

ONLINE APPENDIX TO  
“OFFSETTING DISAGREEMENT AND SECURITY PRICES”

This Draft: October 2017

Table A1. Belief Crossing and CEF Discounts: Holdings

This table replicates Table 2, but in Columns 1, 2, 3 and 4, *InvCov* is now calculated based on the top 20, top 30, top 40 and top 50 holdings, respectively. In Columns 5, 6, 7, 8 and 9, *InvCov* is calculated based on the top 10%, top 20%, top 30%, top 40% and top 50% of holdings, respectively. Our controls are identical to those in Table 2. All independent variables are normalized to have a standard deviation of one. *T*-statistics are reported in parentheses and are based on standard errors clustered by fund and year-quarter. Statistical significance at the 10%, 5%, and 1% levels is denoted by \*, \*\*, and \*\*\*, respectively.

	Top 20 Holdings (1)	Top 30 Holdings (2)	Top 40 Holdings (2)	Top 50 Holdings (4)
Panel A. Baseline <i>InvCov</i>				
<i>InvCov</i>	-0.490* (-1.84)	-0.415*** (-2.62)	-0.528** (-2.50)	-0.450** (-2.41)
<i>Disagreement</i>	0.317 (0.70)	0.455 (0.83)	0.626 (1.19)	0.544 (0.87)
<i>Crossing</i>	0.071 (0.44)	-0.076 (-0.36)	-0.190 (-0.69)	-0.161 (-0.66)
Controls	Yes	Yes	Yes	Yes
#Obs.	1,906	1,906	1,906	1,906
Adj. R <sup>2</sup>	0.843	0.843	0.844	0.844
Panel B. Embed <i>IO</i> into <i>InvCov</i>				
<i>InvCov</i>	-0.559** (-2.05)	-0.461** (-2.58)	-0.585*** (-2.60)	-0.514** (-2.57)
<i>Disagreement</i>	0.427 (1.02)	0.507 (0.95)	0.602 (1.22)	0.533 (0.91)
<i>Crossing</i>	0.115 (0.75)	-0.056 (-0.27)	-0.179 (-0.66)	-0.154 (-0.66)
Controls	Yes	Yes	Yes	Yes
#Obs.	1,906	1,906	1,906	1,906
Adj. R <sup>2</sup>	0.844	0.844	0.845	0.844
Panel C. Embed <i>IO</i> and <i>SI</i> into <i>InvCov</i>				
<i>InvCov</i>	-0.531** (-2.04)	-0.406** (-2.41)	-0.520*** (-2.61)	-0.410** (-2.40)
<i>Disagreement</i>	0.399 (0.88)	0.524 (0.97)	0.682 (1.32)	0.532 (0.92)
<i>Crossing</i>	0.081 (0.52)	-0.099 (-0.44)	-0.216 (-0.77)	-0.205 (-0.79)
Controls	Yes	Yes	Yes	Yes
#Obs.	1,906	1,906	1,906	1,906
Adj. R <sup>2</sup>	0.844	0.844	0.844	0.844

Table A1. Continued.

	Top 10% Holdings (5)	Top 20% Holdings (6)	Top 30% Holdings (7)	Top 40% Holdings (8)	Top 50% Holdings (9)
Panel A. Baseline <i>InvCov</i>					
<i>InvCov</i>	-0.565* (-1.93)	-0.711** (-2.09)	-0.517** (-2.25)	-0.675** (-2.39)	-0.592*** (-2.65)
<i>Disagreement</i>	0.696 (1.38)	0.464 (1.10)	0.464 (1.04)	0.532 (1.12)	0.681 (1.34)
<i>Crossing</i>	0.314** (2.38)	0.462** (2.11)	0.124 (0.87)	0.078 (0.44)	0.056 (0.25)
Controls	Yes	Yes	Yes	Yes	Yes
#Obs.	1,906	1,906	1,906	1,906	1,906
Adj. R <sup>2</sup>	0.844	0.844	0.843	0.844	0.844
Panel B. Embed <i>IO</i> into <i>InvCov</i>					
<i>InvCov</i>	-0.568* (-1.85)	-0.795** (-2.14)	-0.557** (-2.43)	-0.730** (-2.44)	-0.631** (-2.50)
<i>Disagreement</i>	0.791 (1.56)	0.608 (1.34)	0.609 (1.32)	0.600 (1.31)	0.644 (1.36)
<i>Crossing</i>	0.317** (2.50)	0.500** (2.19)	0.138 (1.10)	0.090 (0.56)	0.045 (0.21)
Controls	Yes	Yes	Yes	Yes	Yes
#Obs.	1,906	1,906	1,906	1,906	1,906
Adj. R <sup>2</sup>	0.845	0.845	0.844	0.845	0.845
Panel C. Embed <i>IO</i> and <i>SI</i> into <i>InvCov</i>					
<i>InvCov</i>	-0.514* (-1.74)	-0.731** (-2.05)	-0.532** (-2.20)	-0.646** (-2.43)	-0.570** (-2.51)
<i>Disagreement</i>	0.736 (1.40)	0.498 (1.19)	0.495 (1.07)	0.552 (1.11)	0.708 (1.38)
<i>Crossing</i>	0.255* (1.88)	0.451** (2.20)	0.103 (0.68)	0.003 (0.01)	-0.019 (-0.08)
Controls	Yes	Yes	Yes	Yes	Yes
#Obs.	1,906	1,906	1,906	1,906	1,906
Adj. R <sup>2</sup>	0.845	0.845	0.844	0.845	0.845

Table A2. Belief Crossing and Future CEF/ETF Returns

This table reports coefficient estimates from pooled OLS regressions of one-year returns of CEFs and ETFs on a measure of investor disagreement and belief crossing. The dependent variable is the CEF/ETF's one-year return (based on prices, not NAVs). We construct *InvCov* as follows: For each stock pair involving securities of the CEF/ETF's top-ten holdings, we compile a list of brokerage houses that cover both firms and we compute the Spearman rank correlation in earnings forecasts between these two firms; we also compute the forecast dispersion for each of the two firms. *PairwiseCov* is the product of the Spearman rank correlation and the average forecast dispersion. We aggregate *PairwiseCov* to *InvCov* as the portfolio-weighted average *PairwiseCov* across all stock pairs, multiplied by negative one. A large positive realization of *InvCov* suggests a high level of embedded belief crossing. In Columns 2 and 3, we augment *InvCov* with  $(1-IO)$  and with  $(1-IO) * SI$ , respectively, where *IO* is the residual institutional ownership and *SI* is short interest. Our controls are identical to those in the CEF/ETF discount regression. All independent variables are normalized to have a standard deviation of one. We include year-fixed effects. *T*-statistics are reported in parentheses and are based on standard errors clustered by year. Statistical significance at the 10%, 5%, and 1% levels is denoted by \*, \*\*, and \*\*\*, respectively.

	Baseline <i>InvCov</i> (1)	Embed <i>IO</i> into <i>InvCov</i> (2)	Embed <i>IO</i> and <i>SI</i> into <i>InvCov</i> (3)
<i>InvCov</i>	0.008*** (2.64)	0.009*** (3.40)	0.007*** (3.10)
<i>Disagreement</i>	-0.011** (-2.06)	-0.011** (-2.22)	-0.007* (-1.78)
<i>Crossing</i>	-0.004 (-1.54)	-0.004* (-1.74)	-0.002 (-0.90)
Controls	Yes	Yes	Yes
#Obs.	5,732	5,732	5,732
Adj. R <sup>2</sup>	0.580	0.582	0.580

Table A3. Belief Crossing and CEF Discounts: Controlling for Investor Sentiment

This table replicates Table 2, but now controls for investor sentiment (while omitting year-quarter fixed effects). *Sentiment* is the Consumer Confidence Index as compiled by The Conference Board. Our controls are identical to those in Table 2. All independent variables are normalized to have a standard deviation of one. We include fund-fixed effects. *T*-statistics are reported in parentheses and are based on standard errors clustered by fund and year-quarter. Statistical significance at the 10%, 5%, and 1% levels is denoted by \*, \*\*, and \*\*\*, respectively.

	Baseline <i>InvCov</i> (1)	Embed <i>IO</i> into <i>InvCov</i> (2)	Embed <i>IO</i> and <i>SI</i> into <i>InvCov</i> (3)
<i>InvCov</i>	-0.520*** (-2.61)	-0.606*** (-2.65)	-0.534*** (-2.55)
<i>Disagreement</i>	0.252 (0.60)	0.454 (0.96)	0.444 (1.03)
<i>Crossing</i>	0.106 (0.64)	0.172 (1.08)	0.109 (0.64)
<i>Sentiment</i>	0.125 (0.21)	0.122 (0.20)	0.103 (0.18)
<i>Sentiment * ln(MarketCap)</i>	-0.402 (-1.05)	-0.411 (-1.06)	-0.362 (-0.92)
<i>Sentiment * IO</i>	-0.508 (-1.14)	-0.500 (-1.13)	-0.502 (-1.12)
<i>Sentiment * Idiosyncratic Volatility</i>	-0.029 (-0.12)	-0.027 (-0.11)	-0.046 (-0.20)
<i>ln(MarketCap)</i>	-2.502 (-1.13)	-2.491 (-1.14)	-3.271 (-1.38)
<i>IO</i>	0.192 (0.62)	0.238 (0.71)	0.190 (0.59)
<i>Idiosyncratic Volatility</i>	-0.550 (-0.95)	-0.591 (-1.01)	-0.468 (-0.81)
Controls	Yes	Yes	Yes
#Obs.	1,906	1,906	1,906
Adj. R <sup>2</sup>	0.830	0.831	0.831

### Context for “Table A4. ETF Spillover Effects”

The results in our paper indicate that authorized participants are price stabilizing. However, there is a flip-side to this arbitrage mechanism. Consider an ETF holding three securities, A, B and C. Assume that investors strongly disagree about the values of A and B and that disagreement offsets when the two securities are viewed as a whole. Investors, in the meanwhile, disagree little about security C.

In the absence of arbitrage forces, the ETF will trade at a discount relative to its underlying assets because of its holdings in A and B. If authorized participants redeem ETF shares and sell the underlying portfolio and/or if other smart investors buy ETF shares and simultaneously short the underlying portfolio to take advantage of the ETF discount, the price of C may fall initially due to the selling pressure, only to rebound subsequently. Note that the spillover mechanism we describe here is *independent* from the investor disagreement channel tested in prior literature, as there is little investor disagreement regarding stock C.

To explore this idea, we construct a measure of *PeerInvCov*. For all non-top-ten stocks, *PeerInvCov* equals *InvCov* computed across the top-ten holdings. For top-ten stocks, *PeerInvCov* is the *InvCov* computed across the other nine top-ten stocks. For each stock, we take the TNA-weighted average *PeerInvCov* across all ETF holdings in that stock. If arbitrage trades – both from authorized participants and other smart investors – have a meaningful impact on the price of C (due to price pressure), we expect *PeerInvCov* to negatively associate with contemporaneous stock returns, but to positively predict future returns.

We start with checking the contemporaneous return patterns and we employ the same event window as in the flow test.<sup>1</sup> Specifically, we examine how stock returns in the three months (i.e., -1, 0, 1) surrounding the ETF’s quarter end reporting date relate to quarterly *changes* in *PeerInvCov*. We focus on the change rather than level of *PeerInvCov* because it is the shock to *PeerInvCov* (a highly persistent variable) that triggers arbitrage trading (similar to  $\Delta InvCov$  triggering ETF flows). Further, since the return effect should be concentrated in the part of the sample with large  $\Delta PeerInvCov$ , we compare stocks in the top quintile in terms of  $\Delta PeerInvCov$  with stocks in the other four quintiles. (Our results would go through if we instead compare the top  $\Delta PeerInvCov$  quintile with the bottom quintile.) Consistent with our conjecture, in untabulated analyses, we find that the average cumulative four-factor alpha of the top quintile is -1.2% ( $t$ -statistics = -1.77) while the average alpha of stocks in the

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<sup>1</sup> Our sample consists of NYSE/AMEX/NASDAQ common stocks with price-per-share greater than \$5 and with fraction of shares held by ETFs greater than the median of its distribution.

other four quintiles is 0.12% ( $t$ -statistics = 1.10). The difference between the two is statistically significant ( $\Delta = -1.56\%$ ,  $t$ -statistics = -2.31).

We next examine whether stock prices bounce back after the initial drop. To this end, we employ both a portfolio approach and a Fama-MacBeth (1973) regression analysis. In the calendar-time portfolio test, we sort stocks into quintiles based on *PeerInvCov* as of month zero, and go long the top quintile and short the bottom four quintiles from months 2 through 6. We argue that for the purpose of detecting the return reversal, the level of *PeerInvCov* reflects the cumulative effect of arbitrage trades to date and is thus the right variable to focus on. As shown in Panel A of Table A5, stocks in the top quintile outperform their peers, on a four-factor adjusted basis, by 0.34% ( $t$ -statistic = 2.27) to 0.50% ( $t$ -statistic = 3.07) per month in these five months, or by 1.7% to 2.45% over the entire period. The magnitude of the reversal pattern lines up well with the magnitude of the initial price drop.

In Panel B, we estimate Fama-MacBeth (1973) regressions. The dependent variable is the monthly DGTW-adjusted return. The independent variable of primary interest is each stock's *PeerInvCov*. We also include in the regression the stock's own earnings forecast dispersion, and other controls that are known to forecast future stock returns. All independent variables are normalized to have a standard deviation of one with the exception of *PeerInvCovQR*, which is the quintile ranking of *PeerInvCov*.

As shown in Column 2 of Panel B, after controlling for the stock's own earnings forecast dispersion, the coefficient estimate on the quintile dummy *PeerInvCovQR* is 0.102 ( $t$ -statistic = 2.78). This implies that stocks in the top quintile outperform those in the bottom quintile by nearly 41bps ( $0.102 * 4 = 0.408$ ) per month in the next five months. The point estimate increases to 0.150 ( $t$ -statistic = 2.43) if in each cross section, we estimate a weighted-least-square regression where the weight is proportional to each stock's lagged market capitalization. Overall, the evidence confirms our prediction that arbitrage trades that are aimed to correct the discrepancy between the ETF value and underlying portfolio value can sometimes have a destabilizing effect on some of the underlying securities.

Table A4. ETF Spillover Effects

This table reports the profitability of a trading strategy exploiting the ETF spillover effect. For each stock, we construct *PeerInvCov* as discussed above. The sample consists of common stocks traded in NYSE/AMEX/NASDAQ for which the price-per-share is greater than \$5 and fraction of shares held by ETFs is greater than the median of its distribution. We skip a month after portfolio formation and we hold the portfolios for six months. Panel A reports the monthly Carhart (1997) factor alphas for the “highest *PeerInvCov* quintile” portfolio and the “remaining four quintile” portfolio. Panel B reports coefficient estimates from monthly Fama-MacBeth (1973) regressions of DGTW-adjusted returns [%] on *PeerInvCov*. We use quintile rankings (0-4) for *PeerInvCov*; all other independent variables are normalized to have a standard deviation of one. In Columns 1 and 2 of Panel B, we equal-weight each month. In Columns 3 and 4 of Panel B, we weight by market capitalization. *T*-statistics are based on Newey-West (1987) standard errors with six lags and are reported in parentheses. Statistical significance at the 10%, 5%, and 1% levels is denoted by \*, \*\*, and \*\*\*, respectively.

Panel A: Portfolio Approach				
	Equal-Weighted	<i>T</i> -Statistics	Value-Weighted	<i>T</i> -Statistics
Top <i>PeerInvCov</i> Quintile	0.35%	[2.55]	0.42%	[2.93]
Other <i>PeerInvCov</i> Quintiles	0.01%	[0.14]	-0.08%	[-2.02]
Top-Other	0.34%	[2.27]	0.50%	[3.07]
Panel B: Regression Approach				
	OLS (1)	OLS (2)	WLS (3)	WLS (4)
<i>PeerInvCov</i>	0.119*** (2.70)	0.102*** (2.78)	0.187** (2.13)	0.150** (2.43)
<i>Ln(MarketCap)</i>		-0.148** (-2.55)		-0.103 (-0.54)
<i>Book-to-Market Ratio</i>		-0.050 (-0.80)		0.042 (0.28)
<i>Past-One-Year Returns</i>		-0.067 (-0.36)		0.030 (0.11)
<i>Turnover</i>		-0.167 (-1.37)		0.713*** (2.83)
<i>Dispersion</i>		-0.215*** (-2.99)		-0.984*** (-2.68)
<i>Volatility</i>		-0.012 (-0.18)		-0.729*** (-2.63)
# Qtrs.	36	36	36	36
Adj. R <sup>2</sup>	0.003	0.038	0.022	0.143



Table A5. Belief Crossing and Operating Performance of the Combined Firm

This table reports coefficient estimates from regressions of post-M&A operating performance measures on a measure of investor disagreement and belief crossing about the acquirer and the target. The dependent variable is the post-M&A five-year average of *ROA*, *ROE*, *Profitability* and *Sales Growth*. We construct *InvCov* as follows: We compile a list of brokerage houses that cover both the acquirer and the target and we compute the Spearman rank correlation in earnings forecasts between these two firms; we also compute the forecast dispersion for each of the two firms. *InvCov* is the product of the Spearman rank correlation and the average forecast dispersion, multiplied by negative one. A large positive realization of *InvCov* suggests a high level of embedded belief crossing. In Panels B and C, we augment *InvCov* with  $(1-IO)$  and with  $(1-IO) * SI$ , respectively, where *IO* is the residual institutional ownership and *SI* is short interest. Our controls are identical to those in the Combined-Announcement-Day-Return regression. All independent variables are normalized to have a standard deviation of one. We include year-fixed effects. *T*-statistics are reported in parentheses and are based on standard errors clustered by year. Statistical significance at the 10%, 5%, and 1% levels is denoted by \*, \*\*, and \*\*\*, respectively.

	<i>ROA</i>	<i>ROE</i>	<i>Profitability</i>	<i>Sales Growth</i>
	(1)	(2)	(3)	(4)
Panel A. Baseline <i>InvCov</i>				
<i>InvCov</i>	0.000 (0.00)	0.003 (0.29)	0.008 (1.01)	0.003 (0.38)
<i>Disagreement</i>	-0.005* (-1.96)	-0.013* (-1.79)	-0.006 (-0.97)	-0.009 (-1.43)
<i>Crossing</i>	-0.001 (-0.40)	0.001 (0.09)	0.002 (0.29)	0.005 (0.71)
#Obs.	363	363	363	363
Adj. R <sup>2</sup>	0.568	0.451	0.349	0.281
Panel B. Embed <i>IO</i> into <i>InvCov</i>				
<i>InvCov</i>	0.000 (0.12)	0.003 (0.36)	0.008 (1.08)	0.003 (0.49)
<i>Disagreement</i>	-0.005** (-2.19)	-0.014* (-1.95)	-0.007 (-1.17)	-0.008 (-1.33)
<i>Crossing</i>	-0.001 (-0.31)	0.000 (0.05)	0.002 (0.27)	0.005 (0.65)
#Obs.	363	363	363	363
Adj. R <sup>2</sup>	0.570	0.452	0.352	0.295
Panel C. Embed <i>IO</i> and <i>SI</i> into <i>InvCov</i>				
<i>InvCov</i>	0.001 (0.27)	0.007 (0.89)	0.004 (0.53)	-0.006 (-0.84)
<i>Disagreement</i>	-0.004 (-1.34)	-0.009 (-1.16)	-0.016** (-2.29)	-0.005 (-0.77)
<i>Crossing</i>	-0.001 (-0.60)	-0.002 (-0.21)	0.005 (0.74)	0.009 (1.47)
#Obs.	363	363	363	363
Adj. R <sup>2</sup>	0.566	0.449	0.361	0.296

Table A6. Belief Crossing and Post-M&A Returns

This table reports coefficient estimates from regressions of post-M&A one-year returns on investor disagreement and belief crossing about the acquirer and the target. The dependent variable is the one-year post-M&A stock return. We construct *InvCov* as follows: We compile a list of brokerage houses that cover both the acquirer and the target and we compute the Spearman rank correlation in earnings forecasts between these two firms; we also compute the forecast dispersion for each of the two firms. *InvCov* is the product of the Spearman rank correlation and the average forecast dispersion, multiplied by negative one. A large positive realization of *InvCov* suggests a high level of embedded belief crossing. In Columns 2 and 3, we augment *InvCov* with  $(1-IO)$  and with  $(1-IO) * SI$ , respectively, where *IO* is the residual institutional ownership and *SI* is short interest. Our controls are identical to those in the Combined-Announcement-Day-Return regression. Our controls are identical to those in the Combined-Announcement-Day-Return regression. All independent variables are normalized to have a standard deviation of one. We include year-fixed effects. *T*-statistics are reported in parentheses and are based on standard errors clustered by year. Statistical significance at the 10%, 5%, and 1% levels is denoted by \*, \*\*, and \*\*\*, respectively.

	Baseline <i>InvCov</i> (1)	Embed <i>IO</i> into <i>InvCov</i> (2)	Embed <i>IO</i> and <i>SI</i> into <i>InvCov</i> (3)
<i>InvCov</i>	0.099*** (4.30)	0.079*** (3.16)	0.061*** (2.65)
<i>Disagreement</i>	0.091*** (3.96)	0.068*** (2.96)	0.097*** (4.04)
<i>Crossing</i>	-0.004 (-0.17)	-0.007 (-0.29)	0.014 (0.64)
Controls	Yes	Yes	Yes
#Obs.	392	392	392
Adj. R <sup>2</sup>	0.180	0.162	0.175

Figure A1. Sample Factsheet for CEF

