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Market Imperfections

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Abstract: Market imperfections affect virtually every transaction in some way, generating costs that interfere with trades that rational individuals make, or would make, in the absence of the imperfection. Understanding these costs gives us insight regarding the total costs of transactions, where to place them, or whether to make them at all. Market imperfections also generate profit opportunities for entrepreneurs who can reduce or eliminate them. Institutions or individuals who can lower costs tracing to imperfections have a competitive advantage and can earn economic rents until competing firms adapt. Imperfections can and do change over time, but they collectively never go to zero. Identifying and solving the underlying business problems linked to these imperfections remain an ongoing challenge and profit opportunity.

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Key words: markets, imperfections, transactions, frictions

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Market Imperfections

I. Introduction

What comes to mind when we hear, “market imperfections”? Most of us think first of financial markets, and would name taxes and transactions costs. Although these are obvious examples, market imperfections are legion and affect virtually every transaction in some way. Taxes, for example, influence not only financial decisions but also decisions to trade everything from shirts to real estate. Nor must the imperfection be a monetary cost: We sometimes must stand in line to pay a lower price. New businesses must charge lower prices than companies with established reputations. Companies include stock options in their compensation packages to mitigate well-known incentives for agents to shirk and to avoid rules that trigger penalties for “nonperformance based compensation” that exceeds $1 million.[1]

Many readers will have noticed that I have yet to define a market imperfection. Yet, all of us know one when we see one. I define a market imperfection as anything that interferes with trade. This includes two dimensions. First, imperfections cause a rational market participant to deviate from holding the market portfolio. Second, imperfections cause a rational market participant to deviate from his preferred risk level. My definition at first seems very limited. In fact, though, this definition is only as limited as the definition of the market portfolio. In this article, the term *market portfolio* means not only financial assets, but also real estate, human capital, the opportunity costs of time, etc. Put differently and somewhat less obscurely, market imperfections generate

[1] According to Section 162(m) of the Internal Revenue Code, publicly held corporations cannot deduct compensation in excess of $1 million paid to a "covered employee” from taxable income. The Code makes an exception for stock option plans, though, provided that they meet certain requirements.

costs which interfere with trades that rational individuals make (or *would* make in the absence of the imperfection).

Putting this in the context of the Capital Market Line (CML) helps to clarify the concept (see Figure 1). The CML gives the optimal holdings available to investors in two-dimensional space defined by the standard deviation of the portfolio, $\sigma(R_p)$, and the expected return on the portfolio, $E(R_p)$, given that a risk-free asset exists. Risk-averse investors prefer portfolios lying above and to the left of those lying below and to the right -- They want the highest expected return and the lowest risk. In a world with no imperfections, investors achieve this by holding the market portfolio, M^*, and a (possibly short) position in the riskless asset, R_f. Intuitively, they all hold the maximally diversified portfolio and achieve their preferred risk level by adjusting their holding of the riskless asset. This dominates holding a portfolio of only risky assets in all cases, except for the point of tangency between the efficient frontier of risky assets and the CML. In a world with imperfections, though, investors cannot costlessly adjust their holdings. An investor holding portfolio *p* could lower his risk without sacrificing expected return by rebalancing to hold portfolio p_1^*. Or, he could improve his expected return without accepting any more risk by rebalancing his portfolio so that he held portfolio p_2^*. But rebalancing is costly or impossible in a market with imperfections. It may pay to accept the inferior combination of risk and expected return that portfolio *p* offers rather than to incur the costs of trading, or it may not be even be possible to move to p_1^* or p_2^*.

*** Insert Figure 1 about here ***

To see this algebraically, define α_{ij} as the amount investor *i* holds in asset *j*, and define ω_i as the amount of risky assets held by investor *i*. Also define M^* as the value

of the market portfolio, which includes all risky assets. Then $\Sigma_i \omega_i = M^*$ because all assets must be held. Under the Capital Asset Pricing Model (CAPM), $\alpha_i^* = (\omega_i / \Sigma_i \omega_i)$ for each asset *j*. In words, the CAPM tells an investor to hold the same proportion of each risky asset, and that the proportion is his share of aggregate wealth invested in risky assets. In this paper, a market imperfection is anything that drives a wedge between α_i^* and α_i in a rational market, or anything that drives a wedge between the amount of risk that the investor bears and the amount that he prefers to bear.

The adjective *rational* points to the distinction between market *imperfections* and market *inefficiencies*. I assume that asset prices reflect all available public information, but not necessarily all private information. Pricing errors, if they exist, are not imperfections. This means that even if an asset's price is wrong, market participants base their choices and weight their portfolios using this incorrect price. By my definition (as with most), markets can be efficient yet have imperfections such as frictions.

Why Do We Care about Market Imperfections?

Market imperfections generate costs. Understanding these costs gives us insight regarding the total costs of transactions, where to place them, or whether to make them at all. One obvious example is the capital gains tax. Constantinides (1984) shows that the option to take or defer capital losses or gains has substantial value. The option's exact value -- and the corresponding optimal trading strategy -- depends on factors such as transactions costs, the capital gains tax rate, and the asset's volatility.

Market imperfections also generate business opportunities.[2] After all, many costs are paid *to* someone or to some entity. Institutions or individuals that can lower costs which trace to imperfections have a competitive advantage and can earn economic rents -- at least until competing firms adapt. One example from the financial markets is DeGennaro and Kim (1986), which shows how mutual funds relax wealth constraints and asset indivisibilities. Other examples are two exchange-traded funds, the American Stock Exchange's Standard and Poor's Depositary Receipts, better known as Spiders, and Nasdaq-100 Index Tracking Stock, better known as QQQs. Spiders, based on the Standard & Poor's 500 Index, and QQQs, based on the NASDAQ 100 Index, provide a similar solution to the asset-indivisibility problem. They are the two most actively traded securities in the world (Sodano, 2004).

Business opportunities extend beyond financial assets. One example is PayPal, a Web payment service founded in 1998. PayPal evolved to resolve the problem of conducting business over long distances with strangers. Dollar amounts for web transactions are often small, making transactions cost proportionately large, and information asymmetries inherent in distant transactions between faceless participants invite fraud. Quinn and Roberds (2003) show how PayPal reduces these costs. PayPal's success is obvious: In July 2002, eBay acquired PayPal for $1.5 billion.

Imperfections can and do change over time. The degree of existing imperfections varies, new imperfections appear, and existing imperfections disappear. The simplest example is taxes: Tax rates change, new taxes are imposed, and (much less commonly) vanish entirely. Information asymmetries can be affected by technology

[2] Profits from business opportunities are distinct from trading profits. Barring inside information, trading

and business conditions. For example, consider adverse selection and moral hazard. These refer to the tendency of high-risk individuals to buy insurance (or their willingness to pay higher rates for credit) and the risk that a party to a contract can subsequently change its behavior to the detriment of the other party. Longhofer and Peters (forthcoming) shows that adverse selection and moral hazard problems in the mortgage market can change with lender beliefs, and even with the cost of applying for a mortgage. Calem and Stutzer (1995) shows that adverse selection can lead to credit rationing. Reducing this information asymmetry would reduce the rationing. Bank analysts now face the daunting task of analyzing far larger and more complex institutions than 20 years ago, but this is offset in part by a vast increase in the information and computing power which they now have available. Kane (2000) shows that regulators, themselves a source of imperfections, face a similar problem: The complexity and difficulty of resolving an undercapitalized institution increases with the size of the institution, and megamergers have the capacity to shift the political calculus of a resolution, and all of the imperfections that entails, enormously. Other changes include the shift from qualitative information ("He has a good reputation") to quantitative information ("His FICO score is 790"), which makes lending at a distance easier.

II. Market Structure

Market imperfections, especially mechanical transactions costs, depend in part on market structure, and market structure depends on both the risk of the traded asset and trading volume. In thin markets for risky assets, participants search for counterparties directly. As trading volume increases, markets evolve from direct search

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profits would require inefficiencies.

through brokered, dealer, and continuous auction markets. This evolution is a simultaneous process -- As volume increases, structure evolves, and as structure evolves, volume increases. The potential size of the market determines the equilibrium structure.

Professional sports teams are a good example of assets that are traded in direct search markets. Only a very small number of potential buyers have the wealth to buy a team, and an even smaller number of sellers exists at any time. The league restricts the pool of potential buyers still further, such as by refusing to allow buyers with perceived conflicts of interest and by requiring that the general partner of any group that owns a team must have at least a 30 percent stake in the team. In such a situation, it makes no sense to invest in infrastructure and to acquire specialized knowledge about potential buyers and sellers to facilitate the very small number of trades that might ensue. As volume increases, though, such investments do make sense. The classic example would be real estate. In this case, brokers develop expertise and invest in equipment that substantially lowers the marginal costs of bringing buyers and sellers together. Stock brokers are another example. If volume increases still further, or if risk decreases, brokers find it cost-effective to buy and sell on their own accounts. Holding inventory is risky, true, but if the asset value is sufficiently stable or if its liquidity is sufficiently high, then this risk is worth taking because holding inventory permits the dealer to make more trades in less time. For some assets, trading volume is so high that a continuous auction is possible. A good example is the market for United States Treasury securities. The Treasury essentially just announces the auction size, records bids, and distributes the securities.

Of course, the market for some assets switches from one structure to another. The market for equities might be dominated by brokers most of the time, but at other times, continuous auctions might emerge. The specialist, for example, often simply crosses buy and sell orders, but sometimes fills orders from his own inventory.

Some participants with expertise or investment in one type of market structure, such as real estate agents, might tend to resist changes that dilute their competitive advantage. In general, though, society tends to move from less liquid market structures to more liquid ones because of lower (dissipative) transactions costs. A good example is the market for racehorses. Transporting animals is both expensive and risks injury to livestock. Yet, many racehorse owners take them to a central location for auction rather than use direct search or brokered markets. Why would they incur the risk and expense? And why would buyers incur the expense of traveling to this central location? Evidently, buyers and sellers jointly reduce some other costs. First, animals -- particularly racehorses -- are subject to enormous information asymmetries. The difference between winning and losing a race is usually much less than one second in a race lasting a minute and often much more. Even a slight injury or illness can change the value of the animal by an order of magnitude. In such cases, there is no substitute for inspection by a knowledgeable party, and this is best done on-site. Second, using a central location for sales increases liquidity by presenting more assets for sale and generating more bids. Evidently, these advantages add more than enough value to offset the cost and risk of transportation to the central location.

III. A Taxonomy of Imperfections

Many ways to partition the universe of market imperfections exist. In some sense, all of them represent a fool's errand, for there are millions of imperfections and no structure can hope to be complete. Neither can it hope to be precise; for any feasible partitioning, many imperfections can fall into more than one category. Still, providing such a structure is the focus of this paper. What might work?

One approach would be to differentiate between dissipative imperfections that involve a real expenditure of resources, such the physical costs of taking a product to market, versus simply transfers, such as a broker's fee. The problem here is that in a competitive environment, the broker's fee compensates him for his time and effort, or for his expertise accumulated over a period of time. These, too, are a real expenditure of resources. Another approach would be to classify imperfections according to who ultimately bears their cost. This would seem to have the advantage of identifying who has the incentive to reduce them. Yet, this misses the point that those who pay the cost might not be *best able* to reduce them. Often, for example, that task might fall to an entrepreneur seeking a profit opportunity.

Instead, I partition by the economic forces underlying market imperfections. In part this simply reflects my comparative advantage. In part, though, it also takes a step toward identifying those entities best able to reduce the costs of market imperfections. Though I draw most of my examples from financial markets, much of what follows applies to product markets, as well. I use five primary categories. These are Transactions Costs, Taxes and Regulations, Asset Indivisibility, Nontraded Assets, and Agency and Information Problems.

A. Transactions Costs

I partition transactions costs into three categories: The Mechanical Costs of Trade, The Opportunity Costs of Time, and Bankruptcy Costs. I discuss each below.

1. The Mechanical Costs of Trade

In financial markets, the mechanical costs of trade include telephone charges, postage, computer power, etc. These have been declining with technological improvements. Over some periods, of course, these costs have risen in real terms, but surely the costs of communication and data analysis have fallen during any period longer than a few years. Excluding the opportunity cost of time, the marginal cost of electronic mail is zero. And the costs of virtually all other mechanical costs of trade -- telephones, units of computer power, execution costs -- have fallen. There is no reason to expect this trend to stop. For example, on April 20, 2005, the New York Stock Exchange announced plans to merge with Archipelago, an electronic trading firm. If approved, this merger is sure to lower the marginal cost of trading securities.

In the product markets, the trend in mechanical costs of trade over time is less uniform but is probably just as clear. First, product markets demand communication and computer technologies for transactions, just as do financial markets. Second, to cite an example that involves movement of physical items rather than information, the marginal cost of shipping automobile parts to a central location for final assembly is probably lower today in real terms than in almost any previous period.

2. The Opportunity Costs of Time

Clearly, both investors and intermediaries require time to make trades. This includes both search costs -- the time to gather information (including finding a trading partner) -- and the time to make a trade itself. Minimizing these costs represents a profit opportunity (or if the reader prefers, a cost-saving opportunity). One partial solution is to automate the process via automatic electronic payments. Surely, many readers fund their 401(k) plans this way, via payroll deduction. Other automated investment approaches include the automatic reinvestment of dividends. A growing number of investors hold securities directly and automatically reinvest dividends through dividend reinvestment plans (DeGennaro 2003). The result is the same: Investors need decide only once to make investments several times over a (possibly) long, unspecified period.

The amount of time that intermediaries themselves spend on transactions depends on their role -- are they information aggregators, information processors, or information transmitters? How they best allocate their time -- and maximize expected profits -- depends on this role. Regardless, competition forces them to speed transactions and to lower costs in the most effective way.

3. Bankruptcy Costs

Bankruptcy costs boil down to transactions costs. Modigliani and Miller (1958) argue that if we can simply (and costlessly) destroy the existing shareholders' claims and convert the existing bondholders' claims to new equity claims, then there are no bankruptcy costs. By contrast, liquidation introduces information asymmetries, sales taxes, transportation costs for liquidated assets, etc. Most financial economists realize

that a reduction in these costs is a reduction in bankruptcy costs. At least as early as Smith and Warner (1979), they had also realized that indirect bankruptcy costs (for example, the opportunity cost of time lost to managing bankruptcy risk) are nonnegligible and possibly much larger than direct bankruptcy costs, especially at the margin. To my knowledge, though, no one has explored the effects of a reduction in direct bankruptcy costs on indirect bankruptcy costs. Beyond the obvious intuitive conjecture that lower direct costs would trouble management less and therefore likely reduce indirect costs, this question remains very much open.

Further Thoughts on Transactions Costs

Transactions costs are probably among the most familiar market imperfections. Today, though, they might also be among the least important. Advances in communications and data handling technology have reduced the mechanical costs of trade to a fraction of what they were just a few years ago, and have also reduced the time needed to make trades. Together, these forces probably more than offset an increase in the opportunity cost of time itself. For bankruptcy costs, the trend is not as clear. The legal fees involved with bankruptcy (in this paper, a regulatory cost rather than a transactions cost) surely have risen, but liquidation costs have probably declined.

B. Taxes and Regulations

The second major category in my taxonomy of market imperfections is taxes and regulation. In this paper I use the term *regulation* loosely, so that it encompasses laws passed by legislative bodies as well as rules imposed by government agencies and industries themselves. Thus, privately imposed rules, such as exchange-imposed

trading rules, count as regulations. I treat both taxes and regulations as either explicit or implicit. The corporate income tax is explicit. Other taxes are implicit, such as capital requirements that insured banks must meet (Buser, Chen and Kane, 1981). All fall under the rubric of regulation. Regulation varies widely across jurisdictions both within the United States and internationally. In addition, the degree of coordination with the United States varies dramatically. This article focuses on the United States for space considerations, though the concepts are applicable to other jurisdictions.

1. Explicit Taxes

Explicit taxes can be pecuniary or nonpecuniary. Readers are surely familiar with any number of pecuniary taxes, for governments both within and outside the United States impose explicit pecuniary taxes in hundreds if not thousands of ways. Corporations pay taxes on income, which changes prices and affects trade.[3] Sometimes taxes even affect the medium of exchange. For example, corporate acquisitions paid for with stock receive more favorable tax treatment than those paid for with cash.

Individuals pay income taxes, which surely affects their investment decisions. After all, the essential insight in Miller and Scholes (1978) is that investors can offset corporate dividend decisions at the personal level. Just as surely, income taxes affect individuals' consumption decisions and their supply of labor.

[3] Financial economists realize, of course, that corporations do not really pay taxes. Rather, they collect taxes and remit them to the government.

The cost of tax avoidance described in Miller and Scholes (1978) is a good example of a nonpecuniary tax.[4] The cost to taxpayers of an explicit tax extends far beyond the dollars remitted to the taxing authority. Taxpayers can and do take steps to minimize the amount they pay, and to the extent that these steps are costly, they count toward the total tax burden. Examples are the costs of becoming informed about tax avoidance and the cost of suboptimal portfolio choices.

2. Implicit Taxes

a. Self-Imposed Regulations

Examples of self-imposed regulation are easy to find. The Financial Accounting Standards Board, for example, requires firms to meet Generally Accepted Accounting Principles (GAAP) in their financial statements, and one can make a good case that these are as costly as government reporting requirements. In addition to GAAP requirements, institutions routinely impose rules to limit trading. Information from the Vanguard Tax-Managed Small-Cap Fund states:[5]

> "To discourage short-term trading that could disrupt its tax efficiency, the fund charges ... "
>
> "A 2% fee ($20 per $1,000 invested) on redemptions of shares held less than one year."
>
> "A 1% fee ($10 per $1,000 invested) on redemptions of shares held at least one year but less than five years."

Vanguard imposes these fees to prevent trading that would otherwise hinder fund performance, harming other fund investors (such trading could be particularly onerous

[4] Some readers might prefer to classify tax avoidance as an implicit tax rather than as a nonpecuniary explicit tax. That approach would make sense; this illustrates the inherent difficulty with constructing a taxonomy of market imperfections.

for a tax-managed fund). In turn, this lower performance would reduce the fund's attractiveness to those who seek a low-cost, long-term investment. Still, these restrictions do limit trading. An investor wishing to reduce his equity exposure might find a sale to be too expensive relative to the benefits gained, thus keeping him from holding his optimal portfolio.

Short-sale restrictions are another example of a self-imposed regulation. Rule 3350 of The National Association of Securities Dealers, Inc. (NASD) forbids its members from short selling securities on the Nasdaq National Market System in situations that it fears might magnify price declines. Specifically, members cannot short sell at or below the best bid (the highest bid by all market makers quoting that stock) if the best bid is below the previous best bid for that stock. Obviously, such a restriction limits trading, thus fulfilling the definition of an imperfection, but restrictions on short sales can also keep prices from adjusting to equilibrium levels as fast as they would otherwise. Informed traders would prefer to sell an overpriced security short, expecting to profit when the price returns to its equilibrium level. These short sales tend to eliminate the overpricing sooner. But with short-sale restrictions, the price is wrong by a larger amount for a longer time. Thus, an imperfection tracing to regulation can lead to inefficiencies.

Market closings, such as overnight or on weekends, are perhaps the most extreme form of self-regulation that restricts trade. During these periods, if market participants can trade at all, they cannot trade as easily as they can when markets are

[5] Http://flagship4.vanguard.com/VGApp/hnw/FundsSnapshot?FundId=0116&FundIntExt=INT, visited April 15, 2005.

open. Recently, though, this constraint has been somewhat relaxed by innovations such as crosslisting on international exchanges and after hours trading.

b. Govenment-Imposed Regulations

Government agents impose many regulations that impede trade. Some closely parallel self-imposed regulations. For example, Rule 10a-1 under the Securities Exchange Act of 1934 governs securities registered on an exchange. The key provision of Rule 10a-1 is the tick test: Subject to certain exceptions, an exchange-listed security may only be sold short on a plus tick (a price above the immediately preceding reported price) or on a zero-plus tick (the last sale price if it is higher than the last different reported price). The similarity to NASD Rule 3350 is clear.

Other nonpecuniary taxes take the form of reporting requirements. The U.S. Securities and Exchange Commission (SEC), for example, requires numerous filings. Economists might debate the value of these reports, but no one can dispute the claim that they impose costs on businesses. The SEC's EDGAR website (http://www.sec.gov/edgar.shtml) gives some idea of how extensive this burden is. Private companies are not required to file most of these forms, and it is easy to see how this provides incentives to forego access to the public capital markets and remain private. Another well-known example of govenment-imposed reporting requirement is the Sarbanes-Oxley Act of 2002. Among this sweeping legislation's provisions is an increase in management accountability and the requirement that companies institute certain internal controls. Compliance has been expensive. Financial Executives International (2005) surveyed 217 public companies with revenues averaging $5 billion and found that the costs of compliance averaged $4.36 million.

Further Thoughts on Taxes and Regulations

The breadth and influence of taxes and regulations are enormous.[6] Managing and coping with them requires a correspondingly large investment -- hundreds of thousands of lawyers, accountants, and practitioners labor daily to circumvent taxes and regulations when possible, and to comply with them when not. Fortunately for them, their employment prospects are quite good. Of the three certainties in life -- death, taxes and regulations -- only death seems immutable.[7]

C. Asset Indivisibility

If assets were infinitely divisible, then investors could hold an arbitrarily small fraction of each asset. This would permit them to hold the market portfolio of all assets even though the number of assets is unimaginably large. In fact, though, assets are lumpy -- the minimum traded unit is finite. This means that most investors must decide whether to hold the smallest traded unit of an asset -- which is still too much -- or to omit it from their portfolios. Either way, their resulting portfolios lie below the Capital Market Line. Asset indivisibilities are among the main reasons mutual funds and derivative securities such as Spiders and QQQs exist. By pooling funds from many investors, they permit investors to hold portfolios that more nearly approximate the market portfolio.

[6] Even with strict filtering enabled, Googling “taxes” produced 45,800,000 hits as of this writing, and “regulations” produced 122,000,000. I speculate that the reader will find those numbers to have increased.

[7] Googling “tax changes” produced 47,100,000 hits as of this writing, and “regulation changes” produced 60,400,000. Here again, I speculate that the reader will find those numbers to have increased.

Further Thoughts on Asset Indivisibility

Asset indivisibility is a smaller problem for wealthy investors than for less-wealthy ones. If the smallest traded unit of any asset is a binding constraint because it is still larger than α_i^*, the investor's share of aggregate wealth invested in risky assets, then it is sure to be less binding for investors who hold larger portions of the total value of the asset. In addition, a wealthy investor can hold a larger number of assets. Combined with trading costs -- which usually have a fixed component -- asset indivisibility makes it harder for investors of limited means to begin investing because their portfolios tend to lie farther below the CML.

D. Nontraded Assets

Becker (2005) reports that human capital now comprises at least 70 percent of all wealth in economically advanced nations. This enormous stock of capital leads to divergences from holding the market portfolio of financial assets. For example, consider an employee of a publicly traded corporation. In a perfect market, he should short his employer's stock for diversification purposes because the risk of losing his job is positively correlated with his company's stock. This strategy is unavailable to employees of privately held companies, though. Barring those who have high wealth and low human capital, employees of privately held companies are forced to hold a disproportionate stake in their own human capital.

Or are they?

In a market free of imperfections, an alternative to short selling an employer's shares exists. Consider a musician. Typically, he performs and earns income over

time. But suppose that instead he sells claims on his future earnings and invests the proceeds in the market portfolio, M^*. In this case, the investors who buy the claims collect *pro rata* shares of the funds which the musician earns over time.

Selling claims against one's human capital is not as impossible as it sounds; in fact, examples are becoming increasingly common. Palacios (2002) gives one explicit example for human capital contracts for financing higher education in the United States.[8] Note that this is an imperfect solution for at least two reasons. First, transactions costs exist. Second, and more importantly, incentive problems can remain (see Section E).

Financial innovation has spawned other intriguing examples. For example, in January 1997, David Bowie raised $55 million by issuing 10-year asset-backed bonds.[9] What is innovative about this issue is that future royalties from 25 albums that Bowie recorded before 1990 are the collateral backing these bonds. That such a rock "star" could issue such securities serves as a quintessential example of financial ingenuity as well as illustrating the well-known maxim, *digustibus non disputandum est.* Banker David Pullman deserves credit for planning the issue. Pullman soon arranged similar deals with more reputable artists including James Brown (June 1999), The Isley Brothers (September 1999) and the estate of Marvin Gaye (September 2000).

In addition, the law has long been extracting claims against human capital. Divorce courts have been known to garnish the future income of physicians, lawyers, and at least one world-famous economist. The European Union has adopted the

[8] See www.myrichuncle.com. Also see http://www.lumnifinance.com/, which offers human capital contracts in Chile, Columbia and Peru, and http://www.career-concept.de/ which offers them in Germany.
[9] The following draws heavily from http://www.ex.ac.uk/~RDavies/arian/bowiebonds.html.

concept of *droit de suite*, or the resale royalty right, which awards royalties to an artist every time an original work of graphic or plastic art (paintings, sculptures, drawings, engravings, etc.) trades in the secondary market.

Financial innovation continually removes items from the list of nontraded assets. In addition to the human capital examples above, recent years have seen credit-card securitizations, credit-spread derivatives, collateralized mortgage obligations, etc. In some of these cases, pooling the assets reduces idiosyncratic risk. In others, the innovation permits unbundling the assets' risk and selling only a portion to investors who are better able to bear it. Presumably, some new assets appear that cannot (yet) be traded, though it is hard to imagine that these occur in sufficient numbers to keep the list of nontraded assets from growing progressively shorter.

Further Thoughts on Nontraded Assets

This is not to say that if an asset begins to be traded, then the market imperfection has been eliminated. More accurately, the imperfection has been mitigated or exchanged for another (presumably) less onerous imperfection. Taking the example of human capital sales, one obvious problem is that it might not be legal to sell certain claims on future income. If not, then that legal restriction (in this paper, a regulatory imperfection) complicates the problem of an asset being nontraded. And after all, traded assets are subject to imperfections, too. Conflicts of interest, or what economists call agency problems, are another problem with human capital sales. I turn to these problems below.

E. Agency and Information Problems

Jensen and Meckling (1976) is the seminal paper in this area, but the concept has been known since at least Adam Smith:

> "The directors of such companies [joint stock companies] however, being the managers rather of other people's money than of their own, it cannot well be expected that they should watch over it with the same anxious vigilance with which the partners in a private copartnery [corporation or joint stock company] frequently watch over their own. Like the stewards of a rich man, they are apt to consider attention to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company." (Smith, 1776).

Smith's insight is consistent with the familiar adage that states, "If you want the job done right, then do it yourself." The problem is that for all but the smallest businesses, doing it yourself is simply impossible. With size comes the separation of ownership and control, because so few individuals have the wealth to own an entire company and no one can operate a firm of any size without hiring agents to assist him.

Why is this a market imperfection? The answer is that the separation of ownership and control can lead to incentive problems. Suppose that a blues musician wishes to sell shares on his human capital, as in Section D above. The chances are good that he will find few buyers, and those who are willing to buy are almost sure to demand a large discount from what the musician views as fair market value. The reasons include adverse selection and incentives to shirk. First, the musician knows more about his ability and willingness to work than buyers, but buyers *know* that he knows more. This is Akerlof's (1970) familiar Lemons Problem. Second, like Smith's directors, the blues musician's ability and willingness to work can be affected by the asset sale itself. Having a large sum of money might prevent the blues singer from

performing with the same amount of feeling as he did without the funds -- he may no longer have the blues.

But if agency problems would hinder the musician's sales of claims against future earnings, then why were the sales of Bowie bonds successful? The answer, of course, is that the Bowie bonds were sales against future royalties from *existing* albums. Incentives to shirk in the production of those albums can have no effect.

Other agency problems include perverse incentives to manage income. If the human capital contract is infinite or for a very long term, then sellers tend to hide earnings or consume perquisites. If the contract is for a finite term, then sellers also tend to delay earnings. This is a familiar problem at the corporate level, where earnings management and fraud have led to the dismissal of corporate executives and even criminal charges.

Even abstracting from ownership and control, asymmetric information can also affect prices and prevent markets from clearing. The classic example is Akerlof (1970), who shows that asymmetries can lead to market failures. He uses an automobile market with good cars and bad cars, and new cars and used cars. The problem is that the owner of a used car knows whether the car is good or bad, while potential buyers do not. Buyers know that the seller knows, though, and they know that the car is for sale. Thus, they rationally conclude that the car is a lemon and refuse to pay the fair value of a good used car, even if the car is, in fact, a good car. The result is that all used cars sell for a lemon's price, meaning that no rational owner will sell a good used car. The market for good used cars fails.

The Lemons Problem represents a profit opportunity. Suppose that the market for used cars comprises two kinds of participants, dealers and individuals. Both groups can identify lemons if they own them, but not otherwise. Only dealers, though, have the ability to certify credibly that a car which they own is a good car. In this case, dealers can profit by buying many cars, sorting them into lemons and good cars, and reselling them -- lemons at the lemons price, but the certified good cars at a higher price. In fact, we observe this. Dealers do certify some used cars by means of warranties, by their dependence on repeat business, and by the need to maintain their ability to certify credibly. In addition, leasing programs tend to mandate maintenance, which increases the likelihood that late-model cars are good.

Of course, Akerlof's insight is far more general and applies to much more than just used cars. For example, Longhofer and Peters (forthcoming) show that a lender's beliefs about the credit worthiness of a borrower's group (e.g. race, educational attainment, marital status) can affect his assessment of the individual's creditworthiness. If the group's average creditworthiness exceeds the individual's, then the borrower benefits from group membership. But if the individual's creditworthiness exceeds the group's average, then the borrower suffers from group membership. In this framework, the information asymmetry can work either in favor of or against various groups. Thus, imperfect information leads to suboptimal credit decisions, in turn meaning that lenders miss some good loans and make some bad loans. The key point for my purpose is that collecting more information about individual lenders would solve this problem, but only at a cost, and at some point the necessary information is simply not worth collecting.

Corporations are not immune to the Lemons Problem. A good example is the Pecking Order hypothesis of Myers and Majluf (1984). In that paper, management knows the correct value of the company but investors do not. Investors do know that management knows, and they know that management is issuing shares rather than borrowing or using cash. Myers and Majluf show how this information problem can cause firms to forego profitable projects and to issue what would otherwise be too much debt and to hold too much cash.

Further Thoughts on Agency and Information Problems

Agency problems touch virtually every area of financial economics. Jensen (1986) alone has implications for dividend policy, capital structure, mergers and acquisitions, and more. Tkac (2004) shows that investors and investment advisers have inherent conflicts of interest because they have different goals -- investors want maximum returns with minimum risk, and advisers want maximum profits with minimum effort. It is difficult to imagine these types of conflicts vanishing. Pendergast (1999) provides a review of the literature, concluding that,

> "... there is a lot left to learn about the evaluation of workers whose output is hard to see, where objectives and outcomes are determined by superiors. Since this constitutes most of us, this seems a large hole to fill in the literature."

IV. Summary and Conclusions

My taxonomy only begins to describe the incredibly broad array of market imperfections. For example, implicit in Figure 1 is the implication that investors can borrow freely at the riskless rate. In fact, though, borrowing restrictions limit the amount

of leverage that an investor can take. These restrictions, of course, are imperfections. Should they be classified as a regulatory matter, tracing to limited liability? Or should they be classified as an agency or information problem? Perhaps they are not only an imperfection themselves, but also a response to an imperfection -- perhaps they are a mitigant to bankruptcy costs. The list of imperfections I have ignored is of necessity very long.

This paper also focuses on financial markets within the United States. This leaves room for similar research on product markets and international trade. Tariffs, for example, loom as huge impediments to trade. Participants try to circumvent them in several dimensions, including the political arena. Especially in that arena, while some participants attempt to circumvent imperfections, others try to maintain them.

It bears repeating that although imperfections change, they collectively never go to zero. This is because the underlying business problems remain. The conflicts of interest in Tkac (2004) are one example. Another age-old, ongoing problem is conducting business over long distances with unknown counterparties. In the seventeenth century, negotiable banknotes were a workable solution. But negotiable banknotes are unworkable for the online payments of the twenty-first century. Yet Quinn and Roberds (2003) shows that today's online payments have evolved into a form very similar to negotiable banknotes. Both provide payment finality, thus mitigating a key problem for faceless, unknown counterparties conducting business across long distances. The fundamental business problem did not change, but the specific form of the problem did. We should not be surprised that the solution did, too.

Finally, the success of online payment providers reminds us that market imperfections are more than simply impediments to trade. They also represent profit opportunities. Identifying and solving these business problems remains an ongoing challenge.

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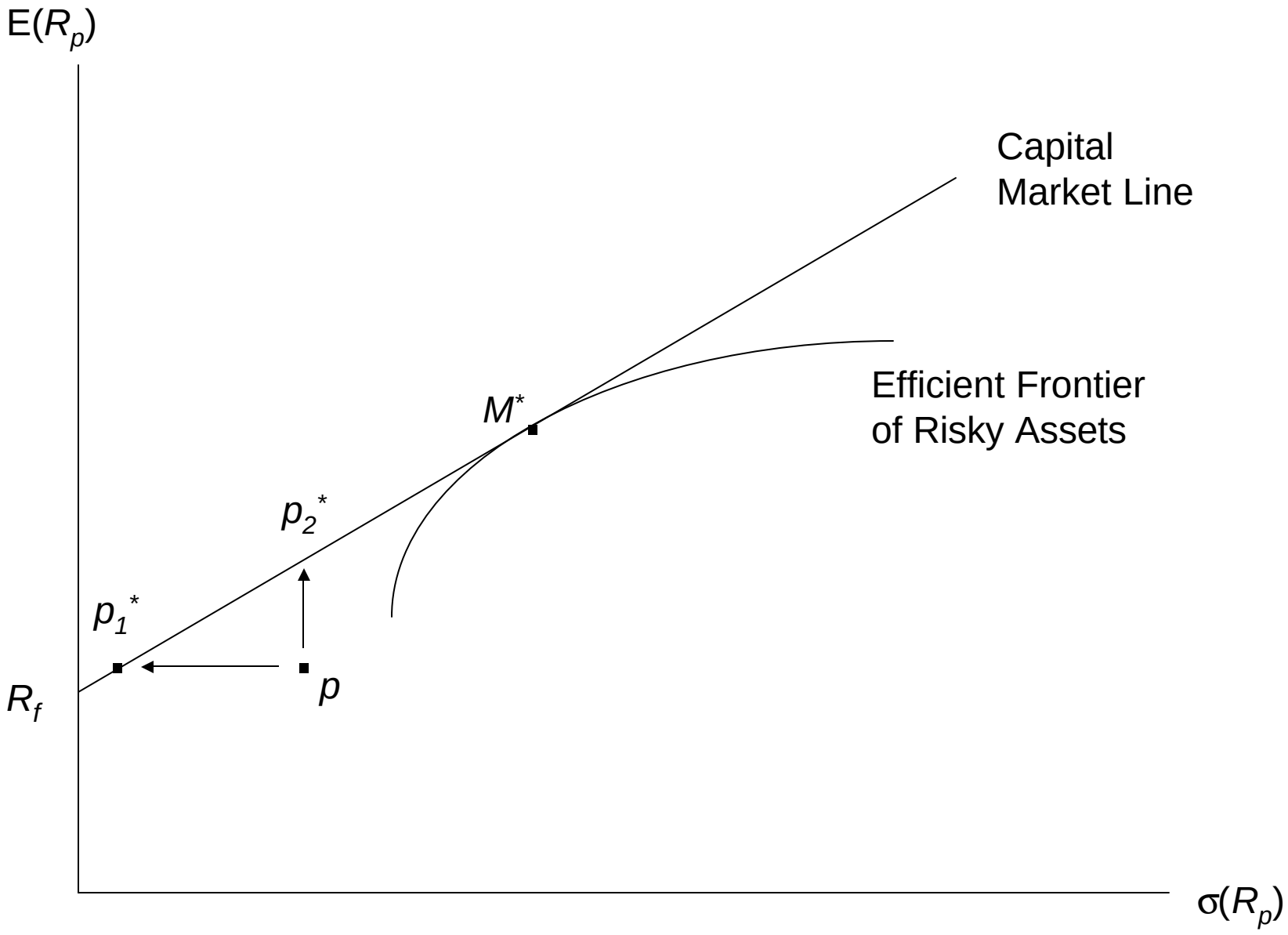
E(R_p)
Capital
Market Line
Efficient Frontier
of Risky Assets
M^*
p_2^*
p_1^*
p
R_f
$\sigma(R_p)$

Figure 1