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ABSTRACT

Diversified firms have different values than comparable portfolios of single-segment firms. These value differences must be due to differences in either future cash flows or future returns. Expected security returns on diversified firms vary systematically with relative value. Discount firms have significantly higher subsequent returns than premium firms. Slightly more than half of the cross-sectional variation in excess values is due to variation in expected future cash flows, with the remainder due to variation in expected future returns and to covariation between cash flow and returns.

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In recent years, the average diversified firm has been worth less than a portfolio of comparable single-segment firms. A large literature attempts to explain this fact by exploring ways that diversification might affect cash flows. This literature hypothesizes that diversification itself causes the diversified firm to generate different cash flows than it would if separated into single-segment firms (for example, Lang and Stulz (1994), Berger and Ofek (1995)).

A second explanation is that diversification does not affect value, but rather merely reflects patterns in what types of firms tend to agglomerate together into diversified firms. If firms generating lower cash flow tend to cluster together into conglomerates, then the fact that the average conglomerate is worth less than a comparable portfolio of single-segment firms does not necessarily imply value destruction.

We examine a third explanation for the diversification discount: diversified firms have expected future asset returns that are different from the returns of single-segment firms. Both of the first two explanations assume that the lower value implies diversified firms generate lower cash flows for security holders. This implication is only true in the special case in which the securities of both diversified firms and single-segment firms have the same expected return. Different securities can have different expected returns for many reasons; explanations include risk, mispricing, taxes, and liquidity.

To decompose the diversification discount into differences in cash flows and differences in returns, we use the fact that the price of any asset is the sum of its discounted future dividends, based on the definition of returns:

$$R_{t+1} = \frac{D_{t+1} + P_{t+1} - P_t}{P_t} \quad (1)$$

where D_t is dividend paid out during period t and P_t is price at the end of period t. "Dividends" includes all cash flows paid to the security holders (including interest payments made to bondholders). Equation (1) defines returns for any portfolio or asset, including a firm's equity, a portfolio of a firm's equity and debt, or a portfolio of many firms' securities. Iterating forward and imposing a terminal condition on the growth of stock prices in the infinite future,

$$P_t = \sum_{j=1}^{\infty} \frac{D_{t+j}}{\prod_{k=1}^{j}(1 + R_{t+k})} \quad (2)$$

The value of any asset mechanically depends on future cash flows and future returns. Equation (2) holds for realized returns and realized cash flows. One can also take expectations of both sides and say that the value of any asset depends on expectations of the interaction of future cash flows and future returns. We describe later how to disentangle expected returns and expected cash flows.

We define the excess value on a diversified firm as the log ratio of the value of a diversified firm and the value of a portfolio of single-segment firms, $\ln(\frac{P_t^D}{P_t^{SS}})$. Using

Equation (2), excess value is:

$$\ln\left(\frac{P_t^D}{P_t^{SS}}\right) = \ln\left(\sum_{j=1}^{\infty}\frac{D_{t+j}^D}{\prod_{k=1}^{j}(1+R_{t+k}^D)}\right) - \ln\left(\sum_{j=1}^{\infty}\frac{D_{t+j}^{SS}}{\prod_{k=1}^{j}(1+R_{t+k}^{SS})}\right) \qquad (3)$$

In calculating excess value, we use a portfolio of single-segment companies and normalize this portfolio to have the same level of either sales or book assets as the diversified firm. Thus the price and dividends on the single-segment portfolio have been multiplied by (for example) the ratio of the diversified firm's current sales to single-segment portfolio current sales. A negative excess value is a diversification discount and a positive excess value is a diversification premium. Equation (3) shows that, mechanically, the diversification discount depends on future cash flows and future returns.

Existing research focuses on dividends (or equivalently on the economic profits generated by the firm) and studies ways in which diversification results in lower future dividends. Potential explanations include incompetent or irrational managers, competent but self-interested managers, wasteful spending in general, and wasteful investment in poorly performing divisions in particular. See for example Morck, Shleifer, and Vishny (1990), Lang and Stulz (1994), Berger and Ofek (1995), Comment and Jarrell (1995), Servaes (1996), Lamont (1997), Scharfstein and Stein (1997), Scharfstein (1998), Dennis, Dennis and Sarin (1997), and Rajan, Servaes, and Zingales (1999). The competing explanation for the diversification discount is that diversification does not cause value to change, but merely reflects the nature of the cash-flow-generating businesses that are part of the diversified firm (see for example Chevalier (1999) and Maksimovic and Phillips (1999)). Both these explanations implicitly assume that returns are the same for diversified firms and single-segment firms. If returns are the same, then two portfolios can only have different scaled prices if the future scaled cash flows are different.

Our alternative approach is based on equation (2). Other things being equal, a diversified firm with a high expected return (relative to single-segment firms) will have a low value and thus a discount. A diversified firm with relatively low expected return will have a premium. We test whether variation in excess values is explainable using variation in expected returns. Specifically, we examine the difference in subsequent returns on diversified firms and on single-segment firms. We find that excess values forecast future returns in the required way. Firms with discounts have higher subsequent returns than firms with premia. The diversification discount puzzle is, at least in part, an expected return phenomenon as well as an expected cash flow phenomenon.

This paper is organized as follows. Section I describes the sample and shows summary statistics. Section II examines monthly portfolio returns and shows basic results on return predictability. Section III briefly examines three explanations for the different returns: risk, liquidity, and mispricing. Section IV examines present value relations using annual data on firm returns, and shows what fraction of cross-sectional variation in excess values is due to different returns and what fraction is due to different cash flows. Section V summarizes and presents conclusions.

I. The Sample

The sample consists of firms reporting segment data in the Compustat Current and Research database, 1979-1997. For each segment, firms report sales, book assets, capital expenditures, depreciation, and earnings. In addition, Compustat assigns each segment a four-digit SIC code based on the line of business description of the segment. We define a diversified firm as a firm with at least two segments, and a single-segment firm as a firm with only one segment. Following Berger and Ofek (1995), we discard firm-years with segments in the financial services industry, total firm sales of less than $20 million, or discrepancies between segment and firm data. See the appendix for more details.

We use two measures of value. The first is *Q*, the market-book ratio of the firm, calculated as the ratio of the market value of the firm (the market value of common stock plus the book value of debt and preferred stock) divided by the total book assets of the firm. The second is *M*, the market-sales ratio of the firm, calculated as the ratio of the market value of the firm to total sales of the firm.

For each value measure, we calculate the ratio for a comparable portfolio of single-segment firms. Again following Berger and Ofek (1995), for each segment of a diversified firm, we find a group of matching single-segment firms with similar SIC codes. We match either by two-, three-, or four-digit SIC code, using the highest precision that meets the requirement of having at least 5 single-segment firms in a given year. We then calculate the value measure for each segment, using either the weighted average or the median. For weights, we use either the book value of assets for *Q* or sales for *M*. We then form a value measure for the entire diversified firm, dropping every diversified firm that does not have comparable value measures for each of its segments.

For a given diversified firm with n different segments, the comparable ratios for a given year are

$$\overline{Q} = \sum_{j=1}^{n} wa_j \left(\frac{1}{\sum_{i=1}^{N_j} A_i} \sum_{i=1}^{N_j} A_i Q_i \right) \qquad (4)$$

$$\overline{Q}_{MEDIAN} = \sum_{j=1}^{n} wa_j \left(median\left\{ Q_1, Q_2, ..., Q_{N_j} \right\} \right) \qquad (5)$$

$$\overline{M} = \sum_{j=1}^{n} ws_j \left(\frac{1}{\sum_{i=1}^{N_j} S_i} \sum_{i=1}^{N_j} S_i M_i \right) \qquad (6)$$

$$\overline{M}_{MEDIAN} = \sum_{j=1}^{n} ws_j \left(median\left\{ M_1, M_2, ..., M_{indnum_j} \right\} \right) \qquad (7)$$

where wa_j is the fraction of the firm's assets that are in segment j; ws_j is the fraction of the firm's sales that are in segment j; Q_i, M_i, A_i and S_i are the q ratio, market-sales ratio, book assets, and sales of single-segment company i; and segment j's industry has N_j single-segment firms.

A. Summary Statistics

Table I shows summary statistics for value ratios, excess values, leverage, and returns. Lower case letters indicate natural logs. Table I's sample contains 14962 annual observations for 2390 different diversified firms in the 19 year period of 1979-1997. The number of firms per year varies from 1031 in 1980 to 542 in 1997. The average number of segments per firm is 2.8. Each segment of a diversified firm is matched with an average of 11 single-segment firms.

Table I contains several different ways of calculating excess values. One way is to compare the levels; for example, to subtract mean Q and $\overline{Q}$ to obtain a mean excess value of -0.21. A second way is to calculate the excess values by taking the natural logarithm of ratio of the Q's or M's, as in Berger and Ofek (1995). We focus on log ratios because they are an important component of the present value calculations performed in section IV.

Measured with log ratios, the average and median excess values are negative, and range from –5 to -30 percent, similar to previous research.[1] Excess value is positive for about a third of the sample (the fraction ranges from 28 percent to 40 percent across the different measures). We show median excess values in Table I only for comparison to previous research. In this paper, we necessarily concentrate on weighted average excess values, since we need to calculate returns on the portfolio of single-segment firms.

Table I also shows the average excess values calculated by value weighting each observation by the diversified firms' market equity value. Table I shows that, using value weighting, the tendency is not a discount but instead a diversification premium as high as 18 percent. Since most of the literature on the diversification discount uses equal weighting (as any OLS regression does), we focus on equal-weighting in this paper.

Table I shows that diversified firms have higher debt ratios than single-segment firms. The debt ratio, D_t, is defined as the end of year t ratio of the book value of debt to the book value of debt plus the market value of equity (where debt includes preferred stock). In calculating leverage ratios for portfolios of single-segment firms, we again weight either by book assets or by sales.

To calculate returns on the diversified firm as a whole, in principle one needs both equity and debt returns. We obtain equity returns for each firm from the Center for Research in Securities Prices. Unfortunately, debt returns are not available for most firms. Just using equity returns would be unwise, since leverage is systematically higher for diversified firms than for single-segment firms (as shown in Table I). It also turns out that discount firms have significantly higher debt ratios than premium firms. Thus leverage is a potentially important confounding factor.

We therefore approximate debt returns for each firm using returns on the Lehman Brothers Corporate Bond Index. For year t, we define total firm returns as

$$R_t^{FIRM\ J} = D_{t-1}^J R_t^{AGGREGATE\ BOND\ RETURNS} + (1 - D_{t-1}^J) R_t^{FIRM\ J\ EQUITY} \qquad (8)$$

This method of calculating total returns induces two biases into our analysis, both of which go in favor of the null hypothesis. First, discount firms are more levered and thus probably have riskier debt with higher expected return. Consistent with this idea, Hecht (1999) finds a small negative relationship between firm market-to-book ratios and actual bond returns. By using aggregate bond returns, we are understating total returns on discount firms and overstating total returns on premium firms. Second, discount firms may have debt that has deteriorated in value and has market value below book value, so that the calculated leverage ratios overstate actual leverage (relative to premium firms). Since average equity returns are higher than average debt returns, we are again understating discount firm total returns and overstating premium firm total returns. Because we intend to test whether total returns on discount firms are higher than total returns on premium firms, we are conservatively measuring returns in a way that is biased against our hypothesis.

II. Monthly portfolio returns

We now test the basic hypothesis of this paper, that excess values are related to expected security returns on diversified firms. We test whether realized future returns on discount firms are significantly higher that realized future returns on premium firms, and discuss evidence that the patterns in realized returns reflect patterns in expected returns. In this section we test the hypothesis using simple portfolio formation rules; later, in section IV, we test the hypothesis using regression methods.

Our portfolio formation rules follow Fama and French (1993) and are designed to incorporate realistic timing constraints. The basic algorithm is that each July of year t, one sorts firms into portfolios based on information in December of year t-1. One examines returns on this portfolio from July of year t until June of year t+1. We use this timing convention to ensure that the sorting information is certainly in the information set of investors.

Table II shows average monthly returns on diversified firms. Panel A reports total raw returns (that is, using no information about the returns on single-segment firms). Panels B-E look at excess returns, defined as diversified firm returns minus returns on the portfolio of comparable single-segment firms. We focus on excess returns because we are trying to explain excess value using returns on diversified firms compared to single-segment firms.

To calculate excess returns, for each diversified firm, we go short the portfolio of comparable single-segment firms, weighting the firms in the same manner used in constructing excess value. In calculating firm returns, we use year t-1 data on sales, assets, debt ratios, and SIC codes. The result is a zero-cost portfolio of excess (or industry-adjusted) returns called $R - \overline{R}$, diversified firm returns minus returns on the industry benchmark.[2] Our sample consists of diversified firms (approximately 714 per month) for which at least 5 matching single-segment firms could be found for each segment. There are two versions of $R - \overline{R}$, one based on asset weights and one based on sales weights, which correspond to the two ways of defining excess value.

Panel B shows total excess returns. We start by discussing the first column of Panel B, which shows excess returns for all diversified firms. Panel B shows that diversified firms have excess returns that are close to zero during the sample period. In other words, diversified firms have returns that the same as the portfolio of comparable single-segment firms. Rather than explain the average discount and average return for all diversified firms, our goal in this paper is to study the cross-sectional variation in excess values. Specifically, we want to test whether subsequent returns are related to the level of excess value. We do not try to explain the average excess value because our 19-year sample period is too short to make any strong statement about expected returns on diversified firms. Over short time periods, realized returns are a noisy measure of expected returns (a point made forcefully by Elton (1999)).[3]

We now turn to whether discount firms have returns that are higher than premium firms. Each July of year t, we sort firms into portfolios based on their excess values as of December of year t-1. We construct two portfolios, a portfolio that buys discount firms and a portfolio that buys premium firms. Using raw returns, panel A shows that discount firms have total returns that are 30 basis points per month higher than premium firms sorting on q, and 28 basis points higher sorting on m. These differences are statistically significant.

Panel B shows the basic results of this paper using simple total excess returns: premium firms have significantly lower excess returns than discount firms. Sorting by *q*, premium firms have returns that are 25 basis points per month lower than a comparable portfolio of single-segment firms. Discount firms have returns that are four basis points higher than single-segment firms. The mean excess returns of premium firms are significantly different from zero; the mean excess return of discount firms is not. More importantly, the difference of 29 basis points in the excess returns is significantly different from zero. Sorting by *m*, the difference is 26 basis points per month.

Panel C shows, as expected, the difference between premium returns and discount returns increases when using equity returns (rather than total firm returns). Panels D and E show results that will be useful for interpreting the analysis of section IV. Panels D and E show differentials similar to Panel B.[4] Across different methods, differential returns are always above 0.2 and significant. Panel D shows continuously compounded (instead of simple) total returns. Panel E shows continuously compounded total returns forming the portfolio in January of year t, instead of in July. This row reports average monthly continuously compounded total firm returns earned by premium and discount firms, from December 31st of year t-1 to December 31st of year t.

In summary, Table II shows that excess values forecast excess returns, so that at least part of the diversification discount phenomenon can be explained by future returns. The difference between discount and premium firm returns is statistically and economically (at three to six percent per year) significant.

The returns in Table II are equal weighted in the sense that each diversified firm in each month has the same weight in calculating the month's returns. They are partially size weighted in the sense that the single-segment firms are always weighted either by sales or book assets when forming the zero cost portfolio $R - \overline{R}$. An alternative method of calculating monthly returns would be to value weight each individual $R - \overline{R}$ by the diversified firms' market equity value. Fama (1998) argues that value-weighted returns are more appropriate to use since they represent a more realistic investment strategy, and because small stock returns are generally anomalous (in the sense that asset pricing models fail to explain small stock returns). He discusses cases in which value weighting causes abnormal returns to shrink towards zero. When we value weight the returns in Table II (not shown), we also find that the differential return is lower and insignificant.[5]

Since our goal is to explain how much of the cross-sectional variation in excess value is due to return differences, we believe equal weighting is appropriate in our context. We are trying to relate the diversification discount to predictable variation in returns, and to understand the extensive literature on the diversification discount in light of this relation. Since the previous literature on the diversification discount uses equal weighting, we do the same.

A. Expected returns vs. realized returns

The present value equation (equation (2)) is true for realized returns, by definition. A more interesting question for financial economists is whether the cross-sectional return patterns reflect expected returns, where “expected” means predictable in advance by a rational agent. Here we present evidence that shows that the variation in returns documented in Table II was predictable *ex-ante*, and did not merely reflect *ex-post* realizations that happened to appear during the sample period.

First, a leading story for *ex post* returns implies that discount firms should have positive excess returns during the sample period, but has a hard time explaining why premium firms should have negative excess returns. During the sample period of 1980-1998, many diversified firms divested unrelated subsidiaries, experienced bust-up takeovers, went private, or took other value-enhancing actions (e.g., Comment and Jarrell (1995), Berger and Ofek (1996)). Under this scenario, value-destroying firms with large discounts are most likely to take value-enhancing actions. If these actions were a surprise to investors, discount firms would have high returns due to high *ex-post* (unexpected) returns, not due to high *ex-ante* (expected) returns.

Looking at simple total excess returns, panel B of Table II shows that predictable returns on diversified firms are not being driven by discount firms who happened to become more focused during the sample period. Almost all of the differential is due to premium firms underperforming their industry benchmarks. It is harder to tell a story about increasing corporate focus consistent with low returns for premium firms but not high returns for discount firms.[6]

Second, we examine the pattern of differential returns earned over time. If the differential returns were concentrated in one specific time period, it would suggest that the differential returns just happened to occur during our sample, and could have been a surprise to investors. If the differential returns were positive year after year, it would suggest that expected differential returns are positive. Whatever the role of value-enhancing actions, if differential returns are consistently positive over time, they cannot be caused by surprises.

Table III displays evidence on the time-series of annual differential returns on the two strategies in Table II, Panel C, $R - \overline{R}$. For each of the 18 years, we report simple total excess returns for the 12-month period ending in June. Sorting by *q*, differential returns are positive in 14 years; sorting by m, differential returns are positive in 15 years. The pattern appears just as strong at the end of the sample as at the beginning. The time patterns show that higher returns on discount firms are not just lucky draws that surprise investors.

More general evidence from other research also supports the idea that these return patterns are not just random. The pattern in returns in diversified firms is an example of the more general "value effect" in security returns: subsequent returns are negatively correlated with value levels. For example, looking prior to our sample period, Davis, Fama, and French (2000) show a consistent value effect in US equities going back to the 1920's.

Having documented that there is substantial variation in expected returns across diversified firms, we next turn to explaining the sources of this return predictability.

III. Risk, liquidity, and mispricing

In judging *whether* expected returns drive the diversification discount, it is not necessary to establish *why* expected returns on diversified firms and single-segment firms differ. This question is of independent interest, however. One explanation for our results is the value effect: stocks with high scaled prices have low subsequent returns. At least since Ball (1978), financial economists have argued that scaled price should contain information about future returns. Researchers have documented this effect in various contexts ranging from closed-end funds to international equities. Our contribution is to document a case of this value effect in order that the valuation of diversified firms is not misinterpreted as arising solely from differences in cash flows.

Explaining the value effect is beyond the scope of this paper, but in this section we take a first pass at three explanations for the predictability of diversified firm returns. First, we examine multifactor explanations based on risk. Second, we examine whether differences in liquidity explain excess values. Third, we examine the possibility of mispricing related to liquidity costs of trading.

A. Multifactor risk explanations

Table IV examines in more detail the differential returns earned by portfolio strategies which buy discount equities (and short the comparable single-segment equities) and short premium equities (and buy the comparable single-segment equities). It tests whether the Fama-French (1993) three-factor model can explain these differential returns. We use equity returns, not total firm returns, because that is what the three-factor model is designed to explain.

The first column shows the mean return on this strategy (the same number reported in the "Difference" column in Table II, Panel C). The regression results in the rest of the table show that while the differential return loads positively on the value factor, HML, the three-factor model does not explain these equal-weighted differential returns very well. Sorting by q, the three-factor model explains only 9 out of the 50 basis points of the return differential. Sorting by m, the three-factor model describes only 11 of the 43 basis points of the return differential. In summary, the patterns in diversified firm stock returns do not merely reflect loadings on the value factor.

This inability to explain returns is not unique to diversified firm returns. Fama and French (1993) find that for portfolios sorted on book-to-market and size, their three-factor model does a relatively poor job explaining the returns on the smaller portfolios. Since the differential returns in Table IV are equal-weighted, it is no surprise that the three-factor model fails to explain them. Along this dimension the differential returns on diversified firms are similar to general patterns related to book-to-market.

B. Liquidity

Capozza and Seguin (1999) reach similar conclusions to this paper. Based on a study of the real estate industry, they conclude that the diversification discount is not due to differences in cash flows, and so must be due to differences in required return. They find suggestive evidence that differences in liquidity (measured by equity trading volume) are positively related to differences in excess value. The idea is that investors demand higher expected returns to compensate for illiquidity.

An implication of Capozza and Seguin (1999), in line with Amihud and Mendelson (1986), is that one should observe high excess returns when diversified firms are less liquid than their comparable portfolio of single-segment firms, and low excess returns when diversified firms are more liquid. We test this implication using our sample of diversified firm excess returns. Following Capozza and Seguin (1998), we use the dollar volume of the firm's equity to measure liquidity. Since we look at equity volume, we examine simple equity returns. Again we form portfolios in July based on information on liquidity and excess value as of the previous December.

The sample includes stocks from both NASDAQ and NYSE/AMEX, trading environments in which volume has different meanings. To create a common measure of volume, we use the annual percentile ranking of each stock relative to the other stocks on its particular exchange (either NASDAQ or NYSE/AMEX) as our measure of volume. For each diversified firm, we calculate both its percentile ranking and the weighted average of the percentile ranking of the portfolio of matching single-segment firms, where the weighting again uses either assets or sales.

The left hand side of Table V shows results for liquidity and returns. It tests whether differences in returns are monotonically related to differences in liquidity. We sort both diversified firms and their particular matching single-segment portfolios into three liquidity groups, and calculate average monthly returns for the resulting nine configurations. For example, the upper left-hand corner of the table shows average excess returns on diversified firms for which both the firm and its matching portfolio are low liquidity positions. According to the hypothesis that return differences are a function of liquidity differences, excess returns should be decreasing as one moves northeast in this half of the table.

Table V shows that the predicted relation between excess returns and liquidity differences is basically present. As predicted by the hypothesis, the lower left corner has higher average excess returns than the upper right corner. Though the differences between those two corners are economically large for both sorts, those differences are not statistically significant in either case. When sorting by q, the difference is 36 basis points per month with an associated t-statistic of 1.06. The *m* sorts generate a difference of 39 basis points. That estimate has a t-statistic of 1.10.

C. Mispricing

An alternative hypothesis that explains our results is mispricing. A version of this hypothesis also has implications regarding liquidity and returns. If mispricing is more severe when it is difficult to arbitrage the mispriced assets, measures of arbitrage costs should be related to the predictability of returns (see also Shleifer and Vishny (1997)). Pontiff (1996) shows that closed-end fund excess values are farther from zero when trading costs are higher. Here, we assume that liquidity is negatively related to arbitrage costs and test whether portfolios of illiquid securities have more predictable returns.

In contrast to the hypothesis that liquidity is monotonically related to returns, the costly arbitrage view implies that as the illiquidity of either the diversified stocks or the comparable single-segment firms rise, the predictability of returns should rise. Returns should be most predictable (based on the level of excess value) when illiquidity makes it most difficult to take advantage of the mispricing.

The right half of Table V shows tests of the costly arbitrage hypothesis. It shows average excess return differentials between discount firms and premium firms. For example, the upper left-hand corner shows the difference between excess returns on discount firms and premium firms, where both sets of diversified firms and their matching portfolios have low liquidity. According to the hypothesis that returns become more predictable as illiquidity increases, differential excess returns should be decreasing as one moves southeast in this part of the table.

Table V shows that the predicted relation between differential excess returns and liquidity differences is weak at best. The hypothesis implies that the upper left corner should have higher average differential excess returns than the lower right corner, which is true for both sorting methods. However the differences are statistically insignificant (the *q* sorts produce a difference of 12 basis points with an associated t-statistic of 0.36 while sorting by *m* generates a difference of 0.30 with an associated t-statistic of .97). Moreover, there is no obvious pattern of decreasing differential returns as one moves southeast across all nine portfolios.

In summary, we find no statistically convincing evidence linking liquidity-based explanations suggested by Capozza and Seguin (1998) and Amihud and Mendelson (1986) to our results. We also find no evidence supporting costly arbitrage explanations like those in Pontiff (1996). However, both investigations are certainly far less complete than previous work. We do find that differential returns are related to returns on the value factor of Fama and French (1993), but not well explained by their model. Thus we are unable to answer the question of why expected returns on diversified firms and single-segment firms differ; we are only able to document that they do differ.

IV. Present value relations

In this section we study the variance of excess values and use a dynamic model of returns and value ratios to decompose the cross-sectional variance into components due to cash flow and returns. The variance of excess values, Var($q_t - \overline{q}_t$) or Var($m_t - \overline{m}_t$), is the cross-sectional variance across all firm-years (which is shown in standard deviation form in Table I). This is the same object of interest in any regression with excess values as the dependent variable, as performed in the many papers on the diversification discount.

The Campbell and Shiller (1988) log-linear approximation to the definition of return in equation (1) is:

$$r_{t+1} \approx \rho p_{t+1} + (1-\rho) d_{t+1} - p_t + k \qquad (9)$$

where r is a continuously compounded return and lower case letters indicate natural logs. *k* is an constant coming from the approximation, which drops out below.

The parameter ρ is the inverse of one plus the ratio of dividends to market value, and is a discounting parameter that is close to one. In the context of this paper, dividends include interest payments. Using our assumptions about corporate debt returns, we calculated ρ and found it to be 0.96 for both diversified firms and for single-segment firms.[7] Thus we use 0.96 in our calculations.

Equation (9) holds either for diversified firms or for portfolios of single-segment firms. Subtracting the two,

$$r_{t+1} - \overline{r}_{t+1} = \rho\left(p_{t+1} - \overline{p}_{t+1}\right) + (1-\rho)\left(d_{t+1} - \overline{d}_{t+1}\right) - \left(p_t - \overline{p}_t\right) \qquad (10)$$

In equation (10), one can scale the portfolio of single-segment firms so that it has the same level of sales or assets as the diversified firm, by multiplying prices and dividends by the ratio of the scaling variables. This renormalization has no effect on the left side of the equation, and allows one to use value ratios instead of actual prices in equation (10). It also means that dividends should be interpreted as the ratio of dividends to sales or to assets.

Iterating (10) forward and taking expected values of both sides, excess value is

$$p_t - \bar{p}_t = (1 - \rho) E_t \sum_{j=0}^{\infty} \rho^j \left(d_{t+j+1} - \bar{d}_{t+j+1}\right) - E_t \sum_{j=0}^{\infty} \rho^j \left(r_{t+j+1} - \bar{r}_{t+j+1}\right) \qquad (11)$$

This equation imposes the condition that the log dividend price ratio does not follow an explosive process. Introducing some notation, equation (11) can be rewritten as

$$p_t - \bar{p}_t = \eta_d - \eta_r \qquad (12)$$

Excess values consist of two parts. The first, η_d, is the sum of discounted future excess dividends (multiplied by 1-ρ). The second, η_r, enters with a negative sign and is the sum of discounted future excess returns. Equation (11) is a completely atheoretical approximation to a dynamic accounting identity. It does not assume that financial markets are efficient or that market participants are rational. The terms "expected returns" and "expected dividends" refer to the rational expectation of returns and dividends, where the rational person is the econometrician not necessarily the investor.

A. Estimating the dynamic behavior of discounts and returns

Section II showed that excess values are related to subsequent returns using the standard, non-parametric, portfolio approach. In contrast, in this section we take a highly parametric approach that imposes homogeneity across all firms and years. We model the evolution of returns and value ratios using a vector autoregression (VAR). Let

$$\mathbf{x_t}' = [r_t, \bar{r}_t, p_t, \bar{p}_t] \qquad (13)$$

be the vector of returns and value ratios. We can represent the joint time-series behavior of returns and excess values using a first-order VAR:

$$\mathbf{x_{t+1} = c + Ax_t + e_{t+1}} \qquad (14)$$

Where **A** is a 4x4 matrix of coefficients, **c** is a 4x1 vector of constants, and **e** is a 4x1 vector of error terms. Define **e1** as the vector [1 0 0 0]' and **e2** as [0 1 0 0]'. After matrix algebra using equation (14), one can calculate the sum of discounted expected returns as

$$h_r = (\mathbf{e1}' - \mathbf{e2}')(I - r\mathbf{A})^{-1}\mathbf{A}\mathbf{x_t} - (\mathbf{e1}' - \mathbf{e2}')(I - r\mathbf{A})^{-1}(\mathbf{I} - r\mathbf{I})^{-1}\mathbf{c} \qquad (15)$$

Using equation (12), h_d is then simply calculated as $p_t - \overline{p}_t + h_r$.

The second term in equation (15) is a constant term that is the same for all firms. As discussed before, our goal is to examine the variance of excess values across firms, not to explain the average discount. In calculating variances, the second term in equation (15) plays no role.

We estimate **A** using an annual VAR with log value ratios and continuously compounded returns. The VAR is estimated using four OLS regressions. The regressions require that the firm has annual returns and excess value ratios in both year t+1 and year t (so that the firm must exist from the end of year t-1 to the end of year t+1). The data requirements cut the sample size substantially, compared to Table II.

Table VI shows VAR results. The first row, for example, shows coefficients from an OLS regression of annual diversified firm continuously compounded total returns on lagged returns and lagged value ratios, where the regression pools all firm-years. Again, each firm's total return is the weighted average of returns on the firm's equity and aggregate bond returns, using the firm's beginning of year debt ratio. The standard errors have been adjusted for correlation of the residuals within years, and for heteroskedasticity.[8]

Table VI shows that lagged own value ratio is a strong and reliable predictor of future firm returns. The negative coefficient on lagged value ratio (-0.11 using *q* and

-0.05 using *m*) reflects the value effect. Firms with high scaled prices have low subsequent returns.

Industry value ratios seem to contain no predictive information for firm returns or industry returns.[9] For value ratios, there is some tendency for firm ratios to move towards industry ratios, indicated by the coefficient of 0.05 on lagged industry value ratios. Since industry value ratios are not helpful in forecasting returns, this convergence probably reflects movement in the scaling variable (either sales or book assets). Both firm value ratios and industry value ratios are strongly persistent (with coefficients of above 0.8 on own lags).

Using the coefficients of **A** defined by the regression coefficients, we calculate $\boldsymbol{h}_d$ and $\boldsymbol{h}_r$ and decompose the variance of excess values. The variance decomposition implied by the dynamics of returns and excess values uses the fact that $\text{Var}(p_t - \overline{p}_t)$ = $\text{Var}(\boldsymbol{h}_d)+\text{Var}(\boldsymbol{h}_r)-2\text{Cov}(\boldsymbol{h}_r, \boldsymbol{h}_d)$. Table VI shows the contribution of these three components, normalizing each component by $\text{Var}(p_t - \overline{p}_t)$ so that they sum to one. The variance decomposition is a highly nonlinear function of the regression coefficients; asymptotic standard errors are calculated using the delta method and the estimated covariance matrix (see Campbell (1991) and Hodrick (1992)).

The variance decomposition shows that slightly more than half (54 percent using *q* and 0.57 percent using *m*) of the cross-sectional variance of excess values can be explained by the differences in expected future cash flows. This fraction is significantly less than one. The remaining variation in excess values is attributable to differences in future returns and to the covariation term. The fractions of variance contributed by future returns and by covariance of returns with cash flows are each significantly different from zero. This decomposition shows the quantitative importance of predictable returns in explaining variation in excess values. If returns were totally unpredictable (so that all the coefficients in the predictive equation for returns were zero), then the procedure would mechanically attribute 100 percent of the variation to differences in future cash flows and zero to the other terms.

Another implication of the variance decomposition is that if one runs a cross-sectional regression with excess value on the left-hand side and only cash-flow related terms on the right-hand side, one should not be able to get an R-squared over 54-57 percent (assuming the cash flow variables used are uncorrelated with expected returns). For example, Lang and Stulz (1994) and Berger and Ofek (1995) regress excess values on size, earnings, investment, etc. They report R-squared's in the 5-11 percent range, so the implied upper bound is not hard to satisfy.

The covariance term (28 percent using *q* and 36 percent using *m*) is substantial. The negative correlation of h_r and h_d means that when a diversified firm has a high expected return (and thus a low excess value due to differences in returns), it also tends to have a low excess value due to differences in cash flows. Put differently, the return effect tends to magnify the cash flow effect. One could describe this covariance as consistent with "over-reaction," in the sense that firms with low cash flow prospects tend to have bigger discounts than suggested by cash flows alone.

B. Regression sample and robustness checks

Unlike Table II, Table VI's annual returns do not represent implementable trading strategies. First, the returns only include firms with complete returns for the entire year. Thus both diversified and single-segment returns are subject to survivorship bias.

Second, the returns are from January 1 to December 31; there may be a substantial time lag between January 1 and the time a firm's data actually becomes available.

To evaluate the importance of these selection biases, we here compare the return characteristics of Tables II and VI. Calculating the annual continuously compounded total return for Table VI's sample, and comparing subsequent returns on discount firms and premium firms, produces a differential return of 3.7 percent (31 basis points per month) using *q* and 4.0 percent (34 basis points per month) using *m.* Thus the results on differential $r - \bar{r}$ are nearly identical to the last row of Table II for *q*, and are similar for *m.*

The homogenous VAR estimated in Table VI is obviously a gross simplification of reality. See Campbell (1991) and Hodrick (1992) for an examination of how well VAR's work in the case of aggregate returns, and Vuolteenaho (1999) for an examination of cross-sectional VAR's similar to ours. Given the traditional emphasis on medians in the diversification literature, one might also worry that outliers heavily influence our results. One way of assessing the ability of our simple model to represent reality is to see whether it can match important characteristics of the data. Using the results from the first two regressions in Table VI, we form annual forecasts for differential returns for discount firms and for premium firms. We find that the forecasts closely match the realized differential returns: the forecast is 4.0 percent (vs. 3.7 percent actual) using *q* and 3.8 percent (vs. 4.0 percent actual) using *m.*

We now report further robustness checks on Table VI. First, Fama-Macbeth estimation produces regression results similar to the ones in Table VI, with the fraction of variance attributable to $\text{Var}(\boldsymbol{h}_d)$ rising to 0.64 for *q* and 0.60 and *m.* [10] Second, we tried dropping extreme values, defined as any observation in which any one of the eight current or lagged variables was in the top or bottom 5 percent of its distribution. Using this sample (about half as large as the baseline sample) produces similar results, with the fraction of variance attributable to $\mathrm{Var}(h_d)$ of 0.58 for *q* and 0.67 and *m*. Third, adding fixed year effects also produces similar results, with the fraction of variance staying at 0.54 for *q* and 0.57 for *m* (here "variance" means the variance of deviation from annual average).

In summary, we have no reason to believe that either selection biases or outliers are quantitatively important for our variance decomposition.

C. Deviations from firm-specific averages

The homogenous model of Table VI forces all firms to have the same coefficients. This constraint implies that all firms have the same long-run value ratio, for example, and does not allow different firms to have permanently different expected returns or different expected cash flows. An alternative estimation strategy is to allow firm-specific fixed effects. By including firm fixed effects in the regression, one allows the long-run level of excess value to differ for each firm and models the dynamic behavior of excess values around this long-run mean. By "firm fixed effects" we mean a different dummy variable for each diversified firm and each matching portfolio of single-segment firms. Fixed firm effects substantially change the nature of the variance decomposition. Of the cross-sectional variance in excess value, about 69 percent for *q* (74 percent for *m*) is explained by firm fixed effects alone. Fixed effects sweep away the constant firm-specific component of both cash flows and returns. Instead of decomposing the cross-sectional variance of excess values, one is now decomposing the cross-sectional variance of deviations of excess values from firm-specific means.

Thus a decomposition of within-firm variation in excess values is likely to be substantially different than a decomposition of cross-sectional variation. However, since several papers investigating the diversification discount use firm fixed effects regressions (for example Rajan, Servaes and Zingales (1999) and Campa and Kedia (1999)), it is useful to estimate the relative contributions of cash flows and returns in this situation.

A complication in estimating the VAR is that fixed effects estimation in panel data, in the presence of a lagged dependent variable, produces biased results (which are large when the number of periods is small and the variable is highly autocorrelated). A standard remedy is to first difference the equation and use lagged levels to instrument (see Hsiao (1986)). Table VII shows instrumental variables estimates of the first difference of equation (14), $\Delta\mathbf{x}_{\mathbf{t+1}} = \mathbf{A}\Delta\mathbf{x}_{\mathbf{t}} + e_{\mathbf{t+1}}$, where we instrument for $\Delta\mathbf{x}_t$ using $\mathbf{x}_{t-1}$.

In general, the coefficients of **A** in Table VII are similar to those in Table VI. The variance decomposition results are also similar, with an attribution to Var(h_d) of 0.60 for *q* and 0.42 for *m*. Although these point estimates are similar, the standard errors rise substantially so that for *q*, one can no longer reject the hypothesis that all variance in excess value deviations is due to cash flow components.

Summarizing the robustness results, while different methodologies produce somewhat different estimates, all estimates of the fraction of cross-sectional variance attributable only to cash flows are less than one. The estimates range from 0.42 to 0.75.

D. Are diversified firms special?

As discussed previously, one explanation of our results is simply that the value effect is present in diversified firm stock returns. This explanation leads naturally to the question of whether diversified firms are in any way different from single-segment firms. Single-segment firms also have value ratios that (for individual firms) are not always identical to the value ratios of their matching portfolio. These differences again must be due to either differences in future returns or in future cash flows. Do the sources of variation in industry-adjusted value ratios look the same for single-segment firms?

To answer this question, we formed excess value ratios and excess returns for single-segment firms. For each single-segment firm, we form a benchmark portfolio of other single-segment firms in the same industry, using the same matching and weighting algorithm as before. When forming the industry benchmark, we exclude the target firm from the set of possible matching firms. The resulting sample of firms is larger than the sample of diversified firms, with about 22 thousand observations on firms that meet the VAR's data requirements.

Table VIII shows results from a vector autoregression using single-segment firms instead of diversified firms. Looking first at the regression coefficients, the results are quite similar to Table VI. Like diversified firms, single-segment firm returns are negatively related to their value ratio. Like diversified firms, single-segment firms have excess value ratios that are highly persistent and that have a slight tendency to converge towards industry benchmark levels.

Looking at the variance decomposition, the comparison is slightly more ambiguous. For *m*, the variance decomposition for single-segment firms looks quite similar to the variance decomposition for diversified firms, with the fraction of variance attributable to Var(h_d) at 67 percent. For *q*, the results are somewhat different. The fraction of variance attributable to Var(h_d) is 89 percent, and one cannot reject the hypothesis that the fraction is one.

On the other hand, there certainly is some predictability of returns and that predictability creates sizeable and statistically significant variance of h_r which happens to be offset by the covariance term. And the confidence interval for variance attributable to Var(h_d) for *q* goes down to 0.49, so Table VIII does not present strong evidence that single-segment firms are different than diversified firms.

These findings suggest that there is nothing special about diversified firms. The effect we find, that excess values are negatively correlated with subsequent returns, simply reflects the well-known value effect in stocks. Stocks with high scaled prices have low subsequent returns, and this holds true for both single-segment and multisegment firms.

V. Conclusions

We show that firms with diversification discounts have high subsequent returns and firms with premia have low subsequent returns. This pattern in diversified firm returns is a manifestation of the familiar value effect, previously documented in the cross section of average equity returns for all firms. Current asset valuations are negatively related to future returns.

Since returns are consistently higher for discount firms than premium firms, we argue that expected returns are also higher for discount firms than premium firms. The pattern of returns does not appear to reflect surprises or news that happened to occur in the sample period. Thus the diversification puzzle is both an expected return phenomenon and an expected cash flow phenomenon.

Using simple present value relations and a first order vector autoregression, we estimate the fraction of the cross-sectional variance of excess values that can be attributed to differences in future cash flows. We find that slightly more than half of the variance is due to future cash flow differences between diversified firms and single-segment firms, with the remaining half due to differences in future returns and the covariance between returns and cash flows.

Since our results are based on the cross-sectional variation in excess values, they say nothing about why the average diversified firm is worth less than the sum of its parts. Nevertheless, one can speculate that the same effect that explains deviations from average might also explain the average.

A. APPENDIX

A. Data Sources and Definitions

Our data on segments comes from several Current and Research segment files obtained from Wharton Research Data Services in April 1999. Our firm-level Compustat and CRSP data comes from the University of Chicago's CRSP, in August 1999. Total returns on the Lehman Brothers Corporate Bond Index are provided by Ibbotson Associates. In our calculation of market value, we use CRSP market equity.

We define our Q measure as {market capitalization (from CRSP) + book assets (data item 6) - book equity (data item 60) - deferred taxes (data item 74)} / book assets (data item 6). We define leverage as total debt / (total debt + market capitalization) where total debt is defined as long-term debt (data item 9) + debt in current liabilities (data item 34) + redemption value of preferred stock (data item 56). We define our measure M as (total debt + market capitalization) / net sales (data item 12).

In some cases, CRSP recorded delisting prices several months after the security ceased trading and thus after a period of missing returns. In these cases, we calculated the total return from the last available price to the delisting price, and pro-rated this return over the intervening months.

For firms with multiple classes of stock, in calculating market equity and stock returns, we aggregate all separate classes of stock together into one value-weighted portfolio.

B. Screening

We drop firm-years if any of the following conditions hold: it has missing or nonpositive firm sales or firm assets; missing or nonpositive (for any segment) segment sales or segment assets; has any segment which Compustat assigns an 1-digit SIC code of 0, 6 (financial), or 9 (largely "NO OPERATIONS"); the sum of segment sales is not within 1 percent of the total sales of the firm; the firm changes the month of its fiscal year-end such that in December of year t-1 our latest information is from year t-2. We also drop firms (such as GM) who report multiple firm totals for the same year (firms which report different Compustat total sales for the same CRSP permanent company identifier number).

When calculating monthly returns, we also impose a constraint to deal with Compustat backfilling (a practice which may induce survivorship bias). We require that firms have at least two years of COMPUSTAT data prior to year t.

FOOTNOTES

[1] In interpreting the values it is important to note that logarithms are concave functions. Since firm-level variables are more volatile than industry-level variables, average log ratios tend to be negative. For example, mean Q is above mean $\overline{Q}$, but mean $q - \overline{q}$ is negative.

[2] We do not require that either the diversified firm or the single-segment firm is present for the entire period. If a firm exits from the CRSP database, we drop it from the portfolio using the delisting return.

[3] In the context of diversified firms, Lang and Stulz (1995) argue that the ex-post performance of diversified firms is a potentially misleading measure of ex ante valuation effects because of (p. 1253) " unexpected technological and regulatory changes."

[4] Using continuously compounded excess returns, diversified firms have negative excess returns. Using simple total excess returns, diversified firms have positive excess returns. This apparent contradiction reflects the concavity of natural logs mentioned in footnote 1.

[5] For the ten differential returns reported in Table II, the mean differential ranges between -0.06 and 0.13. The differential is negative four out of ten times. All ten estimates are insignificant.

[6] Another piece of evidence against this argument appears in section IV, where we examine differential returns for those firms that have complete annual returns for a given calendar year. These annual returns are relevant to the extent that this *ex-post* story involves value-enhancing actions that result in delisting from CRSP. The results using annual returns are quite similar to the results from Table II, showing the difference in

returns for discount and premium firms is not driven by firms that delist in the subsequent year.

[7] For each firm, we calculated the ratio of annual cash flow to end-of-year market value using dividend payments and interest payments. For interest payments, we used the firm's leverage ratio and the income component of the Lehman Brothers Corporate Bond Index. We found that average ρ was 0.956 for diversified firms and 0.962 for the comparable portfolio of single-segment firms (using either asset weighting or sales weighting). Campbell (1991) uses a monthly ρ of 0.9962 that translates into 0.955 annually for the aggregate stock market.

[8] The robust standard errors allow for clustered sampling (dependence of observations within each year). See Rogers (1993).

[9] Cohen and Polk (1999) decompose book-to-market ratios into inter- and intra-industry components, and similarly find that the value effect is primarily intra-industry.

[10] Stambaugh (1999) discusses a small sample bias in time-series predictive regressions of returns on lagged scaled values. Since our regression has a time-series dimension as well as a cross-sectional dimension, it is subject to this bias. Since the pooled OLS results are so similar to the Fama-Macbeth results (which are based on purely cross-sectional regressions with no time-series dimension), the bias is unimportant in our sample.

References

Amihud, Yakov and Haim Mendelson, 1986, Asset pricing and the bid ask spread, *Journal of Financial Economics* 17, 233-249.

Ball, Ray, 1978, Anomalies in relationships between securities' yields and yield-surrogates, *Journal of Financial Economics* 6, 103-126.

Berger, Philip G., and Eli Ofek, 1995, Diversification's effect on firm value, *Journal of Financial Economics* 37, 39-66.

Berger, Philip G., and Eli Ofek, 1996, Bustup takeovers of value-destroying diversified firms *Journal of Finance* 51, 1175-1200.

Campa, Jose Manuel and Simi Kedia, 1999, Explaining the diversification discount, NYU working paper.

Campbell, John Y., 1991, A variance decomposition for stock returns, *Economic Journal* 101, 157-179.

Campbell, John Y. and Robert J. Shiller, 1988, Stock prices, earnings, and expected dividends, *Journal of Finance* 43, 661-676.

Capozza, Dennis R. and Paul J. Seguin, 1999, Focus, Transparency and Value: the REIT Evidence, *Real Estate Economics*, Winter 1999.

Chevalier, Judith, 1999, Why do Firms Undertake Diversifying Mergers? An Examination of the Investment Policies of Merging Firms, working paper, http://gsb-www.uchicago.edu/fac/judith.chevalier/research/

Cohen, Randolph B. and Christopher Polk, 1998, The Impact of Industry Factors in Stock Returns, working paper, http://www.kellogg.nwu.edu/faculty/polk/research/

Comment Robert, and Gregg A. Jarrell, 1995, Corporate Focus And Stock Returns, *Journal of Financial Economics* 37: 67-87

Davis, James L, Eugene F. Fama, and Kenneth R. French, 2000, Characteristics, Covariances, and Average Returns: 1929 to 1997, *Journal of Finance* forthcoming

Denis, David J., Diane K. Denis, and Atulya Sarin, 1997, Agency problems, equity ownership, and corporate diversification, *Journal of Finance* 52, 135-160.

Elton, Edwin J., 1999, Expected Return, Realized Return, and Asset Pricing Tests, *Journal of Finance* forthcoming August.

Fama, Eugene F. , 1998, Market efficiency, long-term returns, and behavioral finance *Journal of Financial Economics* 49, 283-306.

Fama, E. F. and K. R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, 33, 3-56.

Hecht, Peter, 1999, The cross section of expected firm, not equity, returns, working paper

Hodrick, Robert J., 1992, Dividend yields and expected stock returns: Alternative procedures for inference and measurement, *Review of Financial Studies* 5, 357-386.

Hsiao, Cheng, 1986. *Analysis of panel data* (Cambridge University Press, Cambridge).

Lamont, Owen, 1997, Cash flow and investment: Evidence from internal capital markets, *Journal of Finance* 52, 83-109.

Lang, Larry and René Stulz, 1994, Tobin's Q, Corporate Diversification, and Firm Performance, *Journal of Political Economy* 102, 1248-1280.

Maksimovic, Vojislav and Gordon Phillips, 1999, Do Conglomerate Firms Allocate Resources Inefficiently?, working paper, http://www.rhsmith.umd.edu/Finance/gphillips/

Morck, R., A. Sheifer, and R. Vishny, 1990, Do managerial objectives drive bad acquisitions?, *Journal of Finance* 45, 31-48.

Pontiff, Jeffrey, 1996, Costly arbitrage: Evidence from closed-end funds, *Quarterly Journal of Economics* CXI, 1135-1151.

Rajan, Raghuram G., Henri Servaes, and Luigi Zingales, 1999, The Cost of Diversity: Diversification Discount and Inefficient Investment, forthcoming, *Journal of Finance*

Rogers, William, 1993, Regression standard errors in clustered samples, *Stata Technical Bulletin* 13, 19-23.

Scharfstein, David S., 1998, The Dark Side of Internal Capital Markets II, NBER Working Paper No. 6352

Scharfstein, David S. and Jeremy C. Stein, 1997, The Dark Side of Internal Capital Markets: Divisional Rent-Seeking and Inefficient Investment, NBER Working Paper No.5969

Servaes, Henri, 1996, The value of diversification during the conglomerate merger wave, *Journal of Finance* 51, 1201-1225.

Shleifer, Andrei, and Robert W. Vishny, 1997, The limits of arbitrage, *Journal of Finance* 52, 35-55.

Stambaugh, Robert F., 1999, Predictive Regressions, NBER Technical Working Paper 240.

Vuolteenaho, Tuomo, 1999, What drives firm level stock returns?, working paper

Table I
Value ratios and leverage ratios for diversified firms, 1979-1997

Lower case letters indicate natural logarithm. *Q* is the market-book ratio. *M* is the market-sales ratio. *D* is the debt ratio, defined as the book value of the debt divided by the book value of the debt plus the market value of the equity. Comparable portfolio variables are

$$\overline{Q} = \sum_{j=1}^{n} wa_j \left[\left(\sum_{i=1}^{N_j} A_i \right)^{-1} \sum_{i=1}^{N_j} A_i Q_i \right], \ \overline{Q}_{MEDIAN} = \sum_{j=1}^{n} wa_j \left(median\left\{ Q_1, Q_2, ..., Q_{N_j} \right\} \right),$$

and $\overline{D}_{ASSET\ WEIGHT} = \sum_{j=1}^{n} wa_j \left[\left(\sum_{i=1}^{N_j} A_i \right)^{-1} \sum_{i=1}^{N_j} A_i D_i \right]$, where wa_j is the fraction of the firm's assets that are in segment j; Q_i, and A_i are the q ratio and book assets of single-segment company i; and segment j's industry has N_j single-segment firms. The comparable portfolio variables for *M* are defined similarly using sales weights. The sample consists of all diversified firms for which at least 5 matches could be found for every segment. "Value Weight" indicates weighting by market value of the diversified firm's equity. There are 14962 annual observations.

Variable	Mean	Median	Std. Dev.	Min	Max	Mean, Value Weight	Fraction Positive
Q	1.35	1.15	0.72	0.35	16.27	1.98	1.00
$\overline{Q}$	1.56	1.44	0.56	0.64	8.05	1.83	1.00
$\overline{Q}_{MEDIAN}$	1.34	1.24	0.42	0.62	6.15	1.56	1.00
M	1.12	0.75	1.44	0.02	57.20	1.89	1.00
$\overline{M}$	1.28	1.06	0.87	0.11	12.98	1.76	1.00
$\overline{M}_{MEDIAN}$	1.09	0.87	0.79	0.08	12.74	1.49	1.00
$q - \overline{q}$	-0.18	-0.19	0.39	-2.02	2.17	0.02	0.28
$q - \overline{q}_{MEDIAN}$	-0.05	-0.07	0.36	-1.94	2.31	0.16	0.40
$m - \overline{m}$	-0.30	-0.29	0.63	-3.78	2.97	-0.01	0.30
$m - \overline{m}_{MEDIAN}$	-0.13	-0.13	0.61	-3.78	3.16	0.18	0.40
$D - \overline{D}_{ASSET\ WEIGHT}$	0.05	0.02	0.23	-0.71	0.83	-0.06	0.53
$D - \overline{D}_{SALES\ WEIGHT}$	0.06	0.02	0.22	-0.70	0.83	-0.05	0.55

Table II
Time-series average monthly returns for diversified firms, 1980-1998

Average monthly returns in percent. Excess returns are returns in excess of the industry benchmark. Total returns are a linear combination, using firm leverage, of returns on firm equity and returns on aggregate corporate debt. Panel A has an average of 838 diversified firms per month, 1980:7-1998:12. Panels B-D have an average of 714 diversified firms per month, 1980:7-1998:12. Panel E has an average of 750 diversified firms per month, 1980:1-1998:12. Standard errors are in parentheses.

Excess Value Measure	All Firms	Premium Firms	Discount Firms	Difference
A) R: Simple total raw returns, July year t - June year t+1				
Based on *q* and	1.19	0.97	1.27	0.30
asset weights	(0.23)	(0.26)	(0.22)	(0.08)
Based on *m* and	1.19	0.99	1.27	0.28
sales weights	(0.23)	(0.24)	(0.22)	(0.06)
B) $R - \overline{R}$: Simple total excess returns, July year t - June year t+1				
Based on *q* and	-0.04	-0.25	0.04	0.29
asset weights	(0.07)	(0.09)	(0.08)	(0.11)
Based on *m* and	-0.07	-0.25	0.00	0.26
sales weights	(0.07)	(0.08)	(0.08)	(0.08)
C) $R - \overline{R}$: Simple equity excess returns, July year t - June year t+1				
Based on *q* and	0.02	-0.34	0.15	0.50
asset weights	(0.06)	(0.09)	(0.08)	(0.11)
Based on *m* and	-0.02	-0.32	0.10	0.43
sales weights	(0.06)	(0.08)	(0.08)	(0.11)
D) $r - \overline{r}$: Continuously compounded total excess returns, July year t - June year t+1				
Based on *q* and	-0.27	-0.56	-0.16	0.40
asset weights	(0.07)	(0.09)	(0.08)	(0.11)
Based on *m* and	-0.29	-0.50	-0.21	0.30
sales weights	(0.07)	(0.08)	(0.08)	(0.08)
E) $r - \overline{r}$: Continuously compounded total excess returns, Jan. year t - Dec. year t				
Based on *q* and	-0.23	-0.46	-0.14	0.32
asset weights	(0.05)	(0.07)	(0.07)	(0.10)
Based on *m* and	-0.26	-0.44	-0.19	0.25
sales weights	(0.05)	(0.06)	(0.06)	(0.08)

Table III
Annual differential returns on diversified firms, 1980-1998

Annual percent returns on the simple total excess return differential strategy in the last column of Table II, Panel B, July year t - June year t+1.

	$(R-\bar{R})_{DISCOUNT} - (R-\bar{R})_{PREMIUM}$	
Year ending June of	Using *q* and assets weights	Using *m* and sales weights
81	-9.21	-2.35
82	18.62	13.65
83	-4.52	1.58
84	15.62	12.69
85	3.53	2.24
86	0.49	0.22
87	6.59	5.77
88	5.74	3.99
89	3.89	2.32
90	-2.73	-4.30
91	-3.96	-5.93
92	5.56	7.67
93	5.16	5.07
94	9.51	7.84
95	2.14	2.10
96	4.30	4.50
97	3.47	2.43
98	7.53	9.07

Table IV
Three-factor regressions on simply monthly equity returns, 1980-1997

$$(R-\overline{R})_{DISCOUNT} - (R-\overline{R})_{PREMIUM} = a + bRMRF + sSMB + hHML$$

The dependent variable is the difference between simple equity excess returns on discount firms and premium firms, from the last column of Table II, Panel C. The independent variables are from Fama and French (1993) and include RMRF, the market return minus the risk-free return; SMB, the size factor; and HML, the market-to-book factor. The mean repeats information from Table II which has sample 1980:7-1998:12. The regression results reflect the sample 1980:7-1997:12. Standard errors are in parentheses.

	Mean	a	b	s	h	R2
$(R-\overline{R})_{DISCOUNT} - (R-\overline{R})_{PREMIUM}$ sorted on $q-\overline{q}$	0.50 (0.11)	0.41 (0.10)	-0.01 (0.03)	0.17 (0.04)	0.37 (0.04)	0.33
$(R-\overline{R})_{DISCOUNT} - (R-\overline{R})_{PREMIUM}$ sorted on $m-\overline{m}$	0.43 (0.11)	0.32 (0.09)	0.02 (0.02)	0.19 (0.04)	0.38 (0.04)	0.36

Table V
Dollar volume and monthly returns on diversified firms, 1980-1998

Dollar volume is the average of all available monthly dollar trading volume of a firm from January t-1 to December t-1. Each year, we calculate the dollar volume percentile ranking on each type of exchange (NYSE/AMEX or Nasdaq) for all firms, both diversified and single-segment. We then calculate the (asset or sales-weighted) matched dollar volume percentile ranking for each diversified firm's single-segment matching portfolio. Each year we sort all diversified firms on the diversified firm's dollar volume percentile ranking into three portfolios. We independently sort all diversified firms on the diversified firm's matched portfolio dollar volume percentile ranking. From the intersection of these two sorts we form nine portfolios. We then calculate the equal-weighted excess return over the period July t to June t+1 on these portfolios as well as the difference between the excess returns on the discount and premium subsets within each portfolio. We report below the time-series average return on these portfolios. The nine portfolios have an average of 74 stocks over the 19 year period with approximately seventy percent of the diversified firms within each of the nine portfolios being discount firms. The sample period is 1980:7-1998:12. Nasdaq firms are in the sample from 1984:7-1998:12 as a full year of volume information for those firms becomes available on CRSP in 1983. Standard errors are in parentheses.

			$R - \overline{R}$			$(R - \overline{R})_{DISCOUNT}$ - $(R - \overline{R})_{PREMIUM}$		
			Diversified firm volume					
			Low	Medium	High	Low	Medium	High
Based on *q* and asset weights	Single segment firm volume	Low	0.16	-0.14	-0.22	0.44	0.51	0.07
			(0.16)	(0.10)	(0.16)	(0.30)	(0.22)	(0.19)
		Medium	0.36	0.10	-0.09	0.68	0.54	0.19
			(0.18)	(0.12)	(0.11)	(0.34)	(0.22)	(0.19)
		High	0.14	-0.07	-0.09	0.84	0.74	0.32
			(0.24)	(0.13)	(0.09)	(0.44)	(0.23)	(0.15)
Based on *m* and sales weights	Single segment firm volume	Low	0.13	-0.12	-0.29	0.67	0.37	0.47
			(0.15)	(0.11)	(0.16)	(0.30)	(0.22)	(0.20)
		Medium	0.31	0.03	-0.07	0.58	0.36	0.20
			(0.17)	(0.11)	(0.12)	(0.33)	(0.22)	(0.18)
		High	0.09	-0.11	-0.13	-0.32	0.48	0.36
			(0.25)	(0.13)	(0.09)	(0.56)	(0.26)	(0.15)

Table VI
Dynamic behavior of annual returns and values ratios for diversified firms and matching portfolios, 1981-1997

Vector autoregression results using pooled OLS estimation. The regression is $\mathbf{x_{t+1} = c + Ax_t + e_{t+1}}$ where $\mathbf{x_t}' = [r_t, \bar{r}_t, p_t, \bar{p}_t]$ is the vector of returns and value ratios. The sample consists of 8698 diversified firm-years that have excess values and excess returns for two consecutive years. Using the estimated coefficients, we forecast future returns for each firm and calculate h_d and h_r. h_d is a function of the sum of discounted future excess dividends, and h_r is the sum of discounted future excess returns. We decompose the variance of excess values using Var($p_t - \bar{p}_t$) = Var(h_d)+Var(h_r)-2Cov(h_r, h_d). The variances and covariances have been normalized by Var($p_t - \bar{p}_t$). The standard errors are calculated allowing for both heteroskedasticity and for the residuals to be correlated within each of the 17 years. Standard errors are in parentheses.

	Constant	r_t	$\bar{r}_t$	p_t	$\bar{p}_t$	R2	Var(h_d)	Var(h_r)	-2Cov(h_r, h_d)
				Using q and assets weights					
r_{t+1}	0.15	0.04	-0.15	-0.11	0.01	0.03	0.54	0.18	0.28
	(0.03)	(0.03)	(0.09)	(0.02)	(0.02)		(0.09)	(0.05)	(0.09)
$\bar{r}_{t+1}$	0.16	-0.02	-0.11	-0.02	-0.02	0.03			
	(0.03)	(0.02)	(0.10)	(0.02)	(0.03)				
p_{t+1}	0.04	-0.03	-0.08	0.82	0.05	0.70			
	(0.01)	(0.03)	(0.07)	(0.02)	(0.02)				
$\bar{p}_{t+1}$	0.10	-0.01	-0.15	0.00	0.86	0.70			
	(0.02)	(0.02)	(0.09)	(0.01)	(0.03)				
				Using m and sales weights					
r_{t+1}	0.12	0.01	-0.14	-0.05	0.01	0.03	0.57	0.07	0.36
	(0.02)	(0.03)	(0.08)	(0.01)	(0.02)		(0.08)	(0.03)	(0.05)
$\bar{r}_{t+1}$	0.15	-0.02	-0.11	-0.01	-0.03	0.04			
	(0.02)	(0.01)	(0.09)	(0.01)	(0.02)				
p_{t+1}	0.01	-0.06	-0.12	0.89	0.05	0.84			
	(0.02)	(0.03)	(0.10)	(0.01)	(0.01)				
$\bar{p}_{t+1}$	0.09	-0.03	-0.19	0.03	0.85	0.80			
	(0.02)	(0.02)	(0.12)	(0.01)	(0.02)				

Table VII
Dynamic behavior of first-differences in annual returns and values ratios for diversified firms and matching portfolios, 1982-1997

Vector autoregression results on differenced data using instrumental variables estimation. The regression is $\Delta\mathbf{x_{t+1}} = \mathbf{A}\Delta\mathbf{x_t} + \boldsymbol{e}_{\mathbf{t+1}}$ where $\Delta\mathbf{x_t}' = [r_t - r_{t-1}, \bar{r}_t - \bar{r}_{t-1}, p_t - p_{t-1}, \bar{p}_t - \bar{p}_{t-1}]$ is the vector of first-differenced returns and value ratios. The sample consists of 6761 diversified firm-years that have excess values and excess returns for three consecutive years. We instrument for $\Delta\mathbf{x}_t$ using $\mathbf{x}_{t-1}$. Using the estimated coefficients, we forecast future returns for each firm and calculate $\boldsymbol{h}_d$ and $\boldsymbol{h}_r$. $\boldsymbol{h}_d$ is a function of the sum of discounted future excess dividends, and $\boldsymbol{h}_r$ is the sum of discounted future excess returns. We decompose the variance of excess values using Var($p_t - \bar{p}_t$) = Var($\boldsymbol{h}_d$)+Var($\boldsymbol{h}_r$)-2Cov($\boldsymbol{h}_r, \boldsymbol{h}_d$). The variances and covariances have been normalized by Var($p_t - \bar{p}_t$). The standard errors are calculated allowing for both heteroskedasticity and for the residuals to be correlated within each of the 16 years. Standard errors are in parentheses.

	Constant	Δr_t	$\Delta \bar{r}_t$	Δp_t	$\Delta \bar{p}_t$	Var($\boldsymbol{h}_d$)	Var($\boldsymbol{h}_r$)	-2Cov($\boldsymbol{h}_r, \boldsymbol{h}_d$)
				Using *q* and assets weights				
Δr_{t+1}	0.01	0.04	-0.03	-0.26	-0.11	0.60	0.09	0.32
	(0.04)	(0.03)	(0.15)	(0.15)	(0.34)	(0.34)	(0.13)	(0.24)
$\Delta \bar{r}_{t+1}$	0.01	0.01	-0.03	-0.13	-0.13			
	(0.04)	(0.03)	(0.17)	(0.17)	(0.35)			
Δp_{t+1}	0.02	0.02	0.05	0.59	-0.09			
	(0.03)	(0.02)	(0.12)	(0.13)	(0.20)			
$\Delta \bar{p}_{t+1}$	0.01	0.04	0.02	-0.14	0.52			
	(0.03)	(0.02)	(0.14)	(0.13)	(0.30)			
				Using *m* and sales weights				
Δr_{t+1}	0.01	0.04	-0.05	-0.26	0.03	0.42	0.22	0.36
	(0.04)	(0.03)	(0.16)	(0.15)	(0.23)	(0.23)	(0.20)	(0.32)
$\Delta \bar{r}_{t+1}$	0.01	0.00	-0.05	-0.06	-0.05			
	(0.04)	(0.03)	(0.20)	(0.16)	(0.28)			
Δp_{t+1}	0.02	-0.03	0.08	0.60	0.02			
	(0.04)	(0.04)	(0.18)	(0.19)	(0.22)			
$\Delta \bar{p}_{t+1}$	0.02	0.04	0.00	-0.06	0.61			
	(0.04)	(0.05)	(0.23)	(0.19)	(0.27)			

Table VIII
Dynamic behavior of annual returns and values ratios for single-segment firms and matching portfolios, 1981-1997

Vector autoregression results using pooled OLS estimation. The regression is $\mathbf{x_{t+1}} = \mathbf{c} + \mathbf{A}\mathbf{x_t} + \mathbf{e_{t+1}}$ where $\mathbf{x_t}' = [r_t, \bar{r}_t, p_t, \bar{p}_t]$ is the vector of returns and value ratios. The sample is 22015 single-segment firm-years that have excess values and excess returns for two consecutive years. Using the estimated coefficients, we forecast future returns for each firm and calculate h_d and h_r. h_d is a function of the sum of discounted future excess dividends, and h_r is the sum of discounted future excess returns. We decompose the variance of excess values using Var($p_t - \bar{p}_t$) = Var(h_d)+Var(h_r)-2Cov(h_r, h_d). The variances and covariances have been normalized by Var($p_t - \bar{p}_t$). The standard errors are calculated allowing for both heteroskedasticity and for the residuals to be correlated within each of the 17 years. Standard errors are in parentheses.

	Constant	r_t	$\bar{r}_t$	p_t	$\bar{p}_t$	R2	Var(h_d)	Var(h_r)	-2Cov(h_r, h_d)
				Using *q* and assets weights					
r_{t+1}	0.13	0.05	-0.01	-0.08	-0.04	0.02	0.89	0.29	-0.18
	(0.03)	(0.02)	(0.07)	(0.02)	(0.02)		(0.20)	(0.12)	(0.31)
$\bar{r}_{t+1}$	0.14	-0.01	-0.01	0.00	-0.01	0.00			
	(0.03)	(0.01)	(0.08)	(0.01)	(0.03)				
p_{t+1}	0.05	-0.05	0.02	0.82	0.02	0.69			
	(0.02)	(0.02)	(0.05)	(0.02)	(0.02)				
$\bar{p}_{t+1}$	0.09	-0.03	-0.06	0.02	0.88	0.74			
	(0.02)	(0.01)	(0.08)	(0.01)	(0.03)				
				Using *m* and sales weights					
r_{t+1}	0.08	0.04	-0.05	-0.04	0.00	0.01	0.67	0.12	0.22
	(0.03)	(0.02)	(0.07)	(0.01)	(0.01)		(0.07)	(0.04)	(0.07)
$\bar{r}_{t+1}$	0.14	-0.01	0.00	0.00	-0.02	0.01			
	(0.03)	(0.01)	(0.07)	(0.00)	(0.02)				
p_{t+1}	-0.03	-0.04	-0.02	0.88	0.05	0.83			
	(0.03)	(0.02)	(0.07)	(0.01)	(0.01)				
$\bar{p}_{t+1}$	0.07	-0.04	-0.09	0.03	0.90	0.85			
	(0.03)	(0.01)	(0.08)	(0.00)	(0.02)				

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