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IS THE USE OF PATENTS PROMOTING THE CREATION OF NEW TYPES OF SECURITIES?

Stefania Fusco†

Abstract

Has there been a change in the level of innovation of financial methods subsequent to the State Street decision that allowed the award of patents to protect such methods? Ten years following the issuance of State Street, the patentability of business methods is still so controversial that the Federal Circuit has recently considered overruling its own precedent by rehearing In re Bilski en banc. The goal of the patent system is to promote innovation. If an increase in the level of innovation of financial methods is not present, the adoption of this form of intellectual property to protect creativity in the industry is unjustified and, potentially, even harmful. Indeed, it is important to ascertain the correct balance between encouraging innovation on the one hand, and leaving enough “raw material” upon which individuals can build new ideas on the other. A first step in accomplishing this objective is to understand whether the patent system is “doing its job” or, in other words, whether the provided protection is actually inducing innovation in a specific industry.

In this article, the author presents an empirical study of innovative types of securities that have emerged over the past 25 years. The author also investigates the patent practice of the financial industry and identifies the patent applications submitted and the patents issued on different types of securities. Finally, the author

† Stefania Fusco is a JSD Candidate at Stanford Law School. I have many individuals to thank for their contribution in this project. I have significantly benefited from the collaboration with my advisor, Professor Mark A. Lemley, whose comments helped me to carefully rethink and refine my position of the issues discussed. I am thankful to Professor R. Anthony Reese for his precious comments. I have also benefited from my discussions with the employees at MSCI Barra. Finally, I am grateful to my husband, Davide Negri, for being such an incredible source of inspiration and for providing infinite encouragement, support, and understanding.
discusses her findings and concludes that, recently, creators of new types of securities have shown less interest in the patent system. Nevertheless, the rate of innovation in this field has remained constant. At this time, the available data are not sufficient to reach an entirely conclusive determination with respect to whether the patent system has affected the design of new types of securities. However, the results are still of great significance and cast doubts on the soundness of the State Street decision, at least to the extent that it involves the financial industry. By deciding In re Bilski, the Federal Circuit now has the opportunity to readdress the issue of the patentability of this subject matter in a way that more closely reflects the goal of the patent system as it is described in the Constitution.

INTRODUCTION

In the last few years a renewed interest in the validity of patenting business methods has emerged. The issues appeared to have been settled in 1998 with the State Street Bank and Trust Co. v. Signature Financial Group, Inc. decision. However, in 2008, the U.S. Court of Appeals for the Federal Circuit (Federal Circuit), following the more restrictive approach toward the patent system adopted recently by the Supreme Court, has questioned the soundness of the policy of extending patent protection to this type of subject matter. The change of scenario happened explicitly in In re Bilski when the Federal Circuit decided to rehear the case en banc and to openly solicit amicus briefs on whether State Street should be overruled.

The issue under consideration revolves around an empirical question: does the patent system indeed foster innovation in business methods? If so, patent protection may not only be appropriate, but needed because society benefits from the increased knowledge engendered by this form of incentive. However, if an increase in the level of innovative business methods does not occur as a consequence of providing patent protection to them, State Street should be overruled, because society can be hurt by the grant of property rights that do not produce additional knowledge in return.

2. See infra Part C and specifically notes 50 and 51.
3. In re Bilski, 264 F. App’x 896 (Fed. Cir. 2008).
4. Id. at 896-97.
The focus of this paper is on innovation in financial methods (as a subset of business methods) and, more specifically, in the production of new types of securities over the past twenty-five years. Its purpose is to investigate whether after State Street there has been an increase in the level of innovation in new types of securities which could correlate to the adoption of patents to protect them.

Therefore, Section I of this paper is dedicated to a brief overview of the relevant cases on the patentability of business methods. Section II focuses on the studies of financial innovation which have been produced so far. Particular relevance has been given to those research studies that empirically analyze the effects produced by the recent interaction between the patent system and the financial industry. Section III describes the present research project and the method adopted to perform it. Finally, Section IV illustrates the data collected through the selected method and provides a full data analysis.

I. PATENTABLE SUBJECT MATTER

The Copyright and Patent Clause of the U.S. Constitution gives the Congress the power "to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." This constitutional provision is complemented in relevant part by 35 U.S.C. § 101, which prescribes that patent protection must be granted to any applicant who "invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof ...." Together, the US Constitution and the Patent Act define what is known as patentable subject matter.

The language of these provisions suggests a very broad scope of patent protection which, however, is not unlimited. Indeed, three judicially created exceptions contribute to providing the required guidance to determine what, under U.S. law, is considered to be "good patentable material." Specifically, these three exceptions include: laws of nature, natural phenomena, and abstract ideas.

5. U.S. CONST. art. I, § 8, cl. 8.
7. ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, PATENT LAW AND POLICY: CASES AND MATERIAL 79 (4th ed. 2007) ("[T]he bar to patenting 'laws of nature, physical phenomena, and abstract ideas' was . . . established by a long line of cases. The precise articulation of this rule has not, however, been uniform . . . . Despite the imprecision in its formulation, the rule is the primary doctrinal tool by which the courts limit the category of patentable subject matter.").
8. Id.
From time to time, significant debates have surrounded interpreting the meaning of the aforementioned provisions. Scholars and critics of the patent system have often speculated about determining the ultimate boundaries of patentable subject matter. A definitive answer to this issue has yet to emerge. The only unquestionable conclusion that one can derive from the overall scenario is that, primarily due to judicial intervention, these boundaries change over time, perhaps in relation to altered economic circumstances or to the emergence of new technologies. Thus the debates change accordingly.

Why is it so important to determine what can ultimately be protected by the patent system? The answer is intuitive for those who consider the essence of patent protection—the granting of a legal monopoly to an inventor—9—and combines that concept with the possible effects that this grant can have on society, both in terms of personal liberties10 and the production of additional innovations. Furthermore, if the three aforementioned judicially created exceptions are taken into account, it is possible to see how they represent a reminder about the risk associated with providing excessive patent protection. This risk encompasses the possibility of counteracting the very constitutional goal, to "promote the Progress of Science and useful Arts,"11 for which the patent system was established and thus, ultimately, precluding innovation rather than promoting it.

Indeed, the pursuance of the aforementioned goal has a social cost consisting of excluding society from using certain knowledge, with the consequent reduction of the public domain or the "common pool of information," from which people can derive inspiration to produce new ideas and inventions. Therefore, like in a perverse circle, the patent system can both foster and limit innovation depending on the type of rights provided to the patentee and the scope of protection established by the overall system.

In this context, it is important to ascertain the correct balance between encouraging innovation on the one hand and leaving enough "raw material" upon which people can build new ideas on the other. This is certainly not an easy task. A first step in accomplishing this task is to understand whether the patent system is "doing its job" or, in other words, whether the provided protection is, indeed, inducing

innovation in the specific industry. If so, and if individuals are motivated by the chance to obtain a patent on their inventions or if patentability is at least one of the factors that produces innovation when combined with others, then the creation of proprietary rights may be justified because society is compensated by the advancement in knowledge that otherwise would not occur. If, however, innovation is produced no matter what is provided by the patent system, then the creation of proprietary rights is not only useless, but also reduces the public domain and, thus, damages society.

The specific issue that has more recently occupied commentators and judges regarding patentable subject matter is whether software, but even more so, business methods should be eligible for patent protection and, if so, to what extent. The issue appeared to be settled in 1998 and 1999 when the Federal Circuit decided *State Street Bank and Trust Co. v. Signature Financial Group, Inc.* and *AT&T Corp. v. Excel Communications, Inc.* but more recently this very same court appeared to have second thoughts about the matter. Indeed, on several occasions, the court has expressed more restrictive views toward these two specific subjects.

The history of the patentability of business methods goes hand in hand with that of software innovations. Thus, although the focus of this paper is on financial methods as a subset of business methods, a few words on how software became patentable subject matter seem appropriate.

**A. Brief Description of Life before State Street**

During the 1950s and early 1960s, it was quite clear that the United States Patent and Trademark Office (USTPO) considered software not to be patentable subject matter. However, the Supreme Court did not consider the patentability of software related inventions until 1972 when it decided *Gottschalk v. Benson*. The case

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15. See id. at 1358-60.

16. See MERGES & DUFFY, supra note 7, at 131.

17. See Osenga, supra note 12, at 1093.

concerned a patent application for a method of processing data by a program to convert binary-coded decimal numbers to pure binary numbers.\(^{19}\) The Supreme Court concluded that the process under consideration was not eligible for patent protection, because its claims in the patent application were so broad as to preempt all of the possible uses of the claimed method in a general-purpose digital computer.\(^{20}\) The Court noted that the claims did not attempt to cover a specific invention, but rather the adopted mathematical formula itself.\(^{21}\) Consequently, the claimed method consisted of an abstract idea and was not patentable because it conflicted with one of the three judicially created exceptions to patentable subject matter\(^{22}\): laws of nature, natural phenomena, and abstract ideas.\(^{23}\) In turn, the USPTO interpreted this case to mean that software innovations were unpatentable per se.\(^{24}\) This interpretation was confirmed a few years later when the Supreme Court, in *Parker v. Flook*,\(^ {25}\) found a method for updating the variable alarm limits used for catalytic conversion to be unpatentable because the method did not comprise eligible subject matter. Despite the fact that the claims were not as broad as those in *Benson*,\(^ {26}\) the Court concluded that since the only innovative element of Flook's process was the algorithm through which the recalculation of the aforementioned limits operated,\(^ {27}\) the claimed method was not eligible for patent protection under 35 U.S.C. § 101.\(^ {28}\)

In 1981, the Supreme Court once again had the opportunity to rule on the issue under consideration by deciding the *Diamond v. Diehr* case.\(^ {29}\) However, this time the result was quite different from that in *Benson*\(^ {30}\) and *Flook*.\(^ {31}\) Indeed, despite the fact that the claimed process adopted a mathematical algorithm in several of the steps required for molding and curing synthetic rubber, the Court concluded

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19. *Id.* at 64-65.
20. *Id.* at 71-72.
21. *Id.*
22. *Id.* at 67-68.
27. Parker, 437 U.S. at 585.
28. *Id.* at 594-95 & n.18 ("Very simply, our holding today is that a claim for an improved method of calculation . . . is unpatentable subject matter under § 101.").
31. Parker, 437 U.S. at 594-95 & n.18.
that the invention was patentable.\textsuperscript{32} In particular, the Court specified that

when a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of 35 U.S.C. §101.\textsuperscript{33}

Subsequent to the Diehr case, the number of software patents issued per year began to increase exponentially, reflecting "not only the growing importance of software to the nation's economy, but also the more favorable attitude toward such patents at the PTO and in the courts."\textsuperscript{34} Such favorable momentum for the patentability of software culminated in 1998 with the State Street\textsuperscript{35} decision, which is described in the next section.

\textbf{B. State Street and AT&T}

In 1998 the Federal Circuit decided a case appealing a grant of summary judgment in favor of State Street Bank & Trust Co. (State Street) based on the invalidity of Signature Financial Group, Inc.'s (Signature) patent on a data processing system for implementing a certain investment structure for mutual funds.\textsuperscript{36} Specifically, the system included a method of pooling mutual funds' assets together into a single investment portfolio organized as a partnership to provide their administrators with considerable savings in managing expenses and tax reductions.\textsuperscript{37}

According to the district court, the invalidity of the patent derived from the fact that the "the claimed subject matter fell into one of two alternative judicially-created exceptions to statutory subject matter"\textsuperscript{38} known as the \textit{mathematical algorithm exception} and the \textit{business method exception}.

Reviewing the case, the Federal Circuit noted that "mathematical algorithms are not patentable \ldots to the extent that they are merely

\begin{footnotes}
\textsuperscript{32} See \textit{Diehr}, \textit{450 U.S. at 177, 181, 192-93.}
\textsuperscript{33} \textit{id. at 192.}
\textsuperscript{34} Merges & Duffy, \textit{supra} note 7, at 154.
\textsuperscript{35} See generally \textit{State St. Bank & Trust Co. v. Signature Fin. Group, Inc.}, \textit{149 F.3d 1368 (Fed. Cir. 1998), cert. denied, 119 S.Ct. 851 (1999).}
\textsuperscript{36} \textit{id. at 1370.}
\textsuperscript{37} \textit{id.}
\textsuperscript{38} \textit{id. at 1372.}
\end{footnotes}
abstract ideas." The court reasoned that if the algorithm is applied in a useful way, i.e. "it produces a useful, concrete and tangible result," there is no reason not to consider it patentable subject matter. Specifically, the court found that Signature's patent was not invalid under 35 U.S.C. §101 because it claimed a system based on a mathematical algorithm that transformed "data, representing discrete dollar amount[s] . . . into a final share price." Such an algorithm was, therefore, applied in a useful way; and was thus patentable. Moreover, the court took the opportunity "to lay th[e] ill-conceived [business method] exception to rest" and reversed and remanded the case.

A few months later, the Federal Circuit decided the AT&T case, reiterating and clarifying the conclusions reached in State Street. With these two decisions, the Federal Circuit effectively opened the doors of the USPTO to business methods and significantly simplified the already common practice of patenting software.

To be sure, it should be pointed out that the USPTO issued business method patents even before State Street, but very sporadically and with great uncertainty about their validity. State Street eliminated any doubts about the inclusion of business methods within the scope of patent protection. As a result, the USPTO created a new class for this type of subject matter—class 705—and, particularly in the years immediately following State Street, applicants have filed a huge wave of applications within this class. With the wave of applications, a significant amount of criticism "from academics, journalist and politicians" arose that focused primarily on the policy issues behind the patentability of this type of subject matter and the alleged low quality of the related patents.

39. Id. at 1373.
40. Id.; see also Osenga, supra note 12, at 1102 (noting that the Federal Circuit reached this conclusion by taking "its logic in Arrhythmia Research and Alappat one step further.").
41. State St. Bank, 149 F.3d at 1373.
42. Id. at 1375.
43. AT&T Corp. v. Excel Comms, Inc., 172 F.3d 1352 (Fed. Cir. 1999).
47. Allison & Starling, supra note 46, at 731.
Nevertheless, for almost a decade, State Street and AT&T unquestionably represented the Federal Circuit’s position toward the patentability of software and business methods. In its opinions, the court clearly held that “there should really never be a § 101 rejection of these applications so long as data transformation is present and the invention produces the requisite useful, concrete, and tangible result.” However, in the last few years, a different trend appears to have emerged. Courts and the PTO have expressed more restrictive views about these types of subject matter. These views have been reflected in courts' decisions and in the PTO 2005 Interim Examination Guidelines that “emphasize an element of physicality to find patent eligibility.” The next section will provide a brief overview of the most recent cases on this issue.

C. The World after State Street

On September 20, 2007, the Federal Circuit decided two cases which engendered substantial attention among academics and observers. The reason for such interest is the fact that by issuing these two decisions, the court once again had the opportunity to address the boundaries of patentable subject matter and decided to do so in a way that appeared to be more conservative than what would have been predicted under State Street and AT&T. This shift in position was not totally unexpected since it followed several recent Supreme Court decisions in which the Court had expressed a distinctly more restrictive view toward the patent system than that prevailing in the 1980s.

Specifically, the Federal Circuit had to decide the In re Comiskey case by determining whether the rejection of a patent application claiming a method and a system of mandatory arbitration for disputes arising from unilateral and contractual legal documents

48. See Osenga, supra note 12, at 1102; see also Ho, supra note 12, at 471.
52. In re Comiskey, 499 F.3d 1365 (2007).
was valid. In other having determined that Comiskey’s invention fell within the general category of business methods, the court concluded that his patent application sought to acquire property rights on the “mental process of resolving a legal dispute between two parties by the decision of a human arbitrator.” In other words, Comiskey’s patent application was seeking to monopolize the “use of human intelligence in and of itself” and, therefore, had to be rejected. Indeed, according to the court, mental processes alone, as well as abstract ideas, are not within the scope of patent protection. The court stated that, in order for a mental process to be patentable, it must be combined with one of the statutory subject matter categories defined in 35 U.S.C. § 101. Comiskey, on the other hand, admitted that his invention did not require a machine to be operative, thus, the court concluded that it was not patentable.

Furthermore, in deciding In re Nuijten, the Federal Circuit took an unexpected position when it concluded that a signal encoded according to a certain process that reduces distortions caused by watermarks was not patentable subject matter because it did not fall into any of the four categories of eligible subject matter: process, machine, manufacture, and composition of matter. Specifically, the court said that the Nuijten’s signal could not be a process because it did not involve an act or a series of acts. It could not be considered to be a machine because it was not “made of ‘parts’ or ‘devices’ in any mechanical sense.” It could not be a manufacture either, because it was too transitory and, thus, did not have the required physical characteristics. Finally, Nuijten’s signal could not be considered to be a composition of matter because, in order to fall

53. See id. at 1368. It is worth noting that this appeal derived from the decision of the Board of Appeals and Interferences (Board) to affirm the examiner’s rejection of claims 1-59 of Comiskey’s patent application. The ground on which the Board based its decision was obviousness under 35 U.S.C. § 103 rather than a lack of patentable subject matter. In turn, the Federal Circuit decided sua sponte to tackle the case from the standpoint of subject matter eligibility.
54. Id. at 1379.
55. Id.
56. Id. (citing In re Schrader, 22 F.3d 290, 291 (1994)).
57. Comiskey, 499 F.3d at 1376.
58. Id. at 1379.
59. In re Nuijten, 500 F.3d 1346 (Fed. Cir. 2007).
60. Id. at 1357.
62. Nuijten, 500 F.3d at 1355.
63. Id.
64. Id. at 1356.
within this category, the invention under consideration must be either a chemical union, or a mechanical mixture of a gas, fluid, powder, or solid.\(^6\)

Overall, the generalized absence of physicality seems to have been fatal to the patentability of Nuijten's signal. In this context, of interest is the dissenting opinion of Judge Linn who argued that it did not appear that the majority's holding was "compelled by or consistent with precedent or the language of the statute."\(^6\)

Subsequent to these two decisions, many commentators began to speculate about the possibility that the era of patentability of business methods was coming to an end. Ultimately, the Federal Circuit reinforced such concerns when on February 15, 2008, it sua sponte ordered a rehearing en banc of the *In re Bilski* case.\(^6\)

The appeal was based on the Board of Patent Appeals and Interferences' (Board) decision to affirm the USPTO's rejection of Bilski's patent application on a method for hedging the consumption risk related to the sale of certain commodities.\(^6\) According to the USPTO, Bilski's method was nothing more than an abstract idea, or a mathematical algorithm with no practical application. The Board substantially agreed with the USPTO's conclusions and also underlined the fact that the claims under consideration failed to either "recite the transformation of an article to a different state or thing,"\(^6\) or pass the *State Street* test because they did not produce a "useful, concrete and tangible result."\(^7\) Finally, the Board noted that Bilski's claims were so broad as to cover any possible way of performing the method and, thus, they were claiming an abstract idea.\(^7\) Bilski appealed the Board's decision and the case was argued before the Federal Circuit on October 1, 2007. A few months later, the court ordered the hearing en banc.\(^7\) With this order the Federal Circuit solicited supplemental briefs and amicus briefs on the following issues:

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65. *Id.* at 1357.
66. *Id.* at 1358 (Linn, J., dissenting).
69. *Id.* at *23.
71. *See Bilski*, 2006 WL 4080055, at *34.
72. *See Bilski*, 264 F. App'x at 897.
1. Determination of whether claim 1 of Bilski's patent application claims patentable subject matter.

2. Determination of the appropriate standard for understanding whether a process is patentable subject matter.

3. Determination of whether the reason for the unpatentability of the subject matter claimed in Bilski's patent application is that it constitutes an abstract idea or a mental process.

4. Determination of the circumstances that make an invention containing both mental and physical steps patentable subject matter.

5. Determination of whether, in order to be patentable subject matter, a method or a process must physically transform an article or must be tied to a machine.

6. Determination of whether State Street and AT&T should be reconsidered and, if so, whether they should be overruled.

The oral argument was held on May 8, 2008. It appears that at the hearing, the Federal Circuit "focused more narrowly on what types of business-related inventions should be eligible for patent protection."

II. WHAT DO WE KNOW ABOUT FINANCIAL INNOVATION?

A. Financial Innovation in General

As noted by several commentators at different times in the past few decades, the financial industry has been characterized by a remarkable increase in innovation. "Broadly speaking, financial innovation is the act of creating and then popularizing new financial instruments as well as financial technologies, institutions and..."

73. See State St. Bank, 149 F.3d 1368.

74. AT&T Corp. v. Excel Commc'ns, Inc., 172 F.3d 1352 (Fed. Cir. 1999).

75. Bilski, 264 F. App’x at 897.


markets.”  

In this specific case, it appears that most of the changes engendered by this wave of innovation have occurred in two financial areas: securities and trading strategies/processes.  

The literature on studies that empirically test the causes of financial innovation is sparse. As noted in one paper, which surveys the literature on this topic, “only 39 articles that provide empirical tests of hypotheses of any kind concerning financial innovation” were found. Of these papers, only two focused on the economic or environmental conditions that encouraged innovation. Recently, a few scholars have started publishing studies that more closely examine the impact of patent protection on the innovative process of the financial industry. Since this issue is the primary focus of this paper, a brief description of these more targeted studies will be provided in the next section.

Traditionally, the most important causes of financial innovation are considered to include the following:

1. “Increased volatility of interest rates, inflation, equity prices, and exchange rates
2. Advances in computer and telecommunication technologies
3. Greater sophistication and educational training among professional market participants
4. Financial intermediary competition
5. Incentives to get around existing regulation and tax laws
6. Changing global patterns of financial wealth.”

As Silber points out, it appears that financial innovation occurs when the costs of adhering to existing constraints become too high. Specifically, it can be said that when exogenous changes, such as an increase in interest rates or the development of a new technology, cause the constraints under which a firm normally operates to become

79. Id.; see also Ross, supra note 77.
81. Id. at 117.
82. Id.
83. See infra Part B.
85. See Silber, supra note 77.
too expensive, the search for alternative tools to maximize the company's objective begins.\textsuperscript{86}

On the other hand, Tufano\textsuperscript{87} has empirically demonstrated that, in the case of the issuance of mortgage-backed securities, the innovator has a first-mover advantage, consisting of its ability to conquer a larger market share and then become the leading market-maker for that product. Ultimately, this edge on its competitors is translated into higher profits and the prospect of acquiring this strategic advantage represents a large enough incentive for financial firms to innovate.\textsuperscript{88} This conclusion appears to be confirmed by Herrera and Schroth,\textsuperscript{89} who in 2003 showed that the advantage enjoyed by the first mover mainly comprises information asymmetry. Indeed, by dealing directly with the client and acquiring important information about its needs, the innovator can position itself ahead of the learning curve for the product under consideration as well as subsequent generations of products.\textsuperscript{90} In turn, the innovator is much more competitive than the imitators and can garner a larger share of the market that validates the decision to incur the original research and development (R&D) expenditure.\textsuperscript{91}

The importance of understanding the underlying causes for financial innovation derives from the fact that the possibility of inducing additional innovation by providing the right incentives to market players increases once the motives for the creative process in this sector are known. The result is the emergence of new products that reduce "costs and risks . . . [of new] service[s] that meet[] the particular needs of the financial system participants."\textsuperscript{92} Indeed, it is possible to say that that society inevitably benefits from a richer and

\textsuperscript{86} Id. at 89.


\textsuperscript{88} Id. at 234-35.


\textsuperscript{90} Id.

\textsuperscript{91} Id.

more developed financial system "in which [, for instance,] risks are spread and the advantages of diversification are [fully] achieved." 93

B. Financial Innovation and Patent Protection

As mentioned in the previous section, recently a number of empirical studies focusing on the newly established relationship between the patent system and the financial industry have been produced. Most of these studies have been conducted by Josh Lerner, who published a first article in 2002, 94 offering a systematic analysis of financial patents as they emerged immediately subsequent to State Street. 95 In that context, Lerner emphasized the fact that between 1998 and 2000 there was a significant increase in the issuance of financial patents, characterized by a low involvement of academics and universities, i.e. the number of financial patents awarded to academics and universities, as compared to other fields, was extremely low. 96 Lerner noted that perhaps this phenomenon could be explained by a generalized lack of interest or awareness of financial patents by academics working in finance. 97 He also pointed out the paucity of citations of relevant academic works that also characterized the patents under consideration and concluded that this fact was indicative of the low level of experience and training of the examiners who, at that time, were working on these types of patents. 98

A year later, Lerner presented another study 99 focused on the interplay between the patent system and the financial industry. This time he integrated his previous research with interviews of senior patent attorneys and employees of major financial institutions. He also considered what he refers to as the "investment bank's research intensity" by looking at the number of bank employees serving on the editorial or advisory board of Financial Management and the Journal of Portfolio Management. He noted, among other things, that there was an increasing interest on the part of financial institutions in patent protection and that the majority of the financial patents issued

94. Lerner, supra note 44.
95. Id.
96. Id. at 901.
97. Id. at 902.
98. Id.
100. Id. at 26.
up until that point had been issued to U.S. financial companies with strong ties to academia, i.e. with employees working for the aforementioned academic-practitioner journals.\textsuperscript{101}

In 2006, Lerner published another study on this issue to determine the source of financial innovation by identifying the most innovative institutions within the financial industry. He supplemented his analysis with a study of the patenting patterns of the firms under consideration.\textsuperscript{102} Lerner’s investigation revealed that the most innovative financial institutions include: small firms; less profitable firms; and older and less leveraged firms that are located in areas with high levels of financial innovation.\textsuperscript{103}

On the other hand, his investigations on firms’ patenting patterns produced some surprising results. The only similarity with the findings on the characteristics of the most innovative firms was that older and less leveraged companies tended to obtain more patents.\textsuperscript{104} Particularly striking was the absence of any significance of spillovers in patenting patterns.\textsuperscript{105}

More recently, in 2007, Dew investigated the applicants seeking financial patents and concluded that the majority are imitators rather than innovators.\textsuperscript{106} Indeed, in his opinion, patenting activity is inversely related both to companies’ innovative propensity and to their stock’s rate of return.\textsuperscript{107} Moreover, he pointed out that the financial patents issued up until that point were concentrated in the hands of relatively few financial institutions and that small firms had shown little interest in this form of intellectual property protection.\textsuperscript{108}

Finally, in 2008, Hunt studied the issue specifically at the heart of this paper—whether patent protection had fostered financial innovation over the past decade.\textsuperscript{109} Specifically, he looked at the R&D

\begin{footnotesize}
\begin{enumerate}
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\item Id. at 27.
\item Id. at 248.
\item Id. at 244.
\item Id.
\item Id. at 2.
\item Id. at 10-11.
\end{enumerate}
\end{footnotesize}
spending of financial institutions to understand whether State Street encouraged additional R&D investment that ultimately could have produced more innovation in this field. Given the paucity of traditional data on R&D spending in the financial industry, Hunt focused on the composition of the workforce in this sector and, in particular, investigated those occupations within this context that are more likely to engage in R&D. He then compared his findings with those of other industries to determine whether it was possible to identify a trend specific to the financial industry that was somehow the result of the introduction of patent protection in 1998. Since such a trend did not emerge, Hunt concluded that “at present there is little evidence to argue that business methods patents have had a significant effect on the R&D investments of financial institutions.”110

As mentioned above, this article tackles the very same research question Hunt considered. However, it focuses on different indicators of financial innovation in combination with the financial patent trend developed over the past decade. The next section will provide a full description of the author’s approach to this issue.

III. RESEARCH AND METHOD

A. Research Project

Should there be patents on financial methods? For most of the last century, financial methods, as well as business methods, were unpatentable per se.111 The “result of the United States Patent Office opening its door to financial innovations”112 is that financial institutions, as well as financial and legal departments in nearly every industry, now “have to be mindful of [patent protection].”113 This consideration might appear to be inconsequential. However, if taking into account the fact that, for many years, the financial industry had survived based on its own creative processes114 and its own equilibrium among the market participants, it becomes understandable why the change is more problematic than it initially seems. Indeed, the adoption of patents to protect financial methods has created mixed feelings within the financial industry, and many observers have

110. Id. at 27.
111. See discussion supra Part A.
113. Id.
114. See Tufano, supra note 87, at 215; see generally Silber, supra note 77.
questioned whether the patent system might confer any benefit on this industry.\footnote{115}

Therefore, the primary purpose of this project is to investigate the basis of the aforementioned skepticism by performing an empirical study of financial securities to determine whether, subsequent to the State Street decision,\footnote{116} there has been an increase in the level of innovation in financial instruments that could justify the extension of patent protection to this subject matter.

\textbf{B. Method and Data}

To carry out this research, a list of innovative types of securities that emerged over the past twenty-five years was created. The creation of such a list has three purposes: first, to understand whether there has been an increase in the number of innovative types of securities after 1998; second, to compare this list with the patents issued and the patent applications submitted for securities during the past decade; and third, to understand whether the patent system has had any impact on the items included in the list. The next section will present a full description of how the securities list was created and how the data on patents and patent applications on this subject matter were collected.

\textbf{1. Securities List Creation}

The first, and principal, obstacle encountered in compiling a list of innovative types of securities is determining what constitutes an innovation in the financial market. Indeed, as noted by Tufano, "most innovations are evolutionary adaptations of prior products . . . almost nothing is completely 'new' and the degree of newness or novelty is inherently subjective."\footnote{117} Therefore, the author has decided to tackle this problem by focusing on determining an appropriate benchmark for identifying innovative types of securities. Since the ultimate goal of this paper is to assess what impact, if any, the patent system has on the production of securities types, the author started thinking about this issue in terms of patent law or, in other words, about how an

\begin{footnotesize}
\footnote{117. See Tufano, supra note 78, at 5.}
\end{footnotesize}
innovative security could be described from the perspective of the patent system.

She concluded that an innovative security would have to be new, useful, and nonobvious. More specifically, the innovative security must: implement a new financial function or improve an existing one, i.e. the security must be new; be marketable and thus have a definable price and risk, i.e. the security must be useful; and be more than a simple aggregation of existing securities, i.e. the security must be nonobvious.

The author discussed her conclusions and the overall project with experts in the field and realized that one of the elements that constitutes the mathematical models used to calculate the security's price and risk is described univocally by the financial function performed by the security itself. Therefore, when the security under consideration discharges a different, new, or improved financial function, then the mathematical element within the model adopted to calculate price and risk changes to reflect the different characteristics of the specific instrument. Moreover, once this change is identified, it is possible to say whether it is a known one, i.e. the instrument under consideration is performing a known financial function, or whether it is a new one or an improvement of a known one, i.e. the instrument under consideration is accomplishing a new function. In other words, by looking at the way in which the price and the risk of a security is calculated and, specifically, by looking at the mathematical function defined by the financial function that the security performs, it is possible to ascertain whether or not the financial instrument under consideration is, in fact, innovative. Ultimately, by adopting this criterion, a list of marketable securities performing new financial functions, i.e. a list of innovative types of securities, can be produced.

The author is aware that this method has a subjective component since she decides that the change in the mathematical function defined by the security's financial function is indicative enough to become the benchmark for identifying an innovative product. Nevertheless, the adopted method also presents several important benefits, including being exclusively linked to the most significant aspect of the innovative effort in the field of securities: the performance of a new financial function.

118. Some of the most common financial functions are price-risk transferring, credit-risk transferring, liquidity generation, credit-generation, and equity-generation. See Fabozzi & Modigliani, supra note 84, at 27.

119. Specifically, the author discussed her conclusions with product managers, quantitative analysts, researchers, and software engineers with several years of experience working in the financial industry.
financial function to meet an unanswered need in the market. This method is also based on the mathematical aspect of a new or improved financial function which provides objectivity to the analysis. Finally, this method operates consistently and systematically across the entire securities population.

To clarify the considerations made thus far, it seems useful to present the case in which the mathematical function reflecting the security's financial function changes from one generation of financial instruments to another. An example of this case is the transition from mortgage-backed securities (MBS)\textsuperscript{120} and asset-backed securities (ABS)\textsuperscript{121} to the collateralized debt obligation (CDO).\textsuperscript{122} The financial function of MBS and ABS consists of credit-risk transferring.\textsuperscript{123} However, if built-in credit support is added to their fundamental structure, a different type of security that performs a new or improved financial function is created.\textsuperscript{124} In this specific case, the new type of security is a CDO, whose function is to provide enhanced credit-risk transferring and prepayment-risk hedging.\textsuperscript{125} Ultimately, in calculating the CDO's price or risk, the built-in credit support is translated into mathematical terms.\textsuperscript{126} As a result, the overall mathematical model adopted to calculate the CDO's price or risk differs from that adopted to compute the MBS or ABS's price or risk and it is possible to say that the two different models reflect the two different financial functions carried out by these types of securities.

Finally, it is important to mention the more intuitive case. The case in which the security under consideration does not have a "direct predecessor" or for which the identification of a direct predecessor might be "a bit of a stretch." These securities are entirely new and, therefore, an entirely new model to calculate their price and risk is required. On that basis, and for the purpose of this project, these securities are considered to be innovations. An example of this type of securities is the credit default swap (CDS) whose financial function is to provide insurance against the risk of default by a specific company.\textsuperscript{127} They were created in the 1990s and have been used

\textsuperscript{120} See FABOZZI & MODIGLIANI, supra note 84, at 499.
\textsuperscript{121} Id. at 528.
\textsuperscript{122} Id. at 540.
\textsuperscript{123} FRANK J. FABOZZI, THE HANDBOOK OF MORTGAGE-BACKED SECURITIES 5-6, 26 (5th ed. 2001).
\textsuperscript{124} Id. at 171-73.
\textsuperscript{125} Id.
\textsuperscript{126} Id. at 510-21 (describing explicit valuation of CDO).
\textsuperscript{127} JOHN C. HULL, OPTIONS, FUTURES, AND OTHER DERIVATIVES 507 (6th ed. 2006).
primarily by banks "to shift the credit risk in their loans to other parts of the financial system." In this case, no direct predecessor can be identified; thus, the mathematical model used to calculate CDS' price and risk is completely new.

2. Data Collection from the USPTO Website

Information provided on the USPTO website was used to collect the required data about patent applications submitted, and patents issued on securities, after State Street. Specifically, all of the patents issued after 1998 and all of the patent applications submitted after 1998 that have been assigned to subclasses 35, 36 R and 37 of the general class 705 were reviewed.

While the selected subclasses are those in which patents and patent applications on securities should be assigned, in 2006 Allison and Hunter demonstrated that a number of business method patents can be found under classifications other than 705. A possible explanation for this result resides in what is known as “diversionary drafting” used by a patent attorney to avoid the second level of review, also known as a “Second Pair of Eyes Review” (SPER), that occurs in class 705. In other words, Allison and Hunter have suggested that in order to elude the additional hurdle of SPER, patent attorneys draft their applications in such a way as to avoid class 705. Consequently, the analysis of subclasses 35, 36 R, and 37 was combined with a search of the USPTO database based on keywords. The result of this search counters the “diversionary drafting” problem by finding patents and patent applications on securities outside of class 705.

128. Id. at 508.
130. USPTO, Class Schedule, http://www.uspto.gov/go/classification/uspc705/sched705.htm (last visited Dec. 12, 2008) (showing subclass 35 being defined as “Finance (e.g., banking, investment or credit)
131. Id. (showing subclass 36 R being defined as “Portfolio Selection, Planning or Analysis”).
132. Id. (showing subclass 37 being defined as “Trading, Matching, or Bidding”).
133. Id. (showing Class 705 being defined as “Data Processing: Financial, Business Practice, Management, or Cost/Price Determination”)
134. See Allison & Hunter, supra note 46.
135. Id. at 736.
136. Id.
The next section will provide a full description of the results obtained in terms of innovative securities, patents, and patent applications on securities.

IV. FINDINGS AND ANALYSIS

A. Findings

As noted, Section IV of this paper is dedicated to the description of the collected data and analysis of this data. Therefore, in subsections 1 and 2, findings related to innovative securities, issued patents, and patent applications submitted on securities will be provided. The final section is dedicated to the analysis of those findings.

1. Securities and Financial Methods

Several steps were required to produce a list of innovative securities. The first step involved determining macro categories into which the securities under consideration could be divided.

These categories are:
1. Debt securities (excluding mortgage-backed securities and asset-backed securities)
2. Equity securities
3. Fixed income derivative securities
4. Credit derivative securities
5. MBS and ABS
6. Options
7. Interest-rate derivative securities
8. Currency exchange (FX) derivative securities
9. Collective investment securities
10. Quanto instruments

In reality, these categories are not mutually exclusive; however, for the purpose of this study, financial instruments that could fit into more than one category have been included in just one category so as to avoid double counting. Furthermore, by talking with experts in the field, the author realized that over the past twenty-five years, very little innovation, if any, has been produced in categories one and two. Therefore, the focus was on the remaining eight categories.

The second step involved the identification of the sources from which the relevant securities could be identified. These sources
include financial manuals, financial treatises, financial product guides, and the websites of financial exchanges.

A preliminary list of the types of securities which have been created over the past twenty-five years was produced. The list includes a total of 123 types of securities.

Finally, by adopting the method described in Section III.B.1, sixty-six types of innovative securities have been selected from the preliminary list. Table 1 summarizes these findings. It is important to note that, in the case of securities, a specific “creation date” is extremely difficult to identify. Indeed, it appears that new types of securities often result from the interaction between the innovators and their clients when the innovator designs the specific security to meet the needs of its client. This can occur as the result of a demand by the client or on the innovator’s own initiative. On one hand, the creative process already described is consistent with the work of Tufano and, on the other, with the research by Herrera and Schroth, which were discussed in Section II.A. Indeed, as these researchers have pointed out, by dealing with the client, the innovator learns salient information about the business and its needs. Ultimately, this knowledge allows the innovator to beat its competitors in the race for innovation and to satisfy its client’s present and future needs. Much more should be said about this process of producing new types of securities. Indeed, this analysis requires a different kind of investigation which extends beyond the scope of this paper and will be the subject of the author’s next project.


141. See supra note 119 and accompanying text.

142. Id.

143. See Tufano, supra note 87, at 214, 232-34.

144. See Herrera & Schroth, supra note 89, at 4, 14.
For now, it is important to emphasize that if the aforementioned innovative process is correct, new types of securities are designed in private deals between two companies. By the time the securities under consideration become widespread and well known in the market, a few years can elapse depending on the characteristics of the security and the specific market conditions. Therefore, rather than providing a specific "creation date," it appears to be more appropriate to identify a range of years, based on the time during which the type of securities at issue first became known in the market.

2. Patents and Patent Applications

Some interesting findings have emerged from the analysis of the selected patents and patent applications which were issued and submitted before June 8, 2008, respectively. A first relevant result is the fact that no "diversionary drafting" emerged for the type of subject matter under consideration. Indeed, no patents or patent applications on securities were found outside subclasses 35, 36 R, and 37 of class 705.

A total of 1,985 patents and 5,921 patent applications were reviewed. However, only 18 patents and 132 patent applications on securities were found. Most of the claimed inventions within the selected subclasses represented different categories of financial innovations, such as portfolio and risk management (investment, strategies, pension, and mutual funds, etc.), banking (transactions, billing, payments, etc.), financial information systems (software, e-commerce, data, etc.), financing (loans, leasing, mortgages, etc.) and asset evaluation (equity, real estate, interest rates, etc.). At first, this result could appear to be quite surprising, considering the fact that, as pointed out by some scholars, during the last few decades securities have been one of the two most innovative areas of the financial industry. However, this conclusion does not take into account the fact that most of the patents and the patent applications assigned to the subcategories of interest consist of some technological implementation of a financial process. Therefore, if the technological

145. The search on the USPTO website was conducted on June 8, 2008. The collected data include all of the patent applications in the subclasses of interests which were published by that date.
146. See Allison & Hunter, supra note 46, at 736, 763, 786.
147. See supra note 145.
148. Of the patent and the patent applications assigned to the selected subclasses, only 0.91% and 2.23% respectively were for securities in the last ten years.
149. See, e.g., Tufano, supra note 78, at 5; Ross, supra note 77, at 541.
element is excluded from the present analysis and only patents and patent applications for "pure financial matters" are considered, the percentage of patents and patent applications on securities as compared to those for other forms of financial innovation might change significantly.

The results obtained from the in-depth analysis of the identified patent and patent applications for securities are also of great interest. By applying the criterion described in Section III.B.1 that was adopted to produce the list of innovative types of securities,^{150} it is possible to conclude that only a few of the patents and patent applications under consideration represented real innovations. Indeed, as summarized in Table 2, only 39% of the identified patents and 29% of the patent applications were for innovative securities.

Finally, it seems useful to note that all of the patents issued on securities have been assigned to financial institutions. In the next section, a full analysis of the reported data is provided.

B. Analysis

Preliminary consideration should be given to the distribution of innovative types of securities over time. As illustrated in Figure 1, no specific trend in the creation of innovative types of securities can be identified. However, it seems that in this sector, the 1980s were slightly more productive than the remainder of the period under consideration. Furthermore, and perhaps more importantly for the purpose of this research, it is possible to note that no particular increase in innovation has occurred after 1998.

On the other hand, if Figure 2, which describes the distribution of patent applications on securities over time, is taken into consideration, it appears that, after an initial "fascination" with this form of intellectual property protection, innovators have lost interest. This conclusion is also true if one considers the fact that the decline observed after 2004 could have been mitigated by the time difference that, in certain cases, exists between the application date and the publication date of the patent application.^{151} In this specific case, this lapse of time, on average, equals two years. Therefore, it is

150. See infra Table 1.
151. Figure 2 only describes the distribution of patent applications over time based on their application date. However, some applicants decide not to have their patent application published until an extended period of time after the filing date. As a result, Figure 2 only describes those applications which were reported (i.e. published) on the USPTO website on the day the search was made: June 8, 2008.
conceivable that, in reality, the number of patent applications on securities filed in 2006 and 2007 is higher than that depicted in the graphic. Nevertheless, this final consideration does not change the overall conclusion that, after 2004, a substantial decline in patent applications for securities occurred, whereas the level of innovation for new types of securities during the same period has remained constant.

The reason for such a decline in the number of patent applications for securities and the registered "mismatch" with the general level of innovation in this kind of subject matter is beyond the scope of this paper. Indeed, a different research study including interviews with market participants is required to shed light on this matter. As mentioned above, the author will conduct such an investigation in her next project and will combine those results with the ones in this paper. It is anticipated that this strategy will engender a more significant understanding of the possible impact of the patent system on the production of new types of securities.

CONCLUSION

Over ten years after the issuance of the State Street decision, the patentability of business methods is still so controversial that the Federal Circuit has recently considered overruling its own precedent by rehearing In re Bilski en banc. The heart of the problem is understanding whether the patent system in the specific sector is "doing its job" or, in other words, whether that patent system is fostering the creation of additional business methods.

To answer this question, an empirical study is required. For this reason, the author conducted an empirical investigation of financial methods, as a subset of business methods. Specifically, the author has studied the innovative types of securities that have emerged over the past twenty-five years. She also investigated the patent practice of this industry and identified the patent applications submitted and the patents issued for different types of securities. Finally, the author discussed her findings and concludes that, recently, creators of new types of securities have shown less interest in the patent system. Nevertheless, the rate of innovation in this field has remained constant.

At this time, the available data are not sufficient to reach an entirely conclusive determination regarding whether the patent system has affected the design of new types of securities. However, the obtained results are still of great significance. Indeed, although it is
not currently possible to explain the reason for the "mismatch" between the rate of financial innovation and the decline in patent applications, it is fair to say that the existence of the "mismatch" itself casts doubts on the soundness of the State Street decision, at least to the extent that involves financial methods.

By deciding In re Bilski, the Federal Circuit now has the opportunity to readdress the issue in a way that more closely reflects the goal of the patent system as it is described in the Constitution: to foster innovation. Based on the present study, it emerges that, in the past ten years, such a goal has been somehow neglected, since no additional innovation has occurred in the financial industry after 1998. Moreover, it appears now that market participants have begun ignoring the patent system altogether, posing additional questions about how much of an incentive patent protection is for them.

Further investigation, including interviews with market participants, seems required to shed more light on this issue. However, these preliminary findings already indicate that something within this context did not function as expected, since none of the anticipated results have occurred in the financial industry subsequent to State Street, i.e. the rate of innovation of securities did not increase after 1998 and it has remained constant since 2004 when the number of patent applications on this subject matter dropped. What is now left to determine is, in the first place, why patent protection did not represent the right incentive for financial innovators, and then how best to learn something from this experience that will be useful to inform future policy choices with respect to the boundaries of the patent system.
Table 1. List of New Securities for the Period 1980-2007

<table>
<thead>
<tr>
<th>New Securities</th>
<th>Floors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset-Backed Securities (ABS)</td>
<td></td>
</tr>
<tr>
<td>Autocap</td>
<td>Forward Starting Options</td>
</tr>
<tr>
<td>Average-price Options</td>
<td>Interest Rate Options</td>
</tr>
<tr>
<td>Average-strike Options</td>
<td>Kick-in Options</td>
</tr>
<tr>
<td>Averaging Amortizing</td>
<td>Knockout Options</td>
</tr>
<tr>
<td>Compound/Accreting Swaps</td>
<td>Ladder Options</td>
</tr>
<tr>
<td>Basket Credit Linked Notes</td>
<td></td>
</tr>
<tr>
<td>Basket Options</td>
<td>Laddered Inverse Floater</td>
</tr>
<tr>
<td>Bond Future Options</td>
<td></td>
</tr>
<tr>
<td>Callable Reverse Floater</td>
<td>Lookback Options</td>
</tr>
<tr>
<td>Caps</td>
<td></td>
</tr>
<tr>
<td>CDS Baskets</td>
<td>Option on Better/Worse</td>
</tr>
<tr>
<td>CDS Options</td>
<td></td>
</tr>
<tr>
<td>Chooser Cap</td>
<td>Option on Minimum/Maximum</td>
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<tr>
<td>Chooser Options</td>
<td></td>
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<tr>
<td>Cliquet Options</td>
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<tr>
<td>Collateralized Debt Obligations (CDO)</td>
<td></td>
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<tr>
<td>Collateralized Mortgage Obligation (CMO)</td>
<td></td>
</tr>
<tr>
<td>Compound Options</td>
<td></td>
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<tr>
<td>Constant Maturity (Interest Rate) Swaps</td>
<td></td>
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<tr>
<td>Contingent Options</td>
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<tr>
<td>Contracts For Difference</td>
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<tr>
<td>Crack Options</td>
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<tr>
<td>Credit Default Swaps (CDS)</td>
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<tr>
<td>Credit Linked Notes</td>
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<tr>
<td>Cumulative Inverse Floaters</td>
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<tr>
<td>Digital Interest Rate Options</td>
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<tr>
<td>Digital Options</td>
<td></td>
</tr>
<tr>
<td>Dual-asset Options</td>
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</tr>
<tr>
<td>Equity Default Swaps</td>
<td></td>
</tr>
<tr>
<td>Equity Index Futures</td>
<td></td>
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<tr>
<td>Equity Index Options</td>
<td></td>
</tr>
<tr>
<td>Exchange Traded Funds (ETF)</td>
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<tr>
<td>Flexi Cap</td>
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<tr>
<td>Flexible Cap</td>
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<tr>
<td>Description</td>
<td>Yield</td>
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</tr>
<tr>
<td>(a) Patents reviewed</td>
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<tr>
<td>(b) Patent applications reviewed</td>
<td>5921</td>
</tr>
<tr>
<td>(c) Patents on securities found</td>
<td>18</td>
</tr>
<tr>
<td>(d) Patent applications on securities found</td>
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<tr>
<td>(e) Patents on new securities found</td>
<td>7</td>
</tr>
<tr>
<td>(f) Patent applications on new securities found</td>
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<tr>
<td>Ratio of (c)/(a)</td>
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<tr>
<td>Ratio of (d)/(a)</td>
<td>2.23%</td>
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<tr>
<td>Ratio of (e)/(c)</td>
<td>38.89%</td>
</tr>
<tr>
<td>Ratio of (f)/(d)</td>
<td>28.79%</td>
</tr>
</tbody>
</table>

Fig. 1. Distribution of New Securities During the Period 1980-2007.
Fig. 2. Distribution of Patent Applications on Securities in the Period 1998-2008.

Fig. 3. Distribution of Patents on Securities in the Period 1998-2008.
Fig. 4. Distribution of Patent Applications on New Securities in the Period 1998-2008.

Fig. 5. Distribution of Patents on New Securities in the Period 1998-2008.