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Patent Law and Financial Engineering

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Financial engineering is a highly technical and famously complex field, well known as the home of real "rocket scientists" who build and price financial products. Yet unlike most other technical fields (including rocket science),¹ patent law has played little role in the history of financial innovation, and few financial inventions have been patented until recent years (see Lerner [2000] for an in-depth large sample look at patenting activity in finance). Instead, financial innovators typically have relied on two alternative mechanisms to "protect" the fruits of financial invention: secrecy and first-mover advantages.

Secrecy has been the predominant means of protection for financial inventions like the computer code and financial mathematics underlying cutting-edge derivatives pricing models. Secrecy can facilitate significant non-patent legal protection, including contractual non-disclosure agreements and state trade secrets law, and a few cases have litigated such matters (see, for example, *Investors Guaranty Fund, Ltd. v. Morgan Stanley & Co., Inc.*, 50 U.S.P.Q.2d [BNA] 1523 [S.D.N.Y. 1998]). First-mover advantages have been more important for protecting the financial innovation embodied in new security designs (see Tufano [1989]).

However, both secrecy and first mover advantages possess inherent weaknesses that affect their comparative advantages versus patent protection. Secrecy is vulnerable as a protective mechanism not only because of the constant risk

of disclosure, but also because (with an important recent exception noted below) secret inventions are not protectable against subsequent patents on the same inventions. First-mover advantages are less susceptible to this problem since the invention is disclosed in the first use or sale, limiting its later patentability.² Still, the incrementalism so prevalent in financial engineering—where one financial innovation builds in small ways on an earlier one—means that an early patent might allow much greater returns from an important financial innovation than otherwise available from the first-mover's non-legal advantages alone.

The possibility that patents might protect the "intellectual property" inherent in a financial innovation was once far from the minds of finance professionals. Now, however, the arcane world of patents and patent law is emerging as an important business concern. *Risk* magazine recently reported on widespread criticism of a patent recently awarded to Columbia University for a quasi-Monte Carlo method (U.S. Patent No. 5,940,810: "Estimation Method and System for Complex Securities Using Low-Discrepancy Deterministic Sequences"). An even more recent *Wall Street Journal* article reports on an emerging legal battle between the American Stock Exchange and two inventors over a patented process related to exchange-traded funds (U.S. Patent No. 5,806,048: "Open End Mutual Fund Securitization Process"). A review of recently issued patents not yet in the headlines

(searches available at www.delphion.com) reveals patent claims to tools and techniques actually or potentially important to financial engineers. Applications for new financial patents are surely but secretly in process at the United States Patent and Trademark Office (patent applications are now held secret by the Patent and Trademark Office for the first 18 months after filing).

Patents are enormously powerful legal devices. The owner of a United States patent has the legal right to exclude others from making, using, offering to sell, or selling the patented invention for a term of 20 years. The patent owner may license these rights to others, granting them the right (on an exclusive or nonexclusive basis) to make, use, or sell the patented invention. Indeed, license fees are a substantial source of revenue for many companies. In addition—and perhaps more visibly—patent owners can enforce their patent rights in a federal civil lawsuit. If victorious in a patent infringement lawsuit, patent owners can recover damages and/or permanent injunctions forbidding the acts that infringe the patent. For companies whose existence rests on patentable technologies, patent litigation can be all out legal warfare where the very viability of the business is at stake. For that company's customers, patent litigation can determine whether products or services they have purchased in the past will be available in the future, and at what price and quality. More ominously, customers themselves can face liability for infringement.

The current shift toward patent protection for financial innovation—and away from the prior use of secrecy and first-mover advantages—does not stem from a shift in the underlying distribution of financial innovation (at least as a first order effect). Rather, the shift is linked to changes in the legal landscape. In particular, both the federal courts and Congress have signaled that financial inventions, once previously thought to be outside the scope of strong patent protection, will be treated by the patent laws as on par with inventions in more traditional fields like bioengineering and manufacturing machines.

EXAMPLES OF FINANCIAL PATENTS

Before turning to the basics of patent law and the evolution of the legal landscape, it is instructive to look at some real financial patents. What constitutes a “financial patent” is, to some extent, a matter of opinion. Many patents have applicability to financial products, including more general advances in computer software, computer hardware, and the like. Here, however, we are concerned

with those patents that on their face plainly claim rights to inventions that have undoubted application to financial products. Exhibit 1 presents brief descriptions of six such financial patents.

The first patent (U.S. Patent No. 5,940,810) is the controversial patent issued to Columbia University for quasi-Monte Carlo methods. Its subject matter is most easily grasped by reference to its “abstract” appearing on the front page of the patent as a matter of course. The abstract reads:

In securities trading, in setting the initial offering price of a financial instrument, or in later revaluation as financial parameters such as interest rates may change, an estimate of the value of the instrument may be represented as a multidimensional integral. For evaluation of the integral, numerical integration is preferred with the integrand being sampled at deterministic points having a low-discrepancy property. The technique produces approximate values at significant computational savings and with greater reliability as compared with the Monte Carlo technique.

To a lawyer, the real meat of a patent is its “claims.” Patent claims are statutorily required (35 U.S.C. §112) statements “particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.” Claim 1 of the ‘810 patent (practitioners typically refer to a patent by its last three numbers) provides a more technical description of the invention, using language meant to convey as precisely as possible what exactly the inventor intends to claim:

1. A method for one of buying, holding, and selling a complex security, comprising:
 - (a) deriving a multivariate integrand which, when integrated over a domain of integration, having at least 50 dimensions, represents an estimated value of the security;
 - (b) calculating, by computer, integrand values at points in the domain of integration, which are obtained from a low-discrepancy deterministic sequence;
 - (c) combining the integrand values, by computer, to approximate the estimated value; and
 - (d) effecting, based on the estimated value, one of buying, holding, and selling the security.

EXHIBIT 1

Examples of Recent Financial Patents

Title	Estimation Method and System for Complex Securities Using Low-Discrepancy Deterministic Sequences	Data Processing System and Method for Financial Debt Instruments	Simulation Method and System for the Valuation of Derivative Financial Instruments
U.S. Patent No.	5,940,810	6,092,056	6,061,662
Issued/Filed Dates	August 17, 1999/ July 30, 1997	July 18, 2000/ May 17, 1999	May 9, 2000/ August 15, 1997
Inventors	Joseph F. Traub; Spassimir Paskov; Irwin F. Vanderhoof	Robert Stanley Tull, Jr.; David M. Weisberger; John Vincent Fox; Myriam Joelle Karsenty	Miloje S. Makivic
Assignee	The Trustees of Columbia University in the City of New York	Morgan Stanley Dean Witter	Options Technology Company, Inc.
Subject Matter	Quasi-Monte Carlo Derivatives Pricing	Exchange-Traded Funds	Monte Carlo Pricing Methods
Title	Open-End Mutual Fund Securitization Process	Method and System for Providing Credit Support To Parties Associated With Derivative and Other Financial Transactions	Watershed Method for Controlling Cash Flow Mapping in Value at Risk Determination
U.S. Patent No.	5,806,048	5,802,499	6,122,623
Issued/Filed Dates	September 8, 1998/ October 12, 1995	July 13, 1995/ September 1, 1998	September 19, 2000/ July 2, 1998
Inventors	Kenneth Kiron; Kevin S. Bander	Gerald P. Sampson; Melvin Strauss; Kathleen Tyson-Quah; Jorge Haddock; Thomas S. Sime	Mark B. Garman
Assignee	Mopex, Inc.	Cedel Bank	Financial Engineering Associates, Inc.
Subject Matter	Exchange-Traded Funds	Counterparty Credit Exposure	Value at Risk

The '810 patent contains 21 additional claims, many of which relate to (or, in patent parlance, are "dependent" on) the claim recited above.

In simple terms, the '810 patent claims the exclusive right to use any method that contains all the elements of any of its claims. In this case, those claims relate to the use of what are more commonly known as "quasi-Monte Carlo" methods. To fall under Claim 1, for example, use of the method must be "by computer" since that is a recited limitation in element (b). If, for example, it were possible to solve in one's head the integration problem presented in element (a), then that use would not infringe the '810 patent. The limitations of such a "design around" are obvious to all but the most gifted mental calculators.

While the '810 patent is the work of university

researchers, the second patent described in Exhibit 1—U.S. Patent No. 6,092,056—appears to be the product of financial practitioners. Assigned to Morgan Stanley Dean Witter, the patent purports to cover a "Data Processing System and Method for Financial Debt Instruments." Again, the abstract provides a snapshot of the patent's intended coverage:

A data processing system and method are disclosed for implementing and controlling a financial instrument that is issued for a limited period of time. The instrument is based on an underlying basket of stocks optimally selected to track an established capital market and its price also reflects accrued investment income and maintenance expenses. The data processing system receives input from the

capital market and periodically evaluates the performance of the financial instrument, reporting its price to customers. Also disclosed is a data processing system for administering an investment group of such instruments designed to track the performance of several domestic and foreign markets, estimate their return, and provide current price information to customers.

The '056 patent has 21 claims. Claim 1 is as follows:

1. A data processing system for administering a financial instrument that provides—within a pre-determined, limited period of time—a return commensurate with an established capital market. The system comprises:
 - (a) computer means for selecting one or more securities, the return performance of which is representative of a valuation of the capital market over the limited period of time;
 - (b) means for generating a basket of shares of said one or more selected securities, said basket of shares defining the financial instrument;
 - (c) data entry means for receiving information on each of said one or more selected securities of the financial instrument;
 - (d) data processing means responsive to the information from the data entry means for determining a price for the financial instrument, so as to reflect the current aggregate value of the basket of shares and income and expenses associated therewith; and
 - (e) output means for communicating said price to users.

From the abstract and Claim 1, some readers may recognize the real focus of the '056: Morgan Stanley's "OPALS" (Optimized Portfolios As Listed Securities). The '056 patent illustrates an important concept in financial patenting: control over the computer system used to manage a financial product may be tantamount to control over the product itself if sales of the product are impossible without the associated (patented) computer management system.

The third patent in Exhibit 1—U.S. Pat. No. 6,061,662—covers a "Simulation Method and System for the Valuation of Derivative Financial Instruments," and is the invention of a Syracuse University computer scientist (trained as a theoretical physicist) assigned to the Options

Technology Company, Inc. (OTCI). In a recent Web page description, the company was described as follows:³

OTCI is a financial services company providing Web-delivered risk management strategy analysis and hedge pricing to corporate risk managers. The company's products are all based on a patented breakthrough technology that speeds up the complex computation required by several orders of magnitude. The first patent has been issued and others are on file. All are entirely owned by OTCI. The management, marketing, and technology team is made up of seasoned professionals, including experts in risk management practice and the mathematics and computing disciplines of the field. Our first product is directed to protecting against foreign currency fluctuations. Our initial target market is the 1,000 largest U.S. firms who collectively spend well over a billion dollars annually insuring their non-U.S. currency exposures. The clients average an annual saving of \$1.5 million, yielding a \$300 thousand commission per client for OTCI.

Many other financial patents are held by similarly situated start-ups and entrepreneurs.

The abstract of the '662 patent is as follows:

A Monte Carlo system and method are presented for the pricing of financial instruments such as derivative securities. A path-integral approach is described that relies upon the probability distribution of the complete histories of an underlying security. A Metropolis algorithm is used to generate samples of a probability distribution of the paths (histories) of the security. Complete information on the derivative security is obtained in a single simulation, including parameter sensitivities. Multiple values of parameters are also obtained in a single simulation. The method is applied in a plurality of systems, including a parallel computing environment and an on-line real-time valuation service. The method and system also have the capability of evaluating American options using Monte Carlo methods.

The '662 patent has 52 claims, starting with Claim 1.

1. A system for deriving an option price on an underlying asset comprising:

- (a) a computer;
- (b) means for accessing a database server via the computer, the server having resident thereon historical data on an option and an asset underlying the option;
- (c) interface means for permitting a user to access the computer and to enter an input parameter for a desired option;
- (d) software means resident on the computer for causing the computer to perform a simulation via stochastic statistical sampling on the historical asset data for the desired option, based upon the input parameter using a Monte Carlo path integral simulation algorithm to derive an option price and at least one price sensitivity parameter in a single simulation; and
- (e) means for outputting to the user a graphical representation of the simulation for the underlying asset.

The '662 patent bears obvious resemblance to the Columbia University patent cited above, since both are related in some way to Monte Carlo (or quasi-Monte Carlo) analysis and pricing methods.

The fourth patent in Exhibit 1—U.S. Patent No. 5,806,048—is the subject of a legal battle between its inventors and the American Stock Exchange, with millions of dollars in potential damages at stake. In August 2000, Amex filed a complaint in U.S. District Court (patent cases must be brought in federal court, not state court), seeking a declaration that the '048 patent is invalid, while the patent's owner, Mopex, Inc., filed its own patent infringement lawsuit against Amex only days later. The litigation is pending as of this writing.

The abstract of the '048 patent reveals the source of the dispute, showing that the inventors claim important rights in exchange-traded funds:

A mutual fund securitization process permits the trading of open-end mutual funds and linked derivative securities on or off the floor of a National Securities Exchange. The targeted individual open-end mutual fund or group of open-end mutual funds, selected through a screening process, is securitized through the creation of a new, separate security. This new security is preferably a "closed-end fund of funds" and linked derivative securities, which synthetically replicate the statistical rela-

tionship of the defined individual or group of open-end mutual funds. The maintenance of financial records for the new security is maintained by electronically storing dividend, capital gains, and income received from the open-end funds that have been invested in, and calculating pro-forma financial statements to disseminate to shareholders and all relevant parties.

The patent's first claim discloses a method for administering such a financial product.

The last two patents in Exhibit 1 are also directed to methods and systems important to derivatives management and pricing. United States Patent No. 5,802,499—titled "Method and System for Providing Credit Support to Parties Associated with Derivative and Other Financial Transactions"—is assigned to Cedel Bank and contains the following abstract:

A computer-based information network for managing credit exposure between counterparties to a plurality of credit support agreements. The network comprises information storage and processing systems. The systems store various types of information including information representative of assets of counterparties to a plurality of credit support agreements for use in covering credit exposures over a specified time period, and the plurality of credit support agreements. The systems process the information representative of the assets in order to effectively reflect a movement of certain of the assets to cover the credit exposures over the specified time period. An asset movement optimization process is used for determining an optimal movement of certain of said assets to cover credit exposures over the specified time period.

Finally, U.S. Patent No. 6,122,623—titled "Watershed Method for Controlling Cash Flow Mapping in Value at Risk Determination"—is assigned to Financial Engineering Associates, Inc., the company founded by inventor (and Berkeley professor emeritus) Mark Garman. The abstract of that patent is as follows:

A system, computer implemented method, and software product provide for the correct allocation of cashflows to enable accurate determination of value at risk with respect to income and balance sheet risk for transactions portfolio including trans-

actions occurring in different fiscal periods. The computer implemented method includes establishing watershed variables, such as watershed dates, and partitioning both cashflows derived from the transaction portfolio and the vertex set of market risk data into distinct subsets. The partitioned cashflows are allocated, using a regular allocation function, onto individual ones of the partitioned vertex sets. The partitioning and allocation correctly segregate cashflows with respect to the fiscal periods to which they contribute to the value at risk. The allocated cashflows are then each separately treated by a value at risk computation. A system includes a computer, database of transactions, networked or local access to market risk data, and a software product executing the computer implemented method. The software product may include a module for shredding transactions into cashflows, a module for partitioning the cashflows and vertex sets, a module for performing the regular allocation of partitioned cashflows, and a module for performing the value at risk computations.

In addition to the '623 patent, Financial Engineering Associates, Inc. is the owner of three other financial patents listing Garman as inventor.

These examples give a sense of the types of financial patents recently issued. They range from patents on the applications of mathematics to derivatives pricing (such as the '810 patent on quasi-Monte Carlo methods) to patents on financial products themselves (such as the '048 patent related to exchange-traded funds). Understanding the proliferation of such patents requires a brief introduction to patentability under United States law.

PATENTABILITY

The Congressional authority to enact patent legislation derives from Article I, Section 8, Clause 8 of the United States Constitution, granting 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."

Pursuant to this authority, Congress has enacted several patent laws through the years. While even a basic introduction to patent law is beyond the scope of this article, the conditions for patentability are important to an understanding of the emerging issues in patent law and financial engineering.

In general, an inventor wishing to obtain a patent must comply with four legal requirements for patentability. A patentable invention is 1) of patentable subject matter; 2) useful; 3) new; and 4) nonobvious.

Not everything is patentable. Some inventions are outside the scope of patent law, no matter how useful, new, or nonobvious they might be. For example, a printed book is not patentable subject matter (but may be protectable under copyright law) despite the fact that its teachings might be useful, new, and not at all obvious to any reader. Typically, patentable subject matter was thought to include machines and manufactures, with later acceptance of processes, chemical compositions, and bioengineered products. Outside of the patentable subject matter category were laws of nature, natural phenomena, and abstract ideas.

Only "useful" products or processes are patentable: the patented product or process must "work" to produce some result of some benefit. It need not work well (at least on its own), however, and the usefulness requirement does not demand that the patented product or process work better than anything preceding it. A patent application on a "time machine" claiming the invention of allowing travel back to a prespecified date would likely be rejected as impossible, and thus not useful. Further, a chemical compound with no known use to humanity would also likely be rejected on these grounds. However, a chocolate-powered automobile that traveled at speeds up to two miles per hour might very well pass the usefulness test.

A patentable invention must be "new." The patent laws test the novelty of an invention by reference to the relevant "prior art" in the field of the patent's invention. In general terms, fleshed out by particular statutes and case law, an invention is not new if the elements of the claim are contained in a single piece of relevant prior art. For example, if a relevant published journal article contained each element—either expressly or inherently—of any of the claims recited above, that claim would be said to be "anticipated" by the prior art. Put simply, an anticipated invention is not new, and is not patentable.

Finally, an invention is not patentable if it is "obvious." Obviousness differs from anticipation in the sense that no single piece of relevant prior art must contain (either expressly or inherently) all the teachings of a particular claim. Instead, the test is whether the invention would have been obvious to a person of ordinary skill in the art. The "person of ordinary skill in the art" is a legal construct, a hypothetical individual assumed to be aware of all of the pertinent prior art, but not necessarily a genius in the field.

THE ROAD TO PROLIFERATING FINANCIAL PATENTS

The basic legal requirements of patentability have existed for a long time. The recent proliferation of financial patents thus begs a question: What has changed? The answer is complicated, and does not rest on a single new legal decision or a single new act of Congress.

That we find ourselves in a world where Columbia University can obtain a patent on quasi-Monte Carlo methods is particularly surprising given the origins of patent law. During the time of Thomas Jefferson, one of the authors of the earliest U.S. patent statutes, it was widely agreed that patent protection was aimed at manufactures and machines. The extension of patent protection to "business methods" would have seemed quite strange in light of patent law's origins. As one leading scholar has noted:

Against this background, it would have been seen as absurd for an entrepreneur to file a patent on a new finance technique such as publicly traded corporate shares, techniques for obtaining private financing for a bridge to compete with an existing bridge, or a security interest in uncut timber. These were the earmarks of commerce, of enterprise; laudable surely, but something altogether distinct from the realm of "invention" and the "useful arts."⁴

Ultimately, however, the legal standards for "patentable subject matter" began to embrace the patentability of computer software. In a series of important decisions, the Supreme Court first presented seemingly high hurdles to patentability, suggesting that computer programs might be simply unpatentable mathematical algorithms. The Court then appeared to soften this position for computer programs performing useful functions. The lower courts further developed tests to determine whether computer programs were patentable subject matter, and the role that the presence of a "mathematical algorithm" might play in that determination.

An important application of this development occurred in a relatively early and important patent case surrounding a financial patent. In 1983, the U.S. District Court of Delaware held that a patent related to Merrill Lynch's Cash Management Account (CMA) claimed patentable subject matter because the claims covered the use of a computer to effectuate a business activity. Link-

ing the computer to the business method of the CMA proved the key to Merrill Lynch's litigation success.

By any measure, however, the concern with financial patents is related to a recent and highly influential opinion of the Court of Appeals for the Federal Circuit. The Federal Circuit has responsibility for patent law appeals in the U.S. In 1998, it decided the case of *State Street Bank v. Signature Financial*, 47 U.S.P.Q.2d (BNA) 1596 (Fed. Cir. 1998). In that case, the district court (the lower court where the initial complaint was filed) ruled that subject matter claimed in the patent was not patentable subject matter. On appeal, the Federal Circuit reversed, holding that that Signature Financial's software system for managing a "Hub and Spoke" mutual fund pooling system was patentable subject matter.

Against the background of earlier case law, the *State Street* decision was influential because it laid to rest any continuing doubt as to the patentability of "business methods," made clear that computer programs were patentable subject matter, and eliminated substantial doubt over the patentability of mathematically derived inventions. In perhaps its most important holding for financial patenting, the court stated:

Today, we hold that the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces a useful, concrete and tangible result—a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.

The general viability of the Federal Circuit's interpretation was confirmed when, on November 29, 1999, Congress amended 35 U.S.C. §273 to provide that an alleged infringer of a business method patent can assert as a defense that it reduced the subject matter to practice at least one year prior to the effective filing date of the patent, and commercially used the subject matter before the effective filing date of the patent. The amendment was intended to protect users of business methods who had not patented their earlier inventions, but now were being sued by those who had. But the implicit acceptance by Congress of the business method patent suggests that reversal of the Federal Circuit's decision is highly unlikely.

THE OUTLOOK FOR FINANCIAL PATENTS

Since the Federal Circuit's *State Street* decision, three things are becoming clear. First, financial patents are likely to proliferate. Lerner [2000] estimates that hundreds of financial patent applications are in process at the United States Patent and Trademark Office. The main effect of the *State Street* decision and subsequent developments has been to increase confidence that financial patents—granted by the Patent and Trademark Office—will be upheld by the courts in litigation. New patent applications may be for either offensive purposes (affirmatively protecting one's intellectual property) or defensive purposes (patenting one's technology for use against others who might assert their own patents).

Second, some owners of financial patents will be aggressive in asserting their own financial patents against alleged infringers. Visible examples of patent lawsuits—such as Amazon.com's successful effort to enjoin BarnesandNoble.com from using "one-click" technology—are likely to embolden financial patent holders in their discussions with potential infringers. This possibility is only thinly disguised in the promotional material of some financial patent holders, particularly those in smaller startups built around the patented technology. Consider, for example, the following quote from the Web page of an entrepreneur/inventor and holder of financial patents (emphasis in original):

Finally, if you are an investment banker, actuary, insurance carrier, insurance broker, self-insured company or municipality, and you will be involved in a departure from self-insurance, which uses sophisticated analysis or long term financing, please

contact us regarding our patents. We are happy to consult on these transactions. We also will be happy to spend a small amount of time (at no charge) verifying whether your transaction or analysis is likely to infringe any of the patents' claims. The patents have over 130 claims relating to these types of transactions, so the coverage is quite broad. We will do our best to prevent accidental infringement and prevent unnecessary worries regarding analysis or transactions that will not infringe.⁵

Third, the proliferation of financial patenting and the aggressive assertion of patent rights against alleged infringers will surely lead to high stakes litigation. Patent litigation is highly complex and costly civil litigation, calling for the skills of top trial teams and technical experts. Both holders and alleged infringers of financial patents face enormous risk in litigation. Financial patent holders face intense scrutiny of, among many other things, their satisfaction of the legal requirements for patentability described above and summarized in Exhibit 2. In litigation, questions of patentability are up for grabs, and juries will decide questions like anticipation. In many cases, expert analysis may help show that certain financial patents were "obvious" in light of prior art. The task is not an easy one. There must be some motivation to combine the prior art references in ways that render the invention obvious. That motivation can come from the prior art references themselves, the knowledge of one of ordinary skill in the art, or even from the nature of the problem to be solved—but the showing must be clear.

The road for an alleged infringer is not an easy one for another reason as well. Patent cases are typically tried before juries. Juries are prone to form a strong hypothe-

EXHIBIT 2

The Legal Requirements of Patentability Under U.S. Law

Requirement	Explanation
Patentable Subject Matter	The invention must fall into a category eligible for patent protection; not everything can be patented.
Useful	The invention must have some utility, though it need not work well and need not be superior to pre-existing products or processes.
New	The invention must not have been described in a relevant piece of prior art (e.g., in a prior patent or published article).
Nonobvious	The invention must not have been obvious to a hypothetical person of ordinary skill in the art, assumed to be knowledgeable of all the relevant prior art.

sis that a patent issued by the Patent and Trademark Office is valid, not knowing that most inventions are never tested by examiners, that patent examiners are often overworked and sometimes underqualified, and that patent applications are secret and not subjected to any meaningful adversary process unless litigated.

CONCLUSION

The implications of patent law for financial engineering cannot be ignored. The evolution of legal views of patentable subject matter and an increasing willingness of small companies to leverage intellectual property rights suggest that intellectual property law—the laws pertaining to patents, copyrights, trademarks, and trade secrets—will play an increasingly important role in the process of financial innovation.

Whether the recent proliferation of financial patenting is a good thing is open to debate. To be sure, financial patents that do not meet the standards of patentability because they are not new or nonobvious may be socially costly, requiring substantial expenditures on legal investigation, negotiation, and litigation.

At the same time, both economic and moral considerations can be offered for patent protection. Patents provide an incentive to socially useful innovation⁶ and a legal mechanism recognizing an inherent right of ownership in a new invention. If patent protection was necessary to evoke invention of the Black-Scholes option pricing model (which, at least if programmed into a computer, would likely be patentable subject matter today), it would be difficult to argue that patent protection is not socially useful. Of course, the counter-argument is obvious: financial innovation has proceeded fantastically without an important role for patent law, calling into question the need for its protection as an incentive.

It is also important to keep patent law in its proper perspective. Many financial firms will continue to rely on first mover advantages and trade secret law to protect their intellectual property investment. This may be particularly true in financial engineering. Trade secret law, in particular, offers substantial advantages in that it enables a company to keep its proprietary information secret. Considering that the technological life of pricing models may be obsolete by the time a patent issues, secrecy will continue to be an important source of protection for inventions in the financial engineering field.

Nevertheless, it seems likely that patent law will become increasingly important in controlling the sale and use

of newly designed financial products and widely used pricing and risk management software (as opposed to proprietary models). Given the relative importance of such products to most financial professionals, the message for financial engineers and their customers is clear: patent law—always crucial to more “traditional” fields of invention like manufacturing and chemistry—has come to finance.

ENDNOTES

This article reflects the author's opinions only, and not necessarily those of Bartlit Beck Herman Palenchar & Scott or any of its attorneys.

¹See, for a recent example, United States Patent No. 5,758,846 (Satellite Spin Inversion Using A Single Degree of Freedom Momentum Storage Device), issued June 2, 1998, and assigned to Hughes Electronics Corporation.

²The patent laws contain severe restrictions on the patentability of inventions that were in public use or on sale during times prior to application. For example, one U.S. District Court recently held that a company's demonstrations of its computer software to nonemployees without assurances of confidentiality could be such a public use.

³The quoted language was found at <http://www.venturecapital.org/ICI2000Co.html>.

⁴Merges [1999].

⁵The quoted language was found at <http://www.financialpatents.com/Whyus.html>.

⁶As Huang [2000] notes, however, it is not clear that all financial innovation is socially useful, at least within the framework of traditional incomplete markets economics.

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