Allen and Yago (2010) argue in favor of a studying financial innovation from a historical perspective

when they discuss at length major financial innovations that have occurred in history in their research publications. While these are useful, they do not consider how these innovations have been governed through history. Such an activity allows for comparison between when specific financial innovations occurred and when mechanisms were introduced to govern them. Further, comparisons of this nature can be considered useful because according to Hu (2015), some theories associated with financial innovation, for example decoupling, can have implications for information-based governance mechanisms. Therefore, this paper seeks to take the works of Allen and Gale (1997), Goetzmann and Rouwenhorst (2005) and Allen and Yago (2010) a step further. I describe the emergence of financial innovation and its governance. Specifically, the paper charts the emergence of financial innovations and associated governance throughout history and compares the two in order to assess whether innovation management and governance approaches used throughout history have been sufficiently robust to ensure the responsible emergence of financial innovation. Further the paper highlights lessons that can be learnt from the review with regard to the motivation, drivers and types of financial innovation.

## 2 Research Methodology

A review of the literature (Bhatt and Bhatt, 1994; Brundage, 2013; Salevouris and Furay, 2015; Marius and Page, 2015) suggests three activities are crucial in the historical review process; collecting data, verifying its authenticity and organising, analysing and writing it out. Regarding data collection, these authors highlight primary and secondary data as the main sources which historical researchers can use; and acknowledge that access to primary data could be limited, in which case use of secondary data sources only is justified. To this end, the study uses mainly data from secondary sources.

The main approach of this study is to juxtapose a review of the literature on the emergence of major financial innovations in history and their governance. To identify the articles to be used for the study, research was conducted from secondary sources of data including journal articles, books, encyclopedias and newspapers. The search for relevant material started in bibliographic databases (JSTOR, Emerald and EBSCO) using key words such as “financial innovation”, “innovation in financial services” “history of financial innovation” and “governance of financial innovation”. This yielded a large number of articles which allowed for the identification of innovations considered significant in the financial services industry, but with limited details about the event. Further, the search on governance of financial innovation returned fewer relevant articles. Therefore, for each major innovation identified, a more targeted search was conducted in the bibliographic databases stated above, and in a few cases on the Web to find relevant material that shed light on when, where, why and by whom the first form of the financial innovation emerged, what type of governance mechanism existed to govern the innovation, when and why that mechanism was introduced.

Salevouris and Furay (2015) argue that there is no hard and fast rule in selecting literature to be used for historical writings. However, he suggests a number of things that could be useful to consider including how up-to-date the literature is, whether the

source references of the literature is substantive and whether the work is respected by other researchers in the field. These guidelines as well as others such as relevance to topic, acceptance by fellow researchers and influential strength (i.e. the extent to which the author of selected literature has influence on the advancement of knowledge in the field of study) suggested by Karayiannis (1998) were employed in choosing literature used for the study. Where possible, scholarly secondary sources were used; and for relevant events identified, multiple data sources were reviewed to ensure authenticity and reliability of information.

The study used both the narrative and analytical modes of historical writing suggested by Marius and Page (2015). The narrative method was used at the beginning of the paper to help readers appreciate the financial innovation and governance story; with a chronological ordering of events in a way that allowed for the kind of comparison the researcher wanted to do in terms of timing (i.e. when an innovation was introduced and when some mechanism was put in place to govern it). The analytical method was also applied mainly to the discussion section of the paper to allow the researcher tease out arguments regarding motivations, types and processes of financial innovation and its governance overtime.

### **3 Emergence of financial innovation**

#### **3.1 Definition of financial innovation**

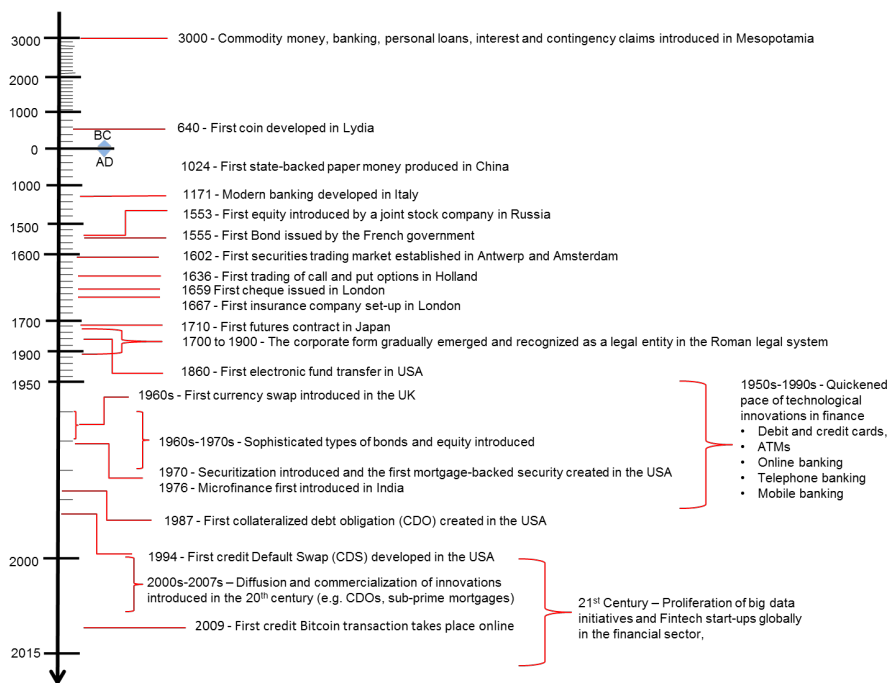
A review of the literature on financial innovation reveals that most researchers (e.g. Llewellyn, 1992; White, 1997; Tufano, 2003; Mishra, 2008; Sánchez, 2010; Delimatsis, 2011; Gubler, 2011; Lerner and Tufano, 2011) define financial innovation as the creation and popularisation of new financial products, processes, markets and institutions. Nevertheless, Mention and Torkkeli (2012; 2014) argue that this definition is narrow thus suggesting a more holistic view of financial innovation which not only acknowledges changes in offerings, and modifications in structures, processes, practices and distribution channels, by financial institutions, but also emphasizes the need for these to lead to some measurable economic or intangible impact on society. For the purpose of this study, I take the definition of Mention and Torkkeli (2012; 2014) and that of others mentioned above a step further and define financial innovation as “*a process, carried out by any institution, that involves the creation, promotion and adoption of new (including both incremental and radical) products, platforms, processes or enabling technologies that introduce new ways or changes to the way a financial activity is carried out*” (Khraisha and Arthur, forthcoming). With this definition, we argue in another paper (Khraisha and Arthur, forthcoming) that financial innovation transcends innovations in the financial instruments category and can come from non-financial institutions; and these are important characteristics which should be captured in its definition.

#### **3.2 Core financial products**

Serving as a hub for financial innovation, Mesopotamian civilisation played an important role in the development of financial innovation in early history (Figure 1). During those early civilisations, societies were normally run as gift economies,

coupled with the practice of the barter trade system. While some individuals gave valuable goods to family and friends for free, without any formal agreements for immediate or future rewards, others traded by exchanging their goods for other goods perceived to be of equivalent value. Thus as far back as 3000BCE, the concept of commodity money was coined and this allowed individuals to purchase goods and services using commodities, such as gold, precious metals and cowry shells, which were perceived to have great value. This ability to trade led to the development of the most primitive form of financial arrangements, personal loans, typically compensated with interest (Allen and Gale, 1994; Wyman, 2012) which made the “intertemporal transfer of value through time”, a key foundation for finance, possible (Goetzmann and Rouwenhorst, 2005, p.4). Over time, more sophisticated financial arrangements sprang up; and banking firms were developed in the Mesopotamian Valley leading to the creation of the first two financial instruments, bank deposits and bankers’ acceptances (Allen and Gale, 1994; Allen and Yago, 2010). A few centuries later (i.e. between 1700 and 1100 BCE), early forms of annuities were recorded to have been traded in Egypt (Wyman, 2012).

Like loans, the development of cuneiform records, which is an example of a contingency claim in Mesopotamian civilisation, presents another important principle in finance; “the ability to contract on future chance outcomes” (Goetzmann and Rouwenhorst, 2005, p.5). This reflects the fact that as individuals transferred the ownership of their monies to the future through financial arrangements, they also exposed themselves to risks derived from uncertainty in the future. As a result, both lenders and borrowers could purchase contingency claims by entering into another financial agreement requiring one party to make a payment depending on the outcome of some event (Goetzmann and Rouwenhorst, 2005). These systems had their own limitations, as transactions under the barter system for example could only take place if a trader could find someone who wanted what he or she had to offer and had what he or she wanted; a situation normally referred to as the “double coincidence of wants”. Thus there was a need for a medium of exchange to make trade easy and early forms of metal money began to emerge by 1000BCE in China. Between 700 and 600 BCE, modern coins were introduced as a way of standardizing money and facilitating trade in Lydia and Western Turkey (Allen and Yago, 2010; Wyman, 2012). This made it easy for market participants to trade their contractual claims to third parties. For example lenders faced with unexpected events leading to a sudden need for cash could sell their loan contract for coins. Goetzmann and Rouwenhorst (2005) call this the “negotiability” feature of finance and argue that true negotiability was developed in China with the introduction of paper money in the eleventh century. Similarly, Allen and Yago (2010) point out that the development of state-backed paper money in 1024 made finance easier. However, financial arrangements returned to a primitive state during the Dark Ages and bank deposits and acceptances faded out of the system (Allen and Gale, 1994).



**Fig. 1.** A historical rise of financial innovation (Adapted from Allen and Gale, 1994, Goetzmann and Rouwenhorst, 2005, Sengupta and Aubuchon, 2008, Allen and Yago, 2010, Davies, 2010, Sudhakara, 2012, Wyman, 2012, Murdock, 2014, Malvey et al., 2013 and Reid and Harrigan, 2013)

Between the twelfth and thirteenth centuries, when commercial practices of the city states in northern Italy emerged and became sophisticated, society saw a re-emergence of bank deposits and acceptances in the form of modern banking; and its use spread widely as trade and commerce grew in Europe (Allen and Gale, 1994). Furthermore, the rapid development in trade and commerce during this period led to prosperity and consequently a desire to create more wealth; and capitalism, “a system based on individual investments in the production of marketable goods, slowly replaced the traditional ways of meeting the material needs of a society” (Appleby, 2010, p.3). Capitalism was characterized by private ownership, entrepreneurial control, free competition and the formation of joint stock companies among other things (Hodgson et al., 2001). Thus there was a motivation to create new financial products that met the needs of capitalists. By the sixteenth century, two new financial instruments were introduced to facilitate this; bonds and equities (Allen and Gale, 1994). While the first equity was issued by a joint stock company in Russia in 1553, the first bond was issued by the French government in 1555 (Allen and Gale, 1994). Gradually the use of equities and bonds became widespread. In addition to governments, companies also began to issue bonds, and also developed various types of securities such as convertibles and preferred stock to meet the needs of investors. At the same time, the first cheque was introduced in 1659 in London as trade continued among financial institutions in continental Europe (Davies, 2010). By the

seventeenth century, the total amount owed to both firms and government had grown larger; and this necessitated secondary trading and a better organisation of how financial markets worked. In 1611, the first securities trading market was opened in Antwerp and Amsterdam (Allen and Gale, 1994). Furthermore, “the development of organized secondary markets for securities led to sophisticated trading practices which in turn spurred financial innovations” in the area of financial risk management in the 17th and 18th centuries (Allen and Gale, 1994, p.13). By the end of the 18th century, innovation of quite sophisticated and complex financial products and services had occurred: and this happened in quite a short space of time.

Between the nineteenth and twentieth century, the Roman legal system developed “a form of de facto depersonalized business entity” (Abatino et al., 2011, p.1) which recognized the corporation as a legal entity, “with right of ownership and the capacity to contract with others” (Goetzmann and Rouwenhorst, 2005, p.13). This concept of the corporate form is seen by Goetzmann and Rouwenhorst (2005) as a financial innovation in itself as it changed to a great extent practices in the financial sector. With this new system, business activities were no longer personal, as managing partners and shareholders held a limited liability in the company. That is to say “no matter how large the loss incurred by a company, its shareholders would be liable for no more than the value of their initial investment” (Goetzmann and Rouwenhorst, 2005, p.14). With the invention of the corporate form, coupled with repeal of the Bubble Act (an act which made it illegal to form a company without a charter (Allen and Gale, 1994)) due to developments in canal and railway construction and falling security values (in Britain), financial activity increased, leading to the development of even more sophisticated types of bonds and equity. Similarly, the USA’s increasing need for capital due to civil war and expansions in railway construction led to creation of different types of financial securities (Allen and Gale, 1994). Some of these were income bonds, commercial paper, warrants and commodity futures exchanges (Allen and Gale, 1994). Further, the first electronic fund transfer was recorded in a transaction by Western Union in the USA (Sudhakara, 2012).

After the Great Depression and the Second World War, financial instruments in common use remained relatively stable. However, between the 1960s and the 1970s, the pace of innovation quickened tremendously (due to changes in the underlying technologies of finance (e.g. data processing and telecommunications), deregulation, changes in the economic environment (i.e. higher and more variable inflation and interest rates) and the desire of many to circumvent regulation (White, 1997); with most of the innovations being a further development of some of the traditional instruments discussed above. Tufano (2003, p.7) argues that this is a “normal pattern of financial innovation where a security is created, but then modified (and improved) slightly by each successive bank that offers it to its clients”. For example, firms introduced floating rate notes, zero coupon bonds, synthetics and poison pill securities, all of which are types of bonds or equity with different features (Allen and Gale, 1994). Important financial innovations such as currency swaps developed in the 1960s by UK banks as a way to avoid UK exchange controls (Allen and Gale, 1994) and securitized loans created in 1970 under the auspices of the US’ Government National Mortgage Association (GNMA) were introduced.

The advancement of technology in finance accelerated greatly, leading to the development of several process-related innovations such as debit and credit cards, automated teller machines (ATMs) and online/telephone banking systems between 1950 and 1980 (Batiz-Lazo, 2011). During this period, microfinance was also introduced by the Grameen Bank in 1976 (Sengupta and Aubuchon, 2008). Within a short time, the concept of securitisation, a process whereby cumbersome, illiquid financial contracts (e.g. the Russian government bond fund which made available loan-backed bonds of Russian government debt to smaller investors in Holland in the nineteenth century) are converted into liquid instruments of smaller denomination that could be traded on a capital market (Goetzmann and Rouwenhorst, 2005) had been extended to other assets (e.g. homes, cars, credit card receivables etc.). This led to the creation of more complex and sophisticated asset-backed securities (ABSs) in the twentieth century. The collateralised debt obligation (CDO), first created in 1987 in the USA (Stefani, 2010) is one of such ABSs; and this has since been classified as 'toxic' (Longstaff and Myers, 2009) and is seen as a major contributor to the recent financial crisis (Gubler, 2011). Unfortunately, there is limited information on innovations that emerged after the year 2000. However, the literature suggests that between the years 2000 and 2007, the financial sector witnessed a rapid diffusion and commercialisation of innovations developed earlier in the mid to late 20th century such as CDOs and subprime mortgages (Arestis and Karakitsos, 2009; Dwyer, 2012; Murdock, 2012). Further, other major innovations witnessed in the 21st century includes company specific big data initiatives in the financial sector (Malvey et al., 2013), financial service technologies (FinTech) startups (Zavolokina et al., 2016), and the virtual currency, Bitcoin, first traded in 2009 (Reid and Harrigan, 2013).

### **3.3 Managing financial risk and uncertainty**

The emergence of innovations to support risk assessment and pricing in finance dates back to 2500BC, in the context of good transport insurance (in Babylonia) around the same time when core financial products were introduced (Wyman, 2012). However, the proliferation of innovations to support the management of financial risk and uncertainty largely occurred in the 17th and 18th centuries in response to increasing sophistication in financial practices (Allen and Gale, 1994). During this period, the first insurance company was established in London in 1667 (Allen and Yago, 2010) to protect investors from the risks and uncertainties arising from the introduction of more complex innovations into the financial system. Further, society witnessed the introduction of innovations such as the call and put options (introduced in 1636 in Holland (Sinclair, 2010)), the futures contract developed by the Japanese in 1710 (Reszat, 1997; Wyman, 2012), the mutual fund created by the Dutch in 1773 (Wyman, 2012) and check clearing houses developed in London in 1774 (Wyman, 2012). While options and futures gave investors protection from fluctuating prices (Smithson, 1998), mutual funds (if managed properly) made it possible for investors to reduce investment risk (through diversification) (Hu et al., 2014) and clearing houses (e.g. counter party clearing houses) helped reduce default risk by netting offsetting transactions (Mehra, 2010; Duffie and Zhu, 2011). Similarly, the creation of the credit default swap (CDS), created in the mid-1990s (Kolb and Overdahl, 2009) in the USA, made it possible for financial institutions to insure against third party

defaults. CDSs have been identified to have contributed to the 2008/09 financial crisis and to the sovereign debt crisis in the Eurozone (Dunbar and Martinuzzi, 2012). In the case of the 2008/2009 financial crises, Adam and Guettler (2015) argue that the destruction was not caused only by the design of the innovation, but also by how it was governed; that is the use of teams to manage the fund slowed down decision making processes at a time when market conditions were changing rapidly.

### **3.4 Summary**

Financial innovation has existed since the civilisation of man; however the pace of financial innovation quickened in the first half of the 17th century, and then again in the 20th century. Although some financial innovations in history are novel (e.g. technological innovations like the ATM) and have changed how the industry works, most innovations, especially in the 20th and 21st century have been further developments of already existing products and service. Therefore the process of creating new and/or improved, products and services appears to have been largely incremental as levels of competition in the industry have increased; and these innovations have been driven by factors that are both internal and external to the innovating organization. Complexity, which derives from reconfiguration in a globalized, socio-technical context, seems to characterize the financial innovation process, causing high risks and uncertainty. This historical review creates a background against which the financial innovation governance landscape can be explored.

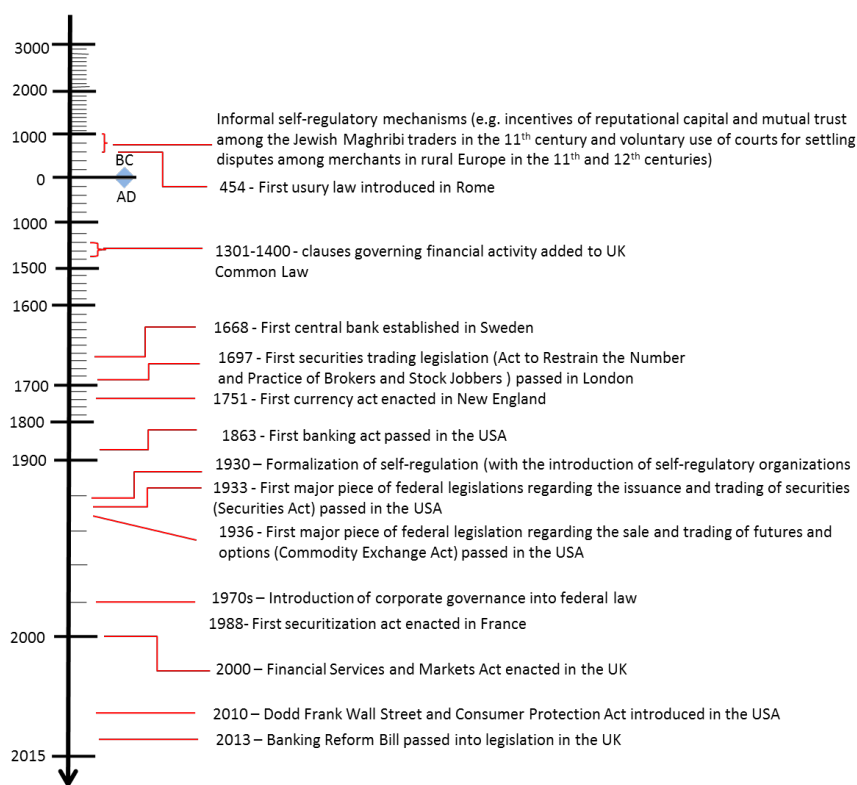
## **4 Emergence of financial innovation governance**

### **4.1 Financial regulation**

The history of governance in financial innovation is evidenced in practices such as the, social and political organisation, called the polis, developed in the eighth century BC by the Greeks to respond to market conditions and limit the effect of the market on society ((Redfield, 1986), regulatory problems resulting from forgery and counterfeiting in the financial system faced by first Roman and then Byzantine States in the Middle Ages (Levi, 1987), competition identified in early civilisation among national authorities in order to subject financial actors to their needs and demands (Germain, 2010) and activities of barter markets centuries ago (Gilligan, 1993). These suggest that governance of financial innovation extends back many centuries, with usury laws being the oldest form of regulation (Benmelech and Moskowitz, 2010). Introduced in 454BCE (Bolles, 1837), usury laws governed aspects of some of the earliest financial innovations (e.g. banking) by putting in place restrictions on the interest that could be charged by bankers; and punishments for offenders. This was to avoid extortion and protect consumers from the negative impact of the lending system. By the 14th century, governance of previous innovations in finance became a part of existing legal frameworks as the UK introduced clauses to govern financial activity in her common law. These legal policies did not govern the innovation process itself but mainly governed financial activity and the products of innovation after they had been introduced. Thus financial traders were prosecuted for several



offences, including engrossing (buying goods to sell in the future at a higher price), forestalling (raising the price of goods by holding up supplies) and regrating (buying goods in any market in order to raise price and selling it at a later date in the same place) (Gilligan, 1993). These practices continued until centuries later (i.e. the 16th and 17th century), when the need arose for the introduction of more prudential forms of regulation due to increasing complexity in financial products/services. In 1668, the first central bank was set-up in Sweden to oversee the issuance and circulation of currency in the economy (Allen and Yago, 2010). Gilligan (1993) suggests that government's increasing demand for short term borrowing coupled with the need for joint stock companies to fund growth into new markets led to an increase in marketing of stocks, fraud and manipulation of the market. Thus in 1697, the Act to Restrain the Number and Practice of Brokers and Stock Jobbers was passed. This, the first securities trading legislation (perceived as being restrictive, preventive and punitive), was a piece of process innovation in itself, as it sought to limit the number of brokers and the commissions paid to them; and to ensure that all brokers were licensed and transactions carried out were recorded (Gilligan, 1993).



**Fig. 1.** Historical rise of governance structures for financial innovation (Adapted from Redfield, 1986, Allen and Yago, 2010, Archarya et al., 2010, Germain, 2010, Omarova, 2010, Komai and Richardson, 2011, Cheffins, 2013, Her Royal Majesty's Treasury and Javid, 2013)

The 18th, 19th and 20th centuries saw the emergence of more policies to govern financial activity in several countries. In New England for example the Currency Act was introduced in 1751; this act declared paper currency a legal tender (Allen, 2009) and provided further guidance on the issue and circulation of money. Similarly, the US Government in 1791 chartered First Bank of the United States to manage the financial needs of the federal government, credit and coinage of the nation; following which the country witnessed in 1863 the passing of the National Currency Act (Komai and Richardson, 2011). In 1873 in Massachusetts, the first standard insurance regulation (for fire) which focused on licensing and reserve requirements (among others) was passed; although the industry had governed themselves prior to this through insurance boards (the first of which was set up in 1855 in New Hampshire) (Meier, 1988). This was followed by the introduction of the first Banking Act (sometimes referred to as the Glass-Steagall Act) in 1933 in the USA which sought to regulate the activities of banks; provisions included the separation of investment from commercial banking (Garten, 1997; Russell, 2008), restrictions on private banking activities and the use of bank credit and requirements for banks to have temporary insurance for deposits (Preston, 1933). In 1929, the USA witnessed the collapse of the New York Stock Exchange i.e. a sudden decline in stock prices (e.g. a fall of 24% for the Dow Jones over a period of two days and a total decline of 37% by the end of November 1929) due to excessive speculation (among other things) which caused distress to the financial system (Mishkin and White, 2002). This led to the introduction of the first major piece of federal legislation (in the USA) governing the issuance, sale and trading of securities as well as futures and options respectively (i.e. the Securities Act in 1933 and the Commodity Exchange Act in 1936) (Germain, 2010; Komai and Richardson, 2011). In 1988, securitisation was introduced into French law as a way of governing securitisation reconfiguration of financial assets (Baums, 1994).

The use of legislation in governing the financial sector worked well until the late 1970s and early 1980s when advancements in technology and communication caused financial institutions to innovate and find ways around existing regulation (Ingham and Thompson, 1993). This, among other things, led to a series of de-regulation initiatives mainly focused on the removal or lessening of interest rate ceilings and the management of competition among banks (e.g. the introduction of the Competition and Credit Control Act of 1971 in the UK, the Depository Institutions Deregulation and Monetary Control (DIDMC) Act of 1980 in the USA, Report of the Campbell Committee of 1982 in Australia and the 1974-75 liberalisation practices in Japan) (Adhikary, 1992). Since the 1980s, the financial sector in various countries has experienced periods of regulation and de-regulation leading to the introduction of new acts and the amendment or repeal of existing acts (Adhikary, 1992; Sherman, 2009). In the USA for example, acts such as the Garn-St. German Depository Institutions Act of 1982 (which allowed commercial lending among savings and loans institutions), the Financial Institutions Reform and Recovery Act of 1989 (which strengthened regulatory mechanisms for governing thrifts), the Gram-Leah Bliley Act of 1999 (which repealed the Glass-Steagall Act of 1933) (Sherman, 2009) and the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (which reforms the financial regulatory environment (in response to the 2007-2008 financial crisis) with a view to improving financial stability and protecting consumers)

(Acharya et al., 2010) among others were introduced. Similarly, acts such as the Banking Act of 1979 and 1987, the Financial Services Act of 1986 and the Financial Services and Market Acts of 2000 have emerged in the UK in an attempt to consolidate financial services regulation, improve financial stability and protect consumers (Radcliffe et al., 1994; McConnachie, 2009; Davies et al., 2010). More recently, the concept of separating investment and commercial banking activities (as in the case of Glass-Steagall mentioned above) has been proposed by the Independent Commission on Banking set up by the UK government (following a series of irregularities e.g. LIBOR scandal) to make recommendations on banking regulation; and UK financial regulators have, following a bill put through to parliament, recently in 2013 passed this into legislation (Edmonds, 2013) under the Banking Reform Bill (Her Royal Majesty's Treasury and Javid, 2013).

Germain (2010) suggests that financial governance went through several changes; and finally gained prominence in the 19th and 20th centuries. In these centuries, it was possible to see establishment of international governance systems operating through a set of linked world markets mainly based in London and central banks across Europe, Latin America and Asia (Brown, 1940; Williams, 1963; Germain, 2010). This led to “a new ‘sectoralisation’ of financial governance in which different parts of the financial system became subject to specific, often statutorily independent, regulatory agencies” (Germain, 2010: 31). In the USA for example Securities and Exchange Commission (SEC) was set up to oversee stock exchange regulation (Germain, 2010). Nevertheless, the financial sector saw a move towards internationally agreed regulatory practices with the deepening of networking relationships (through international conferences and organisations/committee e.g. League of Nations) among financial institutions in the 19th century (Germain, 2010); the collapse of the Bretton Woods fixed rate system (i.e. a system where exchange rates were determined by pegging foreign currencies to the US dollar) in 1971 (Verdier, 2013) and the introduction of the Basel Accord (a consensus among 12 countries to impose upon their international banks a set of minimum capital standards (Van Roy, 2008)) in 1988 (Davies et al., 2010) among others. With the creation of the ‘new international financial architecture’ (NIFA) (which was a reaction to major financial crisis that took place in emerging markets such as Mexico in 1994, East Asia in 1997-8 and Argentina in 2001) (Eichengreen, 1999; Kenen, 2001) in recent years, it can be said that the scope of international financial regulation is broadening to include non-western countries.

#### **4.2 Financial self-regulation**

Greif (1989) suggests that the history of financial self-regulation dates back to the 11th century where Jewish Maghribi traders in Baghdad used structures built around incentives of reputational capital and mutual trust to facilitate trade. This was followed by the voluntary enforcement of courts for settling disputes among merchants in rural Europe in the 11th and 12th centuries (Benson 1989; Benson 1994). The 19th century saw the introduction of self-regulation in the financial securities sector, although evidence of how this worked is limited (Centre for Financial Market Integrity, 2007). The use of this system of governance continued to increase until the 1930s when the SEC formalized self-regulation and statutorily

established various self-regulatory organisations (SROs) in the USA (e.g. Financial Industry Regulatory Authority (FINRA) and national stock exchange) (Centre for Financial Market Integrity, 2007; Omarova, 2010). By the 1970s, financial malpractices among US corporations led to an increased interest in internal governance (by the SEC) and consequently the introduction of concepts of corporate governance (i.e. “a system by which companies are directed and controlled” (Governance, 1992, p.15)) into federal law (Cheffins, 2013). This term gained prominence in the 1990s with the introduction of the UK’s Cadbury Report (Erturk et al., 2004; Cheffins, 2013) and has since been a mechanism used both internally and externally to govern organisations (O’Sullivan and Diacon, 1999; Weir et al., 2002; Hu, 2015). Siepel and Nightingale (2014) suggest that such corporate governance mechanisms could vary from country to country; in their study where they focus on the UK and the US, they argue that practices within the US create a broader scope for ‘managerial agency’ (for example when it comes to issues such as shareholder rights) when compared to the UK. This is an important point to note as they further argue that such differences in agency is positively correlated with managerial risk taking where those with greater agency have the potential to take higher risks (Siepel and Nightingale, 2014).

The 21st century saw the emergence of several open innovation initiatives within the financial services industry (Schueffel and Vadana, 2015). While innovation in traditional settings were initiated by and managed solely within a specific organisation, open innovation encouraged co-creation among multiple stakeholders such as customers, suppliers, consultants, educational institutions and research labs. Therefore, innovation contexts changed considerably; thus encouraging changes in innovation governance mechanisms. In this open innovation setting, governance mechanisms included internal processes, rules of collaboration, new service or product development frameworks that are repetitive, corporate culture initiatives, evaluation methods, and communication and collaboration technologies that fostered flexibility; all of which were managed by stakeholders, specifically, top management within the corporate governance framework (Schueffel and Vadana, 2015). Within the context of financial self-regulation, it is important to note the emerging use of decentralized forms of governance. A typical example of this is evidenced in the virtual currency, Bitcoin, which depends on the efforts of multiple people such as software engineers, users, currency exchanges and regulators in the setting and enforcement of rules. Bitcoin encourages the use of governance rules embedded in the design of the product rather than the use of an intermediary or central authority (Rainer et al., 2015). Therefore, its rules include features in the system’s underlying software that encourage transparency by making transactions traceable and available to all in the Bitcoin network, fosters anonymisation of user identity and money flows through encryption and pooling of transactions and allows users to control the pace of commercialisation of the virtual currency by correctly solving mathematical puzzles in order to validate transactions (Rainer et al., 2015). Although such self-regulatory mechanisms are unique and appear robust, Rainer et al. (2015) suggest the possibility of lapses in the use of self-regulatory mechanisms such as these; thus arguing in favor of supporting them with financial regulation for aspects of the virtual currency (e.g. consumer protection).

### 4.3 Summary

While until recently there is no evidence of specific governance mechanisms for the process of financial innovation itself, governance of the financial sector, in the form of legal frameworks, policies and self-regulatory mechanisms, dates back many years in history. These governing systems mainly focus on financial activity, using internal and external structures and placing emphasis on the regulation of the products of financial innovation after these had been developed and implemented, sometimes many decades or even centuries after this had occurred. Throughout history, governance systems of the financial sector have continued to be restrictive, evolving from being a national activity using a consolidated system to an international activity organized on a sectorial basis. This trend is however changing and society is witnessing a centralization of financial sector governance and an increased focus on financial stability and consumer protection in terms of objectives. I now proceed to discuss lessons learnt in history with regard to the emergence and governance of financial innovation.

## 5 Discussion

### 5.1 Motivations for and drivers of financial innovation

It can be argued that the introduction of money, interests, personal loans, banking firms, contingency claims and all the products associated with lending during Mesopotamian civilisation were introduced as demand increased for these products. This suggests that financial innovation started out as a need - based activity to support trade and enterprise; where financial products, services, and institutions were developed because the need for the product/service already existed, or was created by the innovators. Nevertheless, other factors such as technological advancement, civilisation and consequently the changing needs of man contributed to the continuous improvement of original innovations. Unlike practices in Mesopotamian civilisation (where financial innovations were introduced to profit from trade and enterprise), capitalism introduced a system where money itself became the commodity and profit from trading money rather than non-financial products and services gained emphasis i.e. a move from money as a facilitating agent to money as a tradable commodity that generates profit in itself. This was because society saw massive developments in terms of ownership of private property and means of production among governments and owners of large corporations and financial intermediaries. According to Ferguson (2008) the desire for governments to provide for and support their wars was a major driver of financial innovation in this era. In the cases of Germany, Russia and Austria for example, the countries suffered bad currency collapses and hyperinflation resulting from huge debt mountains they couldn't honour as a result of wars; hence the need to develop various financial instruments to raise additional capital. In the case of large corporations financial innovation was driven by the desire to increase profits; and the case of the Medici and Rothschild brothers who, by actively participating in the evolution of banking, made tremendous financial gains for themselves and their families is a good example

(Ferguson, 2008). Therefore, the introduction of market economies, various types of financial institutions, stock exchanges, options, futures, forwards and swaps can be said to have been stimulated by the desire to increase wealth while minimizing the risks associated; thereby supporting arguments by Laeven et al. (2015) that financial innovation is the output of decision making processes by profit maximizing individuals. Nonetheless, it is also clear, as can be seen from the repeal of the Bubble Act and the introduction of the corporate form, that some of the developments in financial innovation during this stage were a result of changes in the regulatory environment.

With regard to financial innovation in the 21st century, there seems to be a slight change in motivations and drivers. This is because most of the financial innovations that have taken place within this period have been minor variations of already existing products, services and institutions. In a paper exploring the perceptions of banks' senior managers and management consultants on the factors stimulating and constraining the adoption of new technology in financial intermediaries in the UK, Batiz-Lazo and Woldesenbet (2006) found that innovation in banking is largely a process of incremental change that modifies both banks' internal and external environments. Thus Graham and Dodd (1934) identify 258 financial securities; all of which are bonds, shares and warrants with slight differences in characteristics and risks. To this end, it might be suggested that in the 21st century, the vast majority of financial innovations are driven by competition where financial institutions need to differentiate their products by providing options and flexibility in order to survive, thrive and win. Further it could be argued in line with Su and Si (2015) that financial innovations in the 21st century were also made possible due to the existence of national contexts that promoted economic freedom. However, there is limited data to allow for an investigation into whether there are any performance aspiration effects. In conclusion, it can be argued that the main drivers of financial innovation are found to have evolved from need to profit and competition. However it is worth noting that none of these factors have worked alone. Allen and Gale (1994) show that financial innovations were also stimulated by social, cultural and political factors.

## **5.2 Types of financial innovation**

From the historical review above, it can be argued that financial innovation can generally be grouped under four main headings; 1) Products 2) Platforms, 3) Processes and 4) Enablers. These four categories are not mutually exclusive and could be intertwined in many respects (see Table 1).

**Table1.** Typology of financial innovation based on historical review

<b>PRODUCTS</b>	<b>PLATFORMS</b>	<b>PROCESSES</b>	<b>ENABLERS</b>
<b>Cash Instruments</b>	Commercial Banks	Automated Teller Machines (ATM)	<b>Financial Theory</b>
Savings Accounts	Investment Banks	Online, Telephone and Mobile Banking	Econometrics
Checking Accounts	Central Banks	Consumer Online Stock	Portfolio Theory
Money Market Accounts	Fractional Reserve Banking	Trading	Efficient Markets Theory
Certificates of Deposits	Mutual Funds	Point of Sale Terminals	Capital Asset Pricing Model
Interbank Deposits	Clearing Houses	Debit and Credit Cards	Black-Scholes Merton Model
<b>Debt and Equity Instruments</b>	Stock Exchanges	Improvements in Financial Management and Reporting Practices	Risk Adjusted Return on Capital
Loans	High Frequency and Algorithmic Trading Platforms	New Customer Service Processes within Financial Institutions	Duration Analysis
Notes	Secondary Mortgage Markets	Monitoring Diversification	Sensitivity Analysis
Bills	Venture Capital Firms	Relationship Banking	Value At Risk
Bonds	Hedge Funds	Private Banking Wealth Management	Expected Shortfall
Stocks	Blockchain Technology	Risk Management Procedures	Financial Technology
Microfinance products	FinTech Startups	Non-Bank Credit Intermediation	Software and Information Technology
Private equity	Asset Management Funds	Crowd Funding	Computational Power of Computers
<b>Derivative Instruments</b>	Exchange Traded Funds	Risk Culture	Data Collection and Telecommunication
Forwards	Pension Funds	Risk Sharing Techniques	Regulatory Innovations
Future	Mobile Network Operators	Securitization	Limited Liability
Options	Finance Companies	Syndication	Capital Adequacy Requirements
Warrants		Loan Trading	Deposit Insurance
Swaps		Trade Finance	Ongoing Research and Development in Finance
Credit Default Swaps		Islamic Finance	Financial Indices
Mortgage-Backed Securities			
Collateralized Debt Obligations			
Insurance and reinsurance products			

Product financial innovations as those innovations that serve as tools for carrying out financial transactions. These include a wide range of cash, debt, equity and derivative

instruments as well as insurance and reinsurance products. While cash instruments comprise certificates of deposits, interbank deposits and savings, checking, money market and time deposit accounts, debt and equity instruments include loans, notes, bills, bonds and stocks and vary depending on characteristics such as risks and payoffs involved and how payments are to be made among parties. On the other hand, derivative instruments consist of forwards, futures, options, warrants and swaps that vary based on the type of underlying asset, the market in which they trade and the payoffs while insurance and re-insurance products include packages introduced to help individuals and firms pool and diversify risks. Platform financial innovations are defined as those innovations that provide a place for financial activity to take place. They are institutional in nature and include, but are not limited to, banks, financial markets, clearing houses, Blockchain and Fintech start-ups that normally emerge to improve the efficient use of, and create opportunities for using, product innovations. Process financial innovations are those innovations that involve the creation of new ways or the introduction of changes in how a financial activity is carried out and delivered. This includes significant changes in techniques, equipment and/or software used in distributing securities, processing transactions, or pricing transactions. They relate not only to radical (often technology based) innovations (such as Automated Teller Machines (ATMs), online banking, electronic trading and securitisation among others) that transformed the financial sector but also to incremental innovations carried out by organisations to improve how things work; what Mention and Torkelli (2012, p. 11) describe as “modifications to internal structures and processes, managerial practices, new ways of interacting with customers and distribution channels” within financial service firms. An example of this regards the use of e-transparency initiatives by financial institutions to facilitate financial reporting and information dissemination as required by law (Raiiene, 2015).

Innovations within the final category (i.e. the enablers) are defined as those innovations that facilitate advancements in the other three categories. Enabling financial innovations are not per se the end of financial markets, in the sense that they are not the final product to be sold and exchanged. However, they have led not only to the creation of new financial products, platforms and processes but also new ways of using already existing financial innovations. The importance of enablers as a class of financial innovations derives from the fact that financial innovations have shown to follow what Carlota Perez called ‘Technological Revolutions’. Each technological revolution brings about new enabling technologies that trigger the development of new financial innovations (Perez, 2003). Therefore, they deserve to be acknowledged in the financial innovation typology. The most notable financial enablers are the proliferation of sophisticated mathematical models (e.g. Louis Bachelier's theory of speculation, Markowitz mean variance of portfolio selection model, the Capital Asset Pricing Model (CAPM), the Black-Scholes (1973) model for options pricing and the Gaussian copula model for probability distribution which has become central to modern finance (particularly investments and capital markets) in the last two decades (Merton, 1995b). These models played a significant role in the advancement of innovations within the derivatives, risk management, asset management, diversification, investment banking and corporate banking industries.



### 5.3 Process of financial innovation and associated stakeholders

According to the review above, financial innovation appears to have occurred within a process of idea generation to launch with limited understanding of what happens between these two end points, among internal and external stakeholders and associated lead times; thereby suggesting the use of an unstructured approach to innovation. Although some financial innovations in history are novel and have changed how the industry works, most innovations, especially in the 20th and 21st century have been further developments of already existing products and services. Thus ideas generated at the conception stage of the innovation process have evolved from radical, 'do different' strategies to smaller, incremental changes. For instance, while financial innovations in early civilisation (money, early forms of bonds, stocks and exchanges), were found to have caused a dramatic effect on the nature and scope of financial activity, recent innovations, especially in the derivatives and securities sector, follow Merton's innovation spiral principle i.e. a situation where the creation, of one financial product leads to the creation of a new financial product (Merton, 1992). This process is made possible, for example, due to the interaction between financial intermediaries and markets and the effect of cost reduction they benefit from innovation; as products created by financial intermediaries get standardized, new trading markets are created and this in turn leads to the creation of new financial products as financial intermediaries further trade in these new markets (Merton, 1995a). Therefore, recombination, incremental adaptation and increasing complexity are identified as key features of the financial innovation process. This involves both internal and external stakeholders including corporate institutions, governments and individuals who interact and collaborate with each other; thus suggesting an element of co-innovation (Lee et al., 2012) within the innovation process.

### 5.4 Process of and mechanisms for financial innovation governance

Findings from the review show that there are few accounts of specific mechanisms for the governance of financial innovation itself. What exists is governance of the financial sector which focuses on ensuring law and order in financial activity rather than (Germain, 2010) rather than the development of financial innovations from inception to commercialisation (Asante et al., 2014); and these are predominantly monitored and enforced using legal codes. Nevertheless, if issuance, as used to describe the various legislations above, refer to circulation, then it can be argued that although no evidence of specific regulations for the creation of financial innovation exists, some legal frameworks have been put in place to govern its popularisation; but these were imposed sometime after the innovation had occurred and become embedded in practice. Further, Bettzüge and Hens (2001) argue some financial innovations do not become standard instruments of financial trade since they disappear as quickly as they emerge. For example the financial innovation process in early civilisation saw the introduction and disappearance of several products, with some re-appearing at a later date in slightly altered form (Allen and Gale, 1994). Thus there could have been informal mechanisms in place to govern the financial innovation process (i.e. amend those innovations or withdraw them from the system); although evidence of this is limited due to lack of information.

It is visible from the discussions above that financial sector governance is most often reactive rather than forward looking (Pol, 2009; Germain, 2010; Paccès, 2010); normally occurred in response to a crisis (Cox, 2008; Helleiner and Pagliari, 2010); and comprising extensive government involvement (Helleiner, 1994; Eichengreen, 1996) (e.g. as central banks were thought to be incapable of regulating the financial system after the 1929-1931 financial crisis (Germain, 2010)). These suggest that financial sector governance (both financial regulation and financial self-regulation) lags financial innovation itself (Owen et al., 2009) and an attempt to address the impacts of an innovation is normally based on hindsight and not foresight. Thus although major legislations (under financial regulation) were in place to govern basic financial products/services by the 1980s, a series of amendments of these (in the form of several acts after this period were necessary in order to address issues brought to the forefront by various financial crises and scandals (Gilligan, 1993)). This has resulted in an increased focus on maintaining financial stability and protecting consumers in terms of the objectives of financial sector governance.

## 6 Conclusions and contributions

I am left with the impression that the current state of knowledge of financial innovation and its governance is very limited. While studies in the field have engaged in discourses centered primarily on the “back-end” of the innovation process (e.g. the diffusion of innovation, the characteristics of adopters, and the impact of innovation on firm profitability) (Frame and White, 2004), this paper has contributed to calls by these authors to develop a more comprehensive understanding of financial innovation and its governance. My point of departure for the study was to make the argument that an understanding of how financial innovations have occurred and been governed could shed more light on the topic. Although a review of the literature show that some of the historical mapping of financial innovation exists (e.g. Allen and Gale, 1994, Allen and Yago, 2010), none combines this with aspects of their governance, regulatory or otherwise and a comparison of the two is necessary to enable researchers understand the extent to which governance mechanisms used in the past are robust to ensure the responsible emergence of financial innovations.

Findings from this review show that there is huge diversity within the financial innovation landscape with innovations spanning a myriad of activities. These are normally driven by factors such as need, profit and competition which have changed overtime. The innovation process per the review is also identified to be largely unstructured. Nevertheless, this may be more of an information void rather than a management void that may need to be addressed by more open and transparent articulation of internal innovation management approaches by stakeholders to the public. The review also suggests the financial innovation process to be characterized by multiple stakeholder involvement, recombination, incremental adaptation and increasing complexity.

It is important to note that findings from the review brings to bare the lack of specific governance mechanisms for the development and commercialisation of financial innovation. What existed was legislations targeted at the governance of financial activity in the sector with the introduction of legislations lagging the development and

implementation of financial innovations themselves. Thus I could conclude that approaches to governing financial innovation throughout history were insufficiently robust to support the responsible emergence of financial innovations in society; hence the proliferation of financial crises and scandals in the financial innovation and governance narrative.

## 7 Limitations and Areas for Further Research

This review paper has sought to investigate the extent to which mechanisms for governing major financial innovations through history are robust in supporting their responsible emergence in society. Nevertheless, it is important to note that the use of timing of governance in relation to when innovation was introduced is only one way of measuring robustness; thus posing a major limitation to the study. In other studies (Asante et al., 2014; Arthur, 2017), I suggest use of the dimensions of responsible innovation being developed in the literature as another approach to measuring robustness of governance mechanisms. Therefore further studies that relate the innovation governance processes and mechanisms identified in this study to dimensions such as anticipation, reflection, deliberation and responsiveness suggested by Owen et al. (2013) would be beneficial. Further, validation of the features of financial innovation deduced from the review through empirical study within institutions across a wide range of sub-sectors in financial services is necessary if we are to consider the feasibility of a general theory on responsible financial innovation. Additionally, it is important for use to investigate whether financial sector governance subsumes financial innovation governance in a satisfactory way as findings from the review also indicates that legislation could play an indirect (contextual) role in the framing of innovation trajectories

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