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IF WE UNDERSTAND THE MECHANISMS,
WHY DON'T WE UNDERSTAND THEIR OUTPUT?

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**IF WE UNDERSTAND THE MECHANISMS,
WHY DON'T WE UNDERSTAND THEIR OUTPUT?**

*forthcoming Journal of Corporation Law
symposium on the Mechanisms of Market Efficiency*

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Abstract: Despite the considerable research that has occurred over the twenty years following the publication of Ronald Gilson's and Reinier Kraakman's article, *The Mechanisms of Market Efficiency*, there still remains a fundamental puzzle concerning the price fluctuations of securities. The explanatory power – the R^2 – of various models used by financial economists to explain security price fluctuations is quite low, in the range of .20 to .30. What accounts for the other 70% to 80% of price fluctuations? This paper explores the challenges this puzzle poses to our understanding of security markets, the role played by mechanisms of market inefficiency (noise traders) as well as various mechanisms of market efficiency (information revelation via trading; the firm as arbitrageur) and the impact of legal institutions and practices on the operation of security markets.

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I. INTRODUCTION

In 1984 Ronald Gilson's and Reinier Kraakman's groundbreaking article, *The Mechanisms of Market Efficiency*, was published in the Virginia Law Review.¹ Their goal was to identify the market mechanisms by which information becomes impounded into security prices. Their article attempted to explain how security markets appeared to be – at least as a rough approximation – consistent with the efficient market paradigm with respect to a wide range of information.² The topic of market mechanisms is as important and pressing today as it has ever been.

Indeed, the identification of the market mechanisms that ensure market efficiency is part and parcel of one of the fundamental, unresolved questions of finance theory: What accounts for fluctuations in security prices? Is it due to new information being constantly impounded into security prices as a result of one of the four “mechanisms of market efficiency” – universally informed trading, professionally informed trading, derivatively informed trading, and uninformed trading – that Gilson and Kraakman identified in their article? Or is it due to something else altogether? And what implications does the answer to this question have for the efficiency of the markets or the need for their regulation?

These issues remain unresolved because the explanatory power – the R^2 – of various models used by financial economists to account for price (and return) fluctuations is very low.³ A low R^2 for stocks means that even after controlling for a wide range of variables, such as the arrival of new information to the market and industry classification, there still remains a very large percentage of the fluctuations in security returns and prices that are left unaccounted for. These large, unexplained fluctuations represent a

¹ Ronald Gilson and Reinier Kraakman, *The Mechanisms of Market Efficiency*, 70 Vir. L. Rev. 549 (1984).

² It is possible to have stock prices not reflect “fundamental values” and for EMH to still hold in the sense that one cannot earn supra-competitive profits based on the market information set. When referring to the efficient market paradigm, I am referring to the view that security prices equal the present value of future expected (optimally forecasted) dividends.

³ Throughout this piece, I shall sometimes refer to fluctuations in returns and sometimes to fluctuations in prices. The distinction between return and price fluctuations is immaterial for purposes of this commentary.

puzzle for all those interested in security markets; legal academics and financial economists alike.

Part II will discuss the fundamental puzzle posed by unexplained fluctuations. As will be emphasized, the inability to satisfactorily explain fluctuations has been documented in a number of important studies. Part III will then take a brief look at some potential answers suggested in the literature for why we see the fluctuations that have been documented. These include explanations based on the presence of noise traders, changes in investors' discount rates, and the operation of various mechanisms of market efficiency. Finally, in Part IV, I will explain why the puzzle surrounding fluctuations remains (and in some ways has deepened) to this day. Indeed, it is unclear, at this point, whether an inability to explain the return and price fluctuations of a stock is a sign of market efficiency or inefficiency. Part IV will conclude with discussing the importance of this puzzle to legal academics interested in capital market regulation.

II. THE PUZZLE

At the time *The Mechanisms of Market Efficiency* was published, security price fluctuations were largely analyzed within the context of the efficient market paradigm. And not without good reason. The impressive power of the efficient market paradigm can perhaps be seen most starkly in a now classic study published the same year as Gilson and Kraakman's article: Richard Roll's empirical study of the futures market in frozen concentrated orange juice.⁴

A defining feature of this market is the fact that over 90 percent of all oranges used in frozen concentrated orange juice are grown in central Florida. As it turns out, central Florida oranges (given the thickness of their skins) make better frozen concentrated orange juice than California oranges, the other major source of oranges. As a result of the geographic concentration of oranges used for frozen concentrated orange juice, the weather in central Florida is of central importance to orange producers. An entire orange crop can be lost if the weather is too cold.

⁴ Richard Roll, *Orange Juice and Weather*, 74 *American Economic Review* 861 (1984).

One would therefore expect that the anticipated weather in central Florida would be a primary factor in setting the price at which orange juice futures trade. And, indeed, this is true. Amazingly, the price of orange juice futures at the end of the trading day is a *better* predictor of the weather than the National Weather Service's forecast for central Florida, which is publicly released some seven hours after the orange juice futures market closes. The National Weather Service, keep in mind, is a well-regarded organization with considerable resources. If the closing orange juice future price is higher (lower) than its opening price, one would obtain a more accurate prediction of the weather by adjusting downward (upward) the National Weather Service's weather forecast.

While a powerful vindication of the efficient market paradigm, when looked at from this angle, the study also raises a troubling puzzle that remains to this day. Most of the volatility in orange juice futures prices could not be accounted for. Even after considering all the possible sources of information that could conceivably influence the price of orange juice futures (including the weather in central Florida), Roll could only explain 27% of orange juice futures' price variation. What is causing the bulk of price fluctuations; fluctuations which apparently are not attributable to new information reaching the market?⁵

The basic puzzle posed by the orange juice futures study has been reproduced in subsequent studies of stock prices. In a study of U.S. stocks between 1982 and 1987, Roll found that only twenty percent of the daily variation in the returns of stocks in his sample could be explained by standard asset pricing models, i.e., the average daily R^2 of stocks is approximately .2.⁶ The explanatory power of standard asset pricing models did not change substantially on those days for which there did not appear to be any new public information reaching the market. The arrival of new public information to the

⁵ This puzzle is in the spirit of Robert Shiller's work (discussed in *The Mechanisms of Market Efficiency*) finding excessive volatility of stock returns. See Robert Shiller, Do Stock Prices Move so Much to be Justified by Subsequent Changes in Dividends, 71 *American Economic Review* 421 (1981). His finding of excess volatility, however, has been called into serious question. See Terry Marsh and Robert Merton, Dividend Variability and Variance Bounds Tests for the Rationality of Stock Market Prices, 76 *American Economic Review* 483 (1986). There has been some work done since Shiller's original study raising the same basic issue. See, e.g., Kenneth West, Dividend Innovations and Stock Price Volatility, 56 *Econometrica* 36 (1988)

⁶ Richard Roll, R^2 , 43 *Journal of Finance* 541-66 (1988). Among other factors, Roll considered as explanatory variables industry returns and macroeconomic events.

market does not, therefore, appear to account for the remaining, unexplained 80% of fluctuations in returns.

Another study looked at the fifty largest daily changes in stock prices between 1946-1987.⁷ It found that a majority of these dramatic price moves could not be rationalized as a response to new information triggering a reevaluation. It is difficult, for example, to explain the October 19, 1987 stock market crash as a reaction to dramatic new information reaching the market that particular day justifying a 22.6% drop in the value of Dow Jones Industrial Average.

The inability to satisfactorily explain price (or return) variation can be seen from yet another angle: the volatility of prices varies depending on whether markets are open. One would expect the volatility of prices to be the same for equivalent lengths of time if new information is constantly being generated and disclosed. Yet, the volatility of prices is significantly lower when the time period includes the weekend rather than solely business days.⁸ Nor is this just a “weekend effect.” The volatility of the stock market during time periods that include a Wednesday on which the market was closed is significantly lower than time periods of equivalent length that include a Wednesday on which the market was open.

If our goal is to explain price behavior, it is fair to say that we appear to be missing a lot of what’s going on.⁹

III. EXPLANATIONS

In the years since the publication of *The Mechanisms of Market Efficiency*, various explanations have been proposed for the puzzling fluctuations that have been documented. I will briefly touch on three: noise traders; changes in investors’ discount rates; and mechanisms of market efficiency.

⁷ David Cutler, James Poterba and Lawrence Summers, What Moves Stock Prices?, 15 *Journal of Portfolio Management* 4 (1989).

⁸ See French and Roll, Stock Return Variances: The Arrival of Information and the Reaction of Traders, 17 *Journal of Financial Economics* 5-26 (1986).

⁹ Many commentators believe that various pricing “anomalies”, such as the book-to-market effect on stock returns, represent a challenge to the efficient market paradigm. It is difficult to know what to make of various reported pricing anomalies given the possibility that they are the result of fundamental risk that economists have yet to adequately identify or just an artifact of data snooping.

1. *The Noise Trader Explanation*

It should be observed from the outset that as a purely theoretical matter it must be the case that security prices are affected, at least somewhat, by “noise.”¹⁰ Otherwise, one runs into the well-known result that no one would ever rationally engage in securities trading.¹¹ The very willingness to engage in trade would reveal to any potential counterparty that one has superior information. As a result, a rational counterparty would never agree to trade. If there is a possibility that one of the parties is a “noise” trader then trade becomes possible. Having enough noise to grease the wheels of trade, however, is entirely different from a situation in which noise accounts for the bulk of volatility.

Many eminent financial economists, however, do believe that noise traders account for much of the unexplained volatility.¹² According to this view, price volatility is not driven solely by the mechanisms of market efficiency, but also “noise traders” whose actions are correlated.¹³ Correlated action ensures that “noise” will constitute a systematic, undiversifiable source of risk and, hence, be reflected in stock prices.

This approach has had some noted successes. Among the most successful applications of the noise trader approach is its explanation of the closed-end fund puzzle. The puzzle lies in the fact that closed end funds – investment funds that have a fixed number of shares – often sell at a discount relative to the value of the shares the fund owns. The presence of “noise risk” would explain why such a discount exists in the first place. Moreover, the noise trader explanation predicts that the level and changes in closed-end fund discounts should be correlated, regardless of the type of securities the fund holds, as noise traders’ actions are correlated. And, indeed, this prediction is born out by the data.¹⁴

¹⁰ Or some other mechanism that ensures that prices are not fully revealing of all information. Analytically, various ways of modeling this – such as assuming an uncertain supply of the risky asset.

¹¹ This is the so-called No-Trade Theorem.

¹² An excellent discussion of behavioral finance can be found in Shleifer’s *Inefficient Markets: An Introduction to Behavioral Finance* (2000).

¹³ See, e.g., Bradford De Long, Andrei Shleifer, Lawrence Summers and Robert Waldmann, Noise Trader Risk in Financial Markets, 98 *Journal of Political Economy* 703 (1990); see also Campbell and Kyle, Smart Money, Noise Trading and Stock Price Behavior, 60 *Review of Economic Studies* 1 (1993).

¹⁴ For more on the closed end puzzle and the noise trader explanation see Lee, Shleifer and Thaler, Investor Sentiment and the Closed End Fund Puzzle, 46 *Journal of Finance* 75 (1991)

The move from postulating “noise traders” to noisy prices, however, is a relatively short one. Even though these traders are often referred to as “liquidity traders” this is a bit of a misnomer. Individual investors’ liquidity needs, say paying for grandmother’s operation, are unlikely to explain why markets on a particular day experience substantial, unaccounted for price movements. A fuller explanation will require an understanding of the mechanisms of noise. What exactly are the coordination mechanisms that result in noise traders all doing the same thing at the same time? And, a question I will get back to in Part IV, how does the legal environment affect these coordination mechanisms?

And what of rational explanations for price fluctuations? Is it still possible to make the case that informed, rational traders, of one sort or another, are essentially driving price volatility?

2. The Variation in Discount Rates Explanation

One possibility for explaining price fluctuations, consistent with an efficient market perspective, is variation in discount rates. If discount rates fluctuate, then stock prices should also fluctuate given that stock prices are merely the discounted value of a future dividend stream. If the discount rate changes, then the value of the security should also change to reflect the market’s new net present value calculation.

Overall, the empirical evidence, at least so far, does not appear to support this explanation. Much of the volatility in stock returns is not apparently attributable to changes in the discount rates.¹⁵ This is, however, a still active area of research.

3. The Mechanisms of Market Efficiency Explanation

All this gets us back to the mechanisms of market efficiency. Is it possible to model the mechanisms of market efficiency in a way that accounts for the puzzling,

¹⁵ See Shiller, From Efficient Markets Theory to Behavioral Finance, 17 *Journal of Economic Perspectives* 86, 86 – 88 (2002); see also Vuolteenaho, What Drives Firm-Level Stock Returns?, 57 *Journal of Finance* (2002); but see Burton Malkiel, The Efficient Market Hypothesis and Its Critics, 17 *Journal of Economic Perspectives* 59, 73-74 (discussing how the market crash of October, 1987 can be explained, in part, by changes in the discount rate).

unexplained price fluctuations? There have been a series of papers since the publication of the *Mechanisms of Market Efficiency* that have attempted to do just that.

One particularly interesting attempt is David Romer's model of how stock prices can fluctuate in the absence of new information reaching the market while nevertheless still being a rational assessment of the discounted value of future dividend streams.¹⁶ In his model, investors have information of varying quality. Moreover, investors are uncertain about the quality of other investors' information. Over time, as liquidity trading occurs, investors gradually learn the quality of other investors' information. This learning process can lead to very large fluctuations in prices as investors learn more about the fundamental value of the stock. Rational price fluctuations can, therefore, occur even in the absence of new public information (such as a company press release or a *Wall Street Journal* story) hitting the market.

A second potential mechanism of market efficiency which has gained prominence (and one I believe holds significant insights) over the last twenty years is the firm as arbitrageur of its own securities. When a firm's securities are overpriced, a firm interested in taking advantage of this fact should increase supply, i.e. issue more securities. This could potentially explain the low returns of securities issued in public offerings. Moreover, firms with overvalued securities should be more willing to pay for mergers using their own stock as currency. Conversely, when securities are undervalued, firms should engage in buybacks of their securities.¹⁷ In contrast to other forms of arbitrage, this form of "arbitrage" – increasing and reducing the supply of securities – is likely to affect market valuations at a more leisurely pace. The firm as arbitrageur is far removed from the world of the Miller-Modigliani Theorem where firms are indifferent to capital structure.

There is growing empirical support for viewing the firm as an important market participant. Among professional money managers, stock buybacks and security issuance is viewed as containing important information about valuation.¹⁸ In one recent survey

¹⁶ See David Romer, Rational Asset-Price Movements Without News, 83 *American Economic Review* 1112 (1993).

¹⁷ A model of the firm as arbitrageur is contained in Stein, J., Rational Capital Budgeting in an Irrational World, 37 *Journal of Business* 117 (1996).

¹⁸ See, e.g., the website of Dimension Fund Advisors, library.dfaus.com/faqs (describing firm stock buybacks as one of the mechanisms of market efficiency)

study, managers indicated that whether they viewed their stock as overvalued was a major consideration in their firm's decision whether to issue securities.¹⁹ In an important, recent article, Baker and Wurgler have documented that equity offerings and stock mergers usually occur in overvalued markets that are about to deflate.²⁰

These are only two examples of the work done since the publication of *The Mechanisms of Market Efficiency* exploring the mechanisms by which information becomes impounded in stocks and the implications this has for stock price fluctuations. In light of this and other work done over the last twenty years, what are we to make of stocks low R^2 s?

IV. WHAT TO MAKE OF A LOW R^2 ?

Despite the richness of the literature in the years since the *The Mechanisms of Market Efficiency* first appeared, we still lack a satisfying, empirically tested, comprehensive theory of price fluctuations. Powerful evidence of this continuing gap in our knowledge is the low R^2 of stocks, originally emphasized by Richard Roll in his work in the 1980s. The low R^2 s of stocks stubbornly persist even after controlling for factors, such as new public information, that might trigger a rational reevaluation of a company's worth.

At an even a more basic level, it is unclear how one should even interpret stocks' low R^2 s, beyond the fact that traditional models do not appear to do a very good job of explaining price fluctuations. Is a low R^2 a sign of market inefficiency or market efficiency? The answer to this question has obvious implications for whether we should look to various possible mechanisms of market efficiency for an understanding of what is moving prices or somewhere else, such as the noise trader literature.

Unfortunately, given the current state of research, one can argue both for and against the view that a low R^2 is a sign of market inefficiency. First consider the argument for.

¹⁹ See Graham and Harvey, Theory and Practice of Corporate Finance: Evidence from the Field, 60 *Journal of Financial Economics* 187 (2001).

²⁰ See Baker and Wurgler, Market Timing and Capital Structure, 57 *Journal of Finance* 1 (2002)

1. A Low R^2 as a Sign of Market Inefficiency

Some have argued, drawing on the noise trader literature, that low R^2 s are themselves evidence that arbitrage, one of the primary guarantors of market efficiency, is limited.²¹ The more fluctuations in a stock are unrelated to the movement of similar stocks – say stocks of similarly sized companies in the same industry – the more unique a good that stock becomes. Arbitrage, however, works best when stocks have ready substitutes. Substitutability reduces the risk that arbitrageurs face when they attempt to profit off of a mispriced stock. There might not be very many, if any, satisfactory substitutes for a stock with a sufficiently low R^2 .²²

There is some recent empirical evidence to support the use of R^2 as a proxy for limited arbitrage opportunities, at least in some contexts. In a recent working paper, Wurgler and Zhuravskaya examined the price of stocks that are added to the S&P 500 Index.²³ The standard efficient market position would be that a stock's addition to an index should not affect the stock price unless such an addition reveals new information about the company.²⁴ Consistent with earlier work, they found that an addition to the S&P 500 Index does, in fact, positively affect stock prices.²⁵ Of particular interest is their finding that there is an inverse relationship between the availability of close substitutes for a stock and a positive price effect. Stocks that have poor substitutes experienced a larger positive price reaction (and, hence, deviate more from the prediction of the efficient market view) than those stocks that have closer substitutes. Consistent with

²¹ See Andrei Shleifer, *Inefficient Markets: An Introduction to Behavioral Finance*, p. 21 (2000) for this argument. See also Jonathan Ingersoll, *THEORY OF FINANCIAL DECISION MAKING* (Rowman and Littlefield) (1987).

²² In considering this argument, one must bear in mind that if mispricing is limited to an individual stock, then arbitrage would be riskless, and hence highly effective, as idiosyncratic risk is diversifiable. See Campbell, *Asset Pricing at the Millennium*, 55 *Journal of Finance* 1552 (2000). Correlated noise trading is one way to render arbitrage risky.

²³ See Wurgler, J. and Zhuravskaya, E., *Does Arbitrage Flatten Demand Curves for Stocks?* (1999) Working Paper.

²⁴ For the classic position that uninformed demand shocks (such as increased index purchases) should not (and does not) result in price changes, see Scholes, M. "The market for securities: Substitution versus price pressure and effects of information on share prices, 45 *Journal of Business* 179 (1972).

²⁵ See Harris and Gurel, *Price and Volume Effects Associated with Changes in the S&P 500: New Evidence for the Existence of Price Pressures*, 41 *Journal of Finance* 815 (1986); Andrei Shleifer, *Do Demand Curves Slope Down?*, 41 *Journal of Finance* 579 (1986).

Roll's finding, the closest substitutes for many stocks can only replicate approximately 20% of a stock's volatility.

In a recent study, I examined the effects of imposing the Exchange Act of 1934's mandated disclosure requirements on the over-the-counter (OTC) market in the 1964 Securities Acts Amendments.²⁶ In the course of econometrically measuring the effects of mandated disclosure, I calculated the R^2 of exchange-listed stocks and OTC stocks for the time period covered in the study (1962-1968). I found that the average R^2 of both exchange-listed and OTC stocks dropped over the 1962-1968 period. Interestingly, the OTC market had lower average R^2 s than the exchange-listed market in both the pre-OTC mandated disclosure period (1962-65) and in the post- OTC mandated disclosure period (1965-68). This difference does not appear to be attributable to a different mix of industries traded on the OTC market relative to that of the listed market.

This finding is interesting because one would expect the less liquid, less-followed OTC market of the 1960s to be less informationally efficient than that of the listed market. Is the difference in R^2 s between the OTC market and the listed market evidence of this? Obviously, far more work needs to be done, especially in light of the fact that there is substantial body of work suggesting that low R^2 s are actually a sign of market efficiency.

2. A Low R^2 as a Sign of Market Efficiency

Recent empirical work on emerging stock markets has called into question whether low R^2 s are typically associated with market inefficiency. Randall Morck, along with his co-authors, has found that the degree to which stock prices in a country move in a synchronized manner is inversely related to that country's per capita gross GDP.²⁷ One of their primary measures of stock price synchronicity is the R^2 of stocks.²⁸ In other words, emerging stock markets tend to have high R^2 s when compared to the R^2 s of stocks

²⁶ Ferrell, Does Mandated Disclosure Improve Informational Efficiency: Evidence from the OTC Market (2003), Working Paper.

²⁷ See Morck, Randall, Yeung, Bernard, and Yu, Wayne, The Informational Content of Stock Markets: Why do Emerging Markets have Synchronous Stock Price Movements?, 58 *Journal of Financial Economics* 215 (2000).

²⁸ In their study, they used a market model of stock returns to estimate R^2 s.

in developed stock markets, such as the New York Stock Exchange. What makes this finding interesting is that this association between R^2 and emerging stock markets is not due to low-income countries having more correlated economic fundamentals. Something else appears to be driving the high R^2 s.

This association between economic development and stocks' R^2 s presents a challenge, on several levels, to those that wish to understand stock price fluctuations. Stocks with low R^2 s are characteristic of highly developed stock markets. Given this association, when should low R^2 s of stocks be considered indicative of market inefficiency resulting from limited arbitrage? The normal assumption is that arbitrage, even if limited and imperfect, is likely to be more of a force for market efficiency in developed countries' stock markets; precisely those markets which tend to have low R^2 stocks.

Or consider Roll's finding that the low R^2 of U.S. stocks cannot be explained by public information reaching the market and triggering a reevaluation of stock prices. The Morck findings suggest that there might be other mechanisms of market efficiency that are resulting in information being impounded into security prices that Roll was unable to adequately identify and control for by focusing on public information. One obvious "mechanism of market efficiency" candidate is market participants trading on proprietary, non-public information. The unexplained fluctuations in stock prices would then be the result of a rational reassessment of stocks' underlying fundamental value based on new non-public information. Such an explanation could account for Roll's finding that the R^2 of stocks is similar on days in which there is new information publicly revealed and days on which there appears to be no new information. It could also explain why volatility is lower on days on which there is no trading, if private information, as suggested by David Romer's model of price movements, is revealed through trading.²⁹

And, indeed, there is growing empirical evidence to support this story. In a recent study, Durnev, Morck and Yeung found that the more a stock's variation is unexplained by standard asset pricing models, i.e. has a low R^2 , the more the stock's returns correctly

²⁹ See Kenneth French and Richard Roll, Stock Return Variances: The Arrival of Information and the Reaction of Traders, 17 *Journal of Financial Economics* 5, 23 (1986)

anticipate the future earnings of the company.³⁰ Presumably some market participants, trading on non-public information, are pushing the stock's price so that it reflects their private information. On a related note, another recent study has found that capital is allocated more efficiently the lower the level of stock price synchronicity. Again, one commonly used measure of stock price synchronicity is R^2 .³¹

And what of the high R^2 s in emerging stock markets? One possible explanation – this time drawing from the noise trader literature – is correlated noise trading. The “herd” in a particular market moves together affecting stocks across the board regardless of differences in stocks' underlying fundamentals. The “herd's” actions would reveal itself in high R^2 s not explainable by correlated economic fundamentals and standard asset pricing models.

This is not the only possibility. An alternative “mechanism of market efficiency” explanation could be that the informational content of economy-wide (or general non-firm specific) data is higher in developing countries than that of wealthy nations such as the U.S. Knowledge about the prospects of a specific firm in an emerging market might have to be deduced from more general economic data given a dearth of credible firm-specific information. The evaluation of the prospects of individual companies, even if in relatively unrelated industries, might have to be made using the same information set. In an informational environment in which a great deal is already known about the prospects of individual firms (through credible firm-specific disclosures) economy-wide data is less likely to contain new information concerning the prospects of individual companies and, hence, less likely to move the entire market.

A third explanation, with some empirical support, is the possibility that emerging markets exhibit higher levels of cross-holdings and cross-subsidization between companies, thereby rendering stock prices less reflective of an individual firm's profitability and prospects. Cross-holdings and cross-subsidization would tend to increase the R^2 of companies. This explanation is consistent with rational pricing, albeit a

³⁰ Morck, Randall, Yeung, Bernard, and Zarown, 2001, Does Greater Firm-Specific Return Variation Mean More or Less Informed Stock Pricing?, Working Paper.

³¹ See Wurgler, Jeffrey, Financial Markets and the Allocation of Capital, 58 *Journal of Financial Economics* 187 (2000).

marketplace with financing structures generally less efficient than those available in developed countries.

I will end with one last piece of empirical evidence relevant to the question of how to interpret R^2 . The average R^2 of U.S. stocks has declined dramatically over the last forty years.³² The recent average R^2 of U.S. stocks is in the range of .09. This is sharply lower than the estimates for the average R^2 of stocks in earlier years. The average R^2 of stocks throughout the 1960s was typically above .20. What accounts for this dramatic reduction and what implications does it have for how the market works in setting prices? While there are several plausible candidates, such as the breakup of the conglomerates of the 1960s, research on this question has only just begun.

3. Open Questions

Obviously a situation where low R^2 s may indicate market inefficiency, at least in some contexts (Shleifer; Wurgler & Zhurvskaya) or market efficiency (Morck, Yeung, Yu; Durnev, Morck & Yeung) is an unsatisfactory state of affairs. We need to sort out the implications of these different important lines of research before we can know where to look for an answer for the unexplained variations in prices: noise traders or as of yet unidentified mechanisms of market efficiency.

The inability to identify how different market participants affect stock prices (whether through non-public proprietary information, correlated noise trading, or something else) constitutes a weakness in the mechanisms of market efficiency literature as it has developed since the publication of *The Mechanisms of Market Efficiency*. To be sure, there are some papers that attempt to isolate the effect of different market participants' actions on stock prices.³³ Nevertheless, there remains a lack of empirical evidence (for understandable reasons) on exactly which, of the competing mechanisms proposed in literature, is actually occurring. Can non-public, proprietary information trading really account for the dramatic Roll findings? Who exactly are the market

³² See Campbell, John, Lettau, Martin, Malkiel, Burton and Yexiao Xu, Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk, 56 *Journal of Finance* 1, 24 (2001) (estimating R^2 using monthly quotations for five year periods)

³³ See, for example, Lakonishok, Shleifer, Vishny, The Impact of Institutional Trading on Stock Price, 32 *Journal of Financial Economics* 23-44 (1992).

participants with significant non-public proprietary information?³⁴ If the noise trading explanation of the association between economic development and stock price synchronicity is correct, then why do noise traders appear to congregate in emerging markets?

A satisfactory answer to these questions will almost certainly involve consideration of the legal institutions and practices of countries (and markets) with different R^2 s. This will require the skills not only of the financial economist but the legal academic's understanding of legal institutions and practices.

4. A Promising Line of Inquiry: Legal Institutions and Practices

A suggestive first step is Morck, Yeung and Yu's finding that increased protection of private property rights in a country is correlated with lower average R^2 s for that country's stocks.³⁵ Assuming a low R^2 is a sign of market efficiency, how exactly does protection of private property assist the mechanisms of market efficiency? Or is the protection of private property just proxying for some other casually responsible element? In thinking about these questions, it is important to note that differences in the protection of private property rights do not seem to explain the differences in average R^2 s of countries' stocks when only emerging countries (as opposed to also including developed countries) are included in Morck, Yeung and Yu's sample.

The mystery only deepens when one looks at the impact of the "anti-director rights index" which (supposedly) measures shareholders' rights against directors in various countries.³⁶ Morck, Yeung and Yu report that once this index is included in their regressions, protection of private property rights becomes insignificant in explaining variations in R^2 across developed countries. This finding is especially interesting in light of the fact that a recent working paper by LaPorta, de-Silanes, and Shleifer reports that

³⁴ On the related issue of the informational content of different order flows, there is a well-established literature.

³⁵ See 58 *Journal of Financial Economics* 215. They use the sum of three indexes – the government corruption index, the risk of expropriation of private property index, and the risk of the government repudiating contracts – used in LaPorta, de-Silanes, Shleifer, & Vishny, *The Quality of Government*, Working Paper (1998).

³⁶ This index is used in LaPorta, de-Silanes, Shleifer & Vishny, *Law and Finance*, 106 *Journal of Political Economy* 1112 (1998).

the “anti-director rights index” does not explain the level of development of stock markets (as measured by external stock market capitalization to GDP).³⁷ Given this finding, it is unclear what the respective roles (if any) played by private property rights and shareholders’ rights in stock market development (measured by external market capitalization to GDP or stock price synchronicity).

It is fair to say that at this stage of research it is unclear what effect legal institutions and practices have on stock price synchronicity, stock market development and the effectiveness of the mechanisms of market efficiency. Answering these questions will depend on continuing to exploit the cross-sectional variations in R^2 s, stock market development, and legal regimes.

V. CONCLUSION

The R^2 of stocks can be thought of as one of the “outputs” of the various mechanisms (whether rational or not) that drive price fluctuations. The fact that we do not understand the output of the mechanisms suggests that we do not understand the mechanisms themselves very well. Why are the R^2 s so low? Why do they vary over time? And why do they vary across countries and markets? These questions represent an exciting research agenda that will lead to a better understanding of security pricing and the role legal institutions and practices play in that process. Much work remains to be done: work that was begun some twenty years ago.

³⁷ LaPorta et al, What Works in Securities Regulation?, Working Paper (2002).