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Offsetting Disagreement and Security Prices

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Offsetting Disagreement and Security Prices

Abstract

Portfolios often trade at substantial discounts relative to the sum of their components (e.g., closed-end funds, conglomerates). We propose a simple explanation for this phenomenon, drawing from prior research that investor disagreement coupled with short-sale constraints can lead to overvaluation. Specifically, we argue that while investors may strongly disagree at the component level, as long as their *relative* views are not perfectly positively correlated across components, disagreement will partially offset at the portfolio level. In other words, investors generally disagree less at the portfolio level than at the individual component level, which, coupled with short-sale constraints, provides an explanation for why portfolios trade below the sum of its parts. Utilizing closed-end funds, exchange-traded funds, conglomerates, and mergers and acquisitions as settings where prices of the underlying components and prices of the aggregate portfolio can be separately evaluated, we present evidence supportive of our argument.

JEL Classification: G11, G12, G14, G20

Keywords: Disagreement, Short-Sale Constraints, Belief Crossing

1. Introduction

Portfolios often trade at substantial discounts relative to the sum of their components. Examples range from closed-end funds, where the value of the fund generally is below the value of its underlying assets (e.g., Lee, Shleifer, and Thaler, 1991), to conglomerate firms, where the valuation ratio of the multi-segment conglomerate generally is below that of its single-segment counterparts (e.g., Lang and Stulz, 1994). In this paper, we propose a simple and unifying explanation for these seemingly unrelated phenomena.

Specifically, we note that even if investors disagree strongly about the value of the individual components, as long as their *relative* views are not perfectly positively correlated across these components, disagreement will partially offset at the aggregate portfolio level. Coupled with short-sale constraints, the smaller disagreement at the portfolio level translates to a lower portfolio value relative to the sum of the individual component values.

To illustrate by example, consider the following setting of two investors, A and B, and two assets, S_X and S_Y. Investors A and B disagree at the component level: Investor A believes that the fair price-per-share for S_X is \$10; investor B believes it is \$5. At the same time, investor A believes S_Y should be priced at \$5, whereas investor B believes it should be priced at \$10. Investor A's and investor B's beliefs "cross" such that there is disagreement at the individual component level (\$10 versus \$5), yet zero disagreement at the portfolio level (\$15). In the presence of binding short-sale constraints, the market price will reflect the valuation of the optimist and shares of S_X and S_Y will both trade at \$10. A portfolio containing one share of S_X and one share of S_Y will, thus, have a net asset value of \$20 despite investors' agreement on the overall portfolio value of \$15. If the portfolio's underlying assets and the portfolio itself are traded separately, we will observe a discount in the value of the portfolio relative to the value of the portfolio's underlying assets.

This discount should strengthen with the level of disagreement about the value of the underlying assets: If investors A and B hold similar beliefs about the value of each asset (e.g., S_X=$7.55 versus S_X=$7.45), the fact that investors' beliefs partially offset at the portfolio level is of little practical consequence (*Prediction 1*). The effect of disagreement on discount should strengthen with the degree to which investor A's and investor B's beliefs cross: If the same investor holds the most optimistic belief across all assets (e.g., investor A believes that both S_X and S_Y are worth $10, and investor B believes both should be priced at $5), then both the value of each component and the value of the overall portfolio will be determined by the same investor and there will be no discrepancy between the value of the whole and the sum of its parts (*Prediction 2*).

We identify closed-end funds (CEFs) as our first setting to assess the relevance of our proposition. CEFs are corporations holding a portfolio of securities. Both the CEF and the shares held by the CEF are traded on stock exchanges. To the extent that disagreement at the individual security level partially offsets at the portfolio level and to the extent that short-sale constraints affect prices, we expect the fund's market value (= "the portfolio value") to be below the value of the fund's underlying assets (= "the sum of the individual component values"). This discount should vary with the level of disagreement about the fund's underlying assets and the degree to which beliefs cross.

We approximate investor disagreement about the value of a stock and the degree of investors' *relative* belief crossing via analyst earnings forecasts. Consistent with *Predictions 1* and *2*, we provide evidence that high disagreement among the CEF's underlying assets increases the market price of the fund's assets relative to the market price of the fund itself; that is, high disagreement about the CEF's underlying assets increases the CEF discount. More importantly, we show that the effect of belief dispersion at the individual component level on the CEF discount increases significantly with our measure of *relative* belief crossing. The results are robust to whether we use the level of crossing or change in crossing.

Our second setting considers exchange-traded funds (ETFs). Similar to CEFs, ETFs are investment companies holding portfolios of securities, where both the ETF itself and the shares held by the ETF are traded on stock exchanges. As with CEFs, the market price of an ETF can differ from the value of its underlying assets, although the magnitude of this disparity is much smaller for ETFs than for CEFs due to the presence of authorized participants, who can create and redeem large blocks of the ETF's underlying assets.

Given the similarity in setup between CEFs and ETFs, a natural question arises as to whether the associations found for CEFs extend to ETFs. Our tests answer in the affirmative. The ETF discount increases with the level of average disagreement about the fund's underlying assets. This effect increases with our measure of *relative* belief crossing. Moreover, consistent with the notion that authorized participants create or redeem ETF shares to level the fund price with the underlying portfolio value, we find that higher relative belief crossing is associated with more redemptions of ETF shares.

Our observations carry over to conglomerates and mergers and acquisitions. Conglomerates are corporations operating in multiple industry segments. When comparing the valuation ratio of a conglomerate (= "the portfolio value") to the sales-weighted average industry valuation ratios across the segments that the conglomerate firm operates in (= "the sum of the individual component values"), the literature notes that the former generally falls below the latter, a phenomenon referred to as the diversification discount (e.g., Lang and Stulz, 1994).

Our mechanism provides a partial explanation for this phenomenon.[1] To the extent that disagreement at the individual industry level partially offsets at the conglomerate level, the valuation ratio of the conglomerate should be below the sales-weighted average of the industry valuation ratios of its segments. This diversification discount should vary with the level of disagreement about the conglomerate's underlying industry segments.

To test this hypothesis, we (again) approximate investor disagreement via analyst earnings forecast dispersion. We focus on pure industry players (i.e., single-segment firms) to compute the average valuation ratio and the average forecast dispersion at the industry segment level. Consistent with *Prediction 1*, we provide evidence that the average disagreement about the conglomerate's underlying segments, indeed, positively relates to the diversification discount.

Theoretically, the positive relation between disagreement and diversification discount should strengthen with the degree of industry-belief crossing. To compute our measure of *relative* belief crossing at the industry level, we need multiple analysts covering the same set of industries. Given that analysts tend to specialize in a small set of industries, we are unable to construct the belief-crossing measure for conglomerates and test *Prediction 2*.

In a related, perhaps cleaner analysis focusing on merger and acquisition transactions, we find that disagreement about the acquirer and the target also lowers

[1] Mitton and Vorkink (2010) argue that the reduction of idiosyncratic skewness at the portfolio level can also partially explain the conglomerate firm discount.

the combined announcement day return of the acquirer and the target. The combined announcement day return reflects, among others, the difference between the value of the joint firm (= "the portfolio value") and the sum of the value of the acquirer and the target operating separately (= "the sum of the individual component values"). If disagreement at the acquirer/target level partially offsets at the new joint firm level, we expect this particular channel to pull the value of the aggregate portfolio below the sum of the value of the components, i.e., we expect this particular channel to have a negative effect on the combined announcement day returns. Holding all else equal, the negative effect should be stronger when disagreement among the acquirer and the target is high.

Consistent with this conjecture, we observe that the combined announcement day return of the acquirer and target decreases with analyst forecast dispersion for the acquirer and target. Moreover, in line with *Prediction 2*, this pattern is particularly strong when the most optimistic analyst for the acquirer is *not* among the most optimistic analysts for the target, i.e., when *relative* beliefs for the acquirer and target cross at the component level. Interestingly, we also find that the relative belief crossing for the acquirer and target is gradually decreasing in the five years leading up to the transaction. One possible explanation for this pattern is that firm managers are aware of the valuation effect of investor belief dispersion and that managers time their merger transactions accordingly.

In the end, our paper argues that high valuation due to investor disagreement and short-sale constraints at the stock level (individual segment level) need not translate to high valuation at the aggregate portfolio level (conglomerate firm level). We use our argument to explain seemingly unrelated patterns. As such, our study adds to the growing literature examining the extent to which behavioral frameworks help explain patterns observed in financial markets. Our study also adds to the discussions of how the ease and practice of short selling affects capital markets and market efficiency (e.g, Bris, Goetzmann, Zhu, 2007).

The paper is organized as follows: Section 2 lays out the background of our study. Section 3 describes the data. Section 4 shows our baseline findings and Section 5 presents additional analyses. Section 6 concludes.

2. Background

Over the past decades, a large body of empirical work has uncovered patterns in average stock returns that are difficult to explain with traditional asset-pricing models. As a result, "behavioral" models, which depart from the traditional assumptions of perfect investor rationality and frictionless markets, have become an oft proposed alternative (Hirshleifer, 2001; Barberis and Thaler, 2005).

One such class of models, referred to as "disagreement models," has received particular attention. At their core, disagreement models presume that investor beliefs are accurate, on average, but that investors agree to disagree (due to, for example, overconfidence); in addition, some investors cannot or will not short-sell the asset (Miller, 1977; Scheinkman and Xiong, 2003; Hong and Stein, 2007). An investor, who thinks that a given stock is overvalued, therefore, does not bet against it, but rather sits out of the market. Because, in this setting, market prices are determined by the optimists, prices are upward biased. Moreover, prices go up if the optimists become more optimistic, even if, at the same time, the pessimists become more pessimistic. That is, the upward bias in the stock price increases with the level of investor disagreement. Subsequent work assessing these predictions finds that stocks with higher analyst earnings forecast dispersion and those experiencing reductions in mutual fund ownership breadth earn lower returns subsequently (Diether, Malloy and Scherbina, 2002; Hong and Stein 2002).

While the existing evidence is consistent with models of investor disagreement and short-sale constraints, alternative interpretations remain. For example, investor disagreement may reflect firms' growth opportunities, the exercise of which leads to lower future returns (Johnson, 2004). In addition, one could argue that behavioral biases, in particular over-optimism, strengthen with valuation uncertainty and investor disagreement (Einhorn 1980; Hirshleifer 2001). Over-optimism, in turn, leads to lower future returns.[2]

Unlike the disagreement model, the aforementioned alternative frameworks do not rely on short-sale constraints and imply that any facilitation of short-selling would have little effect on asset prices. Corroborating this view, a growing literature (e.g., Asquith, Pathak and Ritter (2005), Boehmer, Jones and Zhang (2008), Kaplan, Moskowitz and Sensoy (2012)) provides evidence that the practical relevance of short-sale constraints may have been overemphasized and that few stocks are meaningfully short-sale constrained.

In this paper, we distinguish the disagreement model from alternative interpretations by deriving an implication that is unique to the disagreement/short-sale constraint framework. Specifically, our empirical design builds on the simple proposition that the most optimistic investor for stock X need not necessarily (also) hold the most optimistic belief for stock Y; in other words, investor beliefs sometimes *cross* at the

[2] This argument is often viewed as a possible explanation for the Nasdaq bubble. Investors became overly optimistic about internet firms' future prospects partly because these firms had high valuation uncertainty.

component level. This simple premise, coupled with the fact that, for some securities, the value of a security and the value of its underlying components can be evaluated separately, allows for a relatively clean assessment of the relevance of investor disagreement and short-sale constraints in determining asset prices.

As such, our study helps determine to what degree each of the alternative behavioral models (and their various underlying behavioral biases) explains evidence observed in financial markets. By linking various initially seemingly unrelated phenomena to one simple mechanism, we also speak to the common criticism that behavioral finance needs "ten models to explain ten patterns." Our research also contributes to the literature examining the relevance (or irrelevance) of short-sale constraints in determining asset prices.

3. Data and Variables

3.1 Closed-End Funds

Our first set of analyses focuses on CEFs. We include in our sample CEFs with data necessary to construct the fund discount and the following independent variables: *Disagreement*, *Crossing*, *Inverse Price*, *Dividend Yield, Liquidity Ratio*, and *Expense Ratio* (all defined below or in Table 1). The sample contains 88 CEFs over the 1999 to 2009 period. The sample period is determined by our availability of *LIPPER* and *MORNINSTAR* data, which we use to compute our variables of interest. Following Chan, Jain, and Xia (2008), we exclude data for the first six months after the fund's initial public offering (IPO) and for the month preceding the announcement of liquidation or open-ending to "*avoid distortions associated with the flotation and winding up of closed-end funds*" (p. 383).

Weekly CEF premia/(discounts) are calculated using closing prices and net asset values (NAV) as reported in *LIPPER*:

$$Premium(Discount)_{i,t} = \frac{Price_{i,t} - NAV_{i,t}}{NAV_{i,t}}. \quad (1)$$

Any positive association between some variable X and eq. (1) could be described either as X being positively associated with the CEF premium or as X being negatively associated with the CEF discount (vice versa for negative associations). In this study, we describe results in terms of discounts. As reported in Table 1, the average CEF discount in our sample is 6.0%; the standard deviation is 11.5%.[3] The mean and standard deviation of the CEF discount in this study are similar to those reported in prior studies (e.g., Bodurtha, Kim, and Lee, 1995; Klibanoff, Lamont, and Wizman, 1998; Chan, Jain, and Xia, 2008; and Hwang, 2011).

Our main independent variables are our measure of investor disagreement and our measure of relative belief crossing for each of the CEF's underlying holdings, *Disagreement*, and *Crossing* respectively. To compute *Disagreement*, we begin with data on each CEF's portfolio holdings from *MORNINGSTAR*. On average, portfolio holdings are reported every 2.89 months (the median is 3 months). We match portfolio holding data reported at the end of month t with weekly CEF discounts over the ensuing month t+1. Should portfolio holdings only be reported every other month (or less frequently), we match portfolio holdings dates as of month t with weekly CEF discounts over months t+1 and t+2 (or over months t+1 to t+3, respectively).

For each stock j held by CEF i as of t, we compute the price-scaled analyst earnings forecast dispersion, $Dispersion_{i,j,t}$:

[3] Unless otherwise noted, the mean and the standard deviation are always calculated on the full pooled sample.

$$Dispersion_{i,j,t} = \frac{StDev(Forecast(EPS)_{k,j,t})}{P_{j,t}}, \tag{2}$$

where $Forecast(EPS)_{k,j,t}$ is analyst k's most recent forecast for quarterly earnings-per-share of firm j. We require forecasts to be made in the 90 day period prior to the earnings announcement date, and we require the earnings announcement date to be within 90 days prior to the portfolio holdings date t. $P_{j,t}$ is the price-per-share for firm j as of the end of the corresponding fiscal quarter.

We compute $Disagreement_{i,t}$ as the portfolio-weighted average price-scaled analyst-earnings-forecast dispersion of all stocks held by CEF i as of t.

$$Disagreement_{i,t} = \sum_j w_{i,j,t} * Dispersion_{i,j,t}. \tag{3}$$

To ensure that any variation in *Disagreement* does not reflect lack of data on analyst earnings forecasts, we compute weights, $w_{i,j,t}$, with respect to stocks that have *Dispersion* data only. (Our results remain similar if we use portfolio weights as a fraction of total net assets.) We truncate the absolute value of *Disagreement* at the 99th percentile. We postpone the description of our *Crossing* variable to Sections 4 and 5.

3.2 Exchange-Traded Funds

We next turn our attention to exchange-traded funds (ETFs). ETFs are similar to CEFs in that both the fund itself and the fund's underlying holdings are traded separately in stock exchanges. The market price of an ETF sometimes differs from the value of its underlying assets, although the magnitude of this disparity is much smaller for ETFs than for CEFs due to the presence of authorized participants, who can create and redeem large blocks of the ETF's underlying assets.

Our data sources are LIPPER, MORNINGSTAR and IBES. Our sample consists of 112 funds over the 2003 to 2012 period. Our focus is on U.S. domestic *industry* ETFs and on the holdings from the industry where the ETF invests the most; we identify *industry* ETFs by their name. We use these top industry holdings to construct the *Disagreement* and the *Crossing* measure in the same manner as we did with CEFs. On average, portfolio holdings are reported every 1.86 months (the median is 1 month). We motivate our focus on industry ETFs when we discuss our construction of the *Crossing* variable in Sections 4 and 5. To preview, in order to gauge to what degree beliefs cross, we need a pair of stocks to be covered by at least two analysts. Since analysts frequently specialize in one industry, the focus on industry ETFs facilitates the construction of our *Crossing* variable.

The construction of our other variables is analogous to CEFs. One exception is that ETF premia/(discounts) are now at a monthly frequency, due to data availability. As reported in Table 1, the average ETF discount in our sample is less than 1bp, with a standard deviation of 3.2bp. While the discount may seem small in percentage terms, given the size of ETFs in recent years, the discount is large in dollar terms.

3.3 Conglomerate Firms

Our conglomerate sample consists of conglomerate firms that possess the data necessary to construct the diversification discount variable and the following independent variables: *Disagreement*, *Total Assets*, *Leverage, EBIT/SALES*, and *CAPX/SALES* (all defined in Table 4). The sample period is 1978-2012. Our data sources are CRSP and COMPUSTAT.

The diversification discount is the difference between the conglomerate's market-to-book ratio (*MB*) and its imputed *MB*, divided by its imputed *MB*.

$$Premium(Discount)_{i,t} = \frac{MB_{i,t}\text{-}ImputedMB_{i,t}}{ImputedMB_{i,t}}. \qquad (4)$$

To construct the imputed *MB*, we first compute the average *MB* for each two-digit-SIC industry, *Industry-MB*; we use single-segment firms only when computing *Industry-MB.* The imputed *MB* then is the sales-weighted average *Industry-MB* across conglomerate *i*'s segments as of *t*. Following prior literature, we truncate our variable at the 1st and 99th percentile.

As with CEFs and ETFs, we rely on price-scaled analyst earnings forecast dispersion to approximate investor disagreement. We focus on single-segment firms and compute the average forecast dispersion for each two-digit SIC *j* as of *t*. We compute $Disagreement_{i,t}$ as the sales-weighted average industry forecast dispersion across segments *j* conglomerate *i* operates in as of *t*.

Both $Premium_{i,t}$ and $Disagreement_{i,t}$ are measured at an annual/conglomerate-level. We use information in June of calendar year *t* to compute the market value of equity and we use accounting data from the fiscal year ending in the previous calendar year *t*-1 to compute the book value of equity. Earnings forecasts are for annual earnings for the fiscal year ending in calendar year *t*-1.

3.4 Mergers and Acquisitions

In our final setting, we turn to mergers and acquisitions. We include in our sample those M&A deals with data necessary to construct the following variables: *Combined Announcement Day Return*, *Disagreement, Analyst-Crossing* (*Brokerage-Crossing*), *Acquirer* (*Target*) *Market Capitalization*, *Acquirer* (*Target*) *Market-to-Book Ratio*, and *Acquirer* (*Target*) *ROA* (all defined in Table 5). The sample period is 1980-2008.

The *Combined Announcement Day Return* is the average cumulative abnormal return [-1,+1] across the acquirer and the target, weighted by the acquirer's and target's market capitalization in the month prior to the announcement:

$$CAR(-1,1)_{A,T,t} = w_{A,t} * CAR(-1,1)_{A,t} + w_{T,t} * CAR(-1,1)_{T,t}, \quad (5)$$

where t=0 is the day (or the ensuing trading day) of the acquisition announcement, A indexes acquirers and T indexes targets. Following prior literature, we compute abnormal returns as the difference between raw returns minus returns on a value-weighted portfolio of firms with similar size, book-to-market ratio and past returns (Daniel et al., 1997).

As with CEFs, we use price-scaled analyst earnings forecast dispersion to approximate investor disagreement. We compute $Disagreement_{A,T,t}$ as the average analyst earnings forecast dispersion across the acquirer and target, weighted by the acquirer's and target's market capitalization in the month prior to the announcement:

$$Disagreement_{A,T,t} = w_{A,t} Dispersion_{A,t} + w_{T,t} Dispersion_{T,t}. \quad (6)$$

Again, we postpone the description of our *Crossing* variable to Sections 4 and 5.

4. Baseline Results

In this section, we present baseline results for CEFs and ETFs. We then extend our analyses to conglomerate firms and to mergers and acquisitions.

4.1 Closed-End Funds

We begin our analysis with CEFs. We estimate pooled OLS regressions with year-week fixed effects. The dependent variable is the weekly CEF discount, *Discount*$_{i,t}$. The independent variable of primary interest is our measure of investor disagreement among the CEF's underlying assets, *Disagreement*$_{i,t}$. Control variables include *Inverse Price*$_{i,t-1}$, *Dividend Yield*$_{i,t-1}$, *Liquidity Ratio*$_{i,t}$, and *Expense Ratio*$_{i,t}$. *T*-statistics are computed using standard errors clustered along two dimensions, the CEF level and the year-week level.

As reported in Column 1 of Table 2, after controlling for variables that are known to be related to CEF discounts, the coefficient estimate on *Disagreement* equals -5.855 (*t*-statistic = -2.08). The estimate implies that a one-standard-deviation increase in *Disagreement* leads to a 0.59% increase in the discount. Relative to the average CEF discount of 6%, this increase represents a 9.76% jump.

The effect of belief dispersion on CEF discounts should strengthen in the degree to which investors' beliefs cross. In the extreme case where short-sale constraints are binding and the most optimistic investor for stock *X* (S_X = \$10) also is the most optimistic investor for stock *Y* (S_Y = \$10), no discount should be observed between the price offered for the overall portfolio (\$20) and the value of the portfolio's underlying assets ($S_X + S_Y$ = \$10 + \$10 = \$20). This contrasts with the other extreme where investors' ranking is reversed and the most optimistic investor for stock *X* (S_X = \$10) is the most pessimistic investor for stock *Y* (S_Y = \$5); here, the dollar discount between the value of the overall portfolio and the value of the portfolio's underlying assets equals \$5 (\$15 versus $S_X + S_Y$ = \$10 + \$10 = \$20). In practice, investors' belief ranking likely is somewhere between these two extremes.

To explicitly account for this construct, we compute a measure of belief crossing. One complication in our empirical analysis is that few stock pairs are covered by the same two (or more) analysts. This is because analysts tend to specialize in one or two industries, yet CEFs hold stocks across a wide range of industries.

	Stock A	Stock B
Analyst 1 (Morgan Stanley)	1 (most optimistic)	
Analyst 2 (Morgan Stanley)		1 (most optimistic)
Analyst 3 (Goldman Sachs)	2 (most pessimistic)	2 (most pessimistic)

Figure 1. Example of stock coverage by analyst and brokerage firm.

However, as illustrated in Figure 1, in a number of cases, we do observe stock pairs covered by the same two (or more) brokerage houses. Should some investors rely more on Morgan Stanley-analysts while others rely more on Goldman Sachs-analysts, then the degree to which Morgan Stanley is the most optimistic not just for Stock A, but also for Stock B (versus Morgan Stanley is the most optimistic for Stock A, but the most pessimistic for Stock B) will provide an indication about the level of belief crossing of the underlying investor population.

To construct our crossing variable, we first compute the pairwise crossing for each stock pair (j,l) held by CEF i as of t, covered by at least two common brokerage houses:

$$Pairwise\ \ Crossing(j,\ l)_{i,t} = Corr\ \ (Forecast(EPS)_{h,j,t}\ \ ,\ Forecast(EPS)_{h,l,t}). \qquad (7)$$

Corr denotes the Spearman Correlation Coefficient, h indexes brokerage houses, and j and l indexes the stock pair. Intuitively, when the most optimistic investor of stock J (S_J = \$10) also is the most optimistic investor for stock L (S_L = \$10), the pairwise crossing measure equals 1. In contrast, when the most optimistic investor of stock *J* (S_J = \$10) is the most pessimistic investor for stock *L* (S_L = \$5), the pairwise crossing measure equals -1. *Crossing*, then, is the portfolio-weighted average pairwise crossing across all stock pairs, multiplied by -1:

$$Crossing_{i,t} = - * \sum_{j,l} w_{i,j,t} * w_{i,l,t} * Pairwise\ Crossing(j,l)_{i,t}. \quad (8)$$

To test the effect of belief crossing, we re-estimate our main regression equation, but add the following two terms: *Crossing* and *Crossing* interacted with *Disagreement*. As reported in Column 2 of Table 2, the coefficient estimate on the interaction term is -18.868 (*t*-statistic = -2.08). This implies that when *Crossing* is high–i.e., the most optimistic investor for stock *J* more frequently is not the most optimistic investor for stock *L*–an increase in disagreement has a substantially larger negative marginal effect than when *Crossing* is low. For example, for CEFs in the top quintile of the *Crossing* measure, a one-standard-deviation increase in *Disagreement* is associated with a 1.45% increase in CEF discounts. In comparison, across all CEFs, a one-standard-deviation increase in *Disagreement* is associated with a 0.59% increase in the discount (Column 1 of Table 2).

4.2 Exchange-Traded Funds

We conduct analogous tests for ETFs. Because, due to data availability, our dependent and independent variables are now at an ETF/year-month level, we estimate pooled OLS regressions with year-month fixed effects (as opposed to year-week fixed effects). The dependent variable is the monthly ETF discount. The independent variables are $Disagreement_{i,t}$, $Inverse\ Price_{i,t-1}$, $Dividend\ Yield_{i,t-1}$, $Liquidity\ Ratio_{i,t}$, and *Expense*

Ratio$_{i,t}$. *T*-statistics are computed using standard errors clustered along two dimensions, the ETF level and the year-month level.

As reported in Column 1 of Table 3, the coefficient estimate on *Disagreement* is -0.003 and statistically insignificant. This may not surprise as the unconditional average ETF discount is much smaller than the average CEF discount.

In Column 2, we report results when including *Crossing* and an interaction term between *Crossing* and *Disagreement*. To be consistent with the CEF analysis, our initial *Crossing* measure for ETFs is also constructed at the broker level. We observe that the coefficient estimate on the interaction term is -0.124 (*t*-statistic = -2.89). This estimate implies that for ETFs in the top quintile based on the *Crossing* measure, a one-standard-deviation increase in *Disagreement* is associated with a 2.5bp increase in the ETF discount. Relative to the standard deviation of ETF discounts of 3.2bp, this increase represents a 78.13% jump.

Because of our focus on industry ETFs, we are able to construct *Crossing* also at the analyst level, which likely strengthens the power of our analysis. (There are no industry CEFs in our sample.) We report our findings under the refined *Crossing* measure in Section 5. To preview, as expected, our results strengthen.

4.3 Conglomerates Firms

We next extend our tests to conglomerate firms. Conglomerates are corporations operating in multiple industry segments. When comparing the valuation ratio of a conglomerate (= "the portfolio value") to the sales-weighted average industry valuation ratios across the segments that the conglomerate firm operates in (= "the sum of the individual component values"), prior literature shows that the former generally falls below the latter, a phenomenon referred to as the diversification discount. Our mechanism provides a partial explanation for this phenomenon.

Following the literature on conglomerates, we estimate both pooled OLS regressions with year-fixed-effects and Fama-MacBeth (1973) regressions. The dependent variable is the annual conglomerate-level discount, $Discount_{i,t}$. The independent variable of most interest in the context of this study is $Disagreement_{i,t-1}$. Other independent variables are motivated by prior literature and include log total assets (and its square), leverage ratio, profitability (earnings divided by sales), and investment ratio. *T*-statistics in the fixed-effects regression specification are computed using standard errors clustered along two dimensions, the firm level and the year level.

In the presence of short-sale constraints, the more investor disagreement (at the industry level) partially offsets at the (across-industries) conglomerate level, the lower the value of the conglomerate firm should be relative to the value of the conglomerate's underlying industry components.

As reported in Table 4, this conjecture is borne out by the data. The coefficient estimate on *Disagreement* under the fixed-effects regression specification equals -0.378 (*t*-statistic = -4.57); it equals -0.669 (*t*-statistic = -3.56) under the Fama-MacBeth regression specification. In other words, a one-standard-deviation increase in *Disagreement* is associated with a 3.02% to 5.05% increase in the conglomerate discount. Relative to the average conglomerate discount of 22.9% in our sample, this increase represents a 13.2% to 22.1% jump.

4.4 Mergers and Acquisitions

Since the individual segments of a conglomerate firm are not separately traded and followed by analysts, we cannot compute our *Crossing* measure for conglomerates. For this reason, we conduct a more direct test of our mechanism in a related setting, that of mergers and acquisitions.

Specifically, we ask the question of how the combined announcement day return of the acquirer and target is related to investor disagreement about the acquirer and the target and the level of acquirer/target belief crossing. The combined announcement day return relates to the difference between the value of the joint firm (= "the portfolio value") and the sum of the value of the acquirer and the target operating separately (= "the sum of the individual component values"). If disagreement at the acquirer/target level partially offsets at the new joint firm level, we would expect this particular channel to lower the value of the newly merged firm relative to the sum of its component values. That is, we would expect this particular channel to lower the combined announcement day returns, in particular, when disagreement among the acquirer and the target is high and when beliefs cross.

We estimate pooled OLS regressions with year-week fixed effects across the 855 M&A transactions that meet our data requirements. The dependent variable is the combined announcement day return for each M&A transaction. The independent variables are $Disagreement_{i,t}$, $Crossing_{i,t}$, as well as total assets, market-to-book ratio, and ROA of both the acquirer and the target. We also control for deal characteristics: $RelativeSize_{i,t}$, $TenderOffer_{i,t}$, $HostileOffer_{i,t}$, $CompetingOffer_{i,t}$, $CashOnly_{i,t}$, and $StockOnly_{,t}$. *T*-statistics are computed using standard errors clustered at the year-week level.

As shown in Table 5, after controlling for variables that are known to relate to synergies, the coefficient on *Disagreement* is -0.447 (*t*-statistic = -3.73). This implies that a one-standard-deviation increase in *Disagreement* is associated with a 1.21% decrease in combined announcement day returns. Relative to the standard deviation of combined announcement day returns of 1.50%, this decrease represents a 21% jump downward.

In further tests, we include *Crossing* and an interaction term between *Crossing* and *Disagreement*. Again, initially, *Crossing* is computed at the broker level. Results when computing *Crossing* at the analyst level are presented in Section 5. We observe a coefficient estimate of -3.233 (*t*-statistic = -2.56) on the interaction term. Put differently, for merger deals in the top quintile of the *Crossing* measure, a one-standard-deviation increase in *Disagreement* is associated with a 1.58% decrease in combined announcement day returns.

These results suggest that the degree to which the value of the combined company is below the sum of the acquirer and target value increases with investor disagreement; this relation is particular strong when the most optimistic investor for the acquirer is not among the those most optimistic for the target, i.e., when investors' relative beliefs cross.

5. Additional Analyses

We conduct a number of additional analyses. First, we construct an alternative, embedded measure of belief crossing for portfolios with more than two securities. Second, we directly examine the effect of short-sale constraints on our proposed mechanism by incorporating short-selling costs into our measure. Third, we report results based on belief crossing at the analyst level. Fourth, we examine how belief dispersion and crossing affect capital flows to ETFs and, as an extension, open-end mutual funds. Finally, we provide suggestive evidence that firm managers are aware of the valuation effect of investor belief dispersion and time their merger transactions accordingly.

5.1 Embedded Belief Crossing

While the *Crossing* variable constructed in the previous section has an intuitive interpretation, it misses an important aspect of belief crossing for portfolios with more than two securities. To illustrate, consider a portfolio with three stocks, X, Y, and Z. Assume X and Y have high belief dispersion, but little relative belief crossing. In contrast, security Z has little belief dispersion, yet large relative belief crossing with respect to both securities X and Y. Due to this mismatch, our current *Disagreement* and *Crossing* variables would erroneously suggest that this portfolio should trade at a substantial discount relative to its underlying assets.

To more precisely capture our mechanism, we construct a measure of *embedded* belief crossing. We first compute the pairwise "covariance" for each stock pair (*j*, *l*) in portfolio *i* as of *t*, covered by at least two common brokerage houses:

$$Pairwise\ Covariance(j,l)_{i,t} = Corr(Forecast(EPS)_{h,j,t}\ ,\ Forecast(EPS)_{h,l,t}) * Dispersion_{j,t} * Dispersion_{l,t}, \quad (9)$$

where *Corr* denotes the Spearman Correlation Coefficient, and *h* indexes brokerage houses. We then aggregate to the *InvCov* measure, which is the portfolio-weighted average $Pairwise\ Covariance\ (j,l)_{i,t}$ across all stock pairs, multiplied by -1:

$$InvCov_{i,t} = -\sum_{j,l} w_{i,j,t} * w_{i,l,t} * Pairwise\ Covariance(j,\ l)_{i,t}. \quad (10)$$

We repeat our analyses in Section 4, but now replace the interaction term between *Crossing* and *Disagreement* with *InvCov*. We start with CEFs. As shown in Column 1 of Table 6, the coefficient estimate on *InvCov* is -6.992 (*t*-statistic = -2.35). This estimate implies that a one-standard-deviation increase in *InvCov* increases the CEF discount by 0.70%. Relative to the average discount of 6%, this increase represents an 11.65% jump.

We observe a similar pattern for ETFs. As can be seen in Column 2 of the same table, the coefficient estimate on *InvCov* is -0.004 (*t*-statistic = -3.31). Put differently, a one-standard-deviation increase in *InvCov* is associated with a 2.2bp increase in ETF discounts. Relative to the standard deviation of discount of 3.2bp, this increase represents a 7.04% jump.

Finally, we turn our analysis to mergers and acquisitions.[4] We follow the same set-up as in Table 4, but now replace the interaction term between *Crossing* and *Disagreement* with *InvCov*. As shown in Column 3, the coefficient estimate on *InvCov* is -1.320 (*t*-statistic = -2.57). That is, a one-standard-deviation increase in *InvCov* leads to 1.32% lower combined announcement day returns.

In columns 4 and 5, we repeat our analysis for CEFs and ETFs by focusing on *changes* in fund discounts (as well as changes in relative belief crossing). Our main results are robust to using changes as opposed to levels. In sum, our results based on *InvCov* are consistent with, and in many cases stronger than those based on the

[4] Again, since the individual segments of a conglomerate firm are not separately traded, we cannot compute the *InvCov* measure in the setting of conglomerate firms.

interaction of *Disagreement* and *Crossing*, lending further support to the mechanism proposed in this study.

5.2 Short-Sale Constraints

Returning to our example from the introduction, if we assume that there is an investor A, who believes that the fair price-per-share for S_X is \$10 and that the fair price-per-share for S_Y is \$5 and if we assume that there is an investor B, who disagrees and believes that stock prices for S_X and S_Y should be \$5 and \$10, respectively, then, in the presence of short-sale constraints, the market price will solely reflect the valuation of the optimist and shares of S_X and S_Y will both trade at \$10. A portfolio containing one share of S_X and one share of S_Y will, thus, be priced at \$20 despite investors' agreement on the overall portfolio value of \$15.

As short-sale constraints in the underlying assets X and Y ease, prices for S_X and S_Y will fall below those offered by the most optimistic investor and the discrepancy between the value of the underlying assets and the overall portfolio value of \$15 will narrow. To explore this idea, we approximate short-sale constraints in the underlying assets using one minus institutional ownership (referred to as 1 - *IO* hereafter). Institutional ownership represents the lendable supply in shares (Asquith, Pathak and Ritter, 2005) and short-sale constraints are most binding when supply is limited. In additional tests, we also proxy for short-sale costs using an interaction term between (1 - *IO*) and short interest (*SI*), as stocks with the lowest shorting supply and highest shorting demand are perhaps the hardest to sell short.[5]

[5] Short interest is the number of shares shorted divided by the number of shares outstanding.

For the same reason as described in Section 5.1, we embed our measure of short-sale constraints directly into our *InvCov* measure. First, for each stock pair (*j*, *l*) in portfolio *i* as of *t*, covered by at least two common brokerage houses, we define:

$$Pairwise\ Covariance\_IO(j,l)_{i,t} = Corr(Forecast(EPS)_{h,j,t}, Forecast(EPS)_{h,l,t}) * Dispersion_{j,t} * Dispersion_{l,t} * (1 - IO_{j,t}) * (1 - IO_{l,t}). \quad (11)$$

We then compute *InvCov_IO* as the portfolio-weighted average *Pairwise Covariance_IO(j,l)*$_{i,t}$ across all stock pairs, multiplied by -1:

$$InvCov\_IO_{i,t} = -\sum_{j,l=1} w_{i,j,t} * w_{i,l,t} * Pairwise\ Covariance\_IO(j,l)_{i,t}. \quad (12)$$

We examine the effect of short-sale constraints on our pattern documented in Table 7. The dependent variables in the three columns are the CEF premium, ETF premium, and combined announced day returns of merger transactions, respectively. The independent variable of primary interest is *InvCov_IO* computed as of the prior month end. After controlling for both *InvCov* and the portfolio-weighted average *IO*, the coefficient estimates on *InvCov_IO* for the CEF, ETF, and M&A samples are -2.058 (insignificant), -0.003 (*t*-statistic = -2.05), and -1.807 (*t*-statistic = -4.51), respectively. These results confirm our prediction that the effect of belief dispersion and crossing on portfolio discounts is stronger when the short-sale constraints are more binding.

In columns 4-6, we repeat the same analysis using the interaction of *IO* and *SI* as a proxy for short-sale constraints. First, for each stock pair (*j*, *l*) in portfolio *i* as of *t*, covered by at least two common brokerage houses, we define *Pairwise Covariance_IO_SI* analogously to *Pairwise Covariance_IO*. We then compute *InvCov_IO_SI* as the portfolio-weighted average *Pairwise Covariance_IO_SI* across all stock pairs, multiplied by -1. The results are similar to those reported in columns 1-3.

For example, a one-standard-deviation increase in *InvCov_IO_SI* leads to an 11bp (insignificant) increase in CEF discount, a 1.9bp (*t*-statistic = -3.31) increase in ETF discount, and a 3.01% (*t*-statistic = -2.39) decrease in M&A combined announcement day returns.

5.3 Analyst-Level Crossing

While our baseline results are based on crossing at the broker level, we are mindful that analyst-level data may be cleaner than brokerage-house-level data. In table 8, we report results for industry ETFs and M&As using *Crossing* and *InvCov* measures computed at the analyst level.

The empirical setup is identical to that in Tables 3, 5, and 6, except that *Crossing* and *InvCov* are now constructed at the analyst level. The first two columns include an interaction term between *Disagreement* and *Crossing* (similar to Tables 3 and 5) while the next two columns include the *InvCov* measure (similar to Table 6). The results are very similar to those shown before. For example, the coefficients on *InvCov* for the industry ETF and M&A samples are -0.005 (*t*-statistic = -3.61), and -2.000 (*t*-statistic = -2.76), respectively, which are nearly identical to those reported in Table 6.

5.4 Fund Flows

One important reason that ETFs have a much smaller discount relative to CEFs is the presence of authorized participants, who can create and redeem large blocks of the ETF's underlying assets at relatively small transaction costs. If authorized participants indeed create or redeem blocks of shares to take advantage of discrepancies between the fund value and the underlying portfolio value, we would expect capital flows to ETFs–i.e., the number of new shares created or the number of existing shares redeemed–to respond negatively to *changes* in belief dispersion and crossing. For instance, consider an increase in belief dispersion, which then leads to an increase in the fund discount. Arbitrageurs should buy ETF shares in the secondary market, redeem those shares, and sell the underlying portfolio to lock in profits, which amounts to an outflow to the ETF.

To test this prediction, we estimate a simple regression equation where the dependent variable is the monthly percentage flow to an ETF, and the main independent variable is the change in the *InvCov* measure in the previous period. As shown in Table 9, after including the same set of control variables as in Table 3, the coefficient estimate on *Delta InvCov* (at the broker level) is -0.117 (t-statistic = -2.85). This estimate implies that a one-standard-deviation increase in *Delta InvCov* leads to a 1.12% lower ETF flow in the next month. The results are nearly identical if we use *Delta InvCov* computed at the analyst level.

A natural extension to this prediction is to examine capital flows to open-end mutual funds. We focus solely on sector funds in order to construct our measures of *Crossing* and *InvCov*. We label a mutual fund as concentrating on a particular sector if it invests more than 50% of its total equity portfolio in that sector. The results are shown in Table 10. As with ETFs, changes in investors' belief dispersion and crossing significantly negatively predict future mutual fund flows: A one-standard-deviation increase in *Delta InvCov* leads to a 14bp (*t*-statistic = -2.85) lower monthly flow (as a fraction of lagged fund size). Relative to the average monthly flow in our sample, this increase represents a 14% jump.

5.5 M&A Timing

Given the evidence presented so far in this paper, it is natural to ask whether firm managers are aware of the valuation effect of investor belief dispersion, and time firm decisions accordingly. To test this conjecture, we focus on the setting of mergers and acquisitions, which allows us to measure variation in belief dispersion and crossing over a number of years prior to a firm's decision. If managers indeed try to minimize the discount resulting from investors' relative belief crossing, we would expect them to complete merger transactions in periods when belief crossing between the acquirer and target is relatively low.[6]

Figure 1 plots the average *InvCov* across all merger transactions in our sample in event time from year = -5 to year = 0. We observe that *InvCov* is almost monotonicly decreasing in the five years leading up to the merger. In a more formal test, we regress *InvCov* on a time-trend dummy and we note that the coefficient on this dummy is -0.063 (*t*-statistic = -2.33). This result is consistent with the notion that managers of the acquirer and target firms time their M&A deals, at least in part, based on variation in investors' relative belief crossing.

6. Conclusion

This paper provides a unifying explanation for the phenomenon that, frequently, portfolios trade at substantial discounts relative to the sum of their components. Specifically, we argue that even if investors disagree strongly at the component level,

[6] Theoretically, we can conduct a similar exercise in the opposite direction: firms should be more likely to split up when the relative belief crossing over the various segments is high. However, individual segments within a conglomerate firm are not separately traded, making it difficult (if not impossible) to construct the crossing measure.

they generally disagree less at the portfolio level if their relative views are not perfectly positively correlated across the components. Utilizing CEFs, ETFs, conglomerates, and mergers and acquisitions as settings where prices of the underlying components and prices of the aggregate portfolio can be separately evaluated, we provide evidence consistent with our argument.

Our evidence also provides a fresh perspective on disagreement models by focusing on an implication that is unique to the disagreement/short-sale constraint framework. Specifically, our empirical design exploits the simple proposition that the most optimistic investor for stock X need not necessarily hold the most optimistic belief for stock Y; in other words, investor beliefs sometimes *cross* at the component level. This simple premise, coupled with the fact that, for some securities, the value of a security and the value of its underlying components can be evaluated separately, allows for a relatively clean assessment of the relevance of investor disagreement and short-sale constraints in determining asset prices.

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Table 1. Descriptive Statistics

This table reports descriptive statistics for the samples of closed-end funds (CEFs), exchange-traded funds (ETFs), conglomerates and mergers and acquisitions (M&As) used in this study. The sample period is 1998-2009 for CEFs, 1998-2009 for ETFs, and 1980-2010 for M&As and conglomerates. Panel A reports descriptive statistics for the pooled sample of weekly CEF-level observations. Our analysis uses domestic equity CEFs. *Closed-End Fund Premium* is the CEF's market price minus its NAV, divided by its NAV. *Disagreement* is the portfolio-weighted average price-scaled analyst earnings forecast dispersion of the stocks held by the CEF. To compute *Brokerage-Crossing*, we consider all stocks that are held by the CEF. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman correlation coefficient between the earnings forecasts issued for each of these two stocks; we also compute the pairwise covariance as the Spearman correlation multiplied by the respective earnings forecast dispersions. *Brokerage-Crossing* is the portfolio-weighted average pairwise Spearman correlation coefficient multiplied by (-1). *Brokerage-InvCov* equals the portfolio-weighted average pairwise covariance multiplied by (-1). *Inverse Price* is the inverse of the CEF's market price. *Dividend Yield* is the sum of the dividends paid by the CEF over the past one year, divided by the CEF's market price. *Liquidity Ratio* is the CEF's one-month turnover, divided by the portfolio-weighted average one-month turnover of the stocks held by the CEF. If the stock is listed on NASDAQ, we divide the number of shares traded by two. *Expense Ratio* is the CEF's expense ratio. Panel B reports descriptive statistics for the pooled sample of monthly ETF-level observations. Our analysis uses domestic equity ETFs with an industry focus. *ETF Premium*, *Disagreement*, *Brokerage-Crossing*, *Brokerage-InvCov, Inverse Price*, *Dividend Yield* and *Expense Ratio* are measured similarly as those of CEFs. *Analyst-Crossing* and *Analyst-InvCov* are computed analogously to *Brokerage-Crossing* and *Brokerage-InvCov*, respectively, using analyst earnings forecasts. *Turnover Ratio* is the ETF's lagged one-year turnover. Panel C reports descriptive statistics for the pooled sample of annual conglomerate-level observations. *Diversification Premium* is the difference between the conglomerate's market-to-book ratio (*MB*) and its imputed *MB*, divided by the conglomerate's imputed *MB*. The imputed *MB* and *Disagreement* is the sales-weighted average two-digit-SIC *MB* and the sales-weighted average two-digit-SIC analyst earnings forecast dispersion (scaled by price) across the conglomerate's segments. *Total Assets* is the conglomerate's total assets. *Leverage* is the ratio of long-term debt to total assets. *Profitability* is the ratio of earnings before interest and tax to net revenue. *Investment Ratio* is the ratio of capital expenditure to net revenue. Panel D reports descriptive statistics for the pooled sample of M&As. *Combined Announcement Day Return* is the average cumulative abnormal return [-1,+1] across the acquirer and the target where t=0 is the day (or the ensuing trading day) of the acquisition announcement, weighted by the acquirer's and target's market capitalization in the month prior to the announcement. *Disagreement* is the average analyst earnings forecast dispersion across the acquirer and the target, weighted by the acquirer's and target's market capitalization in the month prior to the announcement. *Brokerage-Crossing* is the Spearman correlation coefficient between earnings forecasts issued for the acquirer and those issued for the target multiplied by (-1). *Brokerage-InvCov* is the Spearman correlation multiplied by the respective earnings forecast dispersions, further scaled by (-1). *Acquirer (Target) Market Capitalization* is the acquirer's (target's) market capitalization in the month prior to the announcement. *Acquirer (Target) Market-to-Book Ratio* is the acquirer's (target's) market-to-book ratio. *Acquirer (Target) ROA* is the acquirer's (target's) ratio of earnings before interest and tax to total assets.

Table 1. Continued.

	N	Mean	Median	St. Dev.
Panel A: Closed-End Funds				
Closed-End Fund Premium	9,426	-0.060	-0.088	0.115
Disagreement	9,426	0.002	0.001	0.001
Brokerage-Crossing	9,181	-0.022	-0.009	0.070
*Brokerage-InvCov (*1,000)*	9,181	0.000	0.000	0.001
Inverse Price	9,426	0.077	0.059	0.062
Dividend Yield	9,426	0.073	0.076	0.056
Liquidity Ratio	9,426	0.418	0.306	0.514
Expense Ratio	9,426	1.273	1.130	0.793
Panel B: Exchange-Traded Funds				
*Exchange-Traded Fund Premium (*100)*	2,994	-0.010	0.000	0.318
Disagreement	2,994	0.003	0.002	0.004
Analyst-Crossing	2,736	-0.094	-0.076	0.132
Brokerage-Crossing	2,980	-0.048	-0.032	0.104
*Analyst-InvCov (*1,000)*	2,736	-0.004	0.000	0.058
*Brokerage-InvCov (*1,000)*	2,980	-0.004	0.000	0.056
Inverse Price	2,994	0.036	0.031	0.021
Dividend Yield	2,994	0.381	0.203	0.512
Turnover Ratio	2,994	0.333	0.230	0.302
Expense Ratio	2,994	0.005	0.005	0.002
Panel C: Conglomerates				
Diversification Premium	22,331	-0.229	-0.398	0.630
Disagreement	22,331	0.030	0.006	0.080
TotalAssets	22,331	4,753	460	26,635
Leverage	22,331	0.196	0.180	0.153
Profitability	22,331	0.061	0.079	0.649
Investment Ratio	22,331	0.079	0.041	0.185
Panel D: Mergers and Acquisitions				
Combined Announcement Day Return	855	0.015	0.009	0.071
AcquirerAnnouncementDayReturn	855	-0.015	-0.011	0.072
TargetAnnouncementDayReturn	855	0.206	0.169	0.228
Disagreement	855	0.004	0.001	0.027
Analyst-Crossing	143	-0.111	0.000	0.681
Brokerage-Crossing	193	-0.047	0.000	0.677
*Analyst-InvCov (*1,000)*	143	-0.002	0.000	0.012
*Brokerage-InvCov (*1,000)*	193	-0.001	0.000	0.010
Acquirer Market Capitalization	855	19,243	3,428	44,849
Acquirer Market-to-Book Ratio	855	3.863	2.651	4.388
Acquirer ROA	855	0.098	0.097	0.106
Target Market Capitalization	855	1,883	395	5,932
Target Market-to-Book Ratio	855	3.478	2.096	11.770
Target ROA	855	0.049	0.074	0.174

Table 2. Closed-End Fund Premium

This table reports coefficient estimates from regressions of weekly closed-end fund (CEF) premia on a measure of disagreement about the fund's underlying assets. The sample period is 1998-2009. The dependent variable is the difference between the CEF's market price and the CEF's NAV, divided by the CEF's NAV. $Disagreement_{i,t}$ is the portfolio-weighted average price-scaled analyst earnings forecast dispersion of the stocks held by CEF i as of t. To compute $Crossing_{i,t}$, we consider all stocks that are held by the CEF. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman correlation coefficient between the earnings forecasts issued for each of these two stocks. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman correlation coefficient multiplied by (-1). All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. T-statistics are computed using standard errors clustered along two dimensions (year-week level and fund level).

	(1)	(2)
$Disagreement_{i,t}$	-5.855**	-9.891**
	(-2.08)	(-2.24)
$Disagreement_{i,t}$ * $Crossing_{i,t}$		-18.868**
		(-2.08)
$Crossing_{i,t}$		0.005
		(0.38)
$InversePrice_{i,t\ [pos]}$	1.094***	1.076***
	(5.96)	(5.87)
$InversePrice_{i,t\ [neg]}$	-0.466***	-0.475***
	(-3.65)	(-3.61)
$DividendYield_{i,t}$	0.438***	0.442***
	(2.61)	(2.57)
$LiquidityRatio_{i,t}$	0.044*	0.044*
	(1.66)	(1.67)
$ExpenseRatio_{i,t}$	0.003	0.003
	(0.42)	(0.50)
# Obs.	9,426	9,181
Adj. R^2	0.482	0.483

Table 3. Exchange-Traded Fund Premium

This table reports coefficient estimates from regressions of monthly exchange-traded fund (ETF) premia on a measure of disagreement about the fund's underlying assets. The sample period is 1998-2009. The dependent variable is the difference between the ETF's market price and the ETF's NAV, divided by the ETF's NAV. $Disagreement_{i,t}$ is the portfolio-weighted average price-scaled analyst earnings forecast dispersion of the stocks held by ETF i as of t. To compute $Crossing_{i,t}$, we consider all stocks that are in the ETF's primary industry. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman correlation coefficient between the earnings forecasts issued for each of these two stocks. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman correlation coefficient multiplied by (-1). All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. T-statistics are computed using standard errors clustered along two dimensions (year-month level and fund level).

	(1)	(2)
$Disagreement_{i,t}$	-0.003	-0.056***
	(-0.20)	(-4.85)
$Disagreement_{i,t}$ * $Crossing_{i,t}$		-0.124***
		(-2.89)
$Crossing_{i,t}$		-0.000
		(-0.15)
$InversePrice_{i,t\ [pos]}$	0.036***	0.036***
	(7.35)	(7.18)
$InversePrice_{i,t\ [neg]}$	-0.047***	-0.046***
	(-9.26)	(-9.17)
$DividendYield_{i,t}$	0.000	0.000
	(0.34)	(0.25)
$TurnoverRatio_{i,t}$	0.000	0.000
	(0.84)	(0.91)
$ExpenseRatio_{i,t}$	0.015	0.005
	(0.44)	(0.13)
# Obs.	2,994	2,980
Adj. R^2	0.302	0.304

Table 4. Conglomerate Premium

This table reports coefficient estimates from regressions of annual diversification premia on a measure of disagreement about the conglomerate's underlying segments. The sample period is 1978-2010. The dependent variable is the difference between the conglomerate's market-to-book ratio (*MB*) and its imputed *MB*, divided by the conglomerate's imputed *MB*. The imputed *MB* and $Disagreement_{i,t}$ is the sales-weighted average two-digit-SIC *MB* and the sales-weighted average two-digit-SIC price-scaled analyst earnings forecast dispersion across the conglomerate's segments as of *t*. We use information in June of calendar year *t* to compute the market value of equity and we use accounting data from the fiscal year ending in the previous calendar year *t*-1 to compute the book value of equity (and other control variables to be described). Earnings forecasts are for annual earnings with fiscal year ending in calendar year *t*-1. All other independent variables are as described in Table 1. In Column (1), we conduct a panel regression with time-fixed effects; *t*-statistics are computed using standard errors clustered along two dimensions (year level and firm level). In Column (2), we conduct a Fama-MacBeth regression; *t*-statistics are computed using Newey-West (1987) standard errors with one lag. The *Adj.* R^2 in Column (2) is the average *Adj.* R^2 across the 31 cross-sectional regressions.

	(1)	(2)
$Disagreement_{i,t}$	-0.378***	-0.669***
	(-4.57)	(-3.56)
$ln(TotalAssets)_{i,t}$	-0.258***	-0.288***
	(-9.91)	(-12.09)
$ln(TotalAssets)^2_{i,t}$	0.016***	0.018***
	(8.41)	(10.43)
$Leverage_{i,t}$	0.372***	0.369***
	(5.99)	(7.07)
$Profitability_{i,t}$	0.013**	0.194
	(2.30)	(1.55)
$Investment\ Ratio_{i,t}$	0.148***	0.170***
	(2.88)	(3.22)
# Obs.	22,331	31
Adj. R^2	0.064	0.073

Table 5. Combined M&A Announcement Day Returns

This table reports coefficient estimates from regressions of combined M&A announcement day returns on a measure of disagreement about the acquirer and the target. The sample period is 1980-2010. The dependent variable is the average cumulative abnormal return [-1,+1] across the acquirer and the target where t=0 is the day (or the ensuing trading day) of the acquisition announcement, weighted by the acquirer's and target's market capitalization in the month prior to the announcement. $Disagreement_{i,t}$ is the average analyst earnings forecast dispersion across the acquirer and the target, weighted by the acquirer's and target's market capitalization in the month prior to the announcement. $Crossing_{i,t}$ is the Spearman correlation coefficient between earnings forecasts issued for the acquirer and those issued for the target multiplied by (-1). $Tender\ Offer_{i,t}$, $Hostile\ Offer_{i,t}$, and $Competing\ Offers_{i,t}$ represent indicators of whether the offer is a tender offer, whether the offer is hostile and whether there is more than one offer. $Cash\ Only_{i,t}$ and $Stock\ Only_{i,t}$ represent indicators of whether the offer is financed via cash and stock only. All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. T-statistics are computed using standard errors clustered at the time (year-month) level.

	(1)	(2)
$Disagreement_{i,t}$	-0.447***	-0.056
	(-3.73)	(-0.05)
$Disagreement_{i,t}$ * $Crossing_{i,t}$		-3.233***
		(-2.57)
$Crossing_{i,t}$		-0.006
		(-0.68)
$ln(AcquirerTotalAssets_{i,t})$	-0.000	-0.000
	(-0.01)	(-0.04)
$AcquirerMB_{i,t}$	-0.002**	0.001
	(-2.32)	(0.81)
$AcquirerROA_{i,t}$	0.034	0.038
	(1.01)	(0.57)
$ln(TargetTotalAssets_{i,t})$	-0.004	-0.002
	(-1.40)	(-0.19)
$TargetMB_{i,t}$	-0.000	0.000
	(-0.07)	(0.11)
$TargetROA_{i,t}$	-0.016	-0.047
	(-0.97)	(-0.62)
$TargetInversePrice_{i,t}$	-0.008	0.016
	(-0.48)	(1.27)

Table 5. Continued.

	(1)	(2)
$RelativeSize_{i,t}$	-0.100***	-0.089
	(-3.50)	(-1.39)
$TenderOffer_{i,t}$	0.019***	0.013
	(2.83)	(0.84)
$HostileOffer_{i,t}$	0.047***	0.048*
	(3.24)	(1.86)
$CompetingOffers_{i,t}$	-0.018*	-0.006
	(-1.79)	(-0.32)
$CashOnly_{i,t}$	0.008	0.017
	(1.33)	(1.31)
$StockOnly_{i,t}$	-0.011*	-0.008
	(-1.76)	(-0.70)
# Obs.	855	193
Adj. R^2	0.151	0.139

Table 6. Embedded Belief Crossing

This table reports coefficient estimates from regressions of weekly closed-end fund premia, monthly ETF premia, and combined M&A announcement day returns on a measure of disagreement about the underlying assets. In column 1, $Disagreement_{i,t}$ is the portfolio-weighted average price-scaled analyst earnings forecast dispersion of the stocks held by CEF *i* as of *t*. To compute $Crossing_{i,t}$ and $InvCov_{i,t}$, we consider all stocks that are held by the CEF. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman correlation coefficient between the earnings forecasts issued for each of these two stocks and the pairwise covariance as the Spearman correlation multiplied by the respective earnings forecast dispersions. $Crossing_{i,t}$ is the portfolio-weighted average pairwise Spearman correlation coefficient multiplied by (-1). $InvCov_{i,t}$ is the portfolio-weighted average pairwise covariance multiplied by (-1). In column 2, we consider all stocks that are in the ETF's primary industry. *ETF* $Disagreement_{i,t}$, $Crossing_{i,t}$, and $InvCov_{i,t}$ are measured similarly as those of CEFs. In column 3, $Disagreement_{i,t}$ is the average analyst earnings forecast dispersion across the acquirer and the target, weighted by the acquirer's and target's market capitalization in the month prior to the announcement. $Crossing_{i,t}$, is the Spearman correlation coefficient between earnings forecasts issued for the acquirer and those issued for the target multiplied by (-1). $InvCov_{i,t}$ is the pairwise Spearman correlation multiplied by the respective earnings forecast dispersions, further scaled by (-1). In columns 4 and 5, we examine changes in CEF and ETF discounts in response to changes in belief dispersion and crossing. All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (year-month level and fund level).

	CEF (1)	ETF (2)	M&A (3)	ΔCEF (4)	ΔETF (5)
$Disagreement_{i,t}$	-9.547**	-0.540***	-0.001		
	(-2.38)	(-6.18)	(0.00)		
$InvCov_{i,t}$	-6.992**	-0.004***	-1.320***		
	(-2.35)	(-3.31)	(-2.57)		
$Crossing_{i,t}$	0.002	-0.001	0.010		
	(0.18)	(-0.81)	(1.25)		
$\Delta Disagreement_{i,t}$				-2.138	-0.064
				(-1.29)	(-0.75)
$\Delta InvCov_{i,t}$				-11.335*	-7.246***
				(-1.66)	(-2.68)
$\Delta Crossing_{i,t}$				0.040*	-0.001
				(1.68)	(-0.48)
Other Controls	Yes	Yes	Yes	Yes	Yes
# Obs.	9,181	2,980	193	1,295	2,097
Adj. R^2	0.483	0.305	0.139	0.027	0.241

Table 7. Short-Sale Constraints

This table reports coefficient estimates from regressions of weekly closed-end fund premia, monthly ETF premia, and combined M&A announcement day returns on a measure of disagreement about the underlying assets. In columns 1 and 4, to compute $InvCov_{i,t}$, we consider all stocks that are held by the CEF. If two stocks are covered by more than two of the same brokerage houses, we compute the pairwise covariance as the Spearman correlation multiplied by the respective earnings forecast dispersions. $InvCov_{i,t}$ equals the portfolio-weighted average pairwise covariance. $InvCov\_IO_{i,t}$ equals the portfolio-weighted average pairwise covariance multiplied by the respective retail ownerships (1-institutional ownership). $InvCov\_IOSI_{i,t}$ equals the portfolio-weighted average pairwise covariance multiplied by (1-institutional ownership) and short interest. In columns 2 and 5, we consider all stocks that are in the ETF's primary industry. ETF $InvCov_{i,t}$, $InvCov\_IO_{i,t}$, and $InvCov\_IOSI_{i,t}$ are measured analogously to those of CEFs. In columns 3 and 6, $Disagreement_{i,t}$ is the average analyst earnings forecast dispersion across the acquirer and the target, weighted by the acquirer's and target's market capitalization in the month prior to the announcement. $InvCov_{i,t}$ is the Spearman correlation coefficient between earnings forecasts issued for the acquirer and those issued for the target multiplied by the respective earnings forecast dispersions, further scaled by (-1). $InvCov\_IO_{i,t}$ is $InvCov_{i,t}$ embedded with the respective retail ownerships (1-institutional ownership). $InvCov\_IOSI_{i,t}$ is $InvCov_{i,t}$ embedded with the respective retail ownership (1-institutional ownership) and short interest. All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (year-month level and fund level).

	CEF	ETF	M&A	CEF	ETF	M&A
	(1)	(2)	(3)	(4)	(5)	(6)
$InvCov_{i,t}$	0.004	0.000	-0.011	0.007	0.000	0.004
	(0.39)	(0.57)	(-0.64)	(0.67)	(0.46)	(0.22)
$InvCov\_IO_{i,t}$	-2.058	-0.003**	-1.807***			
	(-0.38)	(-2.05)	(-4.51)			
$IO_{i,t}$	0.161	-0.001	-0.010			
	(0.43)	(-0.29)	(-0.09)			
$InvCov\_IOSI_{i,t}$				-22.130	-0.012***	-29.139**
				(-1.08)	(-3.31)	(-2.39)
$IOSI_{i,t}$				-0.002	-0.007**	0.939
				(-0.00)	(-2.26)	(0.48)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	9,181	2,980	193	8,678	2,921	184
Adj. R^2	0.477	0.303	0.133	0.468	0.311	0.182

Table 8. Analyst-Level Crossing

This table reports coefficient estimates from regressions of monthly ETF premia and combined M&A announcement day returns on a measure of disagreement about the underlying assets. In columns 1 and 3, $Disagreement_{i,t}$ is the portfolio-weighted average price-scaled analyst earnings forecast dispersion of the stocks held by ETF i as of t. To compute $Crossing_{i,t}$ and $InvCov_{,t}$, we consider all stocks that are in the ETF's primary industry. If two stocks are covered by more than two of the same analysts, we compute the Spearman correlation coefficient between the earnings forecasts issued for each of these two stocks, and the pairwise covariance as the Spearman correlation multiplied by the respective earnings forecast dispersions. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman correlation coefficient multiplied by (-1). $InvCov_{,t}$ equals the portfolio-weighted average pairwise covariance multiplied by (-1). In column 2 and 4, $Disagreement_{i,t}$ is the average analyst earnings forecast dispersion across the acquirer and the target, weighted by the acquirer's and target's market capitalization in the month prior to the announcement. $Crossing_{i,t}$, is the Spearman correlation coefficient between earnings forecasts issued for the acquirer and those issued for the target multiplied by (-1). $InvCov_{i,t}$ is the pairwise Spearman correlation multiplied by the respective earnings forecast dispersions, further scaled by (-1). All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. T-statistics are computed using standard errors clustered along two dimensions (year-month level and fund level).

	ETF (1)	M&A (2)	ETF (3)	M&A (4)
$Disagreement_{i,t}$	-0.072***	-1.659	-0.059***	-1.586
	(-6.12)	(-0.86)	(-5.42)	(-0.85)
$Disagreement_{i,t}$ * $Crossing_{i,t}$	-0.153***	-5.091***		
	(-4.09)	(-2.72)		
$InvCov_{i,t}$			-0.005***	-2.000***
			(-3.61)	(-2.76)
$Crossing_{i,t}$	-0.000	-0.003	-0.001	0.010
	(-0.49)	(-0.35)	(-1.58)	(1.04)
Other Controls	Yes	Yes	Yes	Yes
# Obs.	2,736	143	2,736	143
Adj. R^2	0.301	0.125	0.302	0.123

Table 9. Exchange-Traded Fund Flows

This table reports coefficient estimates from regressions of monthly ETF percentage flows on a measure of disagreement about the fund's underlying assets. The sample period is 1998-2009. *Delta Disagreement*$_{i,t-1}$ is the change in the portfolio-weighted average price-scaled analyst earnings forecast dispersion of the stocks held by ETF *i* in the previous month. To compute *Crossing*$_{,t}$ and *InvCov*$_{i,t}$, we consider all stocks that are in the ETF's primary industry. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman correlation coefficient between the earnings forecasts issued for each of these two stocks, and the pairwise covariance as the Spearman correlation multiplied by the respective earnings forecast dispersions. *Crossing*$_{i,t}$ equals the portfolio-weighted average pairwise Spearman correlation coefficient multiplied by (-1). *InvCov*$_{,t}$ equals the portfolio-weighted average pairwise covariance multiplied by (-1). *Delta Crossing*$_{i,t}$ and *Delta InvCov*$_{i,t}$ are the changes in *Crossing and InvCov*, respectively, in the previous month. All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (year-month level and fund level).

		Crossing at the Analyst-Level	Crossing at the Broker-Level
	(1)	(2)	(3)
Δ*Disagreement*$_{i,t}$	-0.059	-0.091	-0.097
	(-0.96)	(-1.30)	(-1.35)
Δ*InvCov*$_{i,t}$		-0.113***	-0.117***
		(-2.87)	(-2.85)
Δ*Crossing*$_{i,t}$		-0.041	-0.051***
		(-1.20)	(-3.00)
InversePrice$_{i,t\ [pos]}$	-1.081	-1.078	-1.139
	(-1.08)	(-1.11)	(-1.14)
InversePrice$_{i,t\ [neg]}$	-1.532*	-1.593*	-1.592*
	(-1.69)	(-1.76)	(-1.76)
DividendYield$_{i,t}$	-0.031	-0.027	-0.031
	(-0.87)	(-0.75)	(-0.85)
TurnoverRatio$_{i,t}$	0.052*	0.060**	0.055*
	(1.83)	(2.23)	(1.92)
ExpenseRatio$_{i,t}$	1.069	0.703	1.797
	(0.13)	(0.08)	(0.21)
# Obs.	1,767	1,634	1,761
Adj. R^2	0.011	0.011	0.012

Table 10. Open-End Mutual Fund Flows

This table reports coefficient estimates from regressions of monthly mutual fund percentage flow on a measure of disagreement about the fund's underlying assets. The sample period is 1998-2009. *Delta* $Disagreement_{i,t-1}$ is the change in the portfolio-weighted average price-scaled analyst earnings forecast dispersion of the stocks held by mutual fund *i* in the previous month. To compute $Crossing_{,t}$ and $InvCov_{i,t}$, we consider all stocks that are in the mutual fund's primary industry. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman correlation coefficient between the earnings forecasts issued for each of these two stocks and the pairwise covariance as the Spearman correlation multiplied by the respective earnings forecast dispersions. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman correlation coefficient multiplied by (-1). $InvCov_{,t}$ equals the portfolio-weighted average pairwise covariance multiplied by (-1). *Delta* $Crossing_{i,t}$ and *Delta* $InvCov_{i,t}$ are the changes in *Crossing and InvCov*, respectively, in the previous month. All other independent variables are as described in Table 1. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (year-month level and fund level).

	(1)	Crossing at the Analyst-Level (2)	Crossing at the Broker-Level (3)
$\Delta Disagreement_{i,t}$	0.006	-0.000	0.001
	(0.96)	(-0.05)	(0.10)
$\Delta InvCov_{i,t}$		-0.010***	-0.009**
		(-2.90)	(-2.44)
$\Delta Crossing_{i,t}$		0.009	0.005*
		(1.39)	(1.73)
FundSize	-0.007***	-0.006***	-0.007***
	(-3.67)	(-3.41)	(-3.59)
LagFlow	-0.001	0.001	-0.000
	(-0.18)	(0.28)	(-0.06)
$TurnoverRatio_{i,t}$	-0.003*	-0.002***	-0.003*
	(-1.74)	(-4.42)	(-1.73)
$ExpenseRatio_{i,t}$	-1.566***	-1.511***	-1.581***
	(-3.52)	(-3.04)	(-3.43)
# Obs.	5,173	3,753	5,110
Adj. R^2	0.011	0.008	0.010

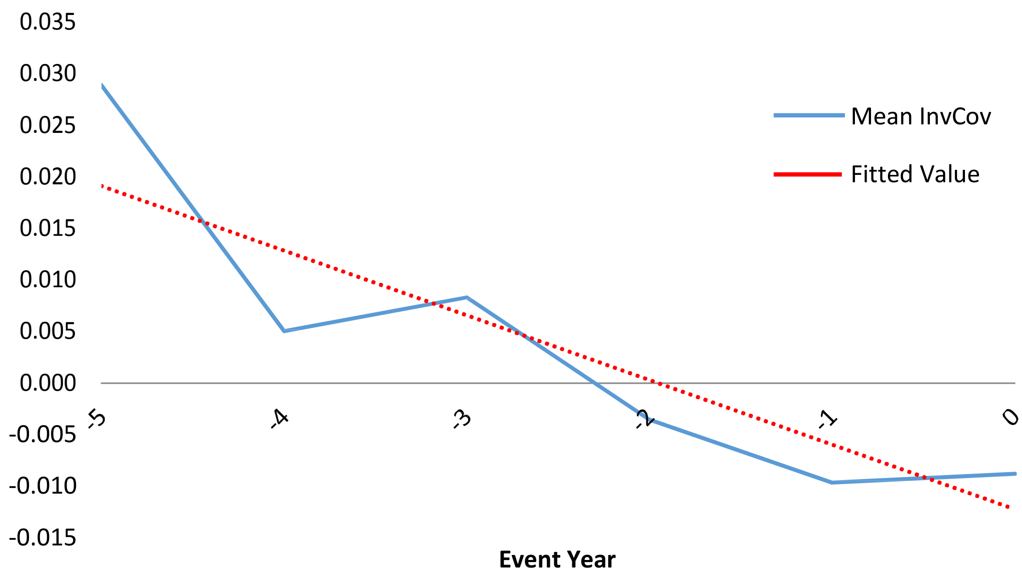

Figure 1. M&A Timing: This figure shows the time variation in *InvCov* of the acquirer and target pair in the five years leading up to the M&A announcement. To compute *InvCov*, we focus on brokerage houses covering both the acquirer and target. We first compute the Spearman correlation coefficient between earnings forecasts issued for the acquirer and those issued for the target. *InvCov* is the Spearman correlation multiplied by the respective earnings forecast dispersions, further scaled by (-1). We demean *InvCov* at the calendar-year level, to remove market-wide fluctuations. For each event year, we then compute the average *InvCov* across all the acquirer-target pairs. *InvCov* is shown in basis points.