Marshall Blume Tribute at RL White Conference, March 22, 2019

Don Keim (Wharton)

Welcome. As most of you know, Marshall Blume passed away suddenly and unexpectedly on January 27, 2019. Marshall earned his PhD from the University of Chicago and arrived at Wharton in 1967. He spent his entire academic career at Wharton – 44 years – and was the Director of the Rodney White center for almost 25 years. We had a beautiful memorial service for Marshall's family that was held in this room last week. The focus then was more about Marshall the person. The plan today is to celebrate Marshall's research contributions. To commemorate the many and varied research contributions Marshall made over his long career, we've gathered together several current colleagues, former colleagues, and students of Marshall's to briefly present highlights from his illustrious career. Marshall's contributions were many, and extend back to the beginning of what we consider modern financial economic research. Marshall's research occupied four distinct areas: asset pricing, household finance, market microstructure, and index construction and institutional investor trading. Each presenter will address one of these four areas.

The contributors today are: Craig McKinley from Wharton, who most of you know. Craig will talk about Marshall's asset pricing contributions. Steve Zeldes from Columbia University, a colleague here at Wharton in the 1980's and 1990's who organized this conference for a number of years, will discuss Marshall's contributions to household finance. Steve can't be here, so Nick Roussanov will present Steve's remarks. Michael Goldstein from Babson College, who was a PhD student of Marshall's and wrote a number of papers with him in the microstructure area, agreed to contribute some remarks. Due to illness Michael can't be here, so I will read his remarks. Finally, Roger Edelen from Virginia Tech University, another former Wharton colleague who wrote several papers with Marshall, is going to speak on Marshall's contributions on index construction and institutional investors. A common thread that emerges from the four discussions is how often Marshall's observations and empirical findings precede important "seminal" papers by several years, in at least one case by a decade. He was, in many ways, ahead of his time.

But first, I want to relay a few comments that were contributed to a conference organized by Craig McKinley and me on the occasion of Marshall's retirement in 2010. Several good friends and colleagues of Marshall's contributed remarks. I'd like to read a few of them now.

The first is from **Gene Fama**, Booth School of Business at University of Chicago, Marshall's dissertation advisor.

"Marshall Blume has had a truly productive career. He is a stellar member of the strongest cohort of Ph.D. students Chicago has ever produced. His thesis is among the best of the early crop of papers that gave rise to the strong empirical tradition in finance. He followed that with a steady stream of outstanding papers that clearly show the thesis is not a fluke."

"Marshall quickly established the credibility of the Chicago Ph.D. program at Wharton. He was the first Chicago grad to break through the Wharton wall. The hole has been exploited productively by many later Chicago students – to the mutual benefit of both schools."

"Marshall and I worked closely when he was a student at Chicago, and we have a joint publication from that time ("Filter Rules and Stock Market Trading", JB 1966). In those early days it was also common for young faculty to associate with Ph.D. students in social settings, and I always enjoyed the personal side of Marshall."

Next, from the late **Steve Ross**, formerly the Franco Modigliani Professor of Finance, Sloan School, MIT.

"I met Marshall when I came to Wharton - about 100 years ago. Marshall was the first person I got to know who was truly "in finance." Meeting Marshall, and becoming part of the finance group at Wharton, was the best thing that could have happened to me then. Marshall introduced me to finance. He and Irwin Friend were at the height of their productivity, producing some of the pioneering work in testing the CAPM, and their work provided much of the stimulation for my own."

"I had never studied any finance, except for a somewhat unsettling and puzzling brush with MM, and I was doing mathematical international equilibrium theory which was every bit as interesting as it sounds. I saw in Marshall a wonderfully talented and generous individual with an infectious passion for what he was doing. Marshall was a great colleague who not only could answer questions but, much more importantly, he could ask them and his questions made you think deeply. The profession of finance owes an enormous debt to Marshall for his research contributions; but, my debt is a very personal one."

Ned Elton, Stern School of Business at New York University.

"I don't know exactly how long I've known Marshall, but it has to be over 40 years. I think we entered the profession at a magical time. The field was changing from a descriptive field to a scientific one and we were at the forefront. There wasn't more than a dozen or two academics importantly involved in that change and we all knew each other, went to meetings together, read each other's papers, and spent time together. Marshall was an important player in that change: both in his writings (I still use several in class) and as editor of the Journal of Finance. Marshall was the first of the finance group to edit the Journal of Finance. Having one of ours as editor signaled a change in direction, and this change became permanent."

John Cox, Sloan School at MIT (emailed to Krishna Ramaswamy after Marshall's passing)

"This is very sad news. I hadn't seen Marshall in a long time, but I thought of him frequently. He was my dissertation advisor. I'm not sure that he understood everything that I was doing, but he always had faith in me and supported me. I remember him with great affection."

Craig MacKinlay (Wharton): Marshall's early contributions to Asset Pricing

What I'd like to talk about are some of Marshall's early contributions to research in empirical asset pricing. Marshall was obviously a top-notch researcher, and a very important participant in early days of this important research area.

I will provide an overview of about 10 or so papers, so I am going to concede upfront that my comments will not reflect just how careful Marshall really was in his research. That Marshall always included all important market characteristics and warned of any statistical biases in his papers will likely not come

through in my brief comments given how much I plan to cover. But no matter which paper of his you read, you will see he is very thorough and makes sure he has everything covered adequately. One thing you will notice as I go through his research is how a lot of his earlier work ties in really quite nicely with much subsequent research; and in some ways he really led the way more than one might think.

I will initially touch on the papers that Marshall and Irwin Friend published the late 60's and early 70's. He and Irwin did a lot research together, of course. And they were some of the early players in the CAPM empirical area, along with others like Fama, MacBeth, Black, Jensen, and Scholes. They were all working at the same time, trying to understand empirically the usefulness of the CAPM.

In "*Measurement of Portfolio Performance Under Uncertainty*" **[3]**, Marshall and Irwin focused on measuring investment performance controlling for CAPM beta. The main purpose of the paper is the computation of risk-adjusted performance, but they tried to measure to what extent risk-adjusted performance actually did remove the effect of the risk measure. So, what they effectively did was calculate what we now call Jensen's alpha, back then they called it "eta"; but they also studied the relationship between the estimated "eta" and the beta risk (from which the "eta" measure was supposed to abstract.) They did this quite carefully, and they found that there was a strong negative relation – low beta assets tend to have higher alphas and high beta assets tend to have lower alphas. And, of course, that squares quite nicely with what we might call the low-risk anomaly rediscovered in recent research. So, all the way back in the 60's and 70's, Marshall and Irwin had already demonstrated that result. This, of course, ties into the security market line being empirically flatter than the theory would predict. And so that was quite an important result, however underappreciated.

In "*A New Look at the CAPM*" **[7]**, Marshall and Irwin were testing the empirical validity of the CAPM, and getting results similar to those found by Fama and MacBeth (1973) and Black, Jensen and Scholes (1972) in that the expected return - beta relation was linear. Importantly, they also measured the extent to which the zero-beta return matched up with a risk-free rate. They got the strong result, expected given their 1970 AER paper, that the zero-beta return was larger than the proxy for risk free rate, thus rejecting the Sharpe-Lintner version of the CAPM (in which the intercept of the model is the risk-free rate.) They also estimated the CAPM relation for bond returns and found results that were quite different from the estimation for stock returns, which they attributed to market segmentation. They argued that in a strict theoretical sense, regardless of the assets you use in your tests, the expected zero-beta return should be the same; yet they found that the zero-beta return was different for stocks and bonds. This was an important first insight into the robustness of the CAPM. Finally, the weighting of securities in test portfolios were a big concern in those early days. Marshall and Irwin addressed this by doing comparative analysis with equal weighted portfolios and value-weighted portfolios. They found that, on a risk adjusted basis, the equal weighted portfolios outperformed the value weighted portfolios. This important observation, due to small-cap stocks receiving disproportionately large weights in EW portfolios, pre-dates by ten years the evidence on the small firm effect.

The last of these early papers with Irwin is "*Risk, Investment Strategy and the Long-Run Rates of Return*" **[10]** in which they estimated the risk-return relation over long investment horizons. They wondered whether the CAPM relation held up if the investor's investment horizon was extended beyond the monthly return interval typically used in empirical tests. For example, when looking at a five-year horizon, is it still the case that the expected return for high beta stocks is higher than the expected return for low beta expected stocks? They found that while the relation holds up over shorter term horizons, when the horizon is extended the risk-return relation breaks down for long run rates of return.

Following up on his early empirical CAPM research with Irwin, Marshall wrote several papers on what he might have called CAPM failures in which he empirically identified deviations from the CAPM. In today's world we would call these findings anomalies. In "*Price, Beta, and Exchange Listing*" **[6]**, with Frank Husic, Marshall found that, after controlling for beta, common stock portfolios sorted on price resulted in a distinct pattern of deviations from the CAPM-predicted returns – the low-priced stocks did better than expected and the high-priced stocks did worse than expected. This ties in quite nicely with the size effect that was discovered perhaps ten or so years later because of the significant correlation between market value and price.

In "*Stock Returns and Dividend Yields*" **[15]** Marshall found that sorting stocks by dividend yield resulted in significant violations from CAPM predictions – the higher the stock's dividend yield the higher the stock's risk-adjusted return. Marshall studied this relation between dividend yields and returns in response to the academic debate at that time about the effect of differential taxation of dividend and capital gain income on the CAPM pricing relationship – the thinking was that stocks with higher dividend yields should provide a higher before-tax return to compensate for their relatively higher taxes. On the one hand, Fischer Black and Myron Scholes (JFE 1974) argued that dividend yields do not explain departures from the CAPM because of a clientele effect – non-taxable or low tax rate investors will hold the (higher-taxed) high yield stocks so you would not expect dividend yields to be something that the CAPM was missing. On the other side, Bob Litzenberger and Krishna Ramaswamy (JFE 1979) developed an after-tax version of the CAPM and found evidence of a significant relation between dividend yields and stocks returns, although not as strong as that identified by Marshall. In the end, Marshall's evidence was more consistent with the Litzenberger-Ramaswamy conclusions.

Marshall is well known for his work on the estimation of beta and I've listed here three papers he did in this area. Of Marshall's papers, "*Betas and their Regression Tendencies*" **[12]** is probably the first one I read. When I was a grad student many years ago I took a course on Bayesian econometrics with Arnold Zellner and we had to write a course paper. I wrote my course paper on a Bayesian analysis of the market model, and one of the background readings I had to do for the paper was in fact Marshall's "*Betas and their Regression Tendencies*." In this paper Marshall formally argues that for a high estimate of beta the measurement error is likely to be positive, and for a low estimated beta the measurement error is likely to be negative. Therefore, if you're trying to predict future betas, there is a better way to estimate it than just by simply using the beta estimate from the prior period (which was the common practice at that time.) To demonstrate this, for two adjacent time periods, he estimated betas using the second-period data and estimated betas using the first-period data, and then regressed the future betas on the current betas.

TABLE 4

MEASUREMENT OF REGRESSION TENDENCY OF ESTIMATED BETA COEFFICIENTS FOR INDIVIDUAL SECURITIES

Regression Tendency Implied Between Periods	$\beta_2 = a + b\beta_1$
7/33-6/40 and 7/26-6/33	$\beta_2 = 0.320 + 0.714\beta_1$
7/40-6/47 and 7/33-6/40	$\beta_2 = 0.265 + 0.750\beta_1$
7/47-6/54 and 7/40-6/47	$\beta_2 = 0.526 + 0.489\beta_1$
7/54-6/61 and 7/47-6/54	$\beta_2 = 0.343 + 0.677\beta_1$
7/61-6/68 and 7/54-6/61	$\beta_2 = 0.399 + 0.546\beta_1$

Although Marshall has not formally built it into his model, you can see that his results imply a predicted beta that takes the current beta and "shrinks" it towards one (confirming an earlier result by Vasicek (1973)). This adjustment was first applied in Merrill Lynch's popular "Beta Book" in the 1970's and 1980's; and the adjusted betas reported by Bloomberg are computed using this framework. (The adjusted betas in Bloomberg use 0.33 as the intercept and 0.67 as the slope coefficient in Marshall's cross-sectional regression setup.) So, this contribution by Marshall lives on to today.

Last, I have one more illustration of the lasting influence of Marshall's research. In "*Unbiased Estimators of Long-Run Expected Rates of Return*" **[8]**, Marshall is concerned with issues related to biases in geometric and arithmetic mean returns over long investment horizons. The idea is that you can combine the estimates of geometric and arithmetic returns for a T-period horizon to estimate the expected return over a shorter/intermediate interval than T periods. The resulting formula is a practical and useful result that can be found in textbooks today, demonstrating that Marshall's work has indeed had impact. For example, this is a paragraph I've taken out of the popular introductory finance text by Ross, Westerfield and Jordan[1], which I use for my undergraduate finance class:

> The good news is that there is a simple way of combining the two averages, which we will call *Blume's formula*.[5] Suppose we have calculated geometric and arithmetic return averages from N years of data, and we wish to use these averages to form a T-year average return forecast, $R(T)$, where T is less than N. Here's how we do it:
>
> $$R(T) = \frac{T-1}{N-1} \times \text{Geometric average} + \frac{N-T}{N-1} \times \text{Arithmetic average}$$

That's a quick review of some of Marshall's early research. If you haven't read these papers, I encourage you to have a look – you will be amazed with just how careful Marshall was, and how detailed he was, and his attention to statistical biases and market characteristics. I'll leave it there and turn it back over to Don. Thank you.

Steve Zeldes (Columbia University): Marshall's contributions to Household Finance

(delivered by **Nick Roussanov)**

Thank you, Don. So, before I speak in Steve's voice, I just wanted to add a minor observation of my own. When I was a PhD student at University of Chicago, I was interested in household portfolio choice and the only academic conference of which I was aware that was dedicated specifically to household portfolio choice was the Rodney White conference, which is where we all are now. That was very much Marshall's imprint on this conference over the years while he was Director of the Rodney White Center; and with the help of Steve Zeldes (whose remarks I will read) in the early days of that conference and by Nick Souleles who was helping Marshall run this conference more recently until Marshall retired. These are Steve's comments on Marshall Blume and household finance.

[1] S. Ross, Westerfield, R., and Jordan, B., Fundamentals of Corporate Finance, 12th Ed, McGraw Hill, 2019.

Steve Zeldes' remarks:

Thanks very much for allowing me to say a few words about Marshall and his early work in asset pricing and household portfolio choice. I'm sorry I'm not able to be there in person, but as these words are read I'll be hiking with my wife and kids in Sedona, Arizona during the spring break. I'm sure you'll understand and I know Marshall would have as well.

I wanted to talk briefly about three of Marshall's papers, each of which I've enjoyed going back and re-reading. The first, by Marshall together with two colleagues at Wharton from an earlier generation, Jean Crockett and Irwin Friend, is titled "*Stockownership in the United States: Characteristics and Trends*," and was published in the *Survey of Current Business* in 1974. The second paper, by Friend and Blume, is titled "*The Demand for Risky Assets*" and was published in 1975 in the *American Economic Review*. And the third, also with Irwin Friend, is titled "*The Asset Structure of Individual Portfolios and some Implications for Utility Functions*," and was published in the *Journal of Finance* in 1975.

In "*Stockownership in the United States: Characteristics and Trends*" **[9]**, Blume and co-authors worked very hard to obtain and construct an innovative data set from the IRS. They used individual taxpayer returns, including demographic characteristics, income, and the tax schedule listing the amount of dividends on each stock or mutual fund owned by the individual, along with the name of the corresponding company. What a feat it was to obtain these data! They were then able to merge this information with data on the firms, such as stock prices, to construct individual portfolios and performance measures. They used these data to document a number of properties of individual portfolios. Three important findings were: 1) the strong concentration of stockownership among high income and high net worth households, 2) the lack of diversification of portfolios, with many individuals holding a very small number of stocks, 3) the variation in stock investment performance across different demographic groups. This paper was an early demonstration of how the creative construction and use of an administrative data set can shed light on important characteristics of household portfolios.

In "*The Demand for Risky Assets*" **[11]**, Blume and Friend nicely combined theoretical asset pricing with data on individual portfolios. They developed a theory that related the coefficient of relative risk aversion to the equity premium, the variance of stock market returns, and the share of wealth held in risky assets (e.g. stocks). The model incorporated two non-standard features: human capital and housing. They then used empirical estimates of portfolio shares held in risky assets to estimate how relative risk aversion varies with wealth. Ignoring human capital and housing, they found evidence that relative risk aversion declined with wealth. However, when human capital and housing were included (building in an adjustment for the beta of human capital with the stock market), they found that relative risk aversion was slightly rising or flat with wealth. Finally, they then went on to estimate the aggregate level of relative risk aversion that would be consistent with the observed equity premium given the assumptions of their model. They found that a coefficient of something in the vicinity of 2-4 was needed, a number higher than the often-assumed coefficient of 1 (corresponding to log utility). Of course, Friend and Blume's number was much lower than the coefficient required in subsequent consumption-based asset pricing models (corresponding to the equity premium puzzle), because Friend and Blume assumed a perfect correlation between wealth and consumption, something we now know is not present in the data. This paper represented an early and important contribution to the literature combining asset pricing with individual level data on household portfolios.

In "*The Asset Structure of Individual Portfolios and some Implications for Utility Functions*" **[13]** Blume and Friend combined and extended some of the insights of the first two papers. They highlighted

their earlier empirical finding that the stock portfolios of many households were not diversified, and then argued that this is not consistent with the foundations of the asset pricing model in the second paper. They suggested that households had heterogeneous expectations about returns, which could lead some to heavily overweight stocks with high perceived returns. They then argued that it would be best to omit these households from the analysis of how risk aversion varies with wealth. When they did so, they found evidence that was closer to (and even more consistent with) constant relative risk aversion. This was a very nice early contribution to the literature on heterogeneous agents and the implications for portfolio choice and asset pricing.

As you can see from these three papers, Marshall Blume, together with his co-authors, was an early pioneer in the field of what is now called household finance.

I really appreciated learning from and working with Marshall during the 12 years that we spent together at Wharton. Marshall's excitement and enthusiasm about household portfolios was contagious. During the latter part of the time I was there, Marshall oriented the Rodney White conferences around modeling and estimating household portfolio behavior and asked me to organize the conferences with him, which I very much enjoyed doing. It was particularly valuable for me to see how he invited both academics and practitioners to interact – a great model to this day. I've continued to use insights from those early conferences to help me as I co-organize the NBER Household Finance working group meetings. One of things we do is help encourage the use of novel public and private sector administrative data sets, something Marshall first did 45 years ago!

I think back to the early days of the Rodney White conferences where we had to search hard and solicit authors to fill a day with strong empirical household finance papers. The field of household finance has blossomed since then. For this year's summer institute in Household Finance, we just received 180 submitted papers!

We'll all remember and be grateful to Marshall for being an early pioneer and advocate in the field of household finance. Thanks, Marshall, for all of your research, guidance, and collegiality.

Nick: Like Steve, I was extremely fortunate to have been Marshall's colleague for the roughly 12 years between my coming here and his unfortunate passing. Marshall's enthusiasm and collegiality, as Steve and others have mentioned, his passion for research, and his always sunny, positive and encouraging attitude is something that I think we will all miss very much. So, thank you very much for listening to me and Steve, and all of us.

Michael Goldstein (Babson College): Marshall's contributions to Market Microstructure

(delivered by **Donald Keim**)

My dissertation advisor, Marshall Blume, had a longstanding interest in the structure of markets that spanned at least 25 years, from his early Journal of Finance article in 1973 with Irwin Friend through his 1997 Journal of Finance article with me on the competition across exchanges. Throughout all of his work, he had a strong interest in the public policy questions of the day, particularly how markets and individuals interacted. The economics of intermarket competition, and its effects on the bid-ask spread, was also a common theme. Indeed, bid-ask spreads and issues related to them show up throughout Marshall's work.

Marshall's early work with Irwin Friend in "*Competitive Commissions on the New York Stock Exchange*" **[5]** is a particularly good example of his wide interest in the structure of markets and public policy, and it also provides a nice roadmap for the next 25 years of his interest. At the time, the NYSE had a fixed commission schedule, and the competitive commissions we know of today were not allowed until "May Day" – May 1, 1975. Well before May Day, Marshall and Irwin set out to examine what would happen IF the NYSE relaxed from fixed commissions. Their paper, importantly, was PROSCRIPTIVE – attempting to answer what WILL happen, which is unusual for most finance papers. Marshall and Irwin got special access to the SEC's computer to do this. Using these data, Marshall and Irwin examined the economics of how NYSE firms made money. Interestingly, they examined not only commissions, but underwriting revenue.

Beyond underwriting, paper **[5]** spends significant time on the effect of commissions on volume, and then bid-ask spreads. Bid-ask spreads were a significant theme in Marshall's work. Another large theme in Marshall's work was intermarket competition. This paper suggested "that halving the average volume of trading … would have much less effect on the bid-ask spread than the added competition of one regional exchange would have in lowering the spread." So, the focus on competition with other markets shows up both here, and in my work with Marshall some twenty years later when I was a PhD student.

(As an aside, Michael notes that Marshall's papers were short, but they contained a lot of footnotes. Paper **[5]** had 25 pages and 27 footnotes! His footnotes were very detailed and often had full regressions and accompanying results in them!)

Of course, Marshall was well known for his interest in beta and returns from the 1970s and earlier. Even so, Marshall's interest in both bid-ask spreads and returns were able to be mixed together in the important 1983 paper "*Biases in Computed Returns*" **[16]** that he wrote with Rob Stambaugh. This article showed that using closing quoted prices to compute daily returns induces a bias due to the bid-ask spread, and that these biases were largest for small stocks (likely because small stocks tend to have large spreads).

(Michael emphasizes the importance of this paper, and that it is still very relevant to empirical asset pricing research today.)

Marshall's interest in the inner workings of markets and in answering public policy questions was very evident in "*Order Imbalances and Stock price Movements on October 19 and 20, 1987*" **[20]** with Craig MacKinlay and Bruce Terker on the 1987 Market Crash. This paper shows that the price declines of SP500 stocks on "Black Monday" were much larger than for non-SP500 stocks. Thus, in addition to the breakdown in the linkage between futures prices and the spot index during the crash, there were also breakdowns in the linkage among NYSE stocks. Given the magnitude of the crash (about a 22% drop in one day), the question of what happened during the crash was (and still is) a major public policy issue.

Paper **[18]** also illustrates several themes that run through much of Marshall's research. First, a detailed description and understanding of the inner workings of the market and the linkages therein; in this case the Consolidated Tape System which has transaction data, and the Consolidated Quote System. Second, Marshall was always concerned about errors in the data, such as those that might be due to wrong time stamps. There is much discussion about potential errors in paper **[18]**; in fact, footnote 18 on page 836

goes into great detail about using the midpoint of the bid ask spread (instead of transaction prices) due to the errors that use of transaction prices might cause – as in Blume and Stambaugh (1983). Last, this paper measures order imbalances – something that many papers in market microstructure now routinely measure. Notably, in this paper they use the bid and ask to "sign" trades – well before the Lee-Ready (JF 1991) algorithm.

Which brings us to my papers with Marshall. Our first paper together, "*Differences in Execution Prices among the NYSE, the Regionals and the NASD*" **[22]**, started when I was between my second and third year in the doctoral program, when I helped him to examine differences between brokerage firms that accepted soft-dollar commissions and those that do not. (He's still interested in commissions nearly 20 years after paper **[5]**!) While doing this work, I found that there were many trades at prices between the bid and ask (resulting in price improvement), and that this varied across the regionals and the NYSE. Working with Marshall, we eventually put together our working paper that compared the NYSE and the regionals, and found the NYSE had the best quote most of the time (and had a long section about the Intermarket Trading System).

Very shortly after, we were interested in measuring the economic value of these transactions between the quotes. I figured that if there were no frictions, a buyer and seller would want to meet at the midpoint, so measuring the absolute deviation from the midpoint would be a good measure, and if you double it, you will get the quoted spread back if trades happen at the bid or the ask. This became the first effective spread measure, 2*|Price – Midpoint|, and became the focus of my paper with Marshall "*Displayed and Effective Spreads by Market*" **[23]**. Effective spreads are now a widely used measure in the market microstructure literature, and markets are required by the SEC to publish a variant of the effective spread measure. Probably the most important paper we wrote together.

Eventually, Marshall and I were interested in the competition across markets for order flow, and how quotes affect this. Due to the rules of the Intermarket Trading System, the market with the best quote does not *necessarily* (or even often) get the trade. In "*Quotes, Order Flow, and Price Discovery*" **[24]**, we "examine the impact of the 1975 Congressional mandate to integrate the trading of NYSE-listed stocks." This paper actually starts with a quote from the SEC's Institutional Investor Study Report from 1971, and its focus shows Marshall's longstanding interest in details of market structure and implications for public policy. (We have two pages on how the NYSE, the regionals, the Intermarket Trading System, the Consolidated Quote System, and the Consolidated Tape System work and six pages on the market structure and payment for order flow and how the NYSE floor works.) The paper is an in-depth examination of the quoting behavior of the NYSE and the regionals, and demonstrates who gets trades when they provide the best quotes. The big take-aways are that the NYSE at the time had the best quote about 99% of the time, but that non-NYSE markets got a lot of trades when they DID NOT have the best quotes.

(Michael goes on to emphasize how much Marshall's research on commissions, bid-ask spreads, and order imbalances has influenced and shaped his own research.)

To conclude, Marshall's work affected and touched many working in this area, and changed the focus and debate about market structure. He impacted the field and so many authors in so many ways. Some of his lasting legacies in this field will be his abiding interest in the details of the inner workings of the market, his strong interest in intermarket competition, and his focus on public policy.

While others will remember him for those, I will remember him for teaching me the importance of crafting a paper. He always said we needed to go one or two levels LOWER than what the tables would present so we truly knew what the data was saying and not get misled by larger group averages. He was always concerned about getting it right – even if it took a much longer time.

But most of all, I will most remember his almost childlike glee when working on a computer program, or finding an unusual result. Marshall didn't just like doing research; he truly loved it.

Roger Edelen (Virginia Tech University): Marshall's contributions to Index Construction & Institutional Investing

I want to start off by saying that I am very grateful to Don and Jules and Nick for inviting me – it's an honor to speak about Marshall's contributions. I was here at Wharton for several years as an assistant professor and Marshall provided frequent guidance and support and was very much a mentor. I was very grateful to have had a chance to work with him; it was a truly unique experience and the relationship was always as collaborators. He was an amazing guy, and a very good friend. As was mentioned previously, Marshall's childlike enthusiasm for research was unbelievable. He was always so excited about it and so enthusiastic.

One of the things that happens when you go last in a set of speakers is that you end up saying the same thing that's already been said. But the main thing I want to emphasize about Marshall is his amazing attention to detail and how careful he was with data. Everybody has said this before, but I want to reiterate just how very, very careful and meticulous a researcher Marshall was, and I think that has had a continuing impact on how research is done today. And that was my experience that I had with him.

What I'd like to talk about are some equity market changes that have occurred over Marshall's long and illustrious career. In particular, two major changes in our institutional and market setting have been indexing and delegated portfolio management. I am going to focus on three recent papers that Marshall wrote on these subjects. I'll begin with "*S&P 500 Indexers, Tracking Errors, and Liquidity*" **[28]** that we wrote together. This project came about when Yahoo in 1998 was added to the S&P500. When that happened, Yahoo's price went up by an astronomical amount, about 65% (compared to earlier studies had measured an average 8-10% abnormal return when a stock is added to an index.) I had been talking about this in my class, and noted that trading in Yahoo had only about 40% float – i.e., 60% of Yahoo shares were tied up with insiders and other holders who couldn't trade. So, this means that index funds had to buy approximately one out of every 5 available Yahoo shares when it was added to the index. I thought that's interesting, maybe the price run-up we see with these index additions is related to the public float. I ran a regression and found there was a significant relationship.

While chatting with Marshall one day I told him about this relationship, and his enthusiasm took over. His interest was in how index managers actually trade, and whether that detailed consideration of the actual trading could explain what I had seen with Yahoo stock. We looked at some of the major players in index funds (Vanguard, Barclays, etc.) and examined the magnitude of the tracking error of their index funds relative to the underlying index. The tracking error from the major players was on the order of only 1-2% basis point per year. To put that in perspective, that means an R-squared of about 0.999999 in terms of their ability to mimic the index. So, think about the difficulty of getting this kind of tracking

error.[2] Marshall's insight was that this could explain why we see such a strong run up in the prices of the constituent stocks right at the time of the index change; immediate rebalancing is the only way that indexers can achieve their low target tracking error. Again, it was his careful attention to detail, and the underlying reality – what actually happens – that broke the insight for the curious phenomenon.

Let me provide a brief comment on another line of Marshall's research, regarding Morningstar's evaluation of fund performance. In "*An Anatomy of Morningstar Ratings*" **[25]**, we again see Marshall's careful attention to detail manifesting as insights into how the industry operates. I note two examples. First, he points out that Specialty Metals Funds are classified as international funds. This little bit of absurdity would escape most researchers, but nothing escapes the watchful eye of Marshall. Second, the fact that load fees are not given there just due as an impediment to returns is another example of his careful analysis of how Morningstar actually constructs their metric for performance.

My final topic pertains to Marshall's most recent work with Don, "*Changing Nature of Institutional Stock Investing*" **[30]**. Here, they uncover some extremely provocative insights about the industry, insights that go against conventional wisdom but could only have been uncovered by the type of careful, detailed evaluation that epitomizes what Marshall has taught us all about what good research is: look carefully at the actual facts, and don't always believe the conventional wisdom. With that research perspective, Don and Marshall show that there has actually been a remarkable shift in institutional willingness to invest in the smallest stocks. This shakes the standard paradigm on institutional investment management in important ways; for example, the role of scale diseconomies. This research has had a tremendous impact on my own work to this day.

While I hope to impress upon you all the nature of Marshall's view towards research, and how that view has come to be a pillar of modern empirical research, the truth is that nothing can compare to actually witnessing it firsthand. I am forever grateful for having had that opportunity to share time and research effort with this great scholar and great friend. It is an experience that I wish you all could have shared, but those of you in the room who have had that experience know well what I refer to. Thank you for your time.

Postscript

Although Marshall's research was primarily focused on equity markets, he also made contributions in the fixed income area (**[18]**, **[19]**, **[21]**, and **[26]**) and in portfolio insurance **[17]**. These papers were not discussed during the tribute.

[2] At this point, Roger related a story that he heard from Gus Sauter, the former Chief Investment Officer at Vanguard and the driving force behind Vanguard's S&P500 Fund. Vanguard would sometimes have busy days with lots of customer phone calls, and during these busy days all Vanguard employees would serve time on the phone bank in interest of fairness – including the person who running the Vanguard S&P 500 Fund, i.e., Gus. Gus gets on a call with a customer, and I don't remember the context, but the customer ends up saying something to effect of "A monkey could run an index fund" to which Gus calmly replied "Well actually I am that monkey."

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