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# Impacts of e-Commerce and Enhanced Information Endowments on Financial Services: A Quantitative Analysis of Transparency, Differential Pricing, and Disintermediation

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# Impacts of e-Commerce and Enhanced Information Endowments on Financial Services: A Quantitative Analysis of Transparency, Differential Pricing, and Disintermediation

## **Abstract**

Some implications of e-Commerce financial services firms are becoming clear. The web drives transparency, and increases the information endowment of all market participants. It is harder to manipulate customers' behavior, or to overcharge them. Transparency drives differential pricing. Not all customers can or should be charged the same prices. Transparency reduces the viability of cross-subsidies between customers can or between products. The differential pricing enabled by the web transforms distribution channels, and enables direct distribution and alternative forms of distribution. Some intermediaries may be bypassed altogether, while others may rapidly lose their best, most profitable, and previously most loyal customers.

## **Keywords**

Net-based financial services, transparency, pricing, bypass and disintermediation

## **Disciplines**

Management Sciences and Quantitative Methods

# **Impacts of the Internet on Financial Services: A Quantitative Analysis of Transparency, Differential Pricing and Disintermediation**

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## **1. Introduction**

Much has already been written in both the academic and popular press about the profound transformational effect of the net on transactions costs. Reducing transactions costs, especially in the financial service sector, has always allowed transaction volumes to increase; New York's May Day and London's Big Bang are simply older examples of this very powerful trend. However, the net has produced trends that will be more significant than the reduction in transactions costs, and that will require changes in the strategies of all major financial institutions.

The three trends to be described in this paper will not appear new, and indeed they are not new. However, although they have been observed before the widespread adoption of the net, they have surely been accelerated by the net. *Disintermediation*, for example, has existed since the first blue chip corporations discovered that they could issue short term commercial paper at rates more attractive than their bank loans. However, this bypass of financial intermediaries, once available only to firms like General Motors or IBM, is now available to micro-breweries placing their first public round of equity, or to individual who do not wish to pay brokerage fees.

In this paper we address the three trends that we feel will have the greatest strategic significance. Although none was created by the net, each has been accelerated by the net; moreover, while each was once largely reserved for commercial financial services the net has accelerated the movement of each from commercial domains to retail and consumer services. Importantly, their full strategic impacts have yet to be experienced, and neither financial services firms nor their regulators seem fully aware of their implications.

In this paper we address the following:

- Price transparency
- Differential pricing
- Bypass and disintermediation

### 1.1. Transparency

*Transparency* reflects the degree to which market participants have access to information on pricing, both before and after trades, order sizes (before resulting in trades) and trade sizes (after execution). As was rapidly clear after London's Big Bang, transparency dramatically affects margins and the profitability of principal traders (alternatively specialists in New York, broker-dealers on Nasdaq, jobbers in pre-Big Bang London, and market makers in London today).

Prior to Big Bang, a jobber cheerfully explained his job by saying:

*"I stand on the floor and people throw tuppence at me. He wants to sell his shares to her, but he can't. He sells them to me and I sell them to her. They each pay me tuppence. That may not sound like much, but it's tuppence a share, times a couple of million shares a day, times a couple of hundred trading days a year. God I love this job!"*

In brief, he was buying low and selling high, which worked as long as customers were willing to buy high and sell low, which they did as long as they were not particularly well informed.

Speaking to the same man a year after Big Bang he described his job very differently:

*"I buy 800,000 shares from him at 304, hoping to sell them to her at 306. But everyone knows I paid 304, everyone knows I have 800,000 shares, and everyone knows I don't want them. I'm lucky to unwind the last of the lot at 304."*

Shortly thereafter he took early retirement and spent the next year on the coast of Portugal. Transparency and easy profits for market makers do not appear to be compatible.

## 1.2. Differential pricing

A wide range of financial services industries exhibit a strong *customer profitability gradient*. That is, customers are heterogeneous in a number of ways that strongly influence profitability. Some people have high cholesterol and do not exercise; they are expensive to insure. Others make extensive use of credit on their credit cards and pay their balances off slowly; they are profitable to serve. While price discrimination has been extensively studied in economics and marketing (c.f., Tirole), net-based services offer the environment in which many of the most sophisticated theories can be practically applied.

*Differential pricing* makes use of underlying customer differences to set prices individually, attracting and retaining the best accounts, and in industries with significant price elasticity actually encouraging these accounts to make more use of profitable services. Differential pricing has long been used by commercial insurers, setting different prices for different fleets of vehicles, different facilities, even different steam boilers, based on estimated risks and expected claims. Similarly, actuarial tables are used to develop approximate estimates of risks for life insurance, so that premiums can be set more accurately. These principles are being applied to individual applicants and account holders in more industries (such as credit cards), with increasing accuracy and precision.

As we will explore below in section 3, the need for differential pricing is heightened by increasing price transparency.

## 1.3. Bypass and Disintermediation

*Bypass* (or *disintermediation*) occurs when a customer is able to interact with the primary supplier of goods or services, without requiring the services of a previously essential intermediary. Bypass can be driven by and initiated by the primary service provider, as when insurance companies attempt to deal directly with customers online, bypassing their traditional agent intermediaries, or by the customers themselves, as when the best prime rate borrowers decide to issue short term commercial paper rather than take loans from their traditional commercial banks. Other examples include the online sale of simple insurance products like term life, online mortgage applications, and online stock trading.

To some extent bypass is enabled by the failure of traditional intermediaries to engage in differential pricing. Customers who are extremely profitable for traditional brokers to serve (for example, day traders who trade frequently and require little or no advice from financial consultants) are most vulnerable to opportunistic pickoff by online brokerage services. Indeed, uniform pricing in the presence of customer heterogeneity is one of the principal drivers of disintermediation, and as we shall explore below disintermediation greatly increases the need for differential pricing.

## 2. Price Transparency

Runaway price transparency can be viewed as the *terror of the net* since it leads increasingly to brutal, Bertrand price competition. Indeed, a quick examination of two online vendors' prices for popular books (figures 1 and 2), in which both are selling the book at the publisher's cost to them, suggests at best limited profit opportunities. As we mentioned above, runaway price transparency was the principal source of pressure on market maker profitability after London's Big Bang (cf. Clemons and Weber for more detail).

Price transparency does not need to lead to the collapse of profits; it merely demands that more complex pricing strategies be adopted, even for online merchants. Amazon and Barnes and Nobles do not use identical pricing strategies for all books, nor are all books sold at their cost. Comparison of figures 3 and 4, showing their prices for Elizabeth Gray's **Green Sea of Heaven** illustrates this clearly. The two merchants do not agree on their discounts. They do not even agree on an appropriate list price. As with supermarkets, where certain benchmark products must be priced as low as possible, online booksellers seem to have adopted everyday low pricing for best sellers; again, as with supermarkets, these same merchants appear to have adopted a mixed, high-low strategy, decreasing comparability and price transparency, in order to retain some profitability.



Figure 1 — Amazon.com's web screen for a best selling novel, Harry Potter and the Prisoner of Askaban

The screenshot displays the BN.com website interface for the book 'Harry Potter and the Prisoner of Azkaban'. At the top, the BN.com logo is visible, along with navigation links for Books, eBooks, Music, eCards, Prints & Posters, Software, and Magazines. A search bar is present with a 'QUICK SEARCH' button and a dropdown menu for 'Title'. Below the navigation, the book title 'Harry Potter and the Prisoner of Azkaban' is prominently displayed, followed by the author 'J. K. Rowling' and the illustrator 'Mary Grandpre'. The price information shows a retail price of \$19.95 and a current price of \$9.97, representing a 50% discount. A 'Buy it Now!' button is available, along with an 'Add To Cart' button. The page also features a 'Write your own Review' section with a 5-star rating and a 'Related Software' section for 'Kids and Education'. The bottom of the page contains a disclaimer about the author's death during his third year at Hogwarts School.

**Related Information**

- **Bibliography**
- Books by J. K. Rowling
- Books by Mary Grandpre
- **About the Book**
- Annotation
- Publisher Information
- Reviews
- Customer Reviews
- **From the Book**
- Table of Contents
- Excerpt
- **Related Titles**

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If you would like to find out more about Harry, visit our [children's bookshelf](#).

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**Harry Potter and the Prisoner of Azkaban**  
J. K. Rowling Mary Grandpre (illustrator)

**bn.com Price: \$9.97**  
**Retail Price: \$19.95**  
**You Save: \$9.98 (50%)**

**In-Stock: Ships within 24 hours**

**Format:** Hardcover, 435pp.  
**ISBN:** 0439136350  
**Publisher:** Scholastic, Inc.  
**Pub. Date:** September 1999  
**bn.com sales rank:** 3

**Other Formats:** [Hardcover](#), [Audio](#), [Compact Disc](#)

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628 other customers have reviewed this book. Average Rating: ★★★★★

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[Harry Potter and the Sorcerer's Stone](#), J. K. Rowling/Mary Grandpre (illustrator)

**ABOUT THE BOOK**

**Annotation**  
**2000 Bram Stoker Award Winner for Work for Young Readers.**

During his third year at Hogwarts School for Witchcraft and Wizardry, Harry Potter must confront the devious and dangerous wizard responsible for his parents' deaths.

**Buy it Now!**

**Add To Cart**

Add this item to your shopping cart. You can always remove it later.

**Safe Shopping Guarantee!**

**Advanced Search**

**Cart Help Account**

**Out of Print**

**Bargains**

**Software**

**Prints & Posters**

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**Magazines**

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**Magazines**

**Browse Subjects**

**Kids**

**Gifts**

**Bargains**

**Out of Print**

**Advanced Search**

**Cart Help Account**

**Search**

**bn.com**

**BARNES & NOBLE**

Figure 2 — BN.com's web screen for a best selling novel, Harry Potter and the Prisoner of Askaban.



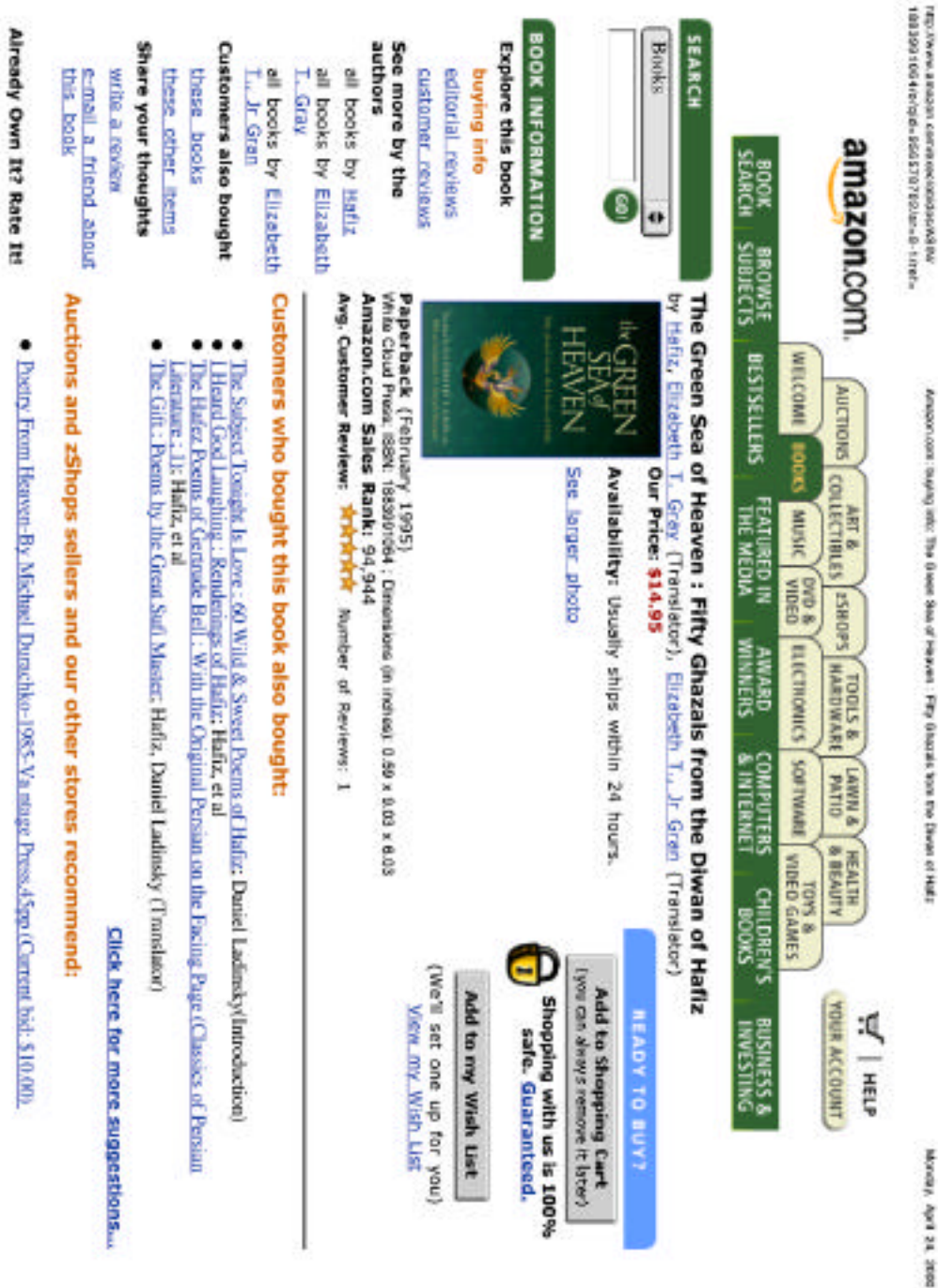


Figure 3 — Amazon.com’s website screen for a less widely read book, Elizabeth T. Gray’s Green Sea of Heaven.

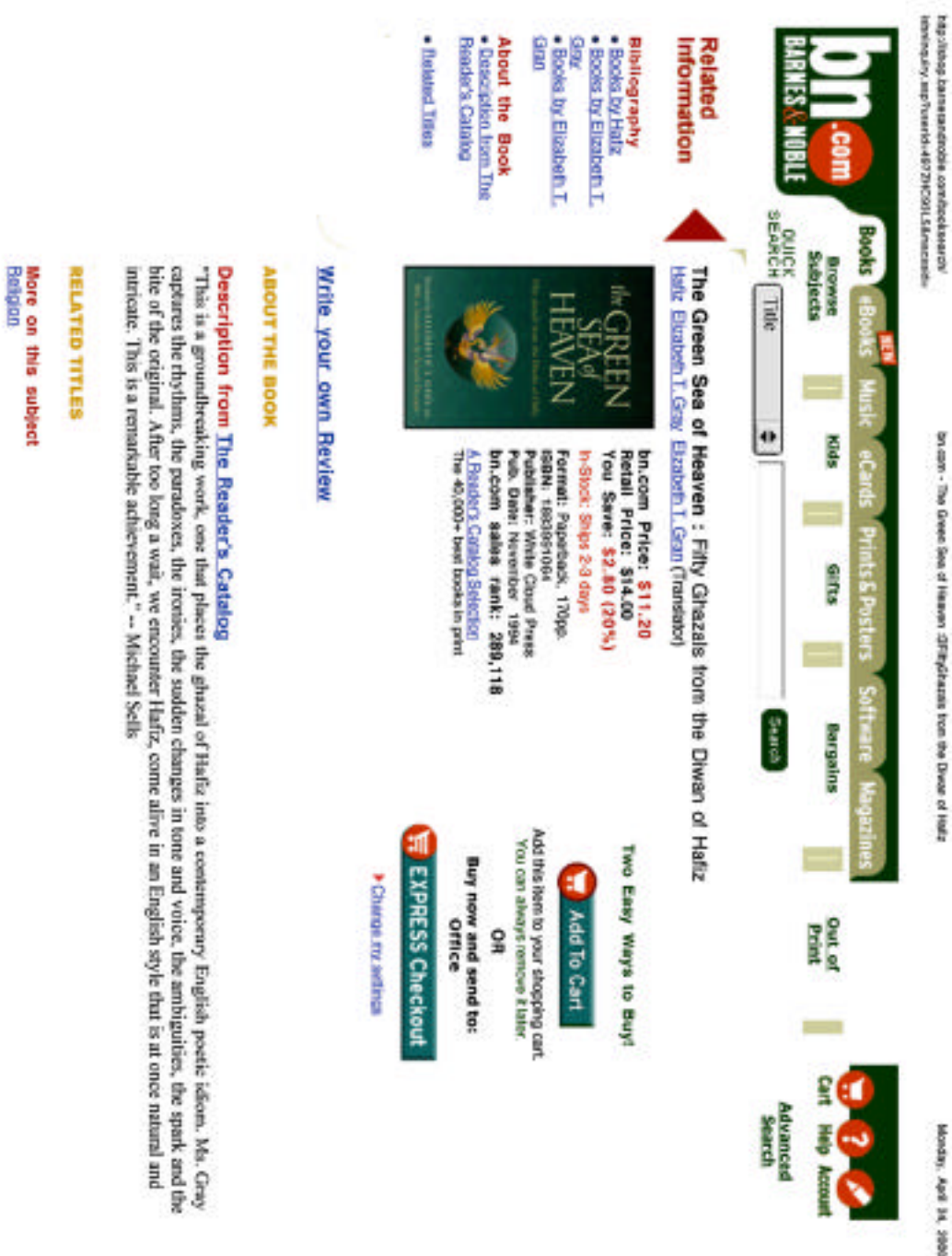


Figure 4 — BN.com's website screen for a less widely read book, Elizabeth T. Gray's *Green Sea of Heaven*.

The net also enables forms of *path dependent* strategies. When customers shop for cell phone service, wireless service companies will often offer attractive discount packages to new accounts. However, if the same customer first buys an expensive, state of the art new phone, with service available from only one carrier, this carrier no longer has any incentive to offer a discount; if the customer clicks through directly from the cell phone vendor to the wireless service provider, none of the discounted packages will be offered.

Path dependent strategies are simply one, simple form of differential pricing, based upon the information endowment of the seller. Indeed, differential pricing is the most important element of pricing strategies, for financial service providers as well as providers of other goods and services, and will be explored in the next section.

### **3. Differential Pricing**

Differential pricing has a long and established history:

- based upon differences in *cost to serve* among different customers (e.g., some brokerage customers need more support and more service than others; some insurance policy holders have higher risk profiles than others; some corporate and individual consumer borrowers have higher risk profiles than others)
- based upon differences in *expected revenues and profits* among different customers (some customers at hotels use the bar, the restaurants, the golf courses more than others, leading to ancillary spending in excess of their room rates; some hotel guests in Las Vegas and Atlantic City gamble extensively and, indeed, receive complimentary rooms in expectations of profits to be made elsewhere during their stays)
- based upon differences in *willingness to pay* among different customers (business travelers are frequently willing to pay far more than leisure travelers for the same flight)

### 3.1. Defense of Differential Pricing

More widespread awareness of differential pricing has led to increasing resentment among customers in many industries (e.g., corporate travel, individual insurance). This resentment has, in turn, led to increasing regulatory interest in these practices, and often, in the case of individual life and health insurance, to regulatory intervention.

Despite this regulatory hostility, it is not difficult to establish that differential pricing based upon customer differences may be beneficial, even essential, to the proper functioning of a market. Akerlof has demonstrated that a market where customers have a continuous distribution between two bounds, and where counterparties have complete information asymmetry, the market collapses, with no sales being completed. (While Akerlof's result is dependent upon complete information asymmetry, with only sellers being aware of the quality of their offerings, the same result will obtain in the presence of regulatory restrictions upon information availability, or upon its use in differential pricing.)

With a discrete distribution the problem is slightly different. Using the insurance industry as an example, and assuming two separate populations differing on expected risk to serve, in the presence of information asymmetry total market collapse is averted. Rather, only the highest risk customers will choose to insure, and they will do so at the actuarially fair rate, subject to slight risk aversion. This result continues to hold in the presence of information asymmetry's close cousin, regulatory enforcement of uniform pricing. Although the market does not collapse fully, market participation and coverage of risk are reduced, as high risk individuals insure and low risk individuals opt out of the market due to costs that greatly exceed expected benefits. Rothschild and Stiglitz have demonstrated that with a discrete distribution even in the presence of complete information asymmetry, product design and differential pricing can be combined so that low risk and high risk insurance applicants self select for the degree of coverage appropriate to them, and market participation increases.

Rothschild and Stiglitz's results, and those of many researchers who followed them in the insurance industry, are based on the size of the deductible, or alternatively, on price rationing of services. The highest risk individuals will accept full coverage, at

the actuarially fair price for their group. Lower risk individuals will accept a higher deductible and only partial coverage, while the expected cost of having this partial coverage is too great to be accepted by those who know themselves to be high risk. Since only low risk individuals will accept the lower coverage, the price for this group can be based upon the actuarially fair rate for them, suitably reduced because they are receiving only partial coverage. Thus a *stable separation* can be achieved, even in the presence of information asymmetry.

Clemons and Thatcher have extended this work to reflect conditions more reflective of those that exist in insurance markets today. In place of partial coverage determined by the size of the deductible, Clemons and Thatcher study the impact on market efficiency when a certain condition is excluded from insurance. That is, if applicants differ in their genetic predisposition to a single condition such as a form of cancer or to diabetes, and if this information is known only to the applicant and not to the insurance company, policies with exclusion of coverage for the specific condition can restore market participation among low risk individuals, much as price rationing did in the Rothschild and Stiglitz example.

Table 1 (Base Case) shows the efficient functioning of a market in the presence of symmetric information, or, more precisely, symmetric lack of information; neither applicants for insurance coverage nor the insurance provider is aware of the risk status of any applicant. This table shows full market participation, as both high risk and low risk applicants are fully insured, and both have chosen to purchase insurance at the actuarially fair rate for the entire population treated as a single group.

The following conditions are used in the simulation of this section and in all the following simulations. The probability of being low risk for cancer is 90%, while the probability of being high risk is 10%. In low risk individuals the lifetime probability of getting cancer is 1%, while in high risk individuals it is 20%. The lifetime probability of developing any medical condition other than cancer is 10%. The cost of cancer treatment averages 500 Thalers (a monetary unit used by experimental economists), while the cost of treatment for other conditions averages 100 Thalers. Consumers' risk aversion is a very modest 5%.

<b>Base Case:</b> No consumer awareness of riskiness, no attempted inference by regulators, no genetic testing and no distinctions made by insurance company.	
<b>Results:</b>	
<b>Consumer Decisions</b>	
% Coverage	100%
% No Coverage	0%
<b>Insurance Company Pricing</b>	
Price of Complete Coverage	Th 24.50
<b>Summary Findings:</b> Under these conditions, assuming even modest risk aversion of 2% or 3%, all consumers opt for complete coverage, and the resulting prices are based on the actuarially correct expected costs for the population as a whole.	

**Table 1—Symmetric information, with neither insurance company nor applicants possessing risk evaluations for individual customers. All individuals choose to participate in the market.**

As table 2 illustrates, the presence of private information causes some market deterioration. Individuals who know themselves to be high risk continue to purchase insurance. Those who know themselves to be low risk believe the price of Th 24.50 to be excessive and they begin to opt out. As the price increases and more low risk customers leave as a result, the market approaches a steady state in which only high risk applicants choose to purchase insurance. This result obtains whether uniform pricing is a result of lack of availability to insurance providers, or regulatory restrictions that prohibit its use. It is clear that this uniform pricing benefits no one. Low risk customers have no insurance. High risk customers pay their actuarially fair rate, with no benefit from their insurance company's lack of information or from regulatory interference with the functioning of the market. Note that these results continue to hold even when consumers' information is less than fully accurate.

<b>Asymmetric Information — Consumers have private information:</b> Consumers assess their riskiness through inference and genetic testing and use this information to guide their insurance purchase decisions. Insurance companies are unable to performing data mining or to use test results. Test is 80% accurate.		
<b>Results with only complete coverage policies available:</b>		
<b>Consumer Decisions</b>		
<u>Test Results</u>	<u>High Risk</u>	<u>Low Risk</u>
% Complete	100%	0%
% No Coverage	0%	100%
<b>Insurance Company Pricing</b>		
Price of Complete Coverage		Th 45

**Table 2—Asymmetric information, with applicants having accurate assessment of their risk profiles but insurance providers having no comparable sources of information. Only high risk individuals continue to participate in the market.**

Table 3 shows how performance of the insurance market can be improved by the introduction of exclusionary policies. Insurance companies now offer two policies, complete coverage (as the name implies) and ABC policies (all but catastrophic risk, where catastrophic risk denotes the single attribute on which consumers have private information on their risk profiles). As is clear from this table, offering such policies represents a *pareto* improvement; high risk individuals are no worse off than they were under the conditions of table 2 (only a single policy type available), and low risk individuals are better off since they are no longer fully uninsured. However, many regulators and legislators, both in individual state governments and in Congress, object to all exclusionary policies under the mistaken belief that they are necessarily damaging to high risk individuals.

<b>Asymmetric Information — Consumers have private information:</b> Consumers assess their riskiness through inference and genetic testing and use this information to guide their insurance purchase decisions. Insurance companies are unable to performing data mining or to use test results. Test is 80% accurate.		
<b>Results with complete coverage and ABC policies available:</b>		
<b>Consumer Decisions</b>		
<u>Test Results</u>	<u>High Risk</u>	<u>Low Risk</u>
% Complete	100%	0%
%ABC Only	0%	100%
% No Coverage	0%	0%
<b>Insurance Company Pricing</b>		
Price of Complete Coverage	Th 45	
Price of ABC Coverage		Th 10
<b>Summary Findings:</b> When only complete coverage policies are available, only consumers who test high risk choose to purchase insurance, and consumers who test low risk remain uninsured. When consumers can choose between complete coverage and ABC coverage, those who believe that they have high risk choose complete coverage and those who believe that they are low risk choose ABC coverage.		

**Table 3—Asymmetric information, with applicants having accurate assessment of their risk profiles but insurance providers having no comparable sources of information. Insurance companies offer two different policies, differing in their coverage of the condition for which consumers have private information. Coverage of risk increases.**

Finally, we consider the case in which both insurance companies and applicants have access to the same information. Individuals can assess their risk based upon the results of private genetic testing (assumed to be only 80% accurate) or based on inferences available from the medical history of family members (also only partially accurate). Table 4 illustrates the case where both insurance companies and applicants have equivalent access to this information. Insurance companies use the information to determine the prices they should charge each applicant for both complete and ABC coverage, and applicants use this information and the prices offered them to determine which policy to purchase. As the table shows, removing information asymmetry restores full market participation; all customers are now



fully insured. This comes at a social cost, however; customers are charged very different prices, for reasons that are often based on genetic conditions and pre-dispositions towards disease that cannot be considered in any way their fault. Additionally, some customers may, due to financial or budgetary constraints, be forced out of the market if they cannot afford to pay their actuarially fair rate. This is the source of much consumer and regulatory resistance to differential pricing. However, as Clemons and Thatcher show, regulatory intervention intended to protect the most high risk segments of the population generally fail; as can be seen from table 2, maximizing information asymmetry by protecting the privacy of high risk individuals does not improve the prices that they pay for insurance, but merely serves to drive low risk individuals out of the market.

<b>Results with complete coverage and ABC policies available:</b>			
<b>Consumer Decisions:</b> All consumers choose complete coverage, regardless of their test status and regardless of their prior estimates of their of riskiness.			
<b>Insurance Company Pricing</b>			
<b>Price of Complete Coverage</b>			
Inference/Test			
$\frac{HI}{HI}$	$\frac{HI}{LO}$	$\frac{LO}{HI}$	$\frac{LO}{LO}$
Th 60	Th 19.9	Th 27	Th 16
<b>Summary Findings:</b> All consumers choose to purchase complete coverage, but they are charged very difference prices.			

**Table 4—Allowing the symmetric use of information by insurance companies and applicants restores full market participation at actuarially fair prices.**

**3.2. Love ‘ems, Kill Yous and Death Spiral**

Data from industries as diverse as credit card, demand deposits accounts in retail banking, cell phone and long distance telephone service, market making and stock broking, and insurance suggest that there are extreme differences in customer profitability. Reports from credit card issuers suggest that prior to differential pricing these profitability differences created a strong customer profitability gradient, where the most profitable 20% represented more than 100% of issuer profits,

the middle 60% were in aggregate essentially break-even for issuers, and the worst two deciles represented net losses. No wonder that a bank that described this problem to us coined the terms *love 'ems* and *kill yous* to describe the best and the worst two decile groups. Love 'ems represented 135% of their profits and kill yous, as net loss makers, would kill you if you had too many of them.

Not surprisingly, the best credit card issuers and the most astute providers of a wide range of services have begun to engage in differential pricing. Rather than compete to obtain as many customers as possible, using economies of scale and lower systems development and operating costs to produce slightly better bottom line figures, these issuers competed to capture and to retain the most profitable individuals, who produced the greatest revenue. That is, rather than engage in *scale-based competition* to achieve at best marginal improvements in the bottom line, they sought to develop *skill-based competition*, producing correspondingly larger improvements in top line and bottom line performance. The most effective form of targeting the best accounts is, in general, differential pricing, or reducing prices for the most attractive customer groups. (An alternative form of skill-based competition, based upon service upgrades for best accounts, or offering better service at the same price that would normally be charged for standard service is, indeed, little different from offering a better price on the better service, and these closely related strategies will not be distinguished further here.)

Section 3.1. demonstrated that in the presence of pronounced differences among customers differential pricing can be beneficial to the efficient performance of markets. We note here that in the presence of these differences, once one player begins employing differential pricing, all must respond. Simplistic pricing in the presence of customer differences creates a customer profitability gradient and vulnerability; anecdotal data suggests that failure to address this vulnerability can lead to a self-reinforcing loss of profits, known as *death spiral*, ultimately forcing competitors who do not respond to exit the market.

Capital One Financial is the best known of the credit card issuers that first employed differential pricing [Clemons and Thatcher]. Their initial strategy employed the *balance transfer product*, which offered significantly more attractive interest rates to those customers who transferred outstanding balances in from other card issuers. *Transactors*, customers who pay their balances off immediately, are usually unprofit-

able for issuers, as they are the recipients of free credit for their charge transactions. In contrast, *revolvers*, customers who keep revolving balances but never pay them off in full, are generally extremely profitable for their issuers, since they historically pay rates well above the bank's cost of capital, and well above the risk adjusted interest rates that they would pay for traditional consumer loans. Capital One's management team recognized that customers who would respond to an offer to transfer balances into the bank in exchange for lower interest rates would predominantly be those customers who care about interest rates, which would predominantly be those that pay finance charges, which in general would be those customers most profitable for the bank. Over time, Capital One developed sophisticated models for assessing each customer's expected profitability and adjusting interest rates to achieve an optimal balance between short term profitability based on rates and long term profitability based on customer retention and extending the lifetime value of this customer as an annuity. Capital One's President, Nigel Morris, observed that "*any fool can lend money. The trick is finding customers who will pay you back, and pay you back slowly.*" Capital One's greatest success came in using pricing as a mechanism for attracting and retaining customers who will "pay you back slowly." As a competitor noted, shortly before his bank was forced out of credit card issuance by sustained losses, "*If one of your competitors starts down this slippery slope [of differential pricing] you have no choice but to follow suit.*"

### **3.3. Differential Pricing when Threatened with Bypass**

Just as price transparency influenced the need for differential pricing, it can be made more critical by the threat of bypass or disintermediation, when that bypass is targeted at attracting love 'em customers from their established relationships with intermediaries.

Analysis of the profitability of market makers acknowledges the differences in customer profitability and correctly attributes this difference to different degrees of customer information endowment. A customer who consistently knows when a stock price is going to change, and changes in advance of this price change, is deadly as a counterparty for market makers, much as the house would find a gambler who knew when the roulette wheel was going to come up red or black to be deadly in a casino. Most analysis of financial market structure and market maker performance uses the powerful simplification of *informed traders* (i.e., those who trade with

superior information on the correct equilibrium price of a stock, our *kill yous*) and *liquidity traders* (i.e., those who buy stock as a long term investment, or who sell because they need the money to pay for a major purchase such as a car, a house, or a college education, our *love 'ems*). Market maker intermediaries charge for their services through the bid-ask spread, which often does not vary among customers; hence, these intermediaries lose money on their trades with informed traders, but more than recover these losses on their trades with liquidity traders.

When possible, market makers do indeed attempt to reduce their information asymmetry where possible, asking numerous questions to improve their own information endowment. Any trader sitting at his upstairs block trading desk would immediately ask some combination of the following questions to assess his degree of risk when accepting a trade:

- “Do you need a price **now** or can I work the trade and get back to you?” (i.e., do you have time sensitive private information?)
- “Am I the **first person** you showed this block to?” (i.e., has somebody else, perhaps with good reason, already declined to trade this position with you?)
- “Is this the **first block**, or am I seeing the tail end of a large position?” (i.e., is the street already flooded with these shares?)
- “Is this the **last block**, or are you going to be trying to place more shares while I am still trying to work off this position?: (i.e., is the street about to be flooded with these shares?)

The net, as well as other and older communications technologies, creates the possibility of alternative trading venues (popularly called electronic communications networks or ECNs). These ECNs can be and indeed have in some instances have been designed to appear selectively to liquidity traders, offering lower cost execution, but usually sacrificing both speed and certainty of execution. While lower cost appeals to all investors, the lack of speed and of certainty of execution frequently discourages informed traders from bringing their order flow to these ECNs. This selective targeting of market makers' most profitable accounts through differential

pricing potentially can transform market making into a newly vulnerable industry, subject to opportunistic pickoff from ECNs.

At the request of planning officers in London we conducted a study of the vulnerability of the London Stock Exchange to such opportunistic pickoff. We considered several cases, using discrete event simulation to model the dynamic behavior of the market under each of these cases. The models were tuned through extensive interviews and data analysis to reflect timing of order flow, the behavior of informed and liquidity traders in the presence of prices that differed from true (and unobservable) equilibrium prices, and the behavior of market makers as their positions became increasingly long or short. We considered first the case where all customers used market maker services and paid the spread. We then examine the increasing request for improved execution and the impact on profitability. We examine naive responses that are possible to market makers and their resulting initiation of death spiral. Finally, we describe an alternative strategy, based on signaling mechanisms, that can preserve both the role of market makers and their profitability.

Table 5 illustrates our base case. All market participants trade through market makers. Liquidity traders do pay for their transactions (their round trip trading costs represent approximately 1% of transaction sizes. Informed traders make a profit (as shown by their negative transactions cost). Since the weighted average of a large pool of liquidity traders and a smaller group of informed traders results in a positive transaction cost, market makers are a group are profitable.

<b>BASE CASE:</b> All classes of trader execute using market maker services.	
<b>Market maker profits (thousands)</b>	£124.2
<b>Transactions Cost</b> (percent of value traded)	
Liquidity traders	1.09%
Informed traders	-2.40%
Weighted average	0.221%

**Table 5—Base case, where all investors trade through market makers.**

The next stage of our analysis illustrates what happens when ECNs (e.g., Trade-Point, Instinet) are made available in London. Before these networks were widely adopted, customers began to demand mid-spread execution from their market makers, threatening to take their business off-exchange if these requests were not granted. Initially, these ECNs were attractive principally to liquidity traders, who were the ones most likely to request mid spread execution (*mids*) from market makers. With no way to distinguish between informed and liquidity traders, however, market makers initially granted *mids* equally to all who requested it. The only determinant is whether or not accepting the trade at mid spread would have forced their position over their position limit, the point at which they would normally adjust their quotes, trade with other market makers, or take other actions to limit increasing their exposure. The sensitivity analysis shown in table 6 makes it clear that this naive strategy is unsustainable. If enough customers request mid spread execution, and as informed traders begin to request it as well, market maker profitability is effectively destroyed. Clearly this strategy is not sustainable.

<b>STAGE 1: Market makers begin to grant midspread execution.</b>			
	<b>Mids=33%</b>	<b>Mids=67%</b>	<b>Mids=100%</b>
<b>Market maker profits (thousands)</b>	£63.6	-£13.0	-£74.6
<b>Transactions Cost</b> (percent of value traded)			
Liquidity traders	0.957%	0.802%	0.642%
Informed traders	-2.59%	-2.79%	-3.00%
Weighted average	0.115%	-0.028%	-0.146%
<b>Middle price requests accommodated</b>	55.2%	52.9%	51.5%

**Table 6—Market maker losses develop as the use of midspread execution increases.**

Of course, market makers would not be willing to continue these loss-making activities. Table 7 examines what happens when market makers become more conservative, tightening the conditions under which they trade. They hold positions more conservatively, more rapidly adjusting their spreads to reflect any change in inventory positions. Market makers are less likely to accommodate midspread requests, but their profits do not fully recover.

	<u>Mids=33%</u>	<u>Mids=67%</u>	<u>Mids=100%</u>
<b>STAGE 2-A:</b> Market makers tighten their position limits, becoming less willing to hold positions without adjusting their quotes. This dramatically improves market maker profitability, but was not sufficient to restore profitability to the levels enjoyed before midspread dealing became prevalent.			
<b>Average dealer position limit</b> (was 18 in prior stage)	14	12	10
<b>Market maker profits (000s)</b>	£68.2	£14.6	-£51.7
<b>Transactions Costs</b>			
Liquidity traders	0.963%	0.823%	0.686%
Informed traders	-2.54%	-2.64%	-2.83%
Weighted average	0.122%	0.022%	-1.04%
<b>Middle price requests accommodated</b>	52.2%	48.8%	46.0%

**Table 7—Market makers tighten their position limits, restoring some profits but becoming less attractive to the market they are attempting to serve.**

Since even the strategies employed in table 7 were not sufficient to restore market maker profitability, market makers now not only reduce their position limits but stop making mids available “except when it suits,” that is, except when it moves their position closer to zero. Since this does improve profitability it would appear to be an effective defensive strategy, except that it reduces the attractiveness of the market differently to different market segments. This is shown in table 8. As the percentage of mid-spread requests granted drops, self selection becomes a significant threat to market makers. Informed traders will continue to use the market. Liquidity traders will move off exchange, to one or more of the ECNs. This trend is shown in table 9.

**STAGE 2-B:** Market makers become more conservative, granting midspread only for trades that move their positions closer to zero.

	<u>Mids=33%</u>	<u>Mids=67%</u>	<u>Mids=100%</u>
<b>Average dealer position limit</b>	14	12	10
<b>Market maker profits (000s)</b>	£80.0	£22.5	-£39.0
<b>Transactions Costs</b>			
Liquidity traders	0.975%	0.841%	0.730%
Informed traders	-2.52%	-2.65%	-2.80%
Weighted average	0.144%	0.037%	-0.079%
<b>Middle price requests accommodated</b>	47.2%	45.0%	43.2%

**Table 8—Increasingly conservative strategies improves market makers' profitability but reduces the attractiveness of the market.**

**STAGE 3:** Market makers accept only middle price trades that reduce their absolute position size (zero-position rule). Only 45%, 35%, and 25% of middle price orders go to market maker initially; the rest go directly into crossing system.

	<u>Mids=33%</u>	<u>Mids=67%</u>	<u>Mids=100%</u>
<b>Market maker profits (000s)</b>	£94.3	-£28.4	-£72.3
<b>Transactions Costs</b>			
Liquidity traders	0.864%	0.636%	0.506%
Informed traders	-2.48%	-2.70%	-3.41%
Weighted average	0.182%	-0.056%	-0.152%
<b>Fill Rates — Mids orders accommodated</b>			
Exchange market makers	39.6%	28.5%	13.8%
Off-exchange crossing system	51.4%	49.1%	50.8%
<b>Crossing System volume as percent of total</b>	18.3%	40.0%	71.2%

**Table 9—Increasingly conservative market maker strategies have driven liquidity customers off exchange. ECNs represent a significant share of the volume and market maker profits have declined.**



Just as screening mechanisms allowed Capital One to appeal more effectively to those customers that it sought to serve, signalling mechanisms are available to attract and retain profitable customers in securities trading. Liquidity traders are attracted by the lower price; informed traders are kept away by one or more features that result from use of the screening mechanisms, much as high risk applicants would not apply for insurance policies that exclude coverage for their high risk conditions, despite the lower cost. A number of these are available and have been reviewed in the literature. Most are employed by ECNs or as dialogues in face to face markets, but others are available to market makers even in screen-based markets such as London. Table 10 shows how the use of such a mechanism can restore market maker profitability, even in the face of threats from ECNs and the disintermediation they represent.

<b>SIGNAL I:</b> A signaling mechanism is in place to appeal selectively to liquidity traders. Liquidity traders all use the signaling mechanism, informed traders do not..	
<b>Market maker profits</b> (000s)	£123.5
<b>Transactions Costs</b>	
Liquidity traders	0.571%
Informed traders	-0.908%
Weighted average	0.246%

**Table 10—Market maker profitability restored and market share retained after the introduction of differential pricing enabled by an effective screening mechanism.**

#### 4. Bypass and Disintermediation

The combination of customer differences and uniform pricing has led to significant opportunities for pick-off, employing targeting strategies based on effective use of differential pricing to attract and retain the most attractive customers . This has been evident in *horizontal competition*, as banks, credit card issues, and insurance companies competed for the best customers, as described in sections 3.1 and 3.2. As shown in section 3.3, differential pricing and targeting can also be used in *vertical*

*competition*, enabling opportunistic pickoff that attempts to bypass an entire class of intermediaries in the distribution channel.

Bypass of intermediaries is dependent upon a combination of factors, including:

- the **ease of disintermediation**, and the ease with which intermediaries' functions can now be taken over by other channel participants, as a result of technology, change in customer preferences, or change in regulation, and the ease with which these channel participants can reach customers directly
- the **attractiveness** of bypass, based largely upon the ability to target customers through a skill-based strategy, reducing or eliminating the need for massive economies of scale by new entrants; this requires both the presence and the visibility of a customer profitability gradient
- the **difficulty** that established incumbents will have in countering the new disintermediation strategy, either by matching them, or by eliminating customer profitability gradients, or by plausibly threatening effective punishment of the new entrants' channel strategies

#### **4.1. Experience with Disintermediation**

As Clemons and Row have demonstrated, airlines were ideally suited to engage in a disintermediation strategy, threatening to eliminate the role of travel agents if they did not accept significant cuts in commissions. Commissions, consequently, have been reduced from 10% of all tickets to the lesser of 8% or \$50.00 (and sometimes \$35.00). As their analysis shows:

- Attack was easy, because the product was readily described online, using an extension to computerized distribution systems that already served travel agents, and easily distributed through electronic (virtual) ticketing.
- Attack was attractive, because the profitability of business travelers was significantly higher, due to higher average ticket prices and lower service demands, and because frequent flyer plans made identification of frequent and profitable travelers relatively straightforward.

- Defense was difficult, because rapid adoption of alternative distribution channels, facilitated by accurate targeting of profitable customers, precluded plausible threats of effective retaliation by travel agents.

The effectiveness of this threatened disintermediation is made clear by the fact that it never needed to occur. Commissions were effectively slashed because it was evident to all parties that agents had no alternative but to comply; the alternative would have been direct distribution by airlines to those customers who were most profitable and easiest to serve. Attack by airlines would have been easy and attractive, and defense would have been difficult or impossible.

In contrast with disintermediation of travel agencies by airlines, analysis by Clemmons and Row predicted that consumer packaged goods would be most unlikely to disintermediate retailers. Their analysis was based on the same three factors as their analysis of air travel — ease of disintermediation, attractiveness of disintermediation, and difficulty of defense. However, these factors were seen to have very different impacts on the two industries:

- Describing each of the tens of thousands of products present in a supermarket electronically is not easy, since the characteristics of produce are so different from canned goods, which differ yet again from health and beauty aids. As importantly, many of these attributes (e.g., freshness, color) are highly subjective. Delivering these products in a cost effective manner likewise requires highly complex logistics and significant economies of scope, which few online retailers have been able to achieve even now.
- There is at best a limited customer profitability gradient. Individual consumers do not pay Procter and Gamble, Campbell Soup, or Unilever markedly different prices for identical products, and even if some consumers were willing to do so this information is available only to the retailer and not to the manufacturer.
- Large mass merchandiser intermediaries are indeed able to defend themselves. The first paper towel manufacturer or the first detergent manufacturer to attempt bypass would face certain retaliation from retailers, who would reduce promotional efforts, raise retail prices, and in

general damage the sales prospects of offending brands. Slow adoption of online grocery shopping by consumers, coupled with the lack of a visible customer profitability gradient that can be exploited, greatly increase both the duration and the severity of punishment inflicted by the retailer.

#### **4.2. Disintermediation of Stock Brokerage**

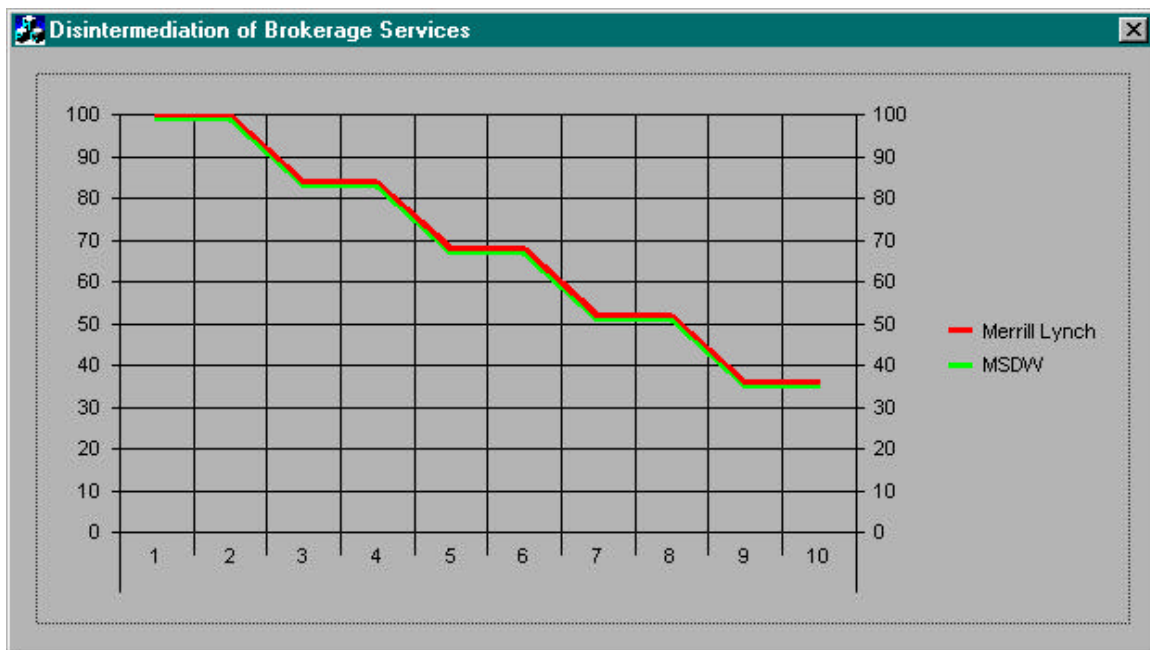
Analysis of bypass in stock brokerage suggests that in many ways it should behave like air travel. The factors analyzed — ease of disintermediation, attractiveness of disintermediation, and difficulty of defense — once again will be the same.

- Describing an order is easy. The customer needs to be prompted to provide the appropriate ticker symbol, whether the order is a buy or a sell, and the order quantity. Other information, such as credit and payment information, needs to be established once, when the customer creates his or her trading account, and then can be automatically invoked after customer authentication. This suggests that new, online brokerage services can readily attack established full service brokers.
- There is indeed a strong customer profitability gradient. Self-directed traders, of which day traders are only the most recent and most extreme example, do not require the expensive research operations that full service brokerage firms provide and do not need to pay for them. Likewise, they do not require extensive advising on stock selection or asset allocation, and they do not need to pay brokerage fees, wrap account fees, or other fees to account executives, financial consultants, and brokers. While a full service firm needs to charge significant commissions to cover the cost of research and of account executive services, an online discount broker competitor can target self-directed traders and charge much, much lower prices for routine trades.
- However, the brokers and account executives of full service firms can indeed defend themselves if their firms attempt to respond to online attack and disintermediation of brokerage. Many full service investors are more loyal to their brokers than to their brokers' employers. A firm that threatens its account executives by putting in direct distribution in

response to attack from a new entrant online broker may find that it has the worst of both worlds. It still has high infrastructure costs, it has lost a significant fraction of its revenue as day traders left it, and it will lose even more revenue as its full service investors follow their account executives away from the firm.

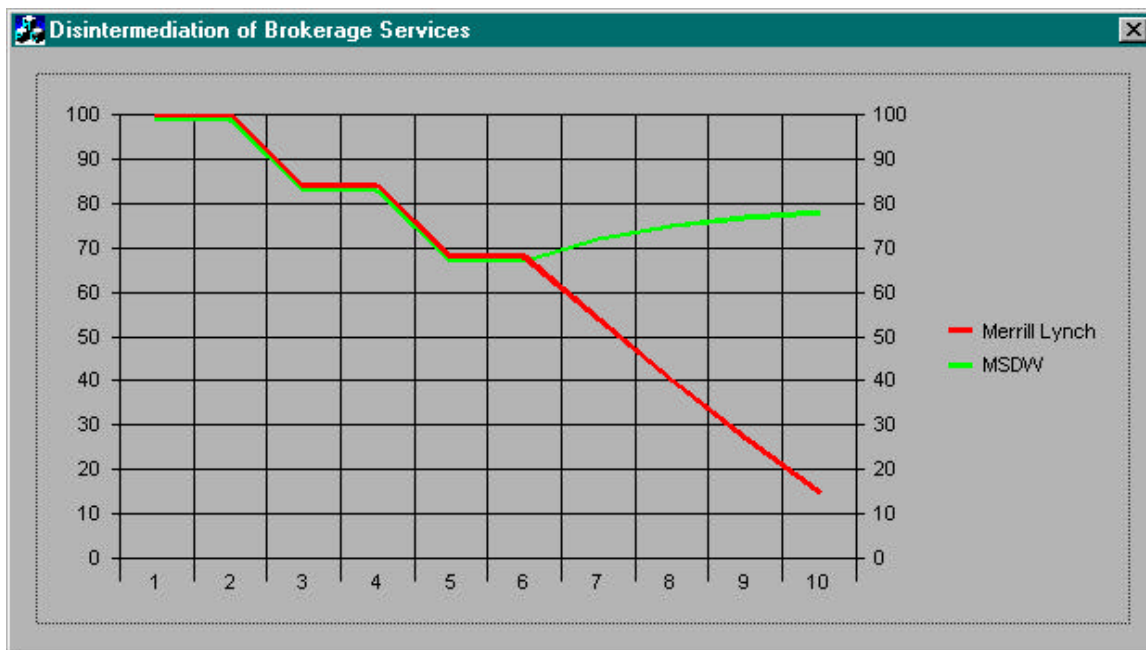
The implications of this analysis are shown in figures 5, 6, and 7.

Figure 5 shows the profitability of two full service firms (without loss of generality we call them Merrill Lynch and Morgan Stanley Dean Witter) under attack by a new entrant that offers inexpensive online trading services to self-directed investors. Full service firms have expensive infrastructure and pay commissions to their brokers and account executives; the high brokerage fees that they charge customers cover commissions, variable trading costs (settlement and clearing), and the fixed infrastructure of the firm. Online discount brokers, offering fewer services, have greatly reduced research and infrastructure expenses, and can charge far lower trading fees. As full service brokers lose more self-directed traders, their revenues decline much more rapidly than their expenses, most of which are fixed. Profitability rapidly declines.



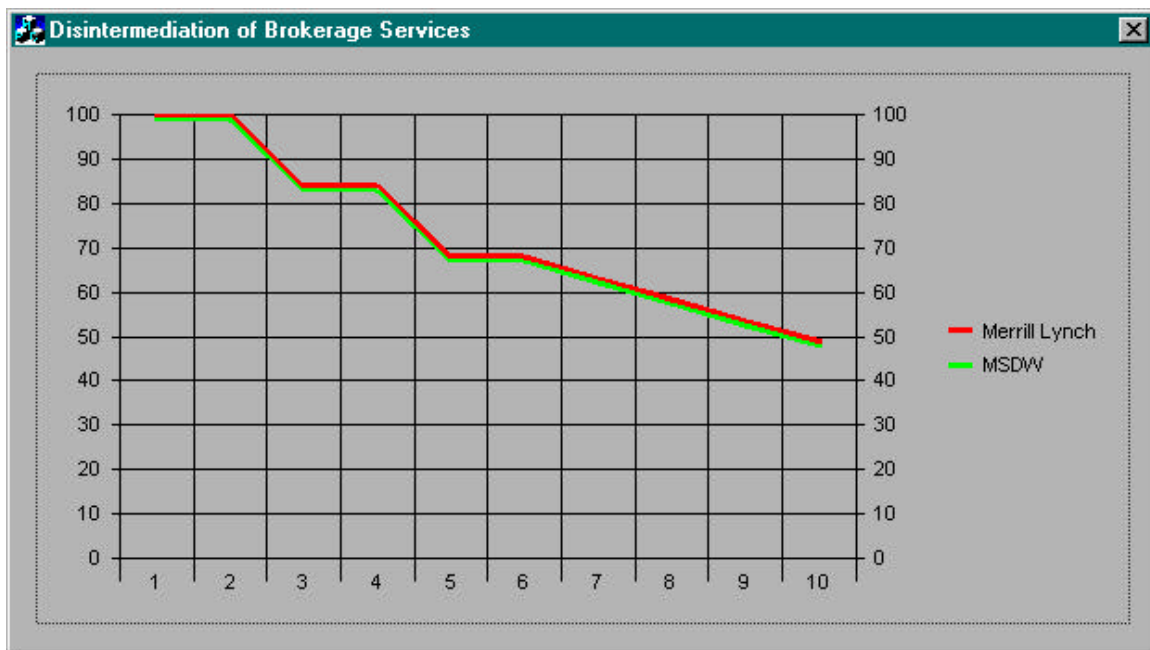
**Figure 5 — Rapid decline in profitability of full service brokerage firms as many self directed investors move their trades to online discount brokers. Although revenues decrease sharply at these full service firms, their high infrastructure costs and costs of research do not decline.**

Figure 6 shows why effective response is difficult. Whichever full service brokerage firm first responds to the threat of online discount services runs the risk of alienating its own account executives, provoking at least some of them to leave the firm; moreover, at least some of those who leave the firm will have customers who follow them and bring their trading accounts with them.



**Figure 6 — Profits of the first full service firm that launches online discount brokerage services decline even more rapidly than before, as many of their best account executives leave for other firms, and as many full service customers follow their trusted brokers, while competitor’s performance improves.**

Figure 7 shows that when both full service firms defensively introduce online trading services, as indeed they would, further attrition to new purely online discount brokers is averted. Financial performance of both firms is affected equivalently, as both follow the same strategy. But both are damaged. This cannot be considered surprising: the loss of revenue (either to competitors’ discount services or your own), without corresponding reduction in infrastructure expense (such as proprietary research needed for full service customers) must reduce profitability.



**Figure 7 — If both full service brokerage firms introduce online discount trading services, their profits decline as these services cannibalize some of their existing business. However, losses are slower than if they fail to respond and continue to lose business to new entrant firms offering only online discount brokerage.**

Analysis of agents in the insurance industry would produce very different results. While there are numerous sources of these differences, principal is the difference in speed with which customers can be attracted to online insurance sales. While most stock brokerage customers in some sense start the day “in play,” with each trade a separate opportunity to earn, most insurance customers do not start the day in play. Property and casualty insurance policy holders are interested in insurance only when their policies are due to be renewed, and life insurance policy holders frequently do not consider changing policies once they have made their first purchase. In contrast, most insurance sales agents start each day with a strong interest in insurance sales. Thus, the retaliation of insurance agents against any companies that launched online sales would be much more rapid than the rate at which customers could be expected to adopt online sales, greatly complicating formulation of online sales and marketing strategy for traditional P&C insurers and issuers of term life insurance.



## 5. Strategic Implications

These three trends — price transparency, differential pricing, and bypass — will have significant strategic impacts of many if not all financial services firms.

For industries with simple products, price transparency will create acute pressure on pricing. Any service provider that does not offer a customer the best price for specific goods and services in these industries is likely to lose that customer. Credit cards and demand deposit banking products are the most obvious examples, but term life, brokerage services, market making services, and many other aspects of financial services are being added to this list. This price pressure will require some form of pricing strategy, especially since there will be few opportunities to overcharge a customer for prices that were too low, either for that customer or another. Since losses from pricing mistakes will be irrecoverable, and since opportunistic pickoff means that customers will be lost to lower price service providers, this implies a careful combination of cost containment and informed differential pricing.

The need for differential pricing will be even more acute in industries with strong customer differences in profitability, because opportunistic pickoff will be even more attractive. Cross subsidizing unprofitable kill you accounts by overcharging love 'ems will not be sustainable when love 'ems are targeted by numerous competitors. Indeed, cross subsidies of any form will be difficult to sustain in the presence of net-based shopping. An example from an unrelated industry makes this quite clear. A golf pro will often charge a higher price for golf clubs but provide a free fitting to assure that club length, shaft stiffness, grip size, and club head angle all fit perfectly; the pro may then find that customers take this fitting information and then buy clubs more cheaply over the net. Many golf pros have responded by charging separately for the fitting but then offering clubs at the same discounted prices available over the net, effectively unbundling the price of fitting from the price of the clubs. Similarly, this unbundling of services may drive financial service firms to unbundle their pricing, charging separately for research and for access to trading services.

Just as bundling of pricing for different services creates vulnerability for golf pros selling clubs, for industries with strong differences in customers' needs for service

there will need to for different prices, or for unbundled prices, to avert the threat of disintermediation.