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Financial innovation and its governance: Cases of two major innovations in the financial sector

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Abstract

The power of financial innovations to affect societies on global and intergenerational levels compels us to ask how we can ensure their responsible emergence in society. This requires an understanding of how innovation occurs and how it is governed in practice. Despite this, there is little research on the process and governance of financial innovation. The few studies conducted in this area have focused on the 'backend' of the innovation process. Therefore, using data from secondary sources, this study investigates how two major financial innovations occurred and were governed, and it discusses the findings in relation to those in the literature. This approach revealed that innovation processes fall within a continuum ranging from structured to unstructured. Moreover, lead times are potentially longer for innovations that are significantly disruptive, new to the market, and technological in nature. Finally, innovation processes can involve multiple stakeholders who use both statutory regulation and self-regulation for innovation governance. This paper concludes that innovation processes and their governance can vary significantly according to different areas of the financial landscape and associated innovation contexts. Thus, there is a need for more empirical work to understand such variability and practices in the sector as a whole.

Keywords: Financial innovation, Innovation process, Governance, Regulation

Introduction

Financial innovation can be defined as the creation and popularisation of new financial products, processes, markets, and institutions (Llewellyn, 1992; White, 1997; Tufano, 2003; Mishra, 2008; Sánchez, 2010; Delimatsis, 2011; Gubler, 2011; Lerner and Tufano, 2011). This definition suggests that financial innovation is a process that can be managed and governed to achieve desired results (Tidd et al., 2005; Tidd and Bessant, 2009). Despite this, there is limited research on the process and governance of financial innovation. The few existing studies are mainly focused on aspects of the 'backend' of the innovation process, such as diffusion, the characteristics of adopters, and the impact of innovation on firm profitability (Frame and White, 2004). As such, there is a need to fill this gap since a better understanding of financial innovation and governance processes can help steer financial innovation toward positive ends (Asante et al., 2014).

The nature of financial services and associated innovations

The financial services industry comprises a broad range of businesses with distinctions that are not clearly distinguished (Asmundson, 2011). That said, they can be broadly categorised into four main groups: monetary financial institutions, other financial institutions, insurance companies or intermediaries, and activities auxiliary to financial intermediation (Burgess, 2011). Monetary financial institutions include banks (i.e. central, investment, and commercial) and building societies. Other financial institutions can include the following: non-bank credit grantors (e.g. credit unions and cooperatives), consumer credit institutions (e.g. payday lenders, pawnbrokers), payment service institutions, electronic money institutions, mortgage and home finance lenders, finance leasing companies, bank holding companies, investment funds, securities dealers, unit trusts and factoring companies, hedge funds, venture capital, private equity, and pension funds (Burgess, 2011).

The activities of monetary and other financial institutions include taking deposits from individuals or institutions and feeding them into funds (e.g. pension funds, unit trusts) or firms in the form of equity institutions (e.g. venture capital, private equity, hedge funds, investment banks) (European Central Bank, 2015). These financial service sub-sectors are associated with innovations in products, processes (Batiz-Lazo and Woldesenbet, 2006), and services (Barras, 1986), which can occur either through a normal product life cycle or through what Barras (1986) calls a reverse product cycle. Within this model of innovation, process improvements and innovations provide the basis for future product innovations rather than the reverse (Barras, 1986). This process can be incremental or radical (Bessant and Tidd, 2007). For some monetary and other financial intermediaries—including those whose activities are 'based around complex, large-scale production and distribution systems', such as investment banks (Nightingale et al., 2003: 478), where the amount of financial risk correlates positively with increases in the scale and scope of financial trades—innovation can include technologies that help to create control systems (Nightingale and Poll, 2000) for minimising financial risk.

The activities of insurers and insurance intermediaries involve pooling and diversifying risks (Harrington and Niehaus, 1999). Meanwhile, activities auxiliary to financial intermediation include facilitating trade between borrowers and lenders (e.g. financial markets and asset management companies) (Burgess, 2011) and supporting individual decisions regarding investments and financial planning (e.g. financial advisers) (Banerjee, 2013). Again, innovations in products, processes, technology, and services are characteristics of these types of financial service institutions (Barras, 1986; Batiz-Lazo and Woldesenbet, 2006).

Current approaches to financial innovation and its governance landscape

A review of the literature (Llewellyn, 1992; White, 1997; Tufano, 2003; Mishra, 2008; Sánchez, 2010; Delimatsis, 2011; Gubler, 2011; Lerner and Tufano, 2011) suggests that the features of contemporary financial innovation include the following: 1) poor characterisation, with no overall descriptive model for how it happens and is governed; 2) a process that is mainly incremental and recombinant but also complex with rapid diffusivity; 3) a process that occurs with a short lead time; 4) an informal process with little

evidence of a systematic framework for management and governance (Armstrong et al., 2012); and 5) the involvement of multiple stakeholders, including individuals, non-financial firms, governments, financial firms, markets and exchanges, and technology firms, all of whom may be involved in the innovation process but with little understanding of how they interact.

In terms of governance, Cox (2008) describes a four-stage cyclical system of issue identification, self-regulation, failure, and legislation. He explains that the process of governing financial activity normally begins when an industry perceives a problem. To address that problem, actors in the industry implement voluntary standards that all are willing to accept. This approach usually works fine until something goes wrong in the financial system, which then triggers legislation since the legislature typically views this as the only solution. Stout (2011), meanwhile, uses the case of credit default swaps to argue that the financial innovation governance process begins with a common-law approach, followed by a modern approach involving codification and de-codification. At the common-law level, laymen and lawmakers use common sense to anticipate the benefits and possible risks of financial innovations, and decisions about which innovations to promote are made on that basis. While this approach does not prohibit financial innovations considered risky, it discourages their emergence by making them unenforceable by law, which leads to the emergence of self-regulatory mechanisms. Over time, common-law courts recognise the legality of such private enforcement activities and introduce legislation to prohibit them. However, this faces resistance from stakeholders, thus leading to a reversal of the old common-law rule. This process of codification and de-codification usually involves introducing transaction costs and establishing a discretionary authority with power over financial instruments and firms as a means to discourage risky innovations (Pradier, 2011).

The processes described above show that two main types of mechanisms are used in the financial innovation governance process—namely, statutory regulation (e.g. using legal sanctions) and self-regulation (e.g. using corporate governance structures and private exchanges) (Stefanadis, 2003; Awrey, 2011). Nevertheless, these mechanisms appear to focus more on financial sector governance than on governing financial innovation. Germain (2010): 27 defines financial sector governance as 'publicly sanctioned decision-making directed towards establishing the framework of rules by which and through which financial institutions undertake and organise financial transactions within and across borders'. This definition emphasises law and order in financial activity; however, it does not touch upon how financial sector innovations and the associated stakeholders are monitored from ideation to commercialisation (Asante et al., 2014). According to Asante et al. (2014), the latter is likely to include mechanisms such as 'stage gating', where challenging and approving ideas is key, as well as test-before-market principles and the use of new-product-development committees that debate the risks and impacts of innovation. However, the literature suggests that use of those mechanisms is limited in financial innovation, with its introduction, approval, elaboration, and diffusion appearing to occur under governance constraints.

Comparing financial innovation with its governance, the literature also suggests a reactive rather than forward-looking approach (Pol, 2009; Germain, 2010; Pacces, 2010). Here, governance occurs after development and commercialisation, and lags behind financial innovation itself, sometimes by decades or even centuries (Asante et

al., 2014). This partly implies an ideal state or condition in which stakeholders in the financial innovation ecosystem could assess risks, implement mechanisms to mitigate them, and respond quickly to emerging knowledge on new risks and wider impacts. The literature suggests the ability to foresee all risks associated with innovation has significant limits. However, many scholars still believe financial innovators can manage such uncertainty with the right mechanisms and tools. To this end, science and technology researchers have suggested a framework of anticipation, reflection, deliberation, and responsiveness to steer innovation toward the desired ends (Owen et al., 2013). This could also be useful in the financial sector (Armstrong et al., 2012; Muniesa and Lenglet, 2013; Asante et al., 2014).

Below, I summarise findings from an analysis of secondary sources regarding how two major financial innovations—automated teller machines (ATMs) and collateralised debt obligations (CDOs)—were developed and governed, as well as the extent to which activities such as anticipation, reflection, deliberation, and responsiveness were adopted. The ATM is considered both a specific and general innovation used not only by financial institutions to dispense cash from an individual's account but also as a facility for cash transfers between financial institutions. Similarly, the CDO is a general innovation used by all financial institutions across the industry. These two cases were selected because they are considered significant innovations in the financial services sector. They are representative of product innovations in the monetary financial intermediary segment of the financial services landscape. This subsector can be considered more risky, and potentially more disruptive, because of its involvement with, for example, structured finance products that help transfer risks using complex mechanisms on a global scale. Thus, understanding innovation and governance processes within that financial service sub-sector can help to discover ways to promote responsible financial innovation.

Automated teller machines (ATMs)

The ATM is a computerised self-service device that dispenses cash and performs other banking services with the insertion of a card and the entering of a personal identification number (PIN) (Curran and King, 2008). It can be traced to the early twentieth century, where increasing interest and rapid development in automation created a trend toward unmanned retail and other services (Harper and Batiz-Lazo, 2013). Though this innovation emerged from a growing pressure to end Saturday business hours in Europe, as well as branch expansion restrictions in the US, it successfully embedded itself in the economics of everyday life in a way that made it one of the biggest technological innovations in financial history (Goode and Moutinho, 1995; Curran and King, 2008; Volcker, 2009; Harper and Batiz-Lazo, 2013). Nevertheless, this entrenchment in society took a period of about 18 years to move from idea generation to commercialisation (Harper and Batiz-Lazo, 2013).

Though normally credited to Don Wetzel (Mandell, 1990; Hayashi et al., 2003), the idea of a fully functioning ATM offering multiple services (e.g. dispensing cash, making deposits, printing balances) cannot be traced to one individual (Harper and Batiz-Lazo, 2013). Rather, it was the product of collaboration among bankers, engineers, and end users in an unstructured, iterative, and evolutionary manner (Harper and Batiz-Lazo,

2013). While collaboration took place within organisations in different parts of the world, society saw the introduction of several standalone devices with various designs, verification systems, and capabilities (most limited to dispensing cash) (Harper and Batiz-Lazo, 2013). Nevertheless, limited capability and security remained major obstacles, leading to continuous improvements in both functionality and hardware. Consequently, there were new innovations in the specific aspects of ATMs, such as PINs and PANs (personal access numbers) associated with verification/security, web-enabled systems with online capabilities, and modular systems with memory storage customisation capabilities. These allowed for the coordination of payment systems across financial institutions—something that can be considered an innovation in itself (Harper and Batiz-Lazo, 2013). Aided by advancements in other sectors (e.g. computing, electronics, and communication), the ATM as we know it emerged as a result of a long, distributed chain of innovations in different aspects of the product, involving different people in different countries (Harper and Batiz-Lazo, 2013).

Although there is limited information on the history of ATM governance, it appears that the ATM was developed under a system of self-regulation rather than legislation. In a few cases, patents were granted to individuals or groups for the innovation or part of it (e.g. US Patent 3,761,682 given to Don Wetzel for the Docuteller and GB Patent 1,197,183 given to Anthony Davies and James Goodfellow for the Chubb MD2), but these occurred only at the end of the innovation process and were not a requirement for commercialisation (Harper and Batiz-Lazo, 2013). Systems for self-regulation were decentralised to top-level leadership as well as the team leaders of various innovation committees (e.g. the Technical Committee of Joint Purchasing Company Sparframjander, who designed the Bankomat, and a committee comprising staff from Midland Bank and Speytec Engineering). These were set up within companies around the world that used the mechanisms of periodic assessment (through meetings), testing (for the resilience of plastic cards with magnetic stripes), and prototypes, mainly to understand security and capability issues (Harper and Batiz-Lazo, 2013). Further, the competitive nature of the industry allowed consumers to play an indirect 'de facto' governance role by eliminating non-performing products (through non-purchase), thereby encouraging innovators to continuously improve (Harper and Batiz-Lazo, 2013). In the late twentieth century, innovation governance shifted from a decentralised structure to a more centralised one with the introduction of the ATM Industry Association (Harper and Batiz-Lazo, 2013). This organisation began as a dedicated media site for selling ads and promoting ATM supplies but grew to become a global self-regulatory body providing best-practice manuals, regulatory monitoring, campaigning services, and benchmarking services (Harper and Batiz-Lazo, 2013). Similarly, government regulation (in the form of legislation) has also improved, though it mainly focuses on fees/surcharges and consumer protection (Harper and Batiz-Lazo, 2013).

The widespread use of committees involving individuals from various backgrounds (e.g. bankers, engineering manufacturers, transaction processors, software providers) created platforms to facilitate deliberation (Harper and Batiz-Lazo, 2013). Nevertheless, anticipation was lacking as these discussions were reactive, narrowly focused on security and capability issues identified only after deployment (Harper and Batiz-Lazo, 2013). The development of the PIN/PAN system provides a good example of this. This innovation came about sometime after the initial deployment of the first Swedish bank

machines in 1967. Someone had discovered that the algorithm used to associate card numbers with PIN codes was not resilient and exploited this by withdrawing money from various ATMs around Sweden during Easter vacation in 1968 (Harper and Batiz-Lazo, 2013). Unfortunately, the bank did not catch this until about 50 days after Easter, creating problems that nearly led to the closure of the company (Harper and Batiz-Lazo, 2013). These events produced discussions among stakeholders (banks, manufacturers, and engineering firms), who studied the work of other companies (e.g. Smith Industries's method for accurate, low-cost, high-security customer access to machines) to create an improved verification/security system (Harper and Batiz-Lazo, 2013). This suggests that although anticipation was lacking, innovators were reflexive and responsive in dealing with identified problems. In another example supporting responsiveness, we find deployment of features of the ATM delayed by about two years after various security issues had been identified through testing (Harper and Batiz-Lazo, 2013). Further, it has been shown that slow adoption processes in the case of the ATM (Harper and Batiz-Lazo, 2013) allowed for mistakes to be corrected at a lesser cost to society.

Collateralised debt obligation (CDO)

Defined as 'an asset-backed security backed by a diversified pool of one or more classes of debt' (Lucas et al., 2008: 395), CDOs were introduced in 1987 in the US (Stefani, 2010). They gained prominence in the twenty-first century, creating a new source of demand for lower-rated 'tranches' of securities (Financial Crisis Inquiry Commission, 2011). Based on the logic that pooling many bonds together reduces investors' exposure to the failure of any one bond, and that 'tranching' will enable investors to pick their preferred levels of risk and return (Lucas et al., 2008), this innovation involved a complex process of purchasing (of assets to invest in), pooling (to obtain diversification benefits), tranching (to identify their place in the cash-flow waterfall), and selling (to investors) (Financial Crisis Inquiry Commission, 2011). Historically, CDOs were composed of asset pools mainly including bank loans, corporate bonds, and emergency bonds. In response to the 1998 liquidity crisis, the composition of asset pools was expanded to include different kinds of securities backed by assets from various sectors (e.g. mortgages, mobile home loans, aircraft leases, and mutual fund fees). In 2002, when these 'multi-sector' CDOs performed poorly, the composition of CDO asset pools was reformed, focusing mainly on non-prime, mortgage-backed securities. Innovators argued that CDO managers understood this industry well, and it seemed to have good performance in terms of returns. This was further narrowed to residential mortgage-backed securities and non-agency mortgages (among others), which offered relatively stable collateral but introduced a lot of complexity into the system (Financial Crisis Inquiry Commission, 2011).

There were five key players in the CDO innovation and governance process: securities firms, CDO managers, rating agencies, financial guarantors, and investors (Financial Crisis Inquiry Commission, 2011). Securities firms, CDO managers, and financial guarantors participated in the development process by originating and underwriting CDOs, selecting collateral and managing portfolios, and providing protection against default, respectively. Meanwhile, rating agencies and audit companies performed

oversight governance by providing basic guidelines on collateral content and CDO structure and signing prospectuses, respectively, to ensure that investors (who buy CDOs) are protected (Financial Crisis Inquiry Commission, 2011). Nevertheless, rating agencies' effectiveness in this governance role is considered poor (Financial Crisis Inquiry Commission, 2011) because of conflicts of interest arising between these agencies and innovators (Mullard, 2012), as well as flaws in the rating models/methodologies used to assess risk and define rating guidelines (Griffin and Tang, 2011). In addition to self-regulation through rating agencies, there was some statutory regulation in the form of guidelines for calculating net capital reserves (to hold against securities portfolios) and the approval of documents (e.g. prospectuses) by various government institutions (e.g. the SEC). However, these occurred just before commercialisation with very little on-site examination (Financial Crisis Inquiry Commission, 2011).

A review of the financial crisis enquiry commission report on the CDO machine (Financial Crisis Inquiry Commission, 2011) suggests that while some anticipation and reflection occurred in the CDO development process, the principles of deliberation and responsiveness were limited. Innovators of CDOs in the late 1990s did anticipate a high default risk (arising from selling low-investment-grade products) as a possible consequence of their innovation. However, the possibility of this leading to the collapse of an entire financial system (i.e. systemic risk) was overlooked. They argued that 'if one security went bad, the second had only a very small chance of going bad at the same time' (Financial Crisis Inquiry Commission, 2011: 128). Anticipation processes were not acted upon, and reflection processes were not broadly constituted. The wider consequences of complex innovations cannot be sufficiently identified and evaluated by narrow reflection alone and require broad deliberation (within and beyond the financial sector). However, deliberation was limited to the five key stakeholders mentioned above, each of which took varying degrees of risk and for a time profited handsomely. Yet, discussions were skewed and did not effectively consider the complex, wider impacts of the innovation—especially on the public. Furthermore, the level of complexity involved in CDO construction made reflection and deliberation increasingly difficult, and in many cases management and boards of directors might have participated only passively in their development and commercialisation (Crouhy et al., 2008; Pol, 2009; Castellano et al., 2011). Unsurprisingly, institutional responsiveness was poor. This was compounded by the fast rate of CDO commercialisation (e.g. nearly $700 billion in CDOs were issued between 2003 and 2007) (Financial Crisis Inquiry Commission, 2011).

Discussion

Findings from the literature (Llewellyn, 1992; White, 1997; Tufano, 2003; Mishra, 2008; Sánchez, 2010; Delimatsis, 2011; Gubler, 2011; Lerner and Tufano, 2011) suggest poor characterisation of the financial innovation landscape with no overall descriptive model for how it occurred. In line with this finding, I observed a largely unstructured innovation process in the development of ATMs. Meanwhile, the CDO case showed the use of some structure comprising a process of purchasing, pooling, tranching, and selling. This suggests the use of both structured and unstructured product development processes in the creation and popularisation of innovations associated with monetary financial institutions. I observed that innovation was largely framed in both case studies

as a 'new' product, with limited explicit framing of innovation in the position-paradigm dimensions, as presented by Tidd et al. (2005) and Tidd and Bessant (2009). Nevertheless, it can be argued that while the ATM represented a paradigm shift from established mental modes of products through automation, CDOs repositioned risk in the marketplace.

In terms of new products, the practice of disruptive innovation, in contrast to findings in the literature, was clearly evident in the development of several standalone devices that emerged across the globe. This deviation could be attributable to links with other technological innovations. Despite this, innovations associated with the CDO and the emergence of fully functioning ATMs offering multiple services were primarily presented as improvements to existing products, such as a debt and security instruments and several standalone cash dispensers. This was demonstrated through the largely incremental nature of innovation activities. With regard to lead times, the development of the ATM took more than 12 months, contrary to findings in the literature (Llewellyn, 1992; White, 1997; Tufano, 2003; Mishra, 2008; Sánchez, 2010; Delimatsis, 2011; Gubler, 2011; Lerner and Tufano, 2011), while development for CDOs was quite fast, usually less than 12 months. This could be because the ATM case was significantly disruptive, was new to the market, and had links with other technological innovations. Thus, innovators required more time to understand the product.

In contrast to findings in the literature regarding the lack of governance in financial innovation processes (i.e. the oversight management of the creation, development, and commercialisation of financial innovations) (Asante et al., 2014), the innovation processes for both ATMs and CDOs were found to be governed. However, this was limited to internal non-regulatory mechanisms such as periodic assessments and testing. Nevertheless, the use of some form of statutory governance was identified in both cases regardless of what it involved and when it occurred in the innovation process. While the government's role in the ATM case was limited to patent granting, with no direct involvement in the innovation process, in the CDO case this role comprised box ticking and approvals prior to launch, which occurred late in the innovation process. This suggests the presence of an information rather than governance void that could be addressed by articulating internal and external innovation governance mechanisms in more open and transparent ways to stakeholders and the public.

Despite this, findings from the analysis of the two cases show an abundance of mechanisms for governing innovations after they were commercialised—what Asante et al. (2014) call financial sector governance, which they argue is different from financial innovation governance. These comprised regulatory and self-regulatory instruments, such as legislation and industry standards, that appear to have occurred through processes similar to those suggested by Cox (2008). Regarding ATMs, Guerette and Clarke (2003) argue that governance of the use of ATMs was limited in the early 1970s since there were few security concerns. By the late 1970s to early 1980s, however, the US banking industry had experienced an upsurge in ATM robberies. This fostered an initial response in which a leading bank developed a technical manual and guidebook for preventing ATM crime. Unfortunately, this did not yield positive results, and the industry faced huge amounts of civil litigation on the matter, thus causing state and city governments to introduce ATM security standards and legislative directives. It can also be argued that stakeholders in the CDO case identified a number of issues (including the

possibility of high default risk), which they sought to address through self-regulatory mechanisms such as embedding credit rating agencies, audit companies, and legal experts in the CDO creation process. However, following the failure of the system during the 2007/2008 crises, regulators introduced legislation (e.g. the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 introduced in the US) that sought to improve financial stability and protect consumers.

Regarding the financial innovation governance process suggested by Stout (2011), limited secondary data on the ATM case makes it difficult to assess the extent to which it is applicable. However, a study by Mehta and Nolan (2009) suggests there is room to corroborate their model with the CDO case. The proliferation of private civil litigation involving CDOs following the 2007/2008 financial crises implies the use of a common-law approach for CDO governance. In this framework, Mehta and Nolan (2009) suggest that lawmakers have yet to resolve the issue of whether CDO-related claims are enforceable in court. Nevertheless, in a case involving Lehman Brothers Special Financing (LBSF) and Ballyrock 2007–1 CDO, LBSF argued that some CDOs with specific contractual provisions (e.g. those that 'eliminate the in-the-money party's gains under the swap agreement simply because the credit support provider files for bankruptcy') are unenforceable because they do not 'attempt to approximate actual damages, but rather create a substantial windfall to the out-of-the-money counterparty' (Mehta and Nolan, 2009: 40). Although I found no evidence of the existence of private enforcement agencies to necessitate a shift to codification and de-codification, an understanding of the issues at stake as court procedures unfold could contribute to such a move in the future. However, this may be difficult as Mehta and Nolan (2009) emphasise the diverse nature of individual CDO transactions, which they believe will make the generalisation of claim types and the resolution of disputes difficult. The findings from both case studies also support the involvement of multiple stakeholders in the innovation and governance processes identified in the literature (Llewellyn, 1992; White, 1997; Tufano, 2003; Mishra, 2008; Sánchez, 2010; Delimatsis, 2011; Gubler, 2011; Lerner and Tufano, 2011). Regarding the ATM case, these stakeholders interacted through elements of co-innovation (Lee et al., 2012), where stakeholders such as bankers, engineers, and end users collaborated in the innovation process framework (Chesbrough, 2003; Blazevic and Lievens, 2008; Piller et al., 2011). Similarly, designing CDOs involved engagement with a broad group of stakeholders, including securities firms, CDO managers, rating agencies, and financial guarantors. Despite this, the involvement of end users (i.e. investors) in the innovation process appeared limited in the CDO case. Further, the introduction of the ATM Industry Association in the late twentieth century (long after ATMs emerged in the early twentieth century) supports, to some extent, arguments in the literature (Pol, 2009; Germain, 2010; Pacces, 2010) that financial innovation governance lags behind financial innovation itself.

Conclusion

This study aimed to investigate how innovations occurred and were governed in two major financial innovations. It found differences in how innovation occurred for ATMs and CDOs. While the first occurred through an unstructured process, the latter occurred in a more structured way. Therefore, it can be argued that innovation processes for monetary financial institutions can fall within a continuum of structured

and unstructured approaches. Innovation generally occurred within longer periods for ATMs, contrasting with findings in the literature. This leads to the argument that for financial innovations that are significantly disruptive, new to the market, and technological in nature, lead times can be much longer. Further, the study also confirmed the multi-stakeholder nature of financial innovation as well as the use of both statutory regulation and self-regulation as instruments in its governance. This leads to the conclusion that while financial innovation is governed, innovation processes and their governance can vary significantly in different areas of the financial sector landscape and associated innovation contexts; these are neither stable nor generalisable when considering the financial sector as a whole. Thus, there is a need for more empirical research on organisations to shed light on such variability. Moreover, there is a need for processes of knowledge exchange and mutual learning regarding innovation governance across stakeholders in the sector as a whole.

The findings regarding the definition and features of financial innovation are not necessarily new. They largely reiterate and reinforce findings already discussed in the literature on financial innovation. However, they are important since they provide the context within which financial sector innovators must understand and frame any conceptualisation of responsible financial innovation. This context includes the fact that innovators may experience extreme dilemmas of control (Collingridge, 1980) because of short lead times in the financial innovation environment. On the other hand, the findings regarding the management and governance processes in financial innovation and its associated mechanisms are novel. At present, innovation and its governance across the sector remain opaque to the outside world. Findings such as the use of structured processes to manage some financial innovations and the existence of governance mechanisms suggest there is room to embed a responsible innovation framework (Owen et al., 2013) in the financial innovation context once modifications are made. Such modifications could include redefining what good deliberation should involve in particular settings (e.g. engagement with limited but pertinent internal and external bodies/individuals who are able to understand highly technical innovations).

Author's contributions
I am the only author of this paper.

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Competing interests
The author understands the "Financial Innovation" Journal Policy on declaration of interests. She declares that she has no competing interests.

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