Offsetting Disagreement and Security Prices[*]

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First Draft: March 2013
This Draft: July 2015

[*] We thank Ulf Axelson, Nick Barberis, Joe Chen, James Choi, Lauren Cohen, Zhi Da, Kent Daniel, Karl Diether, Alex Edmans, John Hand, Chris Hennessy, Nick Hirschey, Seung Hyun Kim, Matti Keloharju, Ralph Koijen, Chris Malloy, Ian Martin, Anna Pavlova, Lasse Pedersen, Christopher Polk, Anna Scherbina, David Solomon, Michela Verardo, Jeff Wurgler, Wei Xiong, Bu Xu, Sterling Yan and seminar participants at Indiana University, London Business School, London School of Economics, Purdue University, Renmin University, Zhejiang University, the 2014 American Finance Association Annual Meeting, the 2014 Helsinki Finance Summit, the 2014 University of California Davis Finance Symposium on "Information and Asset Prices" for helpful comments and suggestions. We also thank Moqi Xu and Lauren Cohen for sharing with us some of the data used in this study. We are grateful for funding from the Paul Woolley Center at the London School of Economics.

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Abstract

Portfolios often trade at substantial discounts relative to the sum of their components (e.g., closed-end funds). We propose a simple, unifying explanation for this phenomenon: Investors often disagree about the value of each individual component. However, as long as their *relative* views are not perfectly and positively correlated, disagreement partially offsets at the portfolio level. That is, investors generally disagree less at the portfolio level than at the individual component level. Coupled with short-sale constraints, this channel provides an explanation for why portfolios often 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, Belief Crossing, Short-Sale Constraints

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 falls 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 build on the notion that even if investors disagree strongly about the value of the individual components, as long as the relative views are not perfectly and positively correlated across these components, disagreement partially offsets at the aggregate portfolio level. Coupled with short-sale constraints, the smaller disagreement at the portfolio level translates into a lower portfolio value relative to the sum of the individual component values.

To illustrate by example, consider a setting of two investors, A and B, and two assets, S_X and S_Y. Investors A and B disagree at the component level. In particular, investor A believes that the fair prices for S_X and S_Y are $10 and $5, respectively. The valuation is reversed for investor B, who believes that the fair prices for S_X and S_Y are $5 and $10, respectively. Investor A's and investor B's beliefs "cross" in such a way that although the two disagree about the value of the individual components, they are in perfect agreement regarding the portfolio value ($10+$5 = $5+$10 = $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 are traded separately, we will observe a discount in the value of the portfolio relative to the value of the 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 portfolio discount should also 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 assets should be priced at $5), then both the value of each component and the value of the overall portfolio are determined by the same investor and there is 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 propositions.[1] CEFs are corporations holding a portfolio of securities. Both the CEF and the shares held by the fund are traded on stock exchanges. To the extent that disagreement at the individual security level partially offsets at the portfolio level and short-sale constraints are binding, we expect the fund's market value to be below the value of the fund's underlying assets. 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 and belief crossing via analyst earnings forecasts. Consistent with our predictions, we find that higher disagreement among the

[1] Duffie, Garleanu and Pedersen (2002) employ a similar argument to explain the higher (seemingly excessive) valuation of equity carve-outs relative to the parent company during the NASDAQ bubble.

CEF's underlying assets generally increases the discount between the value of the fund and that of its underlying holdings. In addition, the effect of disagreement on CEF discount strengthens with the degree to which beliefs cross. The results are robust to using either the level of crossing or the change in crossing.

Our second setting considers exchange-traded funds (ETFs). Similar to CEFs, ETFs are investment companies holding portfolios of securities, whereby both the ETF 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 holdings.

As with CEFs, we find that the ETF discount increases with the level of 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 value with the underlying portfolio value, we find that higher relative belief crossing (→ the ETF share is cheap relative to the underlying portfolio) is associated with more redemption of ETF shares.[2]

Our observations carry over to the settings of conglomerates and mergers and acquisitions (M&As). Conglomerates are corporations operating in multiple industry segments. When comparing the valuation ratio of a conglomerate (i.e., "the portfolio value") to the sales-weighted average valuation ratio of the industries that the conglomerate operates in (i.e., "the sum of the individual component values"), the

[2] We find a similarly negative effect of belief crossing on (open-end) mutual fund flows.

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.[3] 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 industry valuation ratio. This diversification discount should increase 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 average forecast dispersion for each industry. Consistent with Prediction 1, we find that disagreement about the conglomerate's underlying segments positively relates to the diversification discount.

Theoretically, the positive relation between disagreement and diversification discount should strengthen with the degree of industry belief crossing. However, since brokerages do not issue earnings forecasts for individual industry segments, we are unable to construct the belief-crossing measure for conglomerates and, hence, test Prediction 2.

To remedy this, we turn to the setting of M&As. We focus on the combined announcement day return of the acquirer and target, which reflects, among others, the difference between the value of the joint firm (i.e., "the portfolio value") and the sum of the value of the acquirer and the target operating separately (i.e., "the sum of the

[3] Mitton and Vorkink (2010) argue that the diversification of idiosyncratic skewness at the portfolio level can also partially explain the conglomerate firm discount. Throughout our tests (on CEFs, ETFs, conglomerates, M&As), we control for excess idiosyncratic volatility as well as excess idiosyncratic skewness (as defined in Mitton and Vorkink, 2010) to account for this diversification mechanism.

individual component values"). If disagreement at the acquirer/target level partially offsets at the joint firm level, we expect this channel to have a negative effect on the combined announcement day return. Holding all else equal, this negative effect should strengthen with the level of disagreement and the degree of relative belief crossing.

Consistent with these conjectures, we observe that the combined announcement day return indeed decreases with the average forecast dispersion for the acquirer and target. This pattern is particularly strong when the most optimistic investor for the acquirer is not among the most optimistic ones for the target, i.e., when relative beliefs for the acquirer and target cross. In the extreme case in which the most optimistic investors for the acquirer hold the most pessimistic view for the target, the combined M&A announcement return can be substantially negative.

The remainder of our paper is organized as follows: Section 2 places our study in the literature. Section 3 describes the data and our main variables of interest. Section 4 presents our baseline findings and Section 5 presents results of additional analyses. Finally, Section 6 concludes.

2. Background and Contribution

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 and friction-based 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 correct, on average, but that investors agree to disagree (due to, for example, overconfidence). In addition, some investors cannot or will not short-sell (Miller, 1977; Duffie, Garleanu, and Pedersen, 2002; 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 generally 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, holding investors' average belief constant, the upward bias in the stock price increases with the level of investor disagreement. Subsequent work assessing this prediction finds that stocks with higher analyst earnings forecast dispersion, and those experiencing reductions in mutual fund ownership breadth (thus, more investors sitting out of the market), indeed, earn lower returns subsequently (Diether, Malloy and Scherbina, 2002; Chen, Hong and Stein, 2002).

While the existing evidence is consistent with models of investor disagreement and short-sale constraints, alternative interpretations remain. For example, investors tend to disagree more about firms that have many growth opportunities than about firms with mostly assets in place. Thus, one may argue that it is the exercise of growth options, rather than investor disagreement, which leads to the observed lower future returns (Johnson, 2004). In addition, valuation uncertainty tends to increase investor disagreement and strengthen behavioral biases, in particular over-optimism (Einhorn, 1980; Hirshleifer, 2001). Over-optimism, in turn, can lead to lower future returns.[4]

[4] 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.

Unlike the disagreement model, these alternative frameworks do not rely on short-sale constraints and imply that any relaxation of short-sale constraints has little impact on security prices. Corroborating this view, a growing literature (e.g., Asquith, Pathak and Ritter, 2005; Boehmer, Jones and Zhang, 2008; Kaplan, Moskowitz and Sensoy, 2013) 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 tied to growth options and investor optimism by deriving an implication that is unique to the disagreement/short-sale constraint framework. In particular, our empirical design builds on the simple proposition that the most optimistic investor for stock X need not necessarily also hold the most optimistic view for stock Y; that is, investor beliefs sometimes cross at the component level and partially offset at the portfolio level.

Our empirical strategy, then, is to compare two sets of nearly identical, yet separately traded securities: the aggregate portfolio and its underlying components. While being close substitutes, these two sets of securities differ importantly along the dimension of investor disagreement. As such, our approach provides a relatively clean and powerful setting to test the relevance of investor disagreement and short-sale constraints in determining asset prices.

Our evidence, based on all four empirical settings, suggests that short-sales constraints can have a material impact on asset prices and expected returns. That said, we do not take a stance on whether the relaxation of short-sale constraints improves market efficiency. The latter also depends on how investor disagreement

interacts/correlates with other frictions and biases in the market. For example, if investors are, on average, overly pessimistic when they disagree, then the value assigned by the optimists may be closer to the true fundamental value, and the relaxation of short-sale constraints may not necessarily enhance price efficiency.

Another key contribution of our paper is to provide a unifying explanation for a number of seemingly unrelated asset pricing phenomena – the CEF discount, the ETF discount, conglomerate firm discount, and substantial variation in M&A announcement day returns, which have garnered much attention in both empirical and theoretical research. While prior studies have generally attributed these patterns to time-varying investor sentiment, agency issues, and merger synergies, we argue that they are, at least partially, driven by a common mechanism: investor disagreement that partially offsets at the portfolio level.

3. Data and Variables

In this section, we introduce our sample and the dependent variable – the premium/discount of the value of the portfolio relative to that of its underlying components, in the settings of CEFs (Section 3.1), ETFs (Section 3.2), conglomerates (Section 3.3) and M&As (Section 3.4). We discuss our main independent variables – investor disagreement and belief crossing – in Section 3.5. To facilitate interpretation, all independent variables in the regressions are normalized to have a standard deviation of one.

3.1. Closed-End Funds

Our first set of analyses focuses on US Equity CEFs.[5] CEFs are publicly traded companies. Rather than using the proceeds from the initial public offering (IPO) and subsequent seasoned equity offerings (SEOs) to invest in physical assets, these companies acquire a portfolio of equity securities. Because the CEF itself is traded on a stock exchange, we can compare the market value of the fund against the market value of the CEF's underlying holdings. We include in our sample CEFs with data necessary to construct the CEF discount and the following independent variables: *Disagreement*, *Crossing*, *Inverse Price*, *Dividend Yield, Liquidity Ratio*, *Expense Ratio*, *Excess Idiosyncratic Volatility* and *Excess Skewness*. All these variables are defined in Section 3.5 and in Appendix Table A1.

The sample contains 81 CEFs over the 1999 to 2009 period. The sample period is determined by our availability of CEF price and holdings data provided by LIPPER and MORNINSTAR. Following Chan, Jain, and Xia (2008), we exclude data for the first six months after the fund's 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:

$$Premium_{i,t}=\frac{Price_{i,t}\text{-}NAV_{i,t}}{NAV_{i,t}}. \quad (1)$$

As shown in Table 1, the average CEF discount in our sample is 5.9%; the standard deviation is 11.4%. These numbers are similar to those reported in prior studies (e.g.,

[5] Going forward, we use the terms CEF and US Equity CEF interchangeably.

Bodurtha, Kim, and Lee, 1995; Klibanoff, Lamont, and Wizman, 1998; Chan, Jain, and Xia, 2008; Hwang, 2011).

3.2. Exchange-Traded Funds

ETFs are similar to CEFs in that both the fund and the fund's underlying holdings are traded separately in stock exchanges. The market value of an ETF sometimes differs from the combined 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 holdings.

Our data sources for ETFs are again LIPPER and MORNINGSTAR. We include in our sample US Equity ETFs with data necessary to construct the ETF discount and the same set of independent variables as in the CEF setting.[6] Due to data constraints, our variables are measured at a monthly frequency and they are defined in Section 3.5 and in Appendix Table A1.

For ETFs, we have data available from 2003 to 2012 and our sample consists of 383 ETFs. As reported in Table 1, the average ETF discount in our sample is 1bp, with a standard deviation of 38bp. These figures are in line with prior research on ETF discounts (e.g., Petajisto, 2013). While the discount is small in percentage terms, given the size of the ETF industry, it is large in dollar terms.

[6] Going forward, we use the terms ETF and US Equity ETF interchangeably.

3.3. Conglomerate Firms

Conglomerates are firms operating in multiple industry segments. Our conglomerate sample consists of all firms that possess the data necessary to construct the "diversification discount" variable and the following independent variables: *Disagreement*, *Total Assets*, *Leverage*, *Profitability*, *Investment Ratio*, *Excess Idiosyncratic Volatility* and *Excess Skewness*, all of which are defined in Section 3.5 and in Appendix Table A1. The variables are measured at an annual frequency. 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*, scaled by the latter.

$$Premium_{i,t}=\frac{MB_{i,t}\text{-}ImputedMB_{i,t}}{ImputedMB_{i,t}}. \quad (2)$$

We use information in June as 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. To construct the imputed *MB*, we first compute the average *MB* for each two-digit-SIC-code industry, *Industry-MB*; we use single-segment firms only when computing *Industry-MB.* The imputed *MB* 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. The average conglomerate discount in our sample is 23.8%.

3.4. Mergers and Acquisitions

Our final setting studies M&As. We include in our sample M&A deals with data necessary to construct the following variables: *Combined Announcement Day Return*,

Disagreement, *Crossing*, *Acquirer* (*Target*) *Total Assets*, *Acquirer* (*Target*) *Market-to-Book Ratio*, *Acquirer* (*Target*) *ROA*, *Combined Idiosyncratic Volatility*, *Combined Skewness*, as well as various deal characteristics. These variables are defined in Section 3.5 and in Appendix Table A1. The sample period is 1981-2012 and the data sources for M&As and their corresponding abnormal announcement day returns are SDC, CRSP and COMPUSTAT.

The *Combined Announcement Day Return* is the average cumulative abnormal return over [-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:

$$CAR(-1,1)_t = w_{A,t} * CAR(-1,1)_{A,t} + w_{T,t} * CAR(-1,1)_{T,t}, \quad (3)$$

where t=0 is the day (or the ensuing trading day) of the acquisition announcement. Following prior literature, we use DGTW adjusted returns (Daniel, Grinblatt, Titman, and Wermers, 1997) to compute *CAR*. The average combined announcement day return in our sample is 1.7% with a standard deviation of 7.4%.

3.5. Disagreement and Crossing

In the introduction, we present a setting of two investors, A and B, and two assets, S_X and S_Y. 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 (=$20) as both are determined by the same investor. This contrasts with the other extreme where investors' beliefs cross and the most optimistic investor for stock X (S_X = $10) is the most pessimistic investor for stock Y (S_Y = $5); here, we observe a $5 discount between the

value of the overall portfolio, which both investors believe to be $15, and the value of the portfolio's underlying assets, which is determined by the most optimistic investors and thus equals $20. In reality, investors' belief ranking across assets likely is somewhere between these two extremes (i.e., neither perfectly positively, nor perfectly negatively correlated across assets).

To test for our proposed mechanism, we require both a measure of investor disagreement and a measure of investor belief crossing for each pair of stocks. Our study approximates investor beliefs via analysts' earnings forecasts.

One concern regarding our empirical approach is that *analyst* disagreement and *analyst* belief crossing may not be representative of *investor* disagreement and *investor* belief crossing. A related concern is that, in order to construct our *Crossing* variable, we need a pair of stocks to be covered by at least two common analysts; yet, in practice, most analysts focus on stocks from one or two industries.

We speak to both concerns by computing our measures at the *brokerage* level (in robustness checks, we also report results using analyst-level measures). Constructing our measures at the brokerage level has two advantages. Consider the following example:

	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)

Example of stock coverage by analyst and brokerage firm.

Given that most investors, including institutions, deal with a small number of brokers for trade execution, it is plausible that investors rely more on information provided by some brokerage firms than others. In the example above, Morgan Stanley is

more optimistic than Goldman Sachs about the value of Stock A and B. It is conceivable that investors paying more attention to Morgan Stanley's sell-side research also will be more optimistic than investors paying more attention to Goldman Sachs' research. If so, disagreement (belief crossing) measured at the brokerage level provides useful information about the level of disagreement (belief crossing) among investors. Note that we need not take a stand on the direction of information flow, i.e., to what degree information flows from brokerages to investors or from investors to brokerages. If analysts and brokerages are broadcasting opinions/views of their various clients, then disagreement measured at the brokerage level naturally becomes a reflection of the level of disagreement among investors.

Our focus on brokerages also facilitates the construction of the *Crossing* variable. In practice, few stock pairs from a diversified portfolio are covered by the same two (or more) analysts (as few analysts cover stocks from unrelated industries). On the other hand, brokerage firms tend to cover a wide range of stocks through the simultaneous employment of multiple analysts. In the previous example, to the extent that some investors communicate more with Morgan Stanley while others communicate more with Goldman Sachs, the degree to which Morgan Stanley's and Goldman Sachs' beliefs cross provides an indication about the level of belief crossing of the underlying investor population.

Our proposition still goes through even if the set of investors holding the underlying assets is different from the set of investors holding the overall portfolio. As long as the various investor groups all rely, to some degree, on the reports produced by the brokerages, the level of belief crossing at the brokerage level still provides a representative picture of the level of belief crossing of the overall investor population; as

such, the fact that different assets may be held by different investors becomes less critical in our interpretation of the results.[7]

3.5.1. Disagreement and Crossing – CEFs and ETFs

To compute *Disagreement* for CEFs and ETFs, we begin with data on portfolio holdings from *MORNINGSTAR*. In most cases, portfolio holdings are reported every three months for CEFs and every one month for ETFs. We match portfolio holdings data reported at the end of month t with CEF and ETF discounts in the following month(s).

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

$$Dispersion_{i,j,t} = \frac{StDev\left(Forecast(EPS)_{k,j,t}\right)}{P_{j,t}}, \qquad (4)$$

where $Forecast(EPS)_{k,j,t}$ is brokerage k's most recent forecast for quarterly earnings-per-share of firm j. Because each brokerage firm only assigns one of its analysts to cover stock j, brokerage earnings forecast dispersion is equivalent to analyst earnings forecast dispersion. (However, brokerage-level belief crossing is *not* equivalent to analyst-level belief crossing.) 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 dispersion across all stocks held by CEF (ETF) i as of t.

[7] In additional tests, we re-estimate our primary regression equations for the subset of observations for which the CEFs' (ETFs') underlying assets are primarily held by retail investors. That is, we focus on a subset of observations for which there is greater overlap between investors pricing the underlying assets and investors pricing the overall portfolio. Our results are virtually unchanged.

$$Disagreement_{i,t} = \sum_j w_{i,j,t} * Dispersion_{i,j,t}. \quad (5)$$

To ensure that any variation in *Disagreement* does not reflect lack of data on earnings forecasts, we compute weights, $w_{i,j,t}$, with respect to stocks that have *Dispersion* data only.[8] 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.

To construct our crossing variable, we first compute the pairwise correlation for each stock pair (j, l) held by CEF (ETF) i as of t, covered by a common brokerage house h:

$$Pairwise\ Correlation(j,l)_{i,t} =$$

$$Corr\big(Forecast(EPS)_{h,j,t}, Forecast(EPS)_{h,l,t}\big). \quad (6)$$

Corr denotes the Spearman rank correlation, h is the list of brokerages that cover both j and l. Intuitively, when the most optimistic investor of stock j also is the most optimistic investor for stock l ("no belief crossing"), the pairwise correlation gravitates towards one. In contrast, when the most optimistic investor of stock j is the most pessimistic investor for stock l ("belief crossing"), the pairwise correlation gravitates towards negative one. *Crossing*, then, is the portfolio-weighted average pairwise correlation across all stock pairs, multiplied by negative one:

$$Crossing_{i,t} = -\sum_{j,l}(w_{i,j,t} * w_{i,l,t}) * PairwiseCorrelation(j,l)_{i,t} \quad (7)$$

A larger $Crossing_{i,t}$, thus, implies a higher level of investor belief crossing.

[8] To ensure robustness, we have also tried excluding from the sample closed end funds for which we miss more than 20%, 30%, 40%, or 50% of the holdings due to the lack of disagreement data. Our results are unchanged.

3.5.2. Disagreement and Crossing – Conglomerates

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

Our main dependent and independent variable, $Premium_{i,t}$ and $Disagreement_{i,t}$, are measured at the annual/conglomerate level. Recall that when calculating $Premium_{i,t}$, we use information in June as 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 used to construct $Disagreement_{i,t}$ are for annual earnings for the fiscal year ending in calendar year t-1.

3.5.3. Disagreement and Crossing – M&As

As before, we use price-scaled earnings forecast dispersion to approximate investor disagreement. We compute $Disagreement_{i,t}$ as the average dispersion of the acquirer and target in M&A event i at time t, weighted by the acquirer's and target's market capitalization in the month prior to the announcement:

$$Disagreement_{i,t} = w_{A,t} Dispersion_{A,t} + w_{T,t} Dispersion_{T,t}. \qquad (8)$$

We use the brokerages' most recent forecast for annual earnings-per-share. We require the earnings announcement date to be within 90 days prior to the M&A date t.

To construct our *Crossing* variable, we compile a list of brokerage houses that cover both the acquirer and target prior to the M&A announcement date and compute

the Spearman rank correlation in earnings forecasts between the acquirer and the target, multiplied by negative one. Again, a higher value of *Crossing* implies a higher level of investor belief crossing.

4. Baseline Results

In this section, we start by presenting baseline results for CEFs and ETFs. We then extend our analyses to conglomerate firms and to M&As.

4.1. Closed-End Funds

We begin our analysis with CEFs, for which we have weekly price data. We estimate a pooled OLS regression with year-week fixed effects. The dependent variable is the weekly CEF discount. The independent variable of primary interest is our measure of investor disagreement across the CEF's underlying assets, *Disagreement*. Control variables include *Inverse Price*, *Dividend Yield, Liquidity Ratio*, *Expense Ratio*, *Excess Idiosyncratic Volatility* and *Excess Skewness*. *T*-statistics are computed using standard errors clustered along two dimensions: the CEF level and 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 on *Disagreement* equals -0.005 (insignificant). This estimate implies that a one-standard-deviation increase in *Disagreement* leads to a 50bp increase in the discount. Relative to the average CEF discount of 5.9%, this increase represents an 8% jump.

The insignificant effect may not surprise as investor disagreement only affects prices if beliefs cross. In Column 2, we re-estimate our main regression equation, but now add the following two terms: *Crossing* and *Crossing* interacted with *Disagreement*.

As shown in Column 2, the coefficient estimate on the interaction term is -0.001 and statistically significant. This implies that when *Crossing* is high – i.e., the most optimistic investor for stock *j* tends to not be the most optimistic investor for stock *l* – an increase in disagreement has a substantially larger negative effect on prices. For example, for CEFs in the top quintile of the *Crossing* measure, a one-standard-deviation increase in *Disagreement* is now associated with a 77bp increase in the CEF discount.

4.2. Exchange-Traded Funds

We conduct analogous tests for ETFs. Due to data availability, our dependent and independent variables are now at an ETF/year-month level. We thus estimate a pooled OLS regression with year-month fixed effects. The dependent variable is the monthly ETF discount. The independent variables include *Disagreement*, *Crossing*, *Inverse Price*, *Dividend Yield, Liquidity Ratio*, *Expense Ratio*, *Excess Idiosyncratic Volatility* and *Excess Skewness*. *T*-statistics are computed using standard errors clustered at both the fund and year-month levels.

As reported in Column 1 of Table 3, the coefficient on *Disagreement* is -0.001 and statistically insignificant. In Column 2, we report results when including *Crossing* and an interaction term between *Crossing* and *Disagreement*. We observe that the coefficient estimate on the interaction term is -0.005 (*t*-statistic = -3.13). The estimates imply that for ETFs in the top quintile based on the *Crossing* measure, a one-standard-deviation increase in *Disagreement* is associated with a 0.5bp increase in the ETF discount. For reference, the average ETF discount in our sample is about 1bp.

4.3. Conglomerate Firms

We next extend our analysis to the setting of conglomerate firms. Following prior literature (e.g., Lang and Stulz, 1994), we estimate both a pooled OLS regression with year fixed effects and a Fama-MacBeth (1973) regression. The dependent variable is the annual conglomerate firm discount. The independent variable of interest is the sales-weighted average industry disagreement. Other independent variables include the log total assets (and its square), leverage ratio, profitability (earnings divided by sales), investment ratio, excess idiosyncratic volatility, and excess skewness. *T*-statistics in the pooled OLS regression are computed using standard errors clustered at both the firm and year levels. *T*-statistics in the Fama-MacBeth regression are computed using Newey-West (1987) standard errors with one lag.

As shown in Table 4, the coefficient estimate on *Disagreement* is -0.028 (*t*-statistic = -4.42) in the pooled OLS setting; in the Fama-MacBeth setting, the estimate is -0.047 (*t*-statistic = -3.49). These estimates imply that a one-standard-deviation increase in *Disagreement* is associated with a 2.8% to 4.7% increase in the conglomerate firm discount. Relative to the average conglomerate discount of 23.8% in our sample, this increase represents an 11.8% to 19.7% jump.

4.4. Mergers and Acquisitions

Since brokerages do not issue earnings forecasts for individual industry segments, we are unable to compute our *Crossing* measure for conglomerate firms. For this reason, we conduct a more direct test of our mechanism in a related setting, that of M&As.

Specifically, we ask the question of how the combined announcement day return of the acquirer and target is related to investor disagreement and the level of belief

crossing. The combined announcement day return reflects, among other things, the difference between the value of the joint firm (i.e., "the portfolio value") and the sum of the value of the acquirer and target operating separately (i.e., "the sum of the individual components"). If disagreement at the acquirer/target level partially offsets at the joint firm level, we expect this channel to lower the combined announcement day return. The magnitude of this negative return effect should be a function of the average level of disagreement about the acquirer and target, as well as the degree to which investors' relative beliefs cross.

We estimate a pooled OLS regression with year fixed effects across the 938 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 include *Disagreement*, *Crossing*, as well as total assets, market-to-book ratio, ROA and inverse price of both the acquirer and the target. We also control for deal characteristics, such as *RelativeSize*, *TenderOffer, HostileOffer*, *CompetingOffer*, *CashOnly*, *StockOnly*, a same-industry indicator, combined idiosyncratic volatility and combined skewness. *T*-statistics are computed using standard errors clustered at the year level.

As shown in Table 5, after controlling for variables that are known to relate to synergies, the coefficient on *Disagreement* equals -0.011 (*t*-statistic = -3.18), implying that a one-standard-deviation increase in *Disagreement* is associated with a 1.1% decrease in combined announcement day returns. In further tests, we include *Crossing* and an interaction term between *Crossing* and *Disagreement*. We observe a coefficient estimate of -0.010 (*t*-statistic = -2.35) on the interaction term. These results suggest that the degree to which the value of the combined company is below the sum of the acquirer and target increases with investor disagreement; this relation is particular

strong when the most optimistic investor for the acquirer tends to not be among the most optimistic for the target, i.e., when investors' relative beliefs cross.

5. Embedded Belief Crossing and Additional Analyses

We conduct a number of additional analyses. First, we construct an 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, to open-end mutual funds. Finally, we provide suggestive evidence that firm managers are, at least partially, 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 (along with the interaction term with *Disagreement*) has an intuitive interpretation, it misses an important aspect of belief crossing for portfolios with more than two securities. Consider a portfolio with equal weights in 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 vis-a-vis both securities X and Y. In situations we have a "mismatch" like in the example above, our current *Disagreement* and *Crossing* variables will tend to overstate the level of dispersion and the degree of belief crossing and, as a result, erroneously suggest that the 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 for which we interact crossing and dispersion at the pair level and then aggregate to the portfolio level. 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:

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

where *Corr* denotes the Spearman rank correlation across all brokerage firms that cover the two stocks. We then aggregate this to *InvCov*, defined as the portfolio-weighted average *Pairwise Covariance* across all stock pairs, multiplied by negative one:

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

We then repeat our analyses from Section 4, but now replace the interaction term between *Crossing* and *Disagreement* with *InvCov*. We start with CEFs. The coefficient estimate on *InvCov* of -0.003 (*t*-statistic = -2.06), reported in Column 1 of Table 6, implies that a one-standard-deviation increase in *InvCov* comes with a 30bp increase in the CEF discount. We observe a similar pattern for ETFs. As can be seen in Column 2 of the same table, the coefficient estimate on *InvCov* equals -0.006(*t*-statistic = -2.75), suggesting that a one-standard-deviation increase in *InvCov* is associated with a 0.6bp increase in the ETF discount. Finally, as shown in Column 3, in our M&A setting, the coefficient estimate on *InvCov* is -0.012 (*t*-statistic = -2.32), implying that a one-standard-deviation increase in *InvCov* leads to 1.2% 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 a function of 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 interaction of *Disagreement* and *Crossing*, lending further support to our proposed mechanism.

5.2. Short-Sale Constraints

Returning to our example from the introduction, assume that there is an investor A, who believes that the fair prices for S_X and S_Y are \$10 and \$5, respectively, and also an investor B, who believes that stock prices for S_X and S_Y are \$5 and \$10, respectively. In the presence of binding 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 of S_X and S_Y will fall below those offered by the most optimistic investor; consequently, the discrepancy between the value of the underlying assets and the overall portfolio value of \$15 will narrow.

5.2.1. Security-Level Short-Sale Constraints

To explore this idea, we measure short-sale constraints in the underlying assets using an extant proxy – one minus the fraction of shares held by institutions (hereafter referred to as (1-*IO*)). As shown by prior studies (e.g., Nagel, 2005), institutional ownership is

positively related to the supply of lendable shares, the increase in which can ease short-sale constraints. In additional tests, we also proxy for the degree of short-sale constraints using an interaction term between (1-*IO*) and short interest (*SI*), as stocks with lower supply of lendable shares and higher demand for shorting are perhaps most costly to sell short (Asquith, Pathak and Ritter, 2005).[9]

For the same reason as the one described in Section 5.1, we embed our proxy for 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:

$$PairwiseCovariance\_IO_{(j,l)_{i,t}} = Corr\left(Forecast(EPS)_{h,j,t}, Forecast(EPS)_{h,l,t}\right) * Dispersion_{j,t} * Dispersion_{l,t} * \left(1 - IO_{j,t}\right) * \left(1 - IO_{l,t}\right). \quad (11)$$

We then compute *InvCov_IO* as the portfolio-weighted average *PairwiseCovariance_IO* across all stock pairs, multiplied by negative one:

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

We embed the interaction of (1-*IO*) and *SI* into *InvCov* in a similar manner to derive *InvCov_IOSI*.

The results are reported in Table 7. The dependent variables in the three columns are the CEF premium, the ETF premium, and the M&A combined announced day returns, respectively. The independent variable of primary interest is *InvCov_IO*. After controlling for both *InvCov* and the portfolio-weighted average *IO*, the coefficient estimate on *InvCov_IO* in the CEF, ETF, and M&A samples are -0.002 (insignificant), -0.004 (*t*-statistic = -1.94), and -0.016 (*t*-statistic = -4.86), respectively.[10] These results

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

[10] We also proxy for short-sale constraints using a dummy variable that takes the value of one if institutional ownership is in the bottom tercile of its distribution, and zero otherwise. This is to capture

are generally consistent with 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 (1-*IO)* and *SI* as a proxy for short-sale constraints. The results are similar to those reported in columns 1-3. The estimate on *InvCov_IOSI* are 0.000 (insignificant), -0.022 (*t*-statistic = -2.22) and -0.014 (*t*-statistic = -3.20) for the CEF, ETF and M&A samples, respectively.

As a robustness check, we also use the loan fee and fraction of lendable shares as measures of short sale constraints. We obtain both the loan fee and lendable shares data from a market maker specializing in the lending of small-cap stocks.[11] We are able to run this analysis only in the setting of CEFs, as some CEFs have fairly concentrated holdings in small-cap stocks. In a regression similar to that in Columns 1 and 4 of Table 7, except that now we replace institutional ownership with loan fee and the fraction of lendable shares, we find that the coefficients on *InvCov_LoanFee* and *InvCov_LendableShares* are -0.017 (*t*-statistic = -2.33) and -0.014 (*t*-statistic = -2.10), respectively (Appendix Table A2). These results indicate that a one standard deviation increase in *InCov_LoanFee* (*InCov_LendableShares*) leads to a 1.7% (1.4%) increase in the CEF discount.

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the notion that institutional ownership may have a non-linear effect on short-sale constraints; in particular, short-sale constraints are only binding when institutional ownership is below some threshold. The results are similar to those reported in Table 7: the coefficients on *InvCov_IODummy* in the CEF, ETF, and M&A settings are -0.007 (*t*-statistic = -2.93), -0.004 (*t*-statistic = -1.40), and -0.013 (*t*-statistic = -2.61), respectively.

[11] We thank Lauren Cohen, Karl Diether, and Chris Malloy for sharing their data.

5.2.2. Portfolio-Level Short-Sale Constraints

Our focus thus far has been on short-sale constraints at the individual holdings level and how they may increase the portfolio discount. We next examine the impact of portfolio-level short-sale constraints (i.e., constraints to short sell CEFs and ETFs) on our measures of fund discounts. CEF and ETF discounts should be smaller (or the premium should be larger) if short-sale constraints at the fund level are more binding.

To test this idea, we construct a variable that we label *RelativeConstraint*, defined as the difference in institutional ownership between the portfolio-weighted average of all underlying holdings and the fund itself. A large value of this measure implies that short-sale constraints are more binding at the fund level than at the holding level. As shown in Appendix Table A3, a one standard-deviation increase in *RelativeConstraint* lowers CEF and ETF discounts by 2.6% (t-statistic = 2.46) and 0.6bp (insignificant), respectively. In other words, for the average close-end fund in our sample, a 2.2 times standard deviation increase in *RelativeConstraint* will turn the CEF discount into a premium. Thus, the mechanism that we focus on in this paper – investor disagreement coupled with short sale constraints – can partially explain episodes of CEF premia as well.

5.3. Analyst-Level Crossing

While our baseline results are generated using crossing measures computed at the broker level, we also experiment with analyst-level data. In Table 8, we report results for industry ETFs and within-industry M&As, where both *Crossing* and *InvCov* are computed across individual analysts. We focus on *industry* ETFs and *within-industry* M&As because analysts tend to specialize in a single industry and because in order to

construct our *Crossing* variable, we need a pair of stocks to be covered by at least two common analysts. There are, unfortunately, no industry CEFs in our sample.

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 similar to those shown above. For example, the coefficients on the interaction terms for the industry ETF and M&A samples are -0.011 (*t*-statistic = -3.03) and -0.015 (*t*-statistic = -2.69), respectively, which are of similar magnitudes to those reported in Tables 3 and 5.

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 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. To illustrate, consider an increase in belief dispersion, which then leads to an increase in the fund discount. Arbitrageurs in this case should buy ETF shares in the secondary market, redeem those shares, and sell the underlying portfolio to reap the sure profit. This 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 over the previous period.[12] As shown in Table 9, after including lagged flows and returns, as well as the same set of control variables as in Table 3, the coefficient estimate on *Delta InvCov* (at the broker level) is -0.001 (t-statistic = -9.93). This implies that a one-standard-deviation increase in *Delta InvCov* leads to a 10bp lower ETF flow in the next month.

In Appendix Table A4, we extend the flow analysis to open-end mutual funds, which are also subject to daily capital flows. As with ETFs, changes in investors' belief dispersion and crossing significantly negatively forecast future mutual fund flows: A one-standard-deviation increase in *Delta InvCov* leads to a 20bp (t-statistic = -4.47) lower monthly flow (as a fraction of lagged fund size) to open-end mutual funds. An intuitive way to think about this result is that, as investor disagreement about the underlying holdings increases and their relative views across these holdings become less correlated, current mutual fund shareholders find the portfolio less attractive at its high valuation, which, given the open-end nature of the fund, must be equal to the sum of its components. This then leads to outflows from the mutual fund.

5.5. M&A Timing

Given the evidence presented in this paper, one may wonder whether firm managers are aware of the valuation effect of investor belief dispersion and time their M&A activity accordingly. If managers indeed try to minimize the discount resulting from investors'

[12] Flows to ETFs are defined as the percentage change in shares outstanding over two consecutive periods (e.g., Da and Shive, 2015).

relative belief crossing, we would expect them to complete merger transactions in periods when belief crossing between the acquirer and target is unusually low (compared to historical levels).[13]

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 monotonically decreasing in the five years leading up to the merger. In a more formal test, we regress *InvCov* on an event-time dummy and find a coefficient of -0.063 (*t*-statistic = -2.33). This result is consistent with the notion that managers of the acquirer and target time their M&A transactions, in part, based on variation in investors' relative belief crossing.

6. Conclusion

This paper builds on the notion that even if investors disagree strongly about the value of the individual components, as long as the relative views are not perfectly and positively correlated across these components, disagreement partially offsets at the aggregate portfolio level. In the presence of binding short-sale constraints, this can cause the portfolio to trade at a discount relative to the sum of its components. This discount should increase with both the level of investor disagreement and the degree to which their relative views cross.

We take our prediction to the data. Utilizing CEFs, ETFs, conglomerates, and M&As as our empirical settings, where prices of the underlying components and prices of the aggregate portfolio can be separately evaluated, we provide evidence that the

[13] 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 before the split, making it difficult to construct an ex-ante crossing measure.

portfolio discount, indeed, is increasing with both the level of disagreement and the level of belief crossing.

Thus, by comparing two sets of nearly identical, yet separately traded securities: the aggregate portfolio and its underlying components, we provide a relatively clean test of the relevance of investor disagreement and short-sale constraints in determining asset prices. Moreover, our paper provides a novel, unifying explanation for a number of seemingly unrelated asset pricing phenomena – the CEF discount, the ETF discount, the conglomerate firm discount, and substantial variation in M&A announcement day returns, which prior literature has tied to different mechanisms.

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Table 1. Descriptive Statistics

This table presents descriptive statistics for our samples of closed-end funds (CEFs), exchange-traded funds (ETFs), conglomerates, and mergers and acquisitions (M&As). Panel A reports descriptive statistics for the pooled sample of CEF observations. Panel B reports descriptive statistics for the pooled sample of ETF observations. Panel C reports descriptive statistics for the pooled sample of conglomerate observations. Panel D reports descriptive statistics for the pooled sample of M&As. All variables are as described in Appendix Table A1.

	N	Mean	Median	St. Dev.
Panel A: Closed-End Funds				
CEF Premium	9,234	-0.059	-0.088	0.114
Disagreement	9,234	0.001	0.001	0.001
Brokerage-Crossing	8,989	-0.015	-0.009	0.048
*Brokerage-InvCov (*1,000)*	8,989	0.000	0.000	0.001
Inverse Price	9,234	0.076	0.059	0.059
Dividend Yield	9,234	0.072	0.077	0.057
Expense Ratio	9,234	0.013	0.011	0.008
Liquidity Ratio	9,234	0.421	0.309	0.519
Excess Idiosyncratic Volatility	9,234	-0.008	-0.008	0.007
Excess Skewness	9,234	-0.072	-0.085	0.450
Panel B: Exchange-Traded Funds				
*ETF Premium (*100)*	13,622	-0.009	0.000	0.383
Disagreement	13,622	0.000	0.002	0.010
Brokerage-Crossing	12,383	-0.021	-0.001	0.054
*Brokerage-InvCov (*1,000)*	12,383	-0.001	0.000	0.026
Inverse Price	13,622	0.030	0.025	0.020
Dividend Yield	13,622	0.040	0.021	0.040
Expense Ratio	13,622	0.004	0.004	0.002
Liquidity Ratio	13,622	3.300	1.005	7.670
Excess Idiosyncratic Volatility	13,622	-0.010	-0.008	0.010
Excess Skewness	13,622	-0.110	-0.118	0.410

Table 1. Continued.

Panel C: Conglomerates				
Diversification Premium	21,459	-0.238	-0.401	0.617
Disagreement	21,459	0.030	0.006	0.080
Total Assets	21,459	4,846	473	27,059
Leverage	21,459	0.196	0.180	0.153
Profitability	21,459	0.062	0.079	0.660
Investment Ratio	21,459	0.076	0.041	0.165
Excess Idiosyncratic Volatility	21,459	0.020	0.010	0.071
Excess Skewness	21,459	-0.036	-0.053	0.636
Panel D: Mergers and Acquisitions				
Combined Announcement Day Return	938	0.017	0.009	0.074
Acquirer Announcement Day Return	938	-0.014	-0.010	0.072
Target Announcement Day Return	938	0.217	0.178	0.231
Disagreement	938	0.004	0.001	0.026
Analyst-Crossing	156	-0.126	0.000	0.683
Brokerage-Crossing	206	-0.067	0.000	0.674
*Analyst-InvCov (*1,000)*	156	-0.002	0.000	0.017
*Brokerage-InvCov (*1,000)*	206	-0.001	0.000	0.014
Acquirer Market Capitalization	938	19,278	3,418	44,303
Acquirer Market-to-Book Ratio	938	3.711	2.615	3.495
Acquirer ROA	938	0.097	0.097	0.108
Target Market Capitalization	938	1,825	386	5,747
Target Market-to-Book Ratio	938	2.979	2.066	3.268
Target ROA	938	0.045	0.071	0.172
Combined Idiosyncratic Volatility	938	0.078	0.066	0.049
Combined Skewness	938	0.117	0.103	0.499

Table 2. Closed-End Fund Discount

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 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 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 rank correlation between the earnings forecasts issued for each of these two stocks. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman rank correlation, multiplied by negative one. All other independent variables are as described in Appendix Table A1. All independent variables are normalized to have a standard deviation of one. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (time level and fund level). *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
$Disagreement_{i,t}$	-0.005	-0.007
	(-1.29)	(-1.43)
$Disagreement_{i,t}$ * $Crossing_{i,t}$		-0.001**
		(-2.10)
$Crossing_{i,t}$		0.000
		(0.15)
$InversePrice_{i,t\ [pos]}$	0.042***	0.041***
	(4.65)	(4.72)
$InversePrice_{i,t\ [neg]}$	-0.024***	-0.024***
	(-2.71)	(-2.69)
$DividendYield_{i,t}$	0.027**	0.027**
	(2.44)	(2.43)
$LiquidityRatio_{i,t}$	0.022	0.023
	(1.56)	(1.57)
$ExpenseRatio_{i,t}$	0.003	0.003
	(0.63)	(0.59)
$ExcessIdiosyncraticVolatility_{i,t}$	0.003	0.003
	(0.35)	(0.34)
$ExcessSkewness_{i,t}$	-0.001	-0.001
	(-0.49)	(-0.51)
# Obs.	9,234	8,989
Adj. R^2	0.502	0.499

Table 3. Exchange-Traded Fund Discount

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 dependent variable is the difference between the ETF's market price and the ETF's NAV, divided by the ETF's NAV, multiplied by 100. $Disagreement_{i,t}$ is the portfolio-weighted average price-scaled earnings forecast dispersion of the stocks held by ETF i as of t. To compute $Crossing_{i,t}$, we consider all stocks held by the ETF. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman rank correlation between the earnings forecasts issued for each of these two stocks. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman rank correlation multiplied by negative one. All other independent variables are as described in Appendix Table A1. All independent variables are normalized to have a standard deviation of one. Time-fixed effects are included in all columns. T-statistics are computed using standard errors clustered along two dimensions (time level and fund level). *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
$Disagreement_{i,t}$	-0.001	-0.003
	(-0.28)	(-0.91)
$Disagreement_{i,t}$ * $Crossing_{i,t}$		-0.005***
		(-3.13)
$Crossing_{i,t}$		-0.003
		(-0.91)
$InversePrice_{i,t\ [pos]}$	0.098***	0.092***
	(10.32)	(10.56)
$InversePrice_{i,t\ [neg]}$	-0.099***	-0.098***
	(-10.31)	(-9.96)
$DividendYield_{i,t}$	0.006	0.006
	(1.05)	(1.03)
$ExpenseRatio_{i,t}$	-0.004	-0.003
	(-0.80)	(-0.67)
$LiquidityRatio_{i,t}$	-0.007	-0.006
	(-1.23)	(-1.01)
$ExcessIdiosyncraticVolatility_{i,t}$	0.005	0.005
	(0.49)	(0.47)
$ExcessSkewness_{i,t}$	-0.007	-0.008
	(-1.71)	(-1.82)
# Obs.	13,622	12,328
Adj. R^2	0.283	0.283

Table 4. Conglomerate Firm Discount

This table reports coefficient estimates from regressions of annual diversification premia on a measure of disagreement about the conglomerate's underlying segments. 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 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 Appendix Table A1. All independent variables are normalized to have a standard deviation of one. In Column (1), we estimate a panel regression with time-fixed effects; *t*-statistics are computed using standard errors clustered along two dimensions (time level and firm level). In Column (2), we estimate 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 of the cross-sectional regressions. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
$Disagreement_{i,t}$	-0.028***	-0.047***
	(-4.42)	(-3.49)
$ln(TotalAssets)_{i,t}$	-0.494***	-0.549***
	(-9.41)	(-11.33)
$ln(TotalAssets)^2_{i,t}$	0.412***	0.467***
	(8.18)	(10.13)
$Leverage_{i,t}$	0.050***	0.048***
	(5.23)	(5.99)
$Profitability_{i,t}$	0.009*	0.129
	(1.90)	(1.61)
$InvestmentRatio_{i,t}$	0.019***	0.027***
	(2.56)	(2.90)
$ExcessIdiosyncraticVolatility_{i,t}$	0.021***	0.023***
	(6.24)	(6.99)
$ExcessSkewness_{i,t}$	0.014**	0.011***
	(2.46)	(1.82)
# Obs.	21,459	31
Adj. R^2	0.068	0.088

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 dependent variable is the average cumulative abnormal return [-1,+1] of the acquirer and 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 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 rank correlation between earnings forecasts issued for the acquirer and those issued for the target, multiplied by negative one. $TenderOffer_{i,t}$, $HostileOffer_{i,t}$, and $CompetingOffer_{i,t}$ represent indicators of whether the offer is a tender offer, whether the offer is hostile and whether there is more than one offer. $CashOnly_{i,t}$ and $StockOnly_{i,t}$ represent indicators of whether the offer is financed via cash and stock only. $SameIndustry_{i,t}$ is an indicator of whether the acquirer and the target operate in the same two-digit SIC code. All other independent variables are as described in Appendix Table A1. All independent variables are normalized to have a standard deviation of one. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered at the time level. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
$Disagreement_{i,t}$	-0.011***	0.005
	(-3.18)	(0.73)
$Disagreement_{i,t}$ *$Crossing_{i,t}$		-0.010**
		(-2.35)
$Crossing_{i,t}$		-0.003
		(-0.54)
$ln(AcquirerTotalAssets_{i,t})$	-0.008	-0.005
	(-1.18)	(-0.39)
$AcquirerMB_{i,t}$	-0.002	0.009**
	(-0.59)	(2.27)
$AcquirerROA_{i,t}$	0.002	0.001
	(1.00)	(0.11)
$ln(TargetTotalAssets_{i,t})$	-0.006	-0.002
	(-1.27)	(-0.19)
$TargetMB_{i,t}$	-0.005*	-0.006
	(-1.77)	(-0.92)
$TargetROA_{i,t}$	-0.004*	-0.002
	(-1.89)	(-0.26)
$TargetInversePrice_{i,t}$	-0.001	0.004
	(-0.28)	(1.50)

Table 5. Continued.

	(1)	(2)
$RelativeSize_{i,t}$	-0.020***	-0.015
	(-3.82)	(-1.14)
$TenderOffer_{i,t}$	0.019***	0.019
	(2.80)	(0.95)
$HostileOffer_{i,t}$	0.046***	0.047**
	(3.15)	(2.03)
$CompetingOffers_{i,t}$	-0.017*	-0.003
	(-1.81)	(-0.16)
$CashOnly_{i,t}$	0.010*	0.023
	(1.93)	(1.65)
$StockOnly_{i,t}$	-0.010	-0.005
	(-1.50)	(-0.40)
$SameIndustry_{i,t}$	0.005	0.001
	(1.17)	(0.05)
$CombinedIdiosyncraticVolatility_{i,t}$	-0.011***	-0.006
	(-4.14)	(-1.04)
$CombinedSkewness_{i,t}$	-0.001	-0.003
	(-0.55)	(-0.53)
# Obs.	938	206
Adj. R^2	0.170	0.149

Table 6. Embedded Belief Crossing

This table reports coefficient estimates from regressions of weekly CEF 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 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 rank correlation between the earnings forecasts issued for each of these two stocks and the pairwise covariance as the Spearman rank correlation, multiplied by the respective earnings forecast dispersions. $Crossing_{i,t}$ is the portfolio-weighted average pairwise Spearman rank correlation, multiplied by negative one. $InvCov_{i,t}$ is the portfolio-weighted average pairwise covariance, multiplied by negative one. $Disagreement_{i,t}$, $Crossing_{i,t}$, and $InvCov_{i,t}$ are constructed analogously for ETFs (Column 2). In Column 3, $Disagreement_{i,t}$ is the average 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 rank correlation between earnings forecasts issued for the acquirer and those issued for the target, multiplied by negative one. $InvCov_{i,t}$ is the pairwise Spearman rank correlation, multiplied by the respective earnings forecast dispersions, multiplied by negative one. 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 Appendix Table A1. All independent variables are normalized to have a standard deviation of one. Time-fixed effects are included in all columns. T-statistics are computed using standard errors clustered along two dimensions (time level and fund level); for M&As, t-statistics are computed using standard errors clustered at the time level. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	CEF (1)	ETF (2)	M&A (3)	ΔCEF (4)	ΔETF (5)
$Disagreement_{i,t}$	-0.006	-0.002***	0.005		
	(-1.43)	(-0.68)	(1.01)		
$InvCov_{i,t}$	-0.003**	-0.006***	-0.012**		
	(-2.06)	(-2.75)	(-2.32)		
$Crossing_{i,t}$	-0.000	-0.005	-0.006		
	(-0.02)	(-0.86)	(-1.10)		
$DeltaDisagreement_{i,t}$				-0.000	0.006
				(-0.48)	(1.20)
$DeltaInvCov_{i,t}$				-0.001***	-0.011***
				(-4.21)	(-5.62)
$DeltaCrossing_{i,t}$				0.001	-0.006
				(1.02)	(-1.12)
Other Controls	Yes	Yes	Yes	Yes	Yes
# Obs.	8,989	12,383	206	1,280	8,326
Adj. R^2	0.499	0.283	0.151	0.044	0.247

Table 7. Short-Sale Constraints

This table reports coefficient estimates from regressions of weekly CEF 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 rank correlation between the earnings forecasts issued for each of these two stocks, 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 ownership (=1-institutional ownership). $InvCov\_IOSI_{i,t}$ equals the portfolio-weighted average pairwise covariance, multiplied by retail ownership and by short interest. $InvCov_{i,t}$, $InvCov\_IO_{i,t,}$ and $InvCov\_IOSI_{i,t}$ are constructed analogously for ETFs (Columns 2 and 5). In Columns 3 and 6, $Disagreement_{i,t}$ is the average 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 rank correlation between earnings forecasts issued for the acquirer and those issued for the target, multiplied by the respective earnings forecast dispersions, multiplied by negative one. $InvCov\_IO_{i,t}$ is $InvCov_{i,t}$ embedded with the respective retail ownership. $InvCov\_IOSI_{i,t}$ is $InvCov_{i,t}$ embedded with the respective retail ownership and short interest. All other independent variables are as described in Appendix Table A1. All independent variables are normalized to have a standard deviation of one. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (time level and fund level); for M&As, *t*-statistics are computed using standard errors clustered at the time level. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	CEF	ETF	M&A	CEF	ETF	M&A
	(1)	(2)	(3)	(4)	(5)	(6)
$InvCov_{i,t}$	-0.000	-0.003	-0.004	0.001	0.014	-0.003
	(-0.06)	(-1.08)	(-0.94)	(0.68)	(1.30)	(-0.69)
$InvCov\_IO_{i,t}$	-0.002	-0.004*	-0.016***			
	(-1.22)	(-1.94)	(-4.86)			
$IO_{i,t}$	0.018	0.002	0.000			
	(1.43)	(0.80)	(0.06)			
$InvCov\_IOSI_{i,t}$				0.000	-0.022**	-0.014***
				(0.24)	(-2.22)	(-3.20)
$IOSI_{i,t}$				-0.000	-0.005	0.000
				(-0.01)	(-1.10)	(0.03)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	8,989	12,383	206	8,678	12,343	197
Adj. R^2	0.509	0.283	0.140	0.500	0.289	0.147

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 earnings forecast dispersion of the stocks held by ETF i as of t. To compute $Crossing_{i,t}$ and $InvCov_{i,t}$, we consider all stocks held by the ETF. If two stocks are covered by more than two of the same analysts, we compute the Spearman rank correlation between the earnings forecasts issued for each of these two stocks, and the pairwise covariance as the Spearman rank correlation, multiplied by the respective earnings forecast dispersions. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman rank correlation, multiplied by negative one. $InvCov_{i,t}$ equals the portfolio-weighted average pairwise covariance, multiplied by negative one. In Columnd 2 and 4, $Disagreement_{i,t}$ is the average 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 rank correlation between earnings forecasts issued for the acquirer and those issued for the target, multiplied by negative one. $InvCov_{i,t}$ is the pairwise Spearman rank correlation, multiplied by the respective earnings forecast dispersions, multiplied by negative one. All other independent variables are as described in Appendix Table A1. All independent variables are normalized to have a standard deviation of one. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (time level and fund level); for M&As, *t*-statistics are computed using standard errors clustered at the time level. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	ETF	M&A	ETF	M&A
	(1)	(2)	(3)	(4)
$Disagreement_{i,t}$	-0.030***	0.000	-0.022***	0.005
	(-4.29)	(0.02)	(-4.61)	(0.70)
$Disagreement_{i,t}$ * $Crossing_{i,t}$	-0.011***	-0.015**		
	(-3.03)	(-2.69)		
$InvCov_{i,t}$			-0.031***	-0.013*
			(-2.95)	(-1.90)
$Crossing_{i,t}$	0.007	-0.004	-0.002	-0.007
	(0.95)	(-0.60)	(-0.33)	(-1.13)
Other Controls	Yes	Yes	Yes	Yes
# Obs.	2,899	156	2,899	156
Adj. R^2	0.341	0.126	0.342	0.118

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. $DeltaDisagreement_{i,t-1}$ is the change in the portfolio-weighted average price-scaled earnings forecast dispersion of the stocks held by the ETF over the previous month. To compute $Crossing_{i,t}$ and $InvCov_{i,t}$, we consider all stocks held by the ETF. If two stocks are covered by more than two of the same brokerage houses, we compute the Spearman rank correlation between the earnings forecasts issued for each of these two stocks, and the pairwise covariance as the Spearman rank correlation, multiplied by the respective earnings forecast dispersions. $Crossing_{i,t}$ equals the portfolio-weighted average pairwise Spearman rank correlation, multiplied by negative one. $InvCov_{i,t}$ equals the portfolio-weighted average pairwise covariance, multiplied by negative one. $Delta\ Crossing_{i,t}$ and $Delta\ InvCov_{i,t}$ are the changes in *Crossing and InvCov*, respectively, over the previous month. *LagReturns* and *LagFlows* are four variables each, representing quarterly returns and fund flows over the previous four quarters. All other independent variables are as described in Appendix Table A1. All independent variables are normalized to have a standard deviation of one. Time-fixed effects are included in all columns. *T*-statistics are computed using standard errors clustered along two dimensions (time level and fund level). *, **, *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
$DeltaDisagreement_{i,t}$	0.000	0.001
	(0.31)	(0.49)
$DeltaInvCov_{i,t}$		-0.001***
		(-9.93)
$DeltaCrossing_{i,t}$		0.002*
		(1.86)
$InversePrice_{i,t\ [pos]}$	0.003	0.004
	(0.72)	(1.12)
$InversePrice_{i,t\ [neg]}$	-0.006*	-0.004
	(-1.73)	(-1.57)
$DividendYield_{i,t}$	0.004	0.004
	(1.49)	(1.46)
$ExpenseRatio_{i,t}$	0.005	0.005
	(1.13)	(1.20)
$LiquidityRatio_{i,t}$	0.009	0.010
	(1.97)	(2.07)
$DeltaExcessIdiosyncraticVolatility_{i,t}$	0.000	-0.000
	(0.20)	(-0.00)
$DeltaExcessSkewness_{i,t}$	-0.002	-0.002
	(-1.36)	(-0.78)
LagReturns	Yes	Yes
LagFlows	Yes	Yes
# Obs.	6,651	6,035
Adj. R^2	0.068	0.060

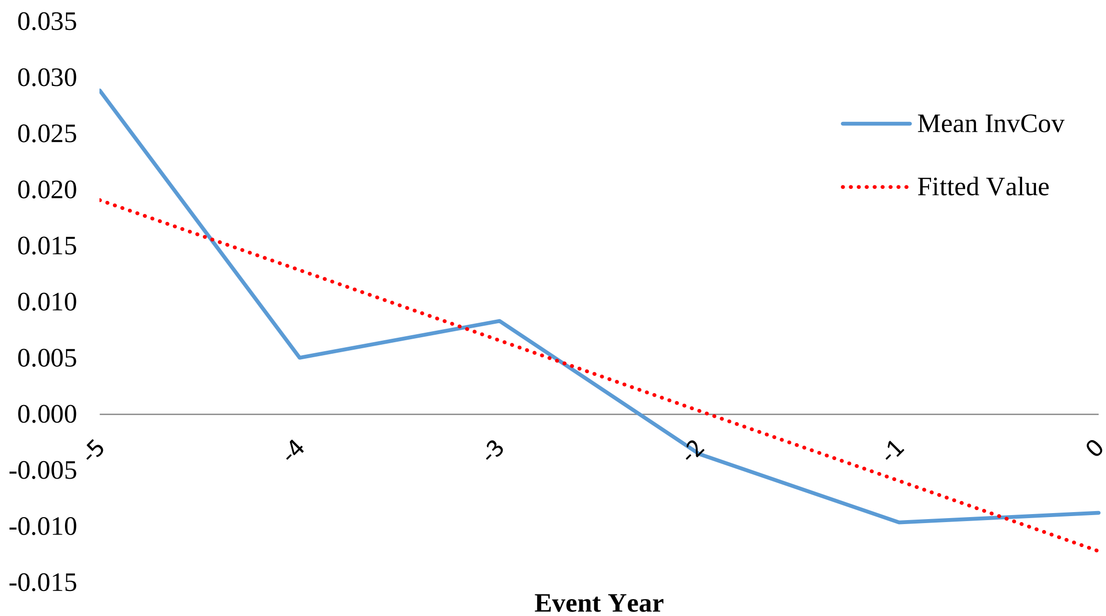

Figure 1. This figure shows the time variation in *InvCov* of the acquirer and target pair in the five years leading up to the M&A transaction. To compute *InvCov*, we focus on brokerage houses covering both the acquirer and target. We first compute the Spearman rank correlation between earnings forecasts issued for the acquirer and those issued for the target. *InvCov* is the Spearman correlation, multiplied by the respective earnings forecast dispersions, multiplied by negative one. We demean *InvCov* in each calendar year to remove market-wide fluctuations. *InvCov* is shown in basis points. The blue curve shows the average *InvCov* in each of the five years leading up to the M&A transaction, and the dotted red line is the fitted value from a linear regression on event years. The slope of the line is -0.063 (t-statistic = -2.33).