

Innovation in Financial Services and Payments

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Session on
Information, IT, and Intellectual Property:

Robert Hauswald and Robert Marquez, "Information Technology and Financial Services," *Review of Financial Studies*, forthcoming (2002).

Jay Thomas, "Patenting on the Nines? An Overview of Patents on Financial Services and Other Methods of Doing Business," mimeo, George Washington University Law School (2001).

by

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*: The views expressed here are solely those of the author and not necessarily those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

- I. Introduction -- my idea
 - A. I'm going to lay out what we learn from these two papers and then ask how the effect of extending patent protection to business methods is likely to affect the potential for innovation in financial services.
 - B. I will suggest a cautionary answer to that question.

- II. The Hauswald Marquez paper
 - A. This is a model of the effects of innovation on lending markets rather than a model of innovation per se.
 - 1. Implications for the incentive to innovate come naturally out of this model, though.
 - B. Innovation is modeled as an improvement in information technology that improves the accuracy of screening.
 - 1. If the innovation is not diffused, information asymmetries rise. Rivals are less able to compete, as they are more disadvantaged by adverse selection. As a result, interest rates rise, and there is a transfer from consumers to the dominant lender.
 - C. In the simplest case, consumers may be better or worse off, on average, depending on their type, the magnitude of the price changes, and the change in the probabilities of being mis-identified.
 - 1. This suggests that access to technologies could be especially important in determining the welfare effects of innovations in financial markets.
 - 2. Hauswald Marquez explore this through their spill-over variable, but another empirically important avenue are technology vendors that serve the industry.

3. In a richer environment, i.e. where there are more than two types of consumers, we would expect an innovation to an extension of credit to riskier borrowers.
- D. In other settings, an innovation that reduces consumer welfare would probably rely on assumptions about increased barriers to entry (fixed costs, network effects), or an un-raveling of cross-subsidies.
1. Most importantly, we would want to examine welfare in a dynamic setting, where firms compete to introduce better technologies.
- III. On screening effort, spillovers and efforts to prevent them.
- A. An intuitive result of the model is that lenders screen more intensively when their technology improves. This is assured by the assumption of perfect complementarity in the model.
1. One might anticipate cases where the quality of technology and the level of effort are substitutes--automated underwriting for consumer credit comes to mind.
 2. But it would almost certainly be the case that the equilibrium accuracy of lenders' screens would be higher after the innovation than before.
- B. Another intuitive result is that screening effort declines as the amount of private information that leaks out increases.
1. That is a standard result in a number of lending models, and similar effects are seen in just about any model of innovation where appropriability is an issue.
- C. The authors allow lenders to take efforts to reduce spillovers, possibly through patents or trade secrets.
1. Naturally lenders will do more of this the more valuable the improvement in information technology.
 2. To the extent that greater appropriability increases screening effort, some amount of this effort can increase welfare. In a more complicated model, it might stimulate more innovation too, but here we must be careful.
 3. But there is a non-monotonic relationship between the ease of spillovers and effort expended in minimizing them--if spillovers are

too strong, it is not worth doing much to prevent them.

D. This intuition is suggestive of how firms are likely to use patents:

Value of IT	Spillovers in the absence of patents	
	Weak	Strong
A little	Less	More
A lot	More	A lot more

IV. Equal access to an innovation

A. The authors consider the possibility that two or more lenders have access to the improved technology. The result is multiple equilibria, including a mixed strategy equilibrium in which both lenders screen with positive probability.

1. In this equilibrium there is, in expectation, more price competition so that consumers enjoy more of the benefits of innovation.
2. The converse is that rents are dissipated, so a static vs. dynamic trade off becomes more clear. Suppose the innovation actually cost something, who would invest?

B. I wonder how the properties of an information sharing equilibrium (credit bureaus) varies as spillovers increase or the disparity in firm's IT (scoring models) increases.

C. It would be interesting to extend the results for efforts to minimize spillovers in this case, as this is an example of picking your competition--a firm that sometimes screens (with a probability you can affect) or that relies on public information.

D. The authors argue the mixed strategy equilibrium may be the more appropriate candidate for new markets and new customers, but not for established markets.

1. To me that conclusion relies on assumptions that are not fully articulated. Isn't it possible for innovations to reduce the significance of existing relationships?

- V. The Thomas paper
 - A. Jay describes the regime change facing the financial services sector--the extension of patents to computer software and methods of doing business.
 - 1. As a policy question, the first thing to wonder about is the quality of the patent examination process (example)--Lerner (2002)
 - 2. A separate change was the relaxation of patentability criteria (nonobviousness) in the mid 1980s--Hunt (1999b), Jaffe (2000).
 - B. There is a tendency to say that either everything is new or nothing is new.
 - 1. PTO claims such patents have been issued since the 1880's. The first Cash Management patent has already expired. Banks and vendors have been patenting (mostly) hardware and software (less so) for many years.
 - 2. The numbers do suggest that firms are taking advantage of the expansion of patentable subject matter (Charts). Most patents of this sort have been obtained by electronics companies, many banks and insurance companies are obtaining these new patents.
 - 3. We are also seeing the first instances of litigation (automated insurance underwriting, online banking) and some significant royalties been paid out (call center patents).
- VI. What is the likely effect on financial services?
 - A. A summary inference from the Hauswald Marquez paper would suggest that by improving appropriability we can increase the incentive innovate, and having done so, to screen more intensively.
 - 1. But we really ought to think of innovation game as a dynamic one, where firms compete to introduce better technologies over time.
 - B. There is a literature that considers the role of appropriability in dynamic settings. A robust result is the existence of an optimal degree of appropriability, optimal in the sense that it maximizes the rate of innovation.
 - 1. Lead time or imitation cost -- Cadot and Lippman (1997), Chou and Haller (1995).
 - 2. Patentability criteria -- Bessen and Maskin (2000), Hunt (1999a),

2001a), O'Donoghue (1998).

- C. A key result is that for rapidly innovating industries, patentability criteria should be strict. Why?
1. In rapidly innovating industries, rents are quickly dissipated by subsequent innovations to the extent they are substitutes and are also proprietary. Hunt (2001a)
 2. One way to preserve rents is to only grant patents on the most significant innovations.
 3. That is in fact the opposite of what has occurred in the U.S. since the mid 1980s.
 4. The result does not depend on transactions costs, or many of the other concerns sometimes voiced about patenting in other industries (hold-up problems, defensive patenting).
- D. To some extent, financial service firms were insulated from this trend because, until the mid 1990s, many of their innovations were not protected by patents. What about the future? This is an open question.

VII. Why shouldn't we think of financial services as a rapidly innovating industry?

- A. That is arguably one of the points of research presented at this conference.
- B. This is not always so apparent because of the problems we have measuring productivity as well as a failure, until recently to measure the industry's investments in new technology.
1. NSF only began measuring R&D in FIRE in the mid-1990s, and almost certainly underestimates it today. You won't see R&D for these firms in Compustat or in Call Reports.
 2. Its measure of R&D is \$1.6 billion in 1998, 2x the level in 1995. Industry employment of scientists and engineers was 17,000 in 1998, 3x the level in 1995.
- C. The industry is a very significant consumer of high technology inputs:
1. Finance and Insurance are the largest users of computer software (some made in house) in the NIPA Input-Output tables -- some \$23 billion in 1998.

2. Software was until recently treated as an expense rather than as an investment. In Canada, where more data is available, most R&D in FIRE is computer software.
3. In the mid 1990s, the banks spent about 15 of non-interest expenses on IT, and were the largest consumers of these inputs--Hitt et al (1998).

VIII. Conclusions

- A. The Hauswald and Marquez paper shows us how innovations in IT can affect lending markets and the potential significance of access to technology on the one hand, and appropriability on the other.
- B. The Thomas paper describes how the patent revolution is now reaching the financial service sector.
- C. What will be the likely effects? No one can say for sure, but there are reasonable practical and sound theoretical arguments for concern.

Sources cited

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A Few Interesting Financial Patents

Patent No.	Year	Description
4,346,442	1982	Securities Brokerage Cash Management System (CMA)
5,532,464	1996	Electronic Check Presentment
5,677,955	1997	Personal Online Banking (Intuit)
5,677,955	1997	Electronic Funds Transfer Instrument
5,848,400	1998	Electronic Check Clearing and Settlement
5,978,485	1999	Foreign Exchange Transaction System
6,017,063	2000	Financial Certificates (inflation indexed securities?)
6,076,074	2000	Intraday Netting Payment Finality
6,078,903	2000	Modeling Risks of Loans in a Financial Portfolio (KMV)
6,112,190	2000	Method and System for commercial Credit Analysis (Citibank)

[This is a slightly edited reproduction of the initial pages of the official patent document]

United States Patent

6,368,227

Olson

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Method of swinging on a swing

Abstract

A method of swing on a swing is disclosed, in which a user positioned on a standard swing suspended by two chains from a substantially horizontal tree branch induces side to side motion by pulling alternately on one chain and then the other.

References Cited [\[Referenced By\]](#)

U.S. Patent Documents

242601	Jun., 1881	Clement	472/118.
5413298	May., 1995	Perreault	248/228.

Claims

I claim:

1. A method of swinging on a swing, the method comprising the steps of:
 - a) suspending a seat for supporting a user between only two chains that are hung from a tree branch;
 - b) positioning a user on the seat so that the user is facing a direction perpendicular to the tree branch;
 - c) having the user pull alternately on one chain to induce movement of the user and the swing toward one side, and then on the other chain to induce movement of the user and the swing toward the other side; and
 - d) repeating step c) to create side-to-side swinging motion, relative to the user, that is parallel to the tree branch.
2. The method of claim 1, wherein the method is practiced independently by the user to create the side-to-side motion from an initial dead stop.
3. The method of claim 1, wherein the method further comprises the step of:
 - e) inducing a component of forward and back motion into the swinging motion, resulting in a swinging path that is generally shaped as an oval.

4. The method of claim 3, wherein the magnitude of the component of forward and back motion is less than the component of side-to-side motion.

IX. Description

DETAILED DESCRIPTION OF THE INVENTION

The present inventor has created, through experimentation on a standard swing, a new and improved method of swinging. ... The standard method of swinging on a swing is defined by oscillatory motion of the swing and the user along an axis that is substantially perpendicular to the axis of the tree branch from which the swing is suspended. ... In contrast to the conventional method of swinging, the present inventor has discovered that much greater satisfaction can be obtained by alternately pulling on one chain to move the swing and the user toward that side, and then pulling on the other chain to move the swing and the user toward that side.

The present inventor has discovered certain other improvements in the art of swinging on a swing, either or both of which can be used in conjunction with the swinging method described immediately above. The first is that the inventive swinging method can be initiated from a dead stop without pushing, and without the user having to contact the ground. That is, the user can climb onto the swing, and begin from an initial dead stop to pull first on one chain, and then on the other chain, alternately until the user and the swing have begun to swing side-to-side in accordance with the inventive swinging method described herein. This enables even young users to swing independently and joyously, which is of great benefit to all.

Another improvement on the swinging method described above is the induction into the side-to-side swinging movement of a component of forward-and-back motion. ...

Lastly, it should be noted that because pulling alternately on one chain and then the other resembles in some measure the movements one would use to swing from vines in a dense jungle forest, the swinging method of the present invention may be referred to by the present inventor and his sister as "Tarzan" swinging. The user may even choose to produce a Tarzan-type yell while swinging in the manner described, which more accurately replicates swinging on vines in a dense jungle forest. Actual jungle forestry is not required.

Licenses are available from the inventor upon request.