Aspects regarding the Design and Development of Innovative Products for Risk Management

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Abstract: Before the recent global financial crisis it was widely recognized that financial innovation is one of the most powerful engine of economic growth (Miller, 1986; Merton, 1992) with a robust potential to spread benefits to the entire economy (Bresnahan, Trajtenberg, 1995; Helpman, 1998) and also capable to actively compensate the sources of weakness. Financial innovations support the growth of firms at lower costs. This process is also sustained by an active management dedicated to the stimulation of innovator’s potential (Michalopoulos, Laeven, Levine, 2010). The recent crisis has changed the perception regarding the financial innovation. In fact, the "negative innovations", associated with the difficulty of understanding the critical mechanisms and the artificial elements in pricing processes are mixed with the gaps in regulation and a poor understanding of the mechanisms that spread systemic risk. Other authors (Johnson, Kwok, 2009; Litan, 2010; Mishra, 2010) had demonstrated that financial innovations contain a mixture of different elements. The analysis of the future of financial innovation should consider the new features of these products, the evolutionary methods for design and adaptation to regulation, the valuation in the context of a new dynamics and a new life cycle. Our application is dedicated to innovative products for SME’s financing.

Key-Words: risk management, financial innovation, global financial crisis, regulation, securization

1 An introduction in financial innovation

Financial innovation represents a complex process of creation/ invention and dissemination/ diffusion of new instruments, technologies, institutions, and markets. The main functions that innovations perform are: moving funds, the pooling of funds, managing risk, extracting information to support decision-making, addressing moral hazard and asymmetric information problems, active support in sales and services through a payment system.

Innovations, exemplified by new derivatives, securities, pooled investments, process innovations, expressed by new technologies of distributions or transactions are interdependent in the context of the evolutionary adaptation process. Financial innovations are instruments characterized by risk, complexity to develop/ diffuse strong relationship with competition and sensitivity to IP protection. There are similarities and differences between financial innovation and the technological innovation. The complex dynamics and the social welfare implications of financial innovation are remarkable tasks and need a special treatment.

The benefits of innovation can be estimated by using the increase in social welfare produced by the new attributes available (Trajtenberg, 1990). For a better understanding of the features of financial innovation, the analysis should detail their main objectives (Goetzmann, Rouwenhorst, 2005): the transfer of value through time, support for the contract on future values, and support for the negotiability of claims.

In Section 2 are analyzed special aspects regarding financial innovation as liquidity, transparency and the securization of these products. The relationship between financial innovation and regulation is very complex and the spiral of innovation give the inspiration for new generations of products capable to better respond to constraints.
In Section 3 are presented emerging methods for an efficient design of innovative financial products. Financial innovation needs to prove a better efficiency, and the classical models for the design should be tuned with computational intelligence ingredients.

In Section 4 some simple applications of financial innovations in SME’s financing, the case of venture capital and private equity together with the path of development, the way to understand, the dissemination to users, in the context of standardization according regulation.

In Section 5 are presented aspects regarding the valuation of financial innovation a process essential for the understanding the efficiency of innovation, the strategy to transfer in real life systems with positive spillovers from the knowledge created.

2 Special aspects of financial innovation- liquidity, transparency and securization

The term “innovation” represents a radical change, and financial innovation is indeed associated with the process of change/ transformation. Here it is a dialectic relationship because transformation and changing are reinforced by the spiral of innovation. The new aspects that should be included in the study of the mechanisms in financial innovation are: the higher degree of interconnection of the financial system, the dynamics of innovation, the change in their underlying structure, the way that they are marketed and used, the changing of the life cycle in the context of a critical need for more regulation.

Financial innovations are defined by special dynamic features like the innovation spiral (Merton, 1992) and the changing in the end-user behavior (Lerner, 2006). The concepts of “sequence of financial innovations” (Tufano, 1995; Mason, Merton, Perold and Tufano, 1995) was integrated by Personsk, Warther (1997) in the model of innovation spiral and underline the importance of follow-on effects and the impact of encouraging innovation.

A branch of the literature is dedicated to the dynamics of the S-type adoption cycle of innovation (with five types of actors: innovators, early adopters, early majority, late majority and last adopters). The diffusion of innovations deals with the potential adopter’s propensity, education and risk-taking abilities to adopt innovations earlier. A better understanding of the dynamics of adoption is essential in estimating the potential for financial innovations to give rise to externalities and to transform the innovations in a widely accepted paradigm. The S-type adoption cycle of innovation is different in emerging countries. There is a paradigm of early adoption that means courage but also responsibility. The regulation is always insufficient prepared for changing and transformation. In emerging markets is necessary to introduce a new way of thinking regarding the innovation and the transfer to real world. In the model of financial innovation (Gennaioli, Shleifer, Vishny, 2010) innovation can address the demand for particular types of cash flows but the mechanisms are not fully understand and the risks associated may be underestimated, resulting an return of the market to classic products.

The relationship between financial innovation and regulation is very complex. New generations of financial products represent the responses that exploit regulatory gaps (Miller, 1986) but regulatory bodies should adapt and react with a minimum lag. In this case the cycle of innovation is reduced.

3 Emerging methods for the design of innovative financial products

For a better efficiency, the classical models for the design of financial innovation should be tuned with computational intelligence ingredients. Machine learning algorithms fuse historical design information distributed in space/ time into more powerful design knowledge.

The ontology enables parties to share knowledge through a common language (Gruber, 1992) and intelligent methods use knowledge organized into ontology.

Data mining provides algorithms for searching and summarizing huge quantity of data in a usable form. Data mining can be mixed with other strategies to develop intelligent systems.

Evolutionary computation is focused on the development of problem-solving methods inspired from nature and includes genetic algorithms (GA), genetic programming (GP), evolutionary algorithms (EA), and evolutionary programming (EP).

GAs are inspired from the representation of the human organism by approximately 30 000 genes expressed as a vector of four genetic letters A, C, G, and T, easy handled by the modern ICT.
GP creates a computer program in the scheme computer language as the solution. Because recombination can cause frequent disruption of building blocks, or mutation can cause abrupt changes in the semantics, Iba (1995) introduced a new approach by integrating a GP-based adaptive search of tree structures and a local parameter tuning mechanism. GPs are able to generate and evaluate a huge quantity of alternatives and represents effective design tools for developing innovative design. EA incorporates the natural selection or survival of the fittest by maintaining a population of structures that evolve according to the rules of genetic operators (selection, recombination, mutation, and survival). The co-evolutionary algorithm is a variation of EA where each individual represents only a partial solution to the problem. EP is an algorithm where individuals/solutions are encoded by a set of real valued variables.

Intelligent decision support systems (IDSS) are useful in financial innovation design characterized by high complexity and high sensitivity to the risks associated with poor decisions. IDSS optimize various design outcomes and could be very productive for the design of innovative products.

Case-based reasoning (CBR) mimics the human capacity to adapt and reuse solutions from old problems to new ones. CBR assumes that similar problems can be solved with similar solution approaches. New problems are compared to known cases until a best match is found and the solution is adapted to solve new problems.

Qualitative reasoning (QR) offers the capability to develop new models when the relationships between variables and parameters are not well established. QR searches in fast manner ideal solutions to simplified situations, but are not able to operate with highly detailed information.

Hybrid methods combine aspects of all the major approaches and could mitigate the shortcomings of the elemental methods. The combined GA and neural network reduce the complexity in design and EP adapts previously stored design solutions in a CBR system. Hybrid techniques are more broadly applicable than conventional approaches.

4 Applications of financial innovations in SME’s financing

The applications of financial innovations in SME’s financing are not a new task but a very important one, especially in the case of venture capital and private equity financing. This aspect is critical in emerging markets, where the access of SMEs to funds is very restrictive. This is fact an application of the one of the most important aspects is the social impact, expressed in the form of externalities, especially in the context of the dynamic and cyclical interchangeability of the attractiveness between different generations of innovation. The net result should consider the detrimental effects and is analyzed by using a simple cost benefit analysis (CBA) equipped with systemic risk (the risk that an economic shock triggers in the context of an interconnected financial system the failure of a set of markets/institutions or a set of significant losses with high impact on the cost/availability of the capital and the financial volatility) ingredient. Innovations like venture capital and private equity funds exert a special impact on the development trajectory of individual firms.

A classical application of financial innovation is related to the optimal decision of financing according different types of structure of capital. Entrepreneurs invest in projects with higher returns but trying to minimize the dividends to shareholders. If the firm uses equity from outside investors (at a higher return than in case of internally generated funds), the manager has an incentive to engage in wasteful expenditures but if the firm raises debt, the manager may increase risk to undesirable levels. Managers employed a variety of tools to monitor/ control firms but modern literature highlights the fact that problem of equity offerings is associated not only with the impact of attractive valuations but also with the dynamics of the stock prices. Managers should intensively analyze firms before providing capital, and only funding a small fraction, according to the prudential portfolio management rules. It is also interesting an analysis of the capability of entrepreneurs to enter into alliances, to get access to institutional investors like banks, mutual funds or pension funds and to find the way to invest into venture capital projects. The impact of venture capital on innovation should consider the technological opportunities and the leverage of a proper using of innovation. Venture capital investments add technological innovation and have a significant positive effect both on the production of patents and the creation of new businesses (Mollica, Zingales, 2007). This aspect is essential in the efficiency of the technological transfer.
The impact of private equity investments is related to a better liquidity, a lower bankruptcy or financial restructuring (Stromberg, 2008). In addition the holding periods for private equity investments have increased, with positive impact on management (Bloom, Sadun, van Reenen, 2009).

The efficiency of financial intermediation should be reconsidered after the global crisis. The difficulty of valuation of the impact of securitization is associated to the sale of loans, the bundling of loans, the standardization of the underlying assets, the guaranteeing of assets, other credit enhancement (collateralization), the tranching of claims to create multiple securities differentiated by credit risk, the creation of securitized structures using other derivatives, the creation of securitized structures using high-risk loans (subprime), the use of not fully understanding credit ratings.

In Adrian, Shin (2010) is underlined the impact of securitization in the case of shadow banking system in which market-based financial intermediaries replaced traditional banks. The challenge with the analysis of the innovation is related to the securitization. Future work should also analyze the impact of network of innovations, with highly interconnected effects.

5 Aspects regarding the valuation of financial innovation

Every process of valuation of intangible assets is difficult and the data bases or the critical case studies could not offer a simple way for statistics. The complex processes for development financial innovations (PDFI) increase the efficiency by improving the quality or reducing the costs, with positive spillovers from the knowledge created. The return to PDFI depends on the strategy (own/competitor), the environment, and it is characterized by a lot of uncertainty. In this case the returns are highly unpredictable, uncertain and volatile.

The analysis of the returns to investments in PDFI is important in strategic decision making because the dynamics of the knowledge development implies huge expenditures.

There are different methods for estimating the return associated to PDFI inspired from the growth of total factor productivity (TFp), at different levels of aggregation. Griliches (1979) work was based on the analogy with the production function, where the output is related to the knowledge/ stock of R&D. In the primal approach, the production function uses quantities as inputs, and in the dual approach, which estimates a system of factor demand equations derived from a dual representation of technology. In the Tobin's q inspiration, the current financial value of a project is related to its underlying assets, including knowledge. The measurement difficulties are related both to the output (when R&D is focused on quality improvement) and input (the stock of R&D capital). Hall (1996) reviews aspects regarding the private and social returns to R&D, and discusses aspects of the measurement problems. Hall (2007) presents a detailed analysis of the problem of estimating the depreciation of R&D capital. Recent surveys include Hall (2000), Lev (2001), Czarnitzki (2006), Grandi (2009). All these contributions could represent valuable contributions for the valuation of PDFI. Future work should be focused on the design of new indicators for PDFI and the description of knowledge production, a better estimation for innovation depreciation.

6 Conclusions

The global financial crisis has changed the paradigm of financial innovation. The new process of understanding the future and the way to perform new developments in spiral of financial innovation depend on the knowledge for understanding the critical mechanisms and the new elements that spread systemic risk. The modern literature had recognized that financial innovations contain a mixture of different elements, good and bad and also the necessity of a better understanding of the way to use properly and to refine or tune these products according regulation. The generation and integration of innovative financial products in emerging markets give a sense to stimulate liquidity, but the regulators should take into account the fragility of these markets, given by consistency and volatility. The way to prevent financial shocks is difficult and more regulation triggers a critical misunderstandings and a return to illiquidity.

The applications of financial innovations in SME’s financing strategies are focused on venture capital and private equity. These types of innovations return after the global crisis as efficient solutions and are capable to exert a special impact on the development trajectory of individual firms. For emerging markets, more work should be done
for the applications regarding the integration of foreign direct investments and the transfer of technology.

The analysis of the future of financial innovation products will be related to the new features of these products, the way to improve the design and the flexibility and adaptation to the more and more dynamic regulation. The valuation in the context of a new dynamics and a new life cycle of innovation will give an important feed back in the analysis of the social impact. The application of this study is dedicated to innovative products for SME’s financing, an important task in the case of emerging economies.

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