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Style Timing with Insiders

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Aggregate demand by insiders predicts time-series variation in the value premium. Insider trading forecasts the value premium because insiders sell (buy) when markets—especially growth stocks—are overvalued (undervalued). This article suggests that investors can use signals from aggregate insider behavior to adjust style tilts and exploit sentiment-induced mispricing.

Although value stocks average higher returns than growth stocks (see, e.g., Chan and Lakonishok 2004), a value tilt does not ensure a positive alpha over any given period because growth often outperforms value. In this study, we investigated whether investors can use aggregate demand by corporate insiders to forecast time-series variation in the value premium—that is, whether a high level of insider buying signals that the future value premium will be lower (growth beats value) and whether insider selling portends a higher value premium (value beats growth). We hypothesized three reasons that insider demand may forecast the value premium. First, time-series variation in the value premium may arise, at least in part, because of changes in macroeconomic fundamental risk and insider demand varies with risk. Second, growth stocks may have larger "cash flow betas" than value stocks and insiders may trade on the basis of private information about future cash flows. Third, insiders may trade against systematic market sentiment and growth stocks may suffer from larger sentiment-induced pricing errors than value stocks.

Data

For our primary tests, we used the U.S. SEC's Ownership Reporting System (ORS) database (July 1978–December 1995) and Thomson Financial's Value-Added Insider data feed (January 1996–April 2004) to collect information on insider trading.[1] "Insiders" required to file with the SEC include officers and directors, large shareholders (those who own more than 10 percent of the outstanding shares), and affiliated shareholders (e.g., an officer of an investment adviser).[2] Following most previous work, we excluded transactions by affiliated shareholders.[3] Over the entire 26-year primary sample period, our data included more than 1.7 million insider transactions in nearly 17,000 companies.

Following Lakonishok and Lee (2001), we computed net aggregate insider demand as the ratio of the net number of insider purchases (in all companies) over period t to the number of insider transactions over the same period:

$$\text{Aggregate insider demand}_t = \frac{\#\text{Insider purchases}_t - \#\text{Insider sales}_t}{\#\text{Insider purchases}_t + \#\text{Insider sales}_t}. \quad (1)$$

We followed Fama and French (1993) in forming value and growth portfolios. We began by sorting all companies (including those that did not have any insider trades) into three book-to-market groups at the end of each June. Companies below the 30th NYSE book-to-market percentile were classified as "growth," and companies above the 70th NYSE book-to-market percentile were classified as "value" (companies between the 30th and 70th percentile were classified as "neutral"). Book-to-market ratios for the end of June of year t were based on the book value of equity (computed from Compustat data) at the fiscal year-end in year $t - 1$ divided by the market capitalization at the end of December in year $t - 1$.[4] Companies were also classified by capitalization: Securities with end-of-June market capitalizations below the median for NYSE companies were classified as "small," and those above the median were classified as "large."[5]

Further following Fama and French (1993), we computed the value-weighted return (using CRSP data) on securities within each of the six size and value classification groups (small value, small neutral, small growth, large value, large neutral, and

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large growth). We defined the return for the "value" portfolio as the average return on the large- and small-cap value portfolios—that is, ½ × (large value + small value); the return on the "growth" portfolio as the average return on the large- and small-cap growth portfolios—that is, ½ × (large growth + small growth); and the value premium as the return on the value portfolio less the return on the growth portfolio. We defined the market return as the value-weighted return on all securities. Because we used the Fama–French (1993) definitions, these portfolios' returns are essentially identical to those reported on Kenneth R. French's website.[6]

Previous research (see, e.g., Asness, Friedman, Krail, and Liew 2000; Cohen, Polk, and Vuolteenaho 2003; Zhang 2005) has demonstrated that the "value spread" (the relative valuations of growth and value stock portfolios) can be used to forecast the value premium. Thus, in our robustness tests, we included the value spread as an explanatory variable. We operationalized the value spread as the ratio of the median book-to-market ratio for value stocks to the median book-to-market ratio for growth stocks (following Asness, Friedman, Krail, and Liew 2000). Book values were from year-end in year $t-2$ for January to June of year t and from year-end in year $t-1$ for July to December of year t. Market values were updated at the beginning of each month, and the value spread was updated each month.

Panel A in **Table 1** reports descriptive statistics for monthly portfolio returns, insider demand (measured over the previous month, three months, six months, and year), changes in monthly insider demand, and the value spread over August 1978–May 2004 (310 months). Although the value premium averages 34.6 bps a month (over our sample period), it has substantial volatility (the standard deviation is 288 bps a month).[7] Moreover, although not reported in the table, the value premium is negative in 44 percent of the months.

Does Aggregate Insider Demand Predict the Value Premium?

Until August 2002, insiders had to report their trades to the SEC within 10 days of the end of the month for each trade (beginning in August 2002,

Table 1. Descriptive Statistics, August 1978–August 2009

	Mean	Std. Dev.	Minimum	Median	Maximum
A. Original sample period (August 1978–May 2004; N = 310 months)					
Market return$_1$	1.124	4.547	–22.557	1.524	12.761
Value return$_1$	1.382	4.361	–23.533	1.936	10.650
Growth return$_1$	1.036	5.734	–27.890	1.487	16.378
Value premium$_1$	0.346	2.880	–11.690	0.415	11.015
Insider demand$_{-1}$	–0.227	0.276	–0.847	–0.231	0.621
Insider demand$_{-1\ to\ -3}$	–0.232	0.253	–0.839	–0.226	0.576
Insider demand$_{-1\ to\ -6}$	–0.232	0.232	–0.827	–0.246	0.362
Insider demand$_{-1\ to\ -12}$	–0.231	0.202	–0.801	–0.254	0.234
ΔInsider demand$_0$	–0.002	0.185	–0.489	–0.231	0.621
Value spread$_{-1}$	5.134	1.062	3.428	4.910	8.840
B. Out-of-sample period (June 2004–August 2009; N = 63 months)					
Market return$_1$	0.297	4.841	–18.470	1.150	11.060
Value return$_1$	0.522	6.300	–21.540	1.415	17.215
Growth return$_1$	0.190	5.056	–18.410	0.915	11.475
Value premium$_1$	0.332	2.769	–9.890	0.230	7.580
Insider demand$_{-1}$	–0.618	0.254	–0.872	–0.707	0.247
Insider demand$_{-1\ to\ -3}$	–0.616	0.245	–0.846	–0.698	0.098
Insider demand$_{-1\ to\ -6}$	–0.631	0.224	–0.839	–0.726	0.069
Insider demand$_{-1\ to\ -12}$	–0.673	0.150	–0.813	–0.733	–0.212

Notes: Returns (month $t+1$) for Market$_1$, Value$_1$, Growth$_1$, and Value premium$_1$ (Value return$_1$ – Growth return$_1$) are monthly and in percentages. Insider demand$_{-X\ to\ -Y}$ is the number of insider purchases less the number of insider sales divided by the number of insider transactions in months $t-X$ to $t-Y$. ΔInsider demand$_0$ is Insider demand$_0$ less Insider demand$_{-1}$. Value spread$_{-1}$ is the ratio of the median book-to-market ratio for value stocks to the median book-to-market ratio for growth stocks at the end of month $t-1$.

insiders were required to report trades within 2 days of the transaction). In addition, Seyhun (1986) pointed out that there is some delay between when the SEC receives the data and when it publishes the *Official Summary*. Bettis, Vickrey, and Vickrey (1997) noted, however, that such delays were eliminated in 1985 when CDA/Investnet began compiling data for the SEC. Thus, after 1985, investors were assured of having complete insider trading data sometime within the month following the insider trade. Because our focus was on whether investors can use insider trading to help time portfolio style tilts, we primarily forecasted portfolio returns one month forward ($t = 1$). That is, we skipped a month ($t = 0$) between the insider trading and the subsequent return to ensure that the insider trading data were available to investors before forecasting the value premium.

Following Lakonishok and Lee (2001), we began to investigate the relationship between aggregate insider demand and subsequent returns by regressing subsequent returns on lag aggregate insider demand:

$$\text{Return}_{t+1} = \alpha + \gamma\left(\text{Aggregate insider demand}_{t-X\,to\,t-Y}\right) + \varepsilon_{t+1}. \quad (2)$$

We measured aggregate insider demand over four different intervals: the previous month ($t - 1$), three months ($t - 1$ to $t - 3$), six months ($t - 1$ to $t - 6$), and one year ($t - 1$ to $t - 12$).

Consistent with previous studies (see, e.g., Lakonishok and Lee 2001), the results (reported in **Table 2**) reveal that aggregate insider demand forecasts market returns (first row; statistically significant at the 5 percent level in every case). The next two rows reveal that the relationship between aggregate insider demand and subsequent market returns primarily arises from a strong positive relationship between aggregate insider demand and subsequent growth stock portfolio returns. Because the value premium is simply the difference between the value and growth portfolio returns (and covariances are linear in the arguments), the coefficient for the value premium is the difference between the coefficients for the value and growth portfolios (i.e., $\gamma_{Value\,premium} = \gamma_{Value} - \gamma_{Growth}$). As a result (as shown in the last row), aggregate insider demand is strongly inversely related to the subsequent value premium (statistically significant at the 1 percent level in all four cases).

To gauge the economic significance of the relationship, recall (from Table 1) that the standard deviations of insider demand measured over the previous month, three months, six months, and year are 0.276, 0.253, 0.232, and 0.202, respectively. Thus, for example, the coefficient associated with insider demand over the previous six months suggests that an increase of one standard deviation in aggregate insider demand results in a 52.9 bp decline (6.54 percentage points [pps] annualized) in the expected monthly value premium (i.e., $0.232 \times -2.282 = -0.529$). For insider demand measured over the previous month, three months, and year, an increase of one standard deviation in aggregate insider demand forecasts a 51.2, 57.5, and 53.3 bp decline in the expected monthly value premium. Because the results did not appear sensitive to the interval over which insider demand was measured, we primarily focused on aggregate insider demand measured over the previous six months (following Lakonishok and Lee 2001) throughout most of the study.

To begin to explore investors' ability to use aggregate insider demand to forecast style tilts, we sorted the entire time series of observations into three groups (N = 101, 102, and 102 months in the low, medium, and high insider demand groups, respectively) on the basis of aggregate insider demand over the previous six months and examined subsequent portfolio returns. Although this method suffered from a look-ahead bias (i.e., breakpoints were based on the entire sample period, from August 1978 to May 2004), it provided a simple and intuitive measure of value and growth returns following high and low levels of insider demand. (We discuss the look-ahead bias later in the article.) Because lag insider demand was based on insider trades over the previous six months, the monthly variable was autocorrelated, which suggests the possibility of substantial runs without changing from one classification to another. **Figure 1** plots aggregate insider demand (Equation 1) in the previous six months over time. The top and bottom dashed lines are the breakpoints for high, medium, and low insider demand. Figure 1 demonstrates that this scheme generates relatively frequent signals—specifically, 36 signal changes (every time the solid line crosses a dashed line) in the 305 observations or, equivalently, a signal change once every 8.5 months, on average.

Panel A of **Table 3** reports the mean insider demand (Equation 1) over the previous six months ($t = -1$ to -6) and the mean subsequent ($t = 1$) monthly market return, value portfolio return, growth portfolio return, and value premium (as well as associated t-statistics) following low insider demand (first column), medium insider demand (second column), and high insider demand (third column). The last two columns report a t-statistic from a difference-in-means test and a z-statistic from a Wilcoxon rank sum test, respectively, of the

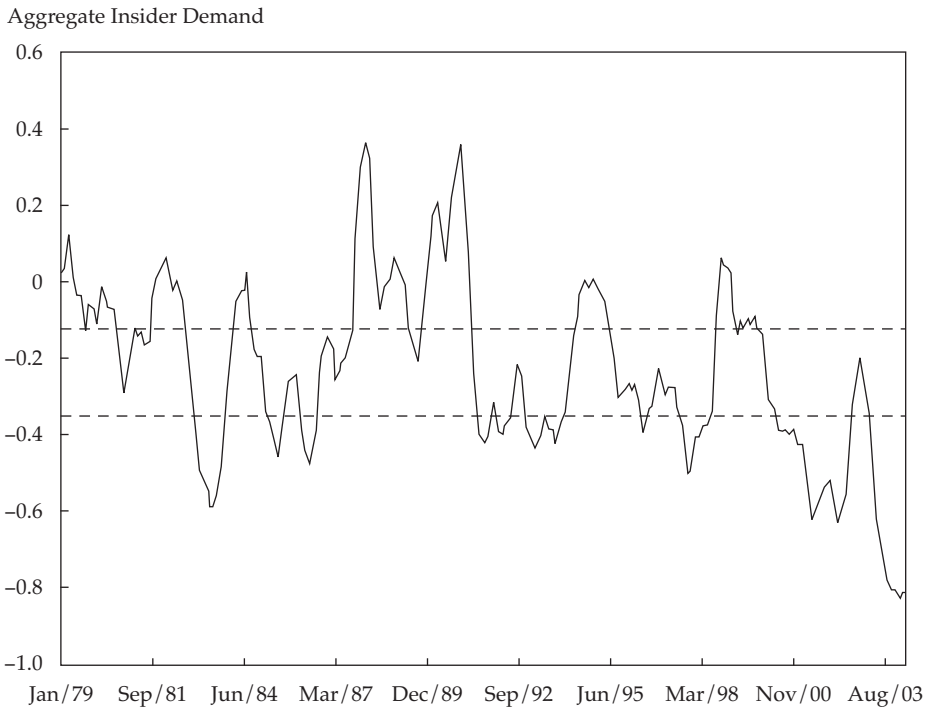
Table 2. Time-Series Regressions of Monthly Portfolio Returns on Lag Aggregate Insider Demand, August 1978–May 2004
(*t*-statistics in parentheses)

	Insider Demand Measured Over											
	Previous Month (t = –1)			Previous Three Months (t = –1 to –3)			Previous Six Months (t = –1 to –6)			Previous Year (t = –1 to –12)		
Dependent Variable	Intercept	Coefficient	Adj. R^2	Intercept	Coefficient	Adj. R^2	Intercept	Coefficient	Adj. R^2	Intercept	Coefficient	Adj. R^2
Market return$_1$	0.017	2.334	1.70%	0.018	2.518	1.68%	0.023	2.314	1.08%	0.018	2.937	1.37%
	(4.99)***	(2.52)**		(5.06)***	(2.50)**		(2.08)**	(2.08)**		(4.57)***	(2.26)**	
Value return$_1$	0.017	1.447	0.52	0.018	1.351	0.32	0.017	1.029	–0.02	0.017	1.498	0.16
	(5.35)***	(1.62)		(5.30)***	(1.40)		(4.76)***	(0.97)		(4.61)***	(1.22)	
Growth return$_1$	0.018	3.301	2.22	0.019	3.622	2.31	0.018	3.311	1.50	0.020	4.135	1.81
	(4.28)***	(2.83)***		(4.49)***	(2.87)***		(4.01)***	(2.38)**		(4.04)***	(2.55)**	
Value premium$_1$	–0.001	–1.854	2.85	–0.002	–2.271	3.66	–0.002	–2.282	3.03	–0.003	–2.637	3.01
	(–0.36)	(–3.17)***		(–0.87)	(–3.56)***		(–0.78)	(–3.24)***		(–1.06)	(–3.20)***	

Notes: Monthly portfolio returns are in percentages. The sample size is 310 months for insider demand measured over the previous month (August 1978–May 2004), 308 months for insider demand measured over the previous three months (October 1978–May 2004), 305 months for insider demand measured over the previous six months (January 1979–May 2004), and 299 months for insider demand measured over the previous year (July 1979–May 2004).

**Significant at the 5 percent level.
***Significant at the 1 percent level.

Figure 1. Insider Demand$_{-1\ to\ -6}$ over Time, January 1979–May 2004



null hypothesis that portfolio returns following low aggregate insider demand equal portfolio returns following high aggregate insider demand. The last row reports the fraction of observations with a positive monthly value premium.

Consistent with Table 2, aggregate insider demand forecasts market returns—the monthly market return averages 1.628 percent following high insider demand versus 0.203 percent following low insider demand. The difference is statistically significant (at the 5 percent level) under either the parametric *t*-test or the nonparametric *z*-test. Results in the next two rows, however, reveal that the ability of aggregate insider demand to forecast market returns largely arises from a strong relationship between aggregate insider demand and subsequent growth portfolio returns (statistically significant at the 1 percent level for both the *t*- and *z*-tests). We found no evidence of a meaningful relationship between aggregate insider demand and subsequent value stock portfolio returns. As a result, aggregate insider demand is inversely related to the subsequent value premium. The value portfolio outperforms the growth portfolio by 1.122 pps, on average, in months following low insider demand (statistically significant at the 1 percent level). Conversely, growth beats value by 0.440 pp, on average, in months following high insider demand (marginally significant at the 10 percent level). The difference in the value premium following low and high insider demand is statistically significant at the 1 percent level for both the parametric *t*-test and the nonparametric *z*-test. The annualized difference in the value premium following high and low insider demand is more than 20 pps—that is, $[1 + 0.01122 - (-0.00440)]^{12} - 1$.

The results in Panel A of Table 3 can also be used to compare the performance of a style-neutral strategy with the performance of a style-timing strategy based on insider demand. Consider, for example, the performance of an investor who holds the value portfolio following low insider demand, the growth portfolio following high insider demand, and a 50/50 mix of value and growth following medium insider demand versus an investor who holds a constant 50/50 mix of value and growth. Following low insider demand, the style-timing manager earns 0.822 percent a month (i.e., the value portfolio return) versus 0.261 percent a month for the style-neutral manager (i.e., the average of the value and growth portfolio returns following low insider demand). Following high insider demand, the style-timing manager earns 1.939 percent a month (i.e., the growth portfolio return) versus 1.720 percent a month for the style-neutral manager (i.e., the average of the value and growth portfolio returns following high insider demand). Following medium insider demand, both the style-timing manager and the style-neutral manager earn 1.724 percent a month. Over all months,

Table 3. Value Premium following Low, Medium, and High Aggregate Insider Demand
(*t*-statistics in parentheses)

				High Insider Demand – Low Insider Demand	
	Low Insider Demand$_{-1\ to\ -6}$	Medium Insider Demand$_{-1\ to\ -6}$	High Insider Demand$_{-1\ to\ -6}$	*t*-Statistic	Wilcoxon *z*-Statistic
A. Equal groups (January 1979–May 2004; N = 305 months)					
N	101	102	102		
Insider demand$_{-1\ to\ -6}$	–0.482	–0.239	0.022		
Market return$_1$	0.203	1.599	1.628	2.26**	2.11**
	(0.44)	(3.60)***	(3.75)***		
Value return$_1$	0.822	1.911	1.500	1.11	0.86
	(1.92)*	(4.66)***	(3.47)***		
Growth return$_1$	–0.300	1.536	1.939	2.88***	2.65***
	(–0.54)	(2.70)***	(3.57)***		
Value premium$_1$	1.122	0.375	–0.440	–3.97***	–3.58***
	(3.85)***	(1.31)	(–1.67)*		
%(Value premium$_1$ > 0)	63.37%	55.88%	50.00%		
B. No look-ahead bias (December 1983–May 2004; N = 246 months)					
N	104	60	82		
Insider demand$_{-1\ to\ -6}$	–0.451	–0.245	0.001		
Market return$_1$	0.268	2.100	1.308	1.48	1.67*
	(0.61)	(4.51)**	(2.38)**		
Value return$_1$	1.064	2.078	0.985	–0.12	–0.37
	(2.50)**	(4.86)***	(1.90)*		
Growth return$_1$	–0.093	2.017	1.424	1.73*	1.75*
	(–0.17)	(3.40)***	(2.07)**		
Value premium$_1$	1.156	0.061	–0.439	–3.66***	–3.35***
	(3.91)***	(0.22)	(–1.37)		
%(Value premium$_1$ > 0)	61.54%	55.00%	48.78%		

Notes: This table reports the mean aggregate insider demand over the previous six months ($t - 1$ to $t - 6$) and the mean subsequent ($t = 1$) monthly market portfolio return, value portfolio return, growth portfolio return, value premium, and fraction of observations when the value premium is positive following low, medium, and high insider demand. The last two columns report a *t*-statistic from a difference-in-means test and a *z*-statistic from a Wilcoxon rank sum test, respectively, of the null hypothesis that portfolio returns following low insider demand equal portfolio returns following high insider demand. The last row in both panels reports the fraction of observations with a positive monthly value premium. Returns are in percentages. Insider demand$_{-1\ to\ -6}$ is the number of insider purchases less the number of insider sales divided by the number of insider transactions in months $t - 1$ to $t - 6$. In Panel A, insider demand is partitioned into three equal groups of monthly observations over January 1979–May 2004. In Panel B, insider demand breakpoints for low, medium, and high categories are updated every month on the basis of insider trading in the five years prior to that month.

*Significant at the 10 percent level.
**Significant at the 5 percent level.
***Significant at the 1 percent level.

the style-timing manager outperforms the style-neutral manager by the weighted average of these three differences.[8] Specifically, the style-timing manager earns an average monthly return that is 0.259 pp larger (approximately 316 bps annually) than that of the style-neutral manager. The difference is statistically significant at the 1 percent level.[9]

Accounting for Lag Returns and the Value Spread

Lakonishok and Lee (2001) pointed out that aggregate insider demand may forecast market returns because the market portfolio exhibits negative autocorrelation (see, e.g., Poterba and Summers 1988) and insiders are "contrarians." To examine whether differences in value and growth portfolio return autocorrelations help explain the relationship between aggregate insider demand and the subsequent value premium, we added the value premium over the previous 24 months (following Lakonishok and Lee) to the regressions (i.e., the difference between value and growth portfolio returns over months $t = -1$ to -24). Results, reported in Panel A of **Table 4**, reveal no evidence of meaningful autocorrelation in the value premium. Moreover, as

Table 4. Time-Series Regressions of Monthly Portfolio Returns on Lag Aggregate Insider Demand, Lag Returns, and the Value Spread, January 1979–May 2004
(*t*-statistics in parentheses)

	Intercept	Insider Demand$_{-1\ to\ -6}$	Dep. Var. Return$_{-1\ to\ -24}$	Value Spread$_{-1}$	Adjusted R^2
A. Value premium on lag insider demand and lag returns					
Value premium$_1$	0.407		–0.006		–0.17%
	(2.18)**		(–0.70)		
Value premium$_1$	–0.106	–2.591	–0.013		3.52
	(–0.45)	(–3.56)***	(–1.60)		
B. Value premium on lag insider demand and value spread					
Value premium$_1$	–1.482			0.356	1.42%
	(–1.86)*			(2.34)**	
Value premium$_1$	–1.253	–1.949		0.223	3.30
	(–1.52)	(–2.62)***		(1.36)	
C. Value premium on lag insider demand, lag returns, and value spread					
Value premium$_1$	–0.664	–2.350	–0.010	0.112	3.31%
	(–0.66)	(–2.78)***	(–1.01)	(0.57)	
D. By subperiod					
Value premium$_1$ (Jan. 1979–Sep. 1991)	0.008	–2.066			2.35%
	(0.03)	(–2.16)**			
Value premium$_1$ (Oct. 1991–May 2004)	–0.732	–3.427			3.82
	(–1.43)	(–2.65)***			
Value premium$_1$ (Jan. 1979–Sep. 1991)	–0.571	–2.134	–0.001	0.126	1.21
	(–0.31)	(–2.07)**	(–0.05)	(0.34)	
Value premium$_1$ (Oct. 1991–May 2004)	–2.466	–3.628	–0.019	0.326	6.09
	(–1.51)	(–2.44)**	(–1.31)	(1.11)	
E. By capitalization					
Small-stock value premium$_1$	–0.120	–2.933			3.38%
	(–0.43)	(–3.41)***			
Large-stock value premium$_1$	–0.240	–1.631			1.39
	(–1.03)	(–2.30)**			
Small-stock value premium$_1$	–0.955	–2.823	–0.005	0.196	3.40
	(–0.79)	(–2.78)***	(–0.62)	(0.86)	
Large-stock value premium$_1$	–0.276	–2.124	–0.022	0.016	2.55
	(–0.30)	(–2.55)**	(–2.09)**	(0.09)	
F. Value premium for stocks without insider trades					
Value premium$_1$ (no insider trading)	–0.664	–2.350	–0.010	0.112	3.31%
	(–0.66)	(–2.78)***	(–1.01)	(0.57)	

Notes: The sample size is 305 months. Monthly portfolio returns are in percentages. In Panel F, the value premium in month $t + 1$ is computed only from securities that do not have insider trades in months $t = -1$ to -6.

*Significant at the 10 percent level.
**Significant at the 5 percent level.
***Significant at the 1 percent level.

shown in the second row of Panel A, the relationship between aggregate insider demand and the subsequent value premium remains intact when controlling for lag returns.[10]

Several studies (e.g., Asness, Friedman, Krail, and Liew 2000; Cohen, Polk, and Vuolteenaho 2003; Zhang 2005) have reported that the relative valuations of growth and value portfolios (the "value spread") can predict the value premium. That is, when growth stock valuations are much higher than value stock valuations, the subsequent value premium is large. Therefore, we next examined the relationship between the subsequent value premium, aggregate insider demand, and the value spread (as previously noted, the value spread is measured as the ratio of the median book-to-market ratio for value stocks to the median book-to-market ratio for growth stocks).[11]

Consistent with previous work, the first row in Panel B of Table 4 reveals a positive relationship between the value spread and the subsequent value premium (statistically significant at the 5 percent level). The second row in Panel B, however, demonstrates that when lag aggregate insider demand is included, (1) the relationship between the value spread and the subsequent value premium is no longer statistically significant and (2) the relationship between aggregate insider demand and the subsequent value premium remains strong (and statistically significant at the 1 percent level).

Panel C of Table 4 reports the results of a regression of the value premium on all three variables: lag insider demand, lag returns, and the value spread. Only aggregate insider demand remains meaningfully related to the subsequent value premium.

Over Time and across Capitalizations

To check for robustness, we partitioned our sample into two equal subperiods (January 1979–September 1991 and October 1991–June 2004). Subperiod results (first two rows in Panel D of Table 4) show that the inverse relationship between aggregate insider demand and the subsequent value premium holds in both the early and the more recent subperiods. The results also remain intact when lag returns and the value spread are included (last two rows in Panel D).

Lakonishok and Lee (2001) reported that aggregate insider demand is more strongly related to subsequent small-stock returns than to large-stock returns. Moreover, several studies (e.g., Loughran 1997; Fama and French 2006; Phalippou 2008) have suggested that small stocks play a more important role than large stocks in driving the value premium in post-1963 U.S. markets. Therefore, we next examined whether insider demand (for all stocks) predicts the small-stock value premium and/or the large-stock value premium. (As previously noted, small stocks are defined as those below the median NYSE capitalization.) Results (Panel E of Table 4) reveal that aggregate insider demand forecasts both the small-stock value premium (i.e., small value stock returns less small growth stock returns) and the large-stock value premium (analogously defined). The results remain qualitatively identical when lag returns and the value spread are added.

Predicting Annual Returns

Lakonishok and Lee (2001) found a stronger relationship between aggregate insider demand and subsequent annual market returns than between aggregate insider demand and subsequent quarterly market returns. Thus, we next examined the relationship between subsequent annual returns (t = 1 to 12) and lag aggregate insider demand (t = –1 to –6). Because the dependent variable consists of overlapping observations, we report Newey–West (1987) autocorrelation- and heteroscedasticity-consistent t-statistics. Panel A of **Table 5** reports the regression results for market returns, value portfolio returns, growth portfolio returns, and the value premium.

Consistent with Lakonishok and Lee (2001), aggregate insider demand is positively related to subsequent annual market returns (statistically significant at the 1 percent level). Moreover, consistent with Table 2, the results confirm that the ability of aggregate insider demand to forecast annual market returns largely arises from the strong relationship between aggregate insider demand and future annual returns on the growth stock portfolio. As a result, aggregate insider demand forecasts the subsequent value premium (statistically significant at the 1 percent level). Specifically, an increase of one standard deviation in aggregate insider demand (0.232 from Table 1) forecasts a 5.04 pp decrease (0.232 × –21.724) in the value premium the following year.

Panel B of Table 5 reports the results for including lag returns and the value spread in the subsequent annual return regressions. The results are fully consistent with the monthly return regressions reported in Table 2. Aggregate insider demand is the only variable that remains statistically significant in predicting the subsequent annual value premium.

Table 5. Time-Series Regressions of Annual Portfolio Returns on Lag Aggregate Insider Demand, Lag Returns, and the Value Spread, January 1979–May 2004
(*t*-statistics in parentheses)

	Intercept	Insider Demand$_{-1\ to\ -6}$	Dep. Var. Return$_{-1\ to\ -24}$	Value Spread$_{-1}$	Adjusted R^2
A. Returns on lag insider demand					
Market return$_{1\ to\ 12}$	20.472	26.067			11.90%
	(7.15)***	(2.95)***			
Value return$_{1\ to\ 12}$	22.002	16.351			4.83
	(6.45)***	(1.62)			
Growth return$_{1\ to\ 12}$	21.839	38.075			16.57
	(5.75)***	(3.59)***			
Value premium$_{1\ to\ 12}$	0.164	–21.724			14.16
	(0.06)	(–3.51)***			
B. Returns on insider demand, lag returns, and value spread					
Market return$_{1\ to\ 12}$	63.513	16.134	–0.133	–8.015	33.12%
	(6.82)***	(2.30)**	(–1.43)	(–4.90)***	
Value return$_{1\ to\ 12}$	58.211	4.307	–0.297	–5.411	15.86
	(3.73)***	(0.57)	(–2.38)**	(–2.46)**	
Growth return$_{1\ to\ 12}$	57.459	31.345	–0.224	–6.070	31.23
	(5.19)***	(3.13)***	(–2.27)**	(–3.07)***	
Value premium$_{1\ to\ 12}$	–10.965	–21.235	–0.135	2.471	25.43
	(–1.10)	(–2.87)***	(–1.43)	(1.30)	

Notes: The sample size is 305 months. Returns are in percentages. The *t*-statistics are based on Newey–West (1987) standard errors.

**Significant at the 5 percent level.
***Significant at the 1 percent level.

Can Investors Use Insider Demand to Forecast the Value Premium?

The results reported in Tables 2–5 suggest that an investor can use insider demand as a signal to adjust style tilts. In practice, of course, an investor cannot replicate the results in Panel A of Table 3 because he or she would need to know the breakpoints for high, medium, and low insider demand on the basis of insider demand in future periods. For example, in the first month (January 1979), an investor could not know whether lag insider demand would be high or low relative to insider demand over the balance of the period (1979–2004).

To test whether an investor without this foresight can use insider demand to signal style tilts, we repeated the analysis in Panel A of Table 3 but updated the low, medium, and high breakpoints monthly on the basis of insider trading in the five years before that month. Doing so ensured that the investor would have the necessary data before investing and allowed breakpoints to vary over time, reflecting more recent average levels of insider sales.[12] Because we required five years of data before estimating the first breakpoints, the analysis in Panel B of Table 3 covers December 1983–May 2004 (insider demand measured over June–November 1983, and return measured for January 1984).

Because the breakpoints were updated monthly on the basis of historical data, the numbers of observations in the high, medium, and low insider demand groups are not equal (the larger number of observations in the low insider demand group reflects the rise in insider selling over time). The results in Panel B of Table 3 show that an investor can use insider demand to adjust style tilts. In the month following low insider demand signals, value stocks outperform growth stocks by 1.156 pps (14.8 pps annualized), on average. In contrast, in the month following high aggregate insider demand, growth stocks outperform value stocks by 0.439 pp (5.40 pps annualized), on average. The difference is statistically significant at the 1 percent level under either the difference-in-means test or the Wilcoxon rank sum test.[13]

Analogous to our discussion of Panel A, the results in Panel B of Table 3 can also be used to compare the performance of a style-timing strategy with the performance of a style-neutral strategy

absent the look-ahead bias. Again, consider an investor who holds the value portfolio following low insider demand, the growth portfolio following high insider demand, and a 50/50 mix of value and growth following medium insider demand versus an investor who holds a constant 50/50 mix of value and growth. Over all months, the style-timing manager beats the style-neutral manager by an arithmetic average of 0.318 pp a month (approximately 388 bps annually).[14] The difference is statistically significant at the 1 percent level.[15] The geometric average return for the style-timing manager is 1.299 percent a month versus 0.99 percent a month for the style-neutral manager. Thus, if both managers began the period with $1, the style-timing manager would end the 246-month period holding a portfolio worth $23.90 versus $11.25 for the style-neutral manager (ignoring transaction costs).[16]

Why Does Aggregate Insider Demand Forecast the Value Premium?

Our empirical tests revealed a strong inverse relationship between aggregate insider demand and the future value premium. We next considered three explanations for this relationship: (1) Aggregate insider demand is related to changes in fundamental risk, and value stocks are fundamentally riskier than growth stocks; (2) insiders trade on the basis of private information about future cash flows, and growth stocks have larger "cash flow betas" than do value stocks; and (3) insiders trade against systematic market sentiment, and growth stocks suffer larger sentiment-induced pricing errors than do value stocks.

Aggregate Insider Demand and Risk. As is well known, value stocks may average larger returns than growth stocks because value metrics (e.g., the book-to-market ratio) proxy for fundamental risk. A number of researchers (see, e.g., Gomes, Kogan, and Zhang 2003; Zhang 2005; Kiku 2006) have noted that this explanation suggests that the value premium should primarily accrue in high-risk environments (i.e., when the business cycle is low). As a result, the value premium should be countercyclical: large in weak economic conditions and small (or even negative) in strong economic conditions.

Thus, theoretically, aggregate insider demand may be related to the future value premium because either (1) insiders increase their buying when risk and the subsequent value premium are large or (2) insiders increase their selling when risk and the subsequent value premium are large. Contrary to our empirical results, the former scenario implies a positive relationship between aggregate insider demand and the subsequent value premium. Under the latter scenario, aggregate insider demand is inversely related to the future value premium. This interpretation, however, does not fit the evidence. Specifically, if insiders sell when risk is large (and expected returns are high, especially for value stocks), then we should see an inverse relationship between aggregate insider demand and future market returns, growth portfolio returns, and, especially, value portfolio returns.[17]

Aggregate Insider Demand and Future Cash Flows. Insiders may forecast returns because they either trade against mispricing or have (and trade on) superior knowledge regarding future cash flows (see, e.g., Piotroski and Roulstone 2005). A number of researchers (e.g., Seyhun 1988, 1998) have proposed that the positive relationship between aggregate insider demand and subsequent market returns results from the latter (i.e., insiders' private "company-specific" cash flow signals may be correlated across companies). For example, although an insider may not directly forecast a decline in GDP growth, the insider may see a decrease in the number of orders, forecast a decline in future cash flows, and sell shares. Thus, a second possible interpretation of the relationship between aggregate insider demand and the subsequent value premium is that insiders trade on superior cash flow forecasts that contain a systematic component and growth stocks are more sensitive than value stocks to changes in expected cash flows. Consistent with this explanation, growth stocks tend to have higher market betas than do value stocks (see, e.g., Chan and Lakonishok 2004).

As Campbell and Vuolteenaho (2004) and Cohen, Polk, and Vuolteenaho (2009) pointed out, however, nonzero abnormal returns imply either cash flow news or discount rate news. As a result, a portfolio's (or stock's) market beta can be partitioned into a cash flow beta and a discount rate beta (i.e., $\beta_{i,M} = \beta_{i,Cash\ flow\ news} + \beta_{i,Discount\ rate\ news}$). In a clever paper, Campbell and Vuolteenaho (2004) used a vector autoregression model to partition the market return into its cash flow and discount rate components.[18] Consistent with previous work (e.g., Campbell and Vuolteenaho 2004; Cohen, Polk, and Vuolteenaho 2009)—and contrary to the explanation that aggregate insider demand forecasts the value premium as a result of private cash flow forecasts and growth stocks' larger cash flow betas—we found that the estimated cash flow

beta for the value portfolio (0.0677) is larger than the estimated cash flow beta for the growth portfolio (–0.0089).

A related possibility is that insiders in growth stocks have more private (correlated) signals regarding future cash flows than do insiders in value stocks. As a result, time-series variation in aggregate insider demand is primarily driven by aggregate insider demand in growth stocks.[19] To examine this possibility, we regressed subsequent monthly portfolio returns on insider demand in value stocks (i.e., Equation 1 limited to value stocks) and on insider demand in growth stocks (analogously defined). Results are reported in **Table 6**.

The results in the first two rows of Table 6 reveal a positive relationship between subsequent market returns and aggregate insider demand in both value stocks (statistically significant at the 10 percent level) and growth stocks (statistically significant at the 5 percent level). The results in the next four rows show that insider demand in *both* value and growth stocks is related to the subsequent growth portfolio return (statistically significant at the 5 percent level or better). In contrast, we found no evidence of a meaningful relation between value stock returns and lag insider demand in *either* value or growth stocks. As a result, aggregate insider demand in either value stocks or growth stocks forecasts the value premium. (We found qualitatively identical results when we included lag returns and the value spread in the regressions.) In sum, the results in Table 6 are inconsistent with the hypothesis that time-series variation in aggregate insider demand is primarily driven by correlated signals of insiders in growth stocks but not by correlated signals of insiders in value stocks (regardless of whether those signals are the result of superior cash flow forecasts or systematic valuation errors).

Aggregate Insider Demand and Market Sentiment. Baker and Wurgler (2007) proposed (but did not test) that if investor sentiment leads to correlated mispricings (i.e., has a systematic component) and insiders trade against mispricing, then aggregate insider demand will be inversely related to market sentiment. Moreover, Jenter (2005) noted that because managers' own wealth is affected, their trades are a direct and powerful indicator of their views of their own security's misvaluation. Consistent with the hypothesis that insiders trade against mispricing, a number of recent studies (e.g., Rozeff and Zaman 1998; Lakonishok and Lee

Table 6. Predicting Value and Growth Returns with Insider Demand in Value and Growth, January 1979–May 2004
(*t*-statistics in parentheses)

	Intercept	Value Insider Demand$_{-1\ to\ -6}$	Growth Insider Demand$_{-1\ to\ -6}$	Adjusted R^2
Market return$_1$	0.953	2.012		0.92%
	(3.45)***	(1.96)*		
Market return$_1$	2.721		3.167	1.27
	(3.60)***		(2.22)**	
Value return$_1$	1.284	1.338		0.29
	(4.90)***	(1.37)		
Value return$_1$	2.144		1.470	0.06
	(2.98)***		(1.08)	
Growth return$_1$	0.776	2.988		1.77
	(2.24)**	(2.32)**		
Growth return$_1$	3.429		4.757	1.97
	(3.63)***		(2.67)***	
Value premium$_1$	0.509	–1.649		1.73
	(2.90)***	(–2.52)**		
Value premium$_1$	–1.285		–3.287	3.91
	(–2.70)***		(–3.65)***	

Notes: This table reports results from regressions of monthly returns (in percentages) on aggregate insider demand in value stocks and on aggregate insider demand in growth stocks. The sample size is 305 months.

*Significant at the 10 percent level.
**Significant at the 5 percent level.
***Significant at the 1 percent level.

2001; Piotroski and Roulstone 2005; Jenter 2005; Sias and Whidbee 2010) have demonstrated that cross-sectional variation in insider demand is inversely related to lag returns and valuation levels. This evidence is largely interpreted as meaning that insiders trade against cross-sectional variation in sentiment-induced mispricing.

We ran four tests of the explanation that aggregate insider demand forecasts the value premium because insiders trade against systematic sentiment and growth stocks have larger sentiment-induced pricing errors than do value stocks. First, if investor sentiment is systematic, insiders trade against systematic sentiment, and growth stocks are more affected by sentiment than value stocks are, then aggregate insider demand should forecast the value premium even for those stocks without insider trading. Thus, we examined whether aggregate insider demand can forecast the value premium for stocks that do not report any insider trading. We began by computing value and growth portfolio returns for month $t + 1$, excluding any security that had an insider trade in months $t - 1$ to $t - 6$. Specifically, we maintained the same size and book-to-market breakpoints and value weighted the individual small-value, large-value, small-growth, and large-growth portfolios, excluding stocks with insider trades in months $t - 1$ to $t - 6$. The "*x-insider*" value portfolio is the equal-weighted average of the large and small *x-insider* value portfolios (consistent with the Fama–French portfolio definitions). We formed the *x-insider* growth portfolio analogously. Excluding those securities from month $t + 1$ with insider trades in months $t - 1$ to $t - 6$ eliminated, on average, 54 percent of value companies and 70 percent of growth companies.[20] The results (Panel F of Table 4) are fully consistent with our previous analysis. In short, aggregate insider trading forecasts the value premium even for stocks without any insider trading, consistent with the explanation that insiders trade against systematic investor sentiment and growth stocks suffer from larger sentiment-induced pricing errors than do value stocks.

For a second test of the sentiment explanation, we examined the relationship between changes in aggregate insider demand and contemporaneous growth and value returns. The idea is straightforward: If insiders trade against systematic sentiment and growth stocks are more strongly affected than value stocks by changes in sentiment, then insider selling should increase as growth outperforms value and decrease as value outperforms growth. That is, under the sentiment explanation, if sentiment is positive, an increase in investor sentiment will generate greater mispricing and greater insider selling.[21] Because growth stocks are more sensitive to investor sentiment, however, the increase in growth stocks' valuations will be greater than the increase in value stocks' valuations.

To examine whether changes in insider demand are more strongly related to contemporaneous growth stock returns than to value stock returns, we estimated regressions of portfolio returns on contemporaneous changes in aggregate insider demand (aggregate insider demand in month t less aggregate insider demand in month $t - 1$):[22]

$$\text{Return}_t = \alpha + \gamma\left(\Delta\text{Aggregate insider demand}_t\right) + \varepsilon_t. \quad (3)$$

The regression results (Panel A of **Table 7**) reveal that changes in aggregate insider demand are inversely related to contemporaneous returns. Moreover, consistent with the explanation that insiders trade against systematic sentiment and growth stocks are more sensitive to changes in sentiment, the relationship between changes in aggregate insider demand and contemporaneous growth stock returns is stronger than the relationship between changes in aggregate insider demand and contemporaneous value stock returns. As a result, changes in aggregate insider demand are positively correlated with the contemporaneous value premium (e.g., insiders increase their selling when growth outperforms value). These results are also consistent with several recent studies (e.g., Eleswarapu and Reinganum 2004; Frazzini and Lamont 2008; Glushkov 2006) that found growth stocks to be more sensitive than value stocks to investor sentiment.[23]

Table 7. Regression of Monthly Returns and Sentiment on Contemporaneous Changes in Aggregate Insider Demand, August 1978–April 2004
(*t*-statistics in parentheses)

	Intercept	ΔInsider Demand$_{0\ to\ -1}$	Adjusted R^2
A. Returns			
Value return$_0$	1.359	–14.447	37.01%
	(6.89)***	(–13.49)***	
Growth return$_0$	1.006	–19.596	39.41
	(3.95)***	(–14.19)***	
Value premium$_0$	0.353	5.150	10.57
	(2.28)**	(6.12)***	
B. Sentiment			
ΔSentiment$_0$	–0.006	–1.574	8.56%
	(–0.11)	(–5.46)***	

Notes: This table reports results from regressions of monthly portfolio returns (Panel A, in percentages) and Baker and Wurgler's (2007) change in investor sentiment proxy (Panel B) in month $t = 0$ on the change in aggregate insider demand between months $t = 0$ and $t = -1$. The sample size is 309 months.

**Significant at the 5 percent level.
***Significant at the 1 percent level.

For a third test of the sentiment explanation, we examined the relationship between changes in aggregate insider demand and changes in a different market sentiment proxy. If insiders trade against systematic sentiment, then changes in aggregate insider demand should be inversely related to changes in other sentiment proxies (because sentiment is unobservable, one must use a proxy). Specifically, we used the Baker–Wurgler (2006, 2007) change in investor sentiment proxy, which is calculated from the first principal component of changes in six metrics: NYSE turnover, dividend premium (a measure of investor demand for dividend-paying stocks operationalized as the log difference in the average book-to-market ratio for dividend payers and nonpayers), the value-weighted average closed-end fund discount, the number of IPOs, the average first-day returns on IPOs, and the equity share of all new issues (debt and equity).[24] Panel B of Table 7 reports the regression results for the Baker–Wurgler change in sentiment proxy vis-à-vis changes in aggregate insider demand. Consistent with the hypothesis that aggregate insider demand varies inversely with market sentiment, we documented a strong inverse relationship between the Baker–Wurgler proxy and changes in aggregate insider demand.[25]

For a final test of the sentiment explanation, we examined the relationships between lag market returns, net demand by insiders, net demand by insiders in value stocks, and net demand by insiders in growth stocks. If the relationship between aggregate insider demand and the future value premium results from insiders trading against systematic sentiment-induced mispricing and growth stocks are subject to greater levels of mispricing, then we would expect aggregate insider demand in growth stocks to be more strongly related (than aggregate insider demand in value stocks) to lag market returns.[26] That is, growth insiders should be "more contrarian" than value insiders.

Following Lakonishok and Lee (2001), we examined this issue by sorting monthly aggregate insider demand (Equation 1) into quintiles and looking at the value-weighted market return over the previous year. We then repeated the tests by sorting monthly aggregate insider demand into quintiles on the basis of aggregate insider demand in value stocks (i.e., Equation 1 limited to value stocks) and aggregate insider demand in growth stocks. Although specific results are not reported (for brevity), we found that differences (both means and medians) in lag market returns for the top and bottom lag insider demand quintiles are largest when sorting on insider demand in growth stocks. Moreover, lag return differences are statistically significant (at the 5 percent level) only when sorting on insider demand in growth stocks.

Out-of-Sample Tests

We purchased additional insider trading data (from Thomson Financial's Value-Added Insider data feed) for May 2004–July 2009 to conduct out-of-sample tests.[27] To extend our sample period as far as possible, we used the market, value, and growth portfolio returns through September 2009 (downloaded from Kenneth R. French's website).[28] Thus, our out-of-sample data covered 63 monthly returns from July 2004 to September 2009. Over this period (the "out-of-sample" period), the data included more than 1.64 million insider trades in more than 6,900 stocks.

The descriptive statistics for the out-of-sample period (Panel B of Table 1) reveal a number of striking differences from the original sample period. First, the average market return is small relative to the earlier period (averaging 30 bps a month in the more recent period versus 112 bps a month in the earlier sample period). Second, insiders are, on average, strongly selling over the more recent period. The average monthly aggregate insider demand (see Equation 1) in the previous month is –0.618 in the more recent period versus –0.227 in the earlier sample period. The volatility (time-series standard deviation) in aggregate insider demand, however, is similar for the two periods.

We began to investigate the relationship between aggregate insider demand and subsequent returns in the out-of-sample period by repeating the regressions reported in Table 2 but forecasting returns over July 2004–September 2009. Contrary to Table 2 and the results of previous studies (e.g., Lakonishok and Lee 2001), the results reported in **Table 8** reveal no evidence that aggregate insider demand measured over the previous month, three months, six months, or year forecasts subsequent market returns, value portfolio returns, or growth portfolio returns (i.e., none of the coefficients reported in the first three rows of Table 8 differ meaningfully from zero). The results in the last row of Table 8, however, reveal some evidence that short-term aggregate insider demand still forecasts the value premium. Specifically, the coefficient associated with aggregate insider demand in month $t - 1$ forecasts the value premium in month $t + 1$ (marginally statistically significant at the 10 percent level in a two-tailed test). When measuring aggregate insider demand over longer intervals, however, we found no evidence of a meaningful relationship between insider trading and the subsequent value premium.

Table 8. Regressions of Monthly Portfolio Returns on Lag Aggregate Insider Demand for Out-of-Sample Period, June 2004–August 2009
(*t*-statistics in parentheses)

	Insider Demand Measured Over											
	Previous Month (t = –1)			Previous Three Months (t = –1 to –3)			Previous Six Months (t = –1 to –6)			Previous Year (t = –1 to –12)		
Dependent Variable	Intercept	Coefficient	Adj. R^2	Intercept	Coefficient	Adj. R^2	Intercept	Coefficient	Adj. R^2	Intercept	Coefficient	Adj. R^2
Market return$_1$	0.022	–0.444	–1.58%	0.855	0.907	–1.42%	2.138	2.916	0.21%	2.299	2.975	–0.78%
	(0.01)	(–0.18)		(0.51)	(0.36)		(1.16)	(1.06)		(0.81)	(0.72)	
Value return$_1$	–0.693	–1.968	–1.00	0.841	0.519	–1.60	3.478	4.686	1.18	4.764	6.302	0.63
	(–0.33)	(–0.62)		(0.39)	(0.16)		(1.46)	(1.32)		(1.30)	(1.18)	
Growth return$_1$	0.495	0.494	–1.58	1.504	2.133	–0.55	2.589	3.801	1.24	2.894	4.017	–0.20
	(0.29)	(0.19)		(0.87)	(0.81)		(1.36)	(1.33)		(0.93)	(0.93)	
Value premium$_1$	–1.189	–2.461	3.54	–0.663	–1.614	0.44	0.891	0.885	–1.12	1.870	2.285	–0.09
	(–1.31)	(–1.81)*		(–0.70)	(–1.13)		(0.84)	(0.56)		(1.15)	(0.97)	

Notes: The sample size is 63 months. Monthly portfolio returns are in percentages.

*Significant at the 10 percent level.

To test how an investor following the style-timing strategy described in our earlier tests would perform over the out-of-sample period, we repeated the analysis in Panel B of Table 3 for returns from July 2004 to September 2009. As before, we focused on insider demand over the previous six months ($t = -1$ to -6) and updated the low, medium, and high insider demand breakpoints monthly on the basis of insider trading in the five years before that month. The results (Panel A of **Table 9**) reveal relatively little evidence that an investor could successfully use aggregate insider demand over the previous six months to adjust style tilts in the post-2004 period. Following low insider demand signals, value stocks outperform growth stocks by 0.476 pp (5.9 pps annualized), on average. In the month following high aggregate insider demand, value stocks still outperform growth stocks, on average, by 0.290 pp (3.5 pps annualized). Although the point estimates are "in the right direction," the difference is not statistically significant at traditional levels.

Table 9. Value Premium following Low, Medium, and High Aggregate Insider Demand with No Look-Ahead Bias for Out-of-Sample Period, June 2004–August 2009
(*t*-statistics in parentheses)

				High Insider Demand – Low Insider Demand	
	Low Insider Demand	Medium Insider Demand	High Insider Demand	*t*-Statistic	Wilcoxon *z*-Statistic
A. Insider demand measured over previous six months (t = –1 to –6)					
N	35	7	21		
Insider demand$_{-1\ to\ -6}$	–0.757	–0.732	–0.389		
Market return$_1$	0.982	0.657	–0.967	–1.15	–0.61
	(2.33)*	(0.61)	(–0.59)		
Value return$_1$	1.115	0.464	–0.447	–0.69	0.14
	(2.16)*	(0.39)	(–0.20)		
Growth return$_1$	0.638	0.733	–0.738	–0.80	–0.13
	(1.12)	(0.60)	(–0.45)		
Value premium$_1$	0.476	–0.269	0.290	–0.19	0.15
	(1.60)	(–0.45)	(0.327)		
%(Value premium$_1$ > 0)	57.14%	28.57%	61.90%		
B. Insider demand measured over previous month (t = –1)					
N	30	13	20		
Insider demand$_{-1\ to\ -6}$	–0.771	–0.702	–0.332		
Market return$_1$	0.498	1.396	–0.720	–0.70	–0.07
	(1.12)	(1.35)	(–0.43)		
Value return$_1$	0.688	1.437	–0.321	–0.43	0.45
	(1.22)	(1.21)	(–0.14)		
Growth return$_1$	0.015	1.648	–0.494	–0.29	0.47
	(0.02)	(1.52)	(–0.30)		
Value premium$_1$	0.673	–0.211	0.173	–0.49	–0.21
	(2.08)**	(–0.54)	(0.18)		
%(Value premium$_1$ > 0)	60.00%	38.46%	60.00%		

Notes: Panel A reports mean aggregate insider demand over the previous six months ($t - 1$ to $t - 6$) and the mean subsequent ($t = 1$) monthly market portfolio return, value portfolio return, growth portfolio return, value premium, and fraction of observations when the value premium is positive following low, medium, and high insider demand. Insider demand breakpoints for low, medium, and high categories are updated every month on the basis of insider trading in the five years prior to that month. Panel B reports analogous figures based on aggregate insider demand over the previous month ($t - 1$). The last two columns report a *t*-statistic from a difference-in-means test and a *z*-statistic from a Wilcoxon rank sum test, respectively, of the null hypothesis that portfolio returns following low insider demand equal portfolio returns following high insider demand. The last row in both panels reports the fraction of observations with a positive monthly value premium. Returns are in percentages. The sample size is 63 months.

*Significant at the 10 percent level.
**Significant at the 5 percent level.

Nonetheless, an investor who follows lag six-month insider trading to forecast the value premium is no worse off. That is, analogous to our discussions of Table 3, we can easily compare the performance of a style-timing strategy with the performance of a style-neutral strategy for the out-of-sample period. Again, consider an investor who holds the value portfolio following low insider demand, the growth portfolio following high insider demand, and a 50/50 mix of value and growth following medium insider demand versus an investor who holds a constant 50/50 mix of value and growth. Over all months, the style-timing manager beats the style-neutral manager by 0.084 pp a month (approximately 101 bps annually).[29] Moreover, although not reported in the table, the style-timing manager experiences lower volatility than the style-neutral manager.[30]

Because the regression analysis suggests that short-term insider demand (i.e., over month $t = -1$) more effectively forecasts the value premium over the out-of-sample period, Panel B of Table 9 reports the analysis for insider demand over the previous month ($t = -1$): The low, medium, and high insider demand breakpoints are updated monthly on the basis of monthly insider trading in the five years before that month. The results reveal somewhat stronger evidence that aggregate insider demand forecasts the value premium. Specifically, in the months following low insider demand, the value portfolio outperforms the growth portfolio by 0.673 pp, on average (statistically significant at the 5 percent level). In the months following high insider demand, the average return on the value portfolio is only 0.173 pp larger than the growth portfolio's average return. The annualized difference in the value premium following high and low insider demand over the out-of-sample period is more than 6 pps—that is, $(1 + 0.00673 - 0.00173)^{12} - 1$. Moreover, in this case, the style-timing manager outperforms the style-neutral manager by 0.133 pp a month (161 bps a year). Again, although not reported in the table, the style-timing manager experiences lower volatility than the style-neutral manager.[31]

To better understand the relationships between aggregate insider demand, market returns, and the value premium over recent years, **Figure 2** (insider demand measured over the previous six months) and **Figure 3** (insider demand measured over the previous month) plot monthly aggregate insider demand (solid line), the cumulative market return (dotted line), and the cumulative value premium (dashed line) over July 2004–September 2009. We calculated the cumulative value premium as the difference between the cumulative return (beginning in July 2004) on the value portfolio and the cumulative return on the growth portfolio. Unshaded areas in the figures indicate low *lag* insider demand, lightly shaded areas indicate medium *lag* insider demand, and darkly shaded

Figure 2. Insider Demand, Cumulative Market Return, and Cumulative Value Premium with Signal Based on Aggregate Insider Demand in Previous Six Months, July 2004–September 2009

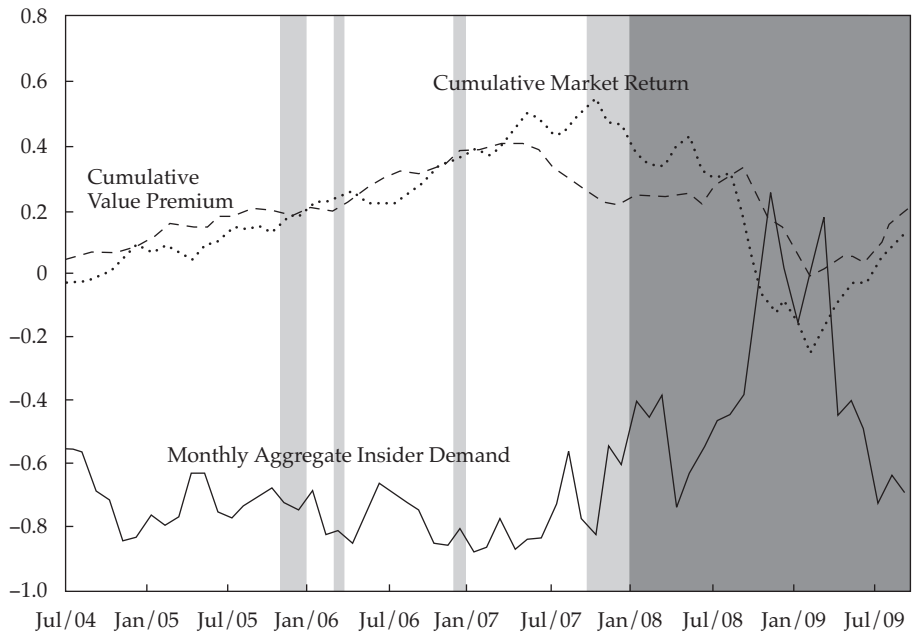
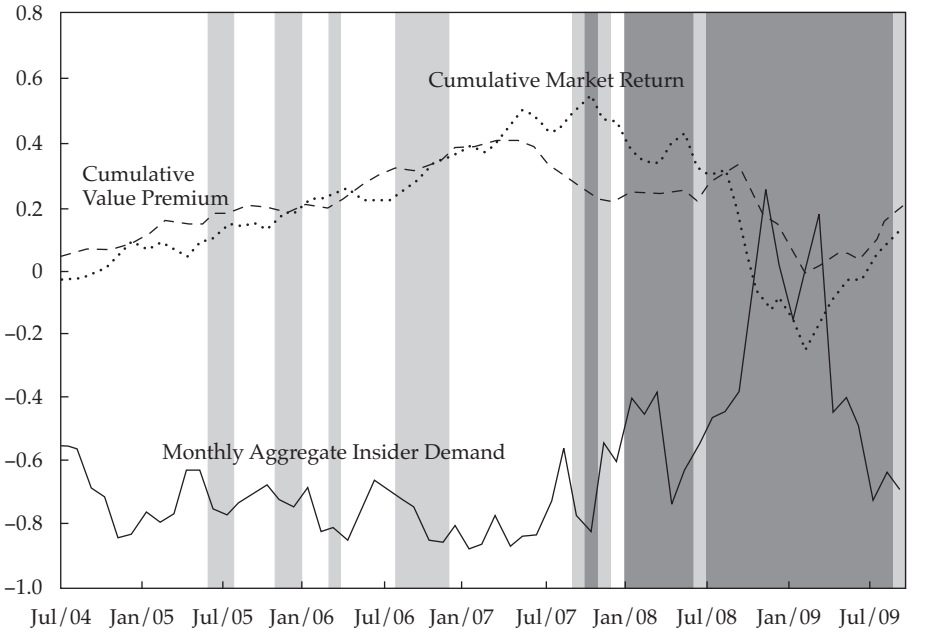


Figure 3. Insider Demand, Cumulative Market Return, and Cumulative Value Premium with Signal Based on Aggregate Insider Demand in Previous Month, July 2004–September 2009



areas indicate high *lag* insider demand. Insider demand breakpoints are the same as those used in Table 9. Therefore, unlike the constant breakpoints in Figure 1, the breakpoints in Figures 2 and 3 are updated (and thus change) each month on the basis of insider trading in the five years before each month.

If insiders are forecasting the value premium, we would expect a rising cumulative value premium in unshaded areas, a relatively flat cumulative value premium in lightly shaded areas, and a declining cumulative value premium in darkly shaded areas. The results in Figures 2 and 3 reveal that the strategy largely "worked" until the cumulative value premium (and market) bottomed in February 2009. Specifically, until May 2007, lag insider demand was low and the cumulative value premium was rising. Between June 2007 and February 2009, lag insider demand increased and the cumulative value premium declined sharply. Following the cumulative value premium (and market) bottom in February 2009, lag insider demand declined sharply but, compared with the previous 60 months, remained relatively strong and continued to generate a "buy growth signal" despite the increase in the cumulative value premium.

In short, the relatively weak relationship between lag aggregate insider demand and the subsequent value premium is driven by the last seven months in the sample (returns over March–September 2009). For example, excluding the last seven months of the out-of-sample period, the difference in the average value premium following low versus high aggregate insider demand is nearly identical to the difference in the original sample period.[32] Moreover, repeating the regressions in Table 8 (untabulated) but excluding the most recent seven months, we once again documented a strong negative relationship (statistically significant at the 1 percent level in every case) between the subsequent value premium and aggregate insider demand regardless of the measurement interval (aggregate insider demand over the previous month, three months, six months, or year).

Finally, we examined the impact of changing the length of our admittedly *ad hoc* 60-month window to gauge whether insider demand is high or low. In untabulated analysis (analogous to Panel B of Table 9), we found that when ranking aggregate insider demand within a short six-month window, aggregate insider demand over the previous month strongly predicts the value premium in the out-of-sample tests; the value premium averages 1.478 pps following low aggregate insider demand versus –0.986 pp following high aggregate insider demand (the difference is statistically significant at traditional levels). Unfortunately, we also found that the short six-month window fares poorly in our original sample period—the point estimates are in the right direction, but the difference is not statistically significant.

Aggregate insider demand fails to forecast the value premium over the most recent period for several possible reasons. First, as noted by previous researchers, the value premium may reflect both a mispricing component and a risk component. If insiders trade against the former but not the latter, then to the extent that the most recent market meltdown/subsequent recovery primarily resulted from changes in risk, aggregate insider demand may be somewhat independent of the value premium. Nonetheless, Figures 2 and 3 clearly show that as the market and value premium fell in 2008, insider demand sharply increased, consistent with the hypothesis that insiders increasingly viewed 2008 as a buying opportunity.

Second, the relationships between insider trading, market returns, and the value premium in the out-of-sample period are unusual relative to historical norms. For example, contrary to earlier periods, no systematic relationship appears to exist between aggregate insider demand and subsequent market returns. In addition, the value premium tended to move with the market over the period. In fact, for this 63-month period—and contrary to previous research (e.g., Chan and Lakonishok 2004)—the value portfolio market beta was larger than the growth portfolio beta. Moreover, the overall level of insider trading was unusually large in the out-of-sample period (relative to historical norms). For example, insiders averaged more than 26,000 transactions a month in the out-of-sample period versus slightly fewer than 7,000 transactions a month in the original sample period.[33]

Conclusion

Aggregate insider demand predicts the value premium—greater insider selling implies a higher future value premium. Mechanically, this relationship arises because aggregate insider demand is more strongly (positively) related to future growth stock returns than to future value stock returns. In fact, the previously documented relationship between aggregate insider demand and future market returns is largely driven by the strong relationship between insider demand and future growth stock returns. Further tests suggested that the relationship between aggregate insider demand and the future value premium arises because insiders trade against systematic investor sentiment and growth stocks suffer from larger sentiment-induced pricing errors than do value stocks. As a result, our analysis suggests that investors can use signals from aggregate insider behavior to adjust style tilts and exploit sentiment-induced mispricing.

Our out-of-sample tests, however, reinforce the notion that aggregate insider demand is no panacea for predicting either market returns or the value premium. Specifically, for the last five years, we found no evidence that aggregate insider demand forecasts market returns or returns on either the growth or the value portfolio. Although we did find some evidence that short-term aggregate insider demand continued to forecast the value premium in the 2004–09 period, the relationship between aggregate insider demand and the subsequent value premium is weaker when compared with the primary sample period (1978–2004). Additional tests revealed that the relatively weak relationship between aggregate insider demand and the future value premium over July 2004–September 2009 largely results from the last few months in the sample, when insider demand was high (relative to the previous 60 months) and the value premium (and market) was recovering.

We thank John Campbell, Ken French, Russ Wermers, and Jeffrey Wurgler for graciously providing data.

This article qualifies for 1 CE credit.

Notes

1. Both data sources provide the number of shares traded by company insiders as reported on SEC Form 4. Following previous work (e.g., Lakonishok and Lee 2001), we excluded duplicate filings, transactions with missing price data, transactions with stocks priced under $2, transactions involving fewer than 100 shares, transactions with prices that deviated from CRSP prices by more than 20 percent, and transactions involving more than 20 percent of the shares outstanding. For the Thomson Financial data, we required cleanse codes of R, H, or L.
2. SEC Rule 16a-1(f) defines the term *officer* to mean

   > an issuer's president, principal financial officer, principal accounting officer (or, if there is no such accounting officer, the controller), any vice-president of the issuer in charge of a principal business unit, division or function (such as sales, administration or finance), any other officer who performs a policy-making function, or any other person who performs similar policy-making functions for the issuer. Officers of the issuer's parent(s) or subsidiaries shall be deemed officers of the issuer if they perform such policy-making functions for the issuer. . . .

   See SEC Reports of Directors, Officers and Principal Shareholders, *Code of Federal Regulations*, title 17, sec. 240.16a-1(f) (2009).

3. We found similar (untabulated) results when we included all shareholders or excluded large shareholders.
4. Following Fama and French (2006), we computed the book value of equity as total assets less liabilities plus balance sheet deferred taxes and investment tax credits (if available) minus book value of preferred stock (liquidating value, redemption value, or carrying value, in order of availability).
5. Although size and book-to-market breakpoints were based on NYSE companies (following Fama and French 1993), all companies (with adequate data) were included in the sample. In measuring aggregate insider demand, we included companies with insufficient data to compute book-to-market ratios.
6. For example, the time-series correlation between the monthly value premium that we estimated and the value premium reported on Kenneth R. French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french) is 0.97. We formed our own value and growth portfolios because our tests included (1) measures of insider demand in value or growth stocks only and (2) the returns of value and growth portfolios that excluded stocks with insider trading.
7. For our sample period, the average value premium is statistically different from zero at the 5 percent level.
8. Because the first period has 101 months and the second and third periods each have 102 months, the first period contributes slightly less to the difference between the style-timing and the style-neutral managers' returns.
9. In an untabulated analysis, we also examined value and growth portfolios, controlling for capitalization and momentum. The style-timing manager beats the style-neutral manager by 0.266 pp a month, on average, on the basis of these capitalization- and momentum-stratified value and growth portfolios. Specifically, we used the intersection of capitalization and momentum quintiles (downloaded from Russ Wermers's website: www.smith.umd.edu/faculty/rwermers/). Within each of these 25 groups, we used book-to-market ratios from Russ Wermers's website to create value and growth portfolios (with the top 30 percent book-to-market ratios identifying value companies and the bottom 30 percent identifying growth companies). We used CRSP returns and market capitalization data to calculate value-weighted portfolio returns within each of the 25 groups. We computed the capitalization- and momentum-stratified value portfolio as the average return across the 25 value portfolios and the capitalization- and momentum-stratified growth portfolio as the average return across the 25 growth portfolios. See Daniel, Grinblatt, Titman, and Wermers (1997) and Wermers (2004) for additional details.
10. Untabulated results revealed that both the value portfolio and the growth portfolio exhibit similar negative autocorrelation. As a result, the value premium exhibits no evidence of meaningful autocorrelation.
11. We tried several different measures of the value spread, including the ratio of the value-weighted average book-to-market ratio in the value portfolio to the value-weighted average book-to-market ratio in the growth portfolio and the ratio of value portfolio (70th percentile) and growth portfolio (30th percentile) breakpoints. For our sample, however, the median ratio used by Asness, Friedman, Krail, and Liew (2000) generated the strongest results for the value spread. In all cases, the coefficient associated with aggregate insider demand remains statistically significant at the 1 percent level.
12. We found similar results, however, when we used all historical data (available at that point) rather than data for the most recent five years only.
13. As noted in our discussion of the data, before 1985, when CDA/Investnet began compiling data for the SEC, there may have been a delay between insiders reporting their trades to the SEC and investors receiving the information via the *Official Summary*. To ensure that our results were not meaningfully affected by this possibility, we repeated the analysis in Panel B but limited the sample to the post-1984 CDA/Investnet period. Results (untabulated) are essentially identical to those reported in Panel B.
14. As before, the figure is a weighted (by number of months) average of the difference between the style-timing and the style-neutral managers' returns.
15. Similarly, the style-timing manager outperforms the style-neutral manager by 0.311 pp (statistically significant at the 1 percent level) on the basis of the capitalization- and momentum-stratified value and growth portfolios (see Note 9).
16. The style-timing manager's ending portfolio value is $\$1(1 + 0.012985)^{246}$ versus the style-neutral manager's ending portfolio value of $\$1(1 + 0.009888)^{246}$.
17. Our results do not suggest that risk plays no role in explaining the value premium or time-series variation in the value premium. Rather, our results suggest that the relationship between aggregate insider demand and the value premium is not explained by fundamentally riskier value stocks and time-varying fundamental risk.
18. As shown in Campbell and Vuolteenaho (2004), the (unexpected) market return is the sum of the return attributable to cash flow news ($N_{CF,t}$) and the negative of discount rate news ($-N_{DR,t}$)—that is, a higher discount rate results in a lower price. As a result, portfolio i's market beta can be written as the sum of the cash flow beta and discount rate beta: $\beta_{i,M} = \text{cov}(r_i, N_{CF,t} - N_{DR,t}) / \sigma^2(N_{CF,t} - N_{DR,t}) = \text{cov}(r_i, N_{CF,t}) / \sigma^2(N_{CF,t} - N_{DR,t}) + \text{cov}(r_i, -N_{DR,t}) / \sigma^2(N_{CF,t} - N_{DR,t})$. We estimated both cash flow and discount rate betas for our growth and value portfolios over the 282 months with data overlapping with Campbell and Vuolteenaho's period. Consistent with previous studies, we also found that the growth portfolio has a larger market beta than the value portfolio (owing to the former's larger discount rate beta).
19. Inconsistent with this explanation, however, aggregate insider demand in value stocks and aggregate insider demand in growth stocks are highly correlated ($\rho = 0.78$). Moreover, both value stock aggregate insider demand and growth stock aggregate insider demand are highly correlated with aggregate insider demand ($\rho = 0.89$ and 0.95, respectively).
20. On average, eliminating companies with lag insider trades excluded 62 percent of large-cap value companies and 45 percent of small-cap value companies (54 percent is the average of these two figures). Similarly, eliminating companies with lag insider trades excluded, on average, 84 percent of large growth stocks and 57 percent of small growth stocks.
21. Under this hypothesis, an increase in sentiment will cause a decline in insider demand (i.e., an inverse relationship exists between insider demand and contemporaneous returns) regardless of whether market sentiment is currently positive or negative. For example, if sentiment is negative and investors become less pessimistic (an increase in sentiment), insider demand will decline as undervalued securities become more fairly valued.

22. Where aggregate insider demand in month *t* is defined as the number of insider purchases less the number of insider sales in month *t* divided by the number of insider transactions in month *t* (i.e., Equation 1 measured over month *t*).
23. Baker and Wurgler (2006), however, are an exception. Specifically, their results suggest a U-shaped relationship between sensitivity to investor sentiment and book-to-market ratios.
24. See Baker and Wurgler (2006, 2007) for estimation details. They also measured a change in sentiment proxy orthogonalized to business cycle measures (industrial production growth; growth in consumer durables, nondurables, and services; and a dummy variable for NBER recessions). Using the orthogonalized values, we found nearly identical results.
25. In an untabulated analysis, we added Baker and Wurgler's (2006, 2007) sentiment proxy to the value premium regression tests in Table 4. Although the Baker–Wurgler proxy forecasts the value premium when it is the only independent variable, the relationship is marginally significant in the regressions (at the 10 percent level) only when the other variables (insider demand, lag returns, and value premium) are included. The coefficient associated with lag insider demand remains statistically significant (at the 5 percent level).
26. We thank an anonymous referee for suggesting this test.
27. We thank an anonymous referee for suggesting that the most recent market turmoil might provide an excellent out-of-sample test of the relationships between aggregate insider demand, market returns, value portfolio returns, growth portfolio returns, and the value premium.
28. At the time of this writing, our CRSP data ended in 2008. Thus, we used the monthly market, value, and growth portfolio returns posted on Kenneth R. French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french). As a result, we did not run the same filters on our out-of-sample insider trading data as we did on our original sample (e.g., excluding transactions with missing price data, excluding stocks priced under $2). Nonetheless, we repeated the original sample period tests without running these filters and found essentially identical results (untabulated).
29. As before, the figure is a weighted (by number of months) average of the difference between the style-timing and the style-neutral managers' returns.
30. The standard deviation of monthly returns for the style-neutral manager is 5.54 percent versus 4.97 percent for the style-timing manager.
31. The standard deviation of monthly returns for the style-neutral manager is 5.54 percent versus 5.00 percent for the style-timing manager.
32. As shown in Table 3, the difference in the value premium following low and high insider demand averages 156.2 bps a month—that is, 1.122 – (–0.440)—in the original sample period. Excluding the last seven months of the sample period, the difference in the value premium averages 148.9 bps a month on the basis of aggregate insider demand over the previous six months and 175.6 bps a month on the basis of aggregate insider demand over the previous month.
33. To ensure that these figures were directly comparable, we computed insider volume before running the filters on the earlier sample period (see Notes 1 and 28).

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