REIT Stock Repurchases: Completion Rates, Long-Run Returns, and the Straddle Hypothesis

Authors

Gregory L. Adams, James C. Brau, and Andrew Holmes

Abstract

This study of real estate investment trusts (REITs) analyzes three possible explanations for the stock price reaction to a repurchase announcement and the subsequent repurchase behavior of managers under each hypothesis. Two of the hypotheses, the signaling hypothesis and the exchange option hypothesis, are established in the existing literature; the third hypothesis is a modification of the exchange option hypothesis. The exchange option hypothesis is extended to allow for additional flexibility in management decisions. This extended exchange option hypothesis is termed the ''straddle'' hypothesis because it provides management with both a call and put option. The empirical analyses show the straddle hypothesis is a more robust explanation of changes in shares outstanding in the post-announcement period than the alternative explanations.

A key element of corporate real estate and corporate finance theory is the return of operating profits to stockholders. As such, stock repurchases have been studied extensively. Masulis (1980), Dann (1981), Vermaelen (1981, 1984), Lakonishok and Vermaelen (1990), Comment and Jarrell (1991), Ikenberry, Lakonishok, and Vermaelen (1995, 2000), and Brau and Holmes (2006) all document positive abnormal stock price performance around the announcement of stock repurchases. The existing literature posits several plausible hypotheses to explain these abnormal returns. The most frequently referenced and studied among these ''traditional'' hypotheses are: (1) signaling (or information content) effects associated with firm undervaluation; (2) agency cost (or free cash flow) effects associated with the disgorgement of cash to shareholders; and (3) personal tax effects associated with differential taxation of dividends and capital gains. Given that these theories all predict the same stock price reaction to repurchase announcements, disentangling the impact of the competing hypotheses has proven elusive (e.g., see Nohel and Tarhan, 1998).

In addition to the traditional hypotheses, Ikenberry and Vermaelen (1996) suggest that the abnormal performance of announcing firms is due to the value of the

exchange option created by the repurchase announcement (see Margrabe, 1978) for a discussion of exchange option valuation. An exchange option created by a repurchase announcement allows management to exploit deviations in the information sets possessed by firm insiders (i.e., management) and outside investors (i.e., other market participants). The exchange option hypothesis contends that the repurchase announcement expands the firm's investment opportunity set by authorizing management to repurchase shares in the future if their ''inside'' information indicates that the buyback will benefit long-term shareholders.[1] Hence, even if the firm is fairly valued at the time of the announcement, the value of the firm will increase concomitantly with the value of the option created by the repurchase announcement.

If a repurchase announcement serves to create an exchange option, one would predict that many of the repurchase options would not be ''exercised.'' In fact, most repurchase programs are never completed. Wiggins (1994), Usem, Shulman, and Brown (1995) and Stephens and Weisbach (1998) all report that only a fraction of announced repurchase programs are completed.[2] Hence, the exchange option hypothesis offers a potential explanation for both the positive stock price reaction to the repurchase announcement and the low frequency with which the programs are completed.

Brau and Holmes (2006) study the traditional hypotheses (i.e., signaling, agency cost, and tax effect) using a real estate investment trust (REIT) sample, but do not consider the exchange option hypothesis. REITs offer a unique laboratory for the study of repurchase announcements.[3] Brau and Holmes argue that as an asset class, REITs possess several unique institutional attributes that render irrelevant the economic intuition sustaining agency cost and personal tax effect theories' explanations for the positive stock price reaction to repurchase announcements. In particular, since REITs are required to distribute 95% of income to shareholders in the form of dividends and are exempted from Federal income taxation, possible agency cost and personal tax effect impacts are mitigated. The 95% distribution rule diminishes managers' ability to accumulate and misuse large cash reserves, reducing the agency costs associated with REIT ownership and thus making the agency cost hypothesis untenable. Similarly, the 95% rule requires large dividend payments (95% of income), which implies that REIT investors are insensitive to the differential taxation of dividends and capital gains,[4] thus making the personal tax effects hypothesis untenable. In an empirical analysis of announcement-period data for a REIT sample, Brau and Holmes show that among traditional hypotheses, only the signaling hypothesis has economic merit in explaining the positive stock price reaction associated with REIT repurchase announcements.[5]

However, announcement period analysis cannot be used to differentiate between a signaling effect and an exchange option effect. Hence, in contrast to Brau and Holmes (2006), this research examines returns subsequent to the repurchase announcement (similar to data used by Giambona, Giaccotto, and Sirmans, 2005), as well as repurchase completion rates. The examination of the long-run implementation of the repurchase announcement allows separation of the

valuation-type motivations from option-type motivations and analysis of the efficacy of these competing hypotheses. Furthermore, the exchange option hypothesis is extended to include both a bull (long call) and a bear (long put) option. The extended exchange option hypothesis is referred to here as the ''straddle'' hypothesis.

The exchange option hypothesis assumes that the repurchase announcement provides management with a long call option on the firm's stock. As a means of explaining management behavior, the straddle hypothesis combines the long call option created by the repurchase announcement with the existing long put option (i.e., the ability to sell stock). Hence, the repurchase announcement can be viewed as simply preserving the bull side of a straddle. Under the straddle hypothesis, the repurchase announcement is not an attempt to signal current mispricing. Rather, the repurchase announcement simply preserves management's ability to exploit future information set deviations between insiders and outsiders.

The straddle hypothesis is consistent with evidence presented by Baker and Wurgler (2002) in a study of financial structure. Specifically, in the context of a explaining capital structure variation, Baker and Wurgler show that managers attempt to exploit informational asymmetries by repurchasing shares when equity values are ''low'' and issuing shares when equity values are ''high'' (i.e., timing the market). The question is whether a repurchase announcement is a signal of the firm's positive future prospects (i.e., the signaling hypothesis) or whether it is a device to acquire options on the firm's shares to be exercised in the event of future mispricing (i.e., the exchange option hypothesis and the straddle hypothesis). Consistent with Baker and Wurgler, the straddle hypothesis extends the exchange option hypothesis by specifically allowing for inside information (i.e., management's information set) to be positive or negative. If the straddle hypothesis is a valid view of repurchase announcement phenomena, management should be observed exercising the long call (i.e., the repurchase) amid superior and positive information about the firm's future prospects and exercising the long put (i.e., the ability to sell stock) amid superior and negative information about the firm's future prospects.

This paper advances the literature by examining long-run returns and completion rates for REIT repurchase announcements and by differentiating the impact of the signaling hypothesis, the exchange hypothesis, and the straddle hypothesis. As with Brau and Holmes (2006), contamination from other traditional hypotheses such as the agency cost hypothesis or the tax-impact hypothesis is avoided by using a REIT sample. Of the three hypotheses considered, the findings support only the validity of the straddle hypothesis as an explanation for 1) the abnormal returns observed around REIT share repurchase announcements and 2) the subsequent implementation of the repurchase program.

The remainder of the paper is organized as follows. First there is a succinct literature review followed by the testable implications of the three hypotheses. Next there is a discussion of the data and results. The paper closes with concluding remarks.

Testable Implications: Signaling, Exchange Option, and Straddle Hypotheses

The managerial signaling hypothesis is based on current asymmetry in the information sets between managers and shareholders. Under the signaling hypothesis, if management views the firm's shares as undervalued, the announcement of a repurchase may serve to homogenize the information sets between the two groups (Aharony and Swary, 1980; Vermaelen, 1984; Ofer and Thakor, 1987; Healy and Palepu, 1988; and Constantinides and Grundy, 1989). The most frequent prediction of the signaling hypothesis is that a repurchase program announcement will precipitate a positive stock price reaction. Many authors, including Dann (1981), Vermaelen (1981), Asquith and Mullins (1986), Comment and Jarrell (1991), and Stephens and Weisbach (1998), empirically document positive stock price reactions following repurchase announcements and offer interpretations consistent with the managerial signaling hypothesis. More recently, Giambona, Giaccotto, and Sirmans (2005) document positive abnormal returns in a REIT sample following a repurchase announcement. Under the signaling hypothesis, positive stock price reaction should accompany repurchase announcements due to the undervaluation conveyed in the signal. This positive reaction will be related to the current degree of mispricing; given that the signal homogenizes the information sets, there is no reason to expect option valuation parameters such as stock volatility to impact the magnitude of the reaction. That is, unlike the other hypotheses, the signaling hypothesis makes no indications that the magnitude of the repurchase announcement reaction is option based.

Previous literature (e.g., Ikenberry, Lakonishok, and Vermaelen, 1995; and Giambona, Giaccotto, and Sirmans, 2005) documents that outside investors typically under-react to share repurchases. That is, outside investors do not immediately fully impound management's signal into the stock price. However, over time, as outsiders observe evidence to collaborate the signal, they drive up the stock price. Based on this literature, the signaling hypothesis predicts announcing firms will have superior post-announcement stock price performance. Finally, if the firm is undervalued at the time of the announcement, one would expect to observe significant buy-back activity after the announcement and little or no stock issuance in the period following the announcement. Hence, if the signaling hypothesis is a robust explanation for repurchase announcement motivation, one would hypothesize the following empirical implications:

- $H1_{signaling}$: A positive reaction to the repurchase announcement;
- $H2_{signaling}$: The magnitude of the announcement reaction will not be dependent on option valuation determinants;
- $H3_{signaling}$: Superior stock price performance in the post-announcement period;
- $H4_{signaling}$: High completion rates for the announced repurchase programs; and

- $H5_{signaling}$: Very few firms issue new shares in the period following the announcement.

The exchange option hypothesis does not assume current share mispricing. Rather, the exchange option hypothesis asserts that the repurchase announcement simply creates an option to buy the firm's shares if management has superior and positive information relative to outside investors. The option's value will result in a positive share price reaction to the announcement. Ikenberry and Vermaelen (1996) show that the magnitude of the stock price reaction to the repurchase announcement varies with standard option valuation parameters.[6] For instance, high volatility stocks (where there is a presumably greater possibility of divergence in the information set of insiders and outsiders) experience a significantly greater announcement period reaction than less volatile stocks. Hence, as with the signaling hypothesis, the exchange option hypothesis predicts a positive reaction to the announcement. Unlike the signaling hypothesis, however, there is no expectation of systematic superior performance in the post-announcement period since there is no assumed asymmetry in the relevant information sets at the time of the announcement.

If the relevant information sets witness no divergence, the exchange option will go unexercised. Given that the completion of the repurchase program depends on the future divergence of information sets, the exchange option hypothesis offers a potential explanation for the low completion rates of repurchase programs (e.g., Wiggins, 1994; Usem, Shulman, and Brown, 1995; and Stephens and Weisbach, 1998). Additionally, a strict interpretation of the exchange option hypothesis would indicate that announcing firms would be unlikely to issue shares in the post-announcement period given the focus on the call option created. Hence, if the exchange option hypothesis is a robust explanation of the motivation for stock repurchase announcements, one would hypothesize the following empirical implications:

- $H1_{exchange}$: A positive reaction to the repurchase announcement;
- $H2_{exchange}$: The magnitude of the announcement reaction will be dependent on option valuation determinants;
- $H3_{exchange}$: Unbiased stock price performance in the post-announcement period;
- $H4_{exchange}$: Low completion rates for announced programs; and
- $H5_{exchange}$: Very few firms issue new shares in the period following the announcement.

Like the exchange option hypothesis, the straddle hypothesis does not assume current mispricing. However, the straddle hypothesis extends the exchange option hypothesis to allow for both positive and negative divergence in the information sets possessed by managers and shareholders. Specifically, the straddle hypothesis explicitly allows for post-announcement insider information to be positive or negative.

Under the exchange option hypothesis, the repurchase announcement creates a call option on the firm's shares which management will exercise to the long-term shareholders' benefit if management comes to possess superior and positive information. Under the straddle hypothesis, the call option created by the repurchase option is simply the companion leg to the existing put option that management already possesses with the ability to issue additional shares. That is, since all firms possess the option to sell stock (subject to legal requirements and corporate governance considerations), the repurchase announcement simply completes the straddle by adding a call option.

The straddle hypothesis is best envisioned as an extension of the exchange option hypothesis. However, the straddle hypothesis may offer a more complete explanation for the stock price reaction to the announcement and, in particular, the post-announcement behavior of the announcing firm. Specifically, under the straddle hypothesis one would expect to see a positive stock price reaction to the repurchase announcement, unbiased performance in the post-announcement period, and low completion rates among repurchase programs. However, if the straddle is a more robust explanation of the repurchase behavior of announcing firms, one would also expect to see the put option exercised with some regularity. If the signaling hypothesis is correct or if the exchange option hypothesis is complete, it would be difficult to explain situations where a firm announced a repurchase program only to issue shares in the post-announcement period. In fact, the existing empirical literature does not consider the option to issue shares in the post-announcement period. Hence, if the straddle hypothesis is a robust explanation of the motivation for stock repurchase announcements, one would hypothesize the following empirical implications:

- $H1_{straddle}$: A positive reaction to the repurchase announcement;
- $H2_{straddle}$: The magnitude of the announcement reaction will be dependent on option valuation determinants;
- $H3_{straddle}$: Unbiased stock price performance in the post-announcement period;
- $H4_{straddle}$: Low completion rates for announced programs; and
- $H5_{straddle}$: Significant numbers of firms issue new shares following the announcement.

Exhibit 1 summarizes the empirical implications of all three hypotheses.

Data Description

Sample Selection

The sample of 149 REIT open market repurchase announcements is taken from Security Data Company's (SDC) Merger and Acquisition database for the years

Exhibit 1 | The Empirical Implications of the Three Hypotheses

	Announcement Period Reaction	Option Determinant Dependent?	Post-Announcement Performance	Repurchase Program Completion Rate	Stock Issuance Rate
Signaling Hypothesis	Positive	No	Superior	High	None
Exchange Option Hypothesis	Positive	Yes	Unbiased	Low	None
Straddle Hypothesis	Positive	Yes	Unbiased	Low	Positive

1989 through 2001.[7] The criteria for inclusion are: (1) that the transaction is classified as an open market share repurchase by the SDC; (2) that the firm is a REIT (SIC Code 6798); (3) that the announcing REIT had the required data from Standard and Poor's Compustat database and the University of Chicago's Center for Research in Security Prices (CRSP) database. Exhibit 2 reports the frequency of announcements by year and shows that the bulk (44%) of the announcements occur in 1998 and 1999.[8] To ensure that the observation cluster in 1998 and 1999 does not induce bias, the subsequent OLS models employ dummy variables for announcements in 1998 and in 1999. The results are robust to this perturbation.

Empirical Methods

Abnormal returns surrounding the repurchase announcements are estimated using a market-adjustment approach employing a REIT index as the market. If a firm has announced a repurchase within a year surrounding the date of the REIT announcement in question, it is not included in the index. A 21-day event window surrounding the announcement is used (Exhibit 3). In the subsequent regression models, the dependent variable is the five-day cumulative abnormal return (CAR) calculated using the two days before the announcement, the announcement date, and the two days following the announcement (Exhibit 4). A five-day window was selected to allow for any leakage preceding the announcement and for those announcements that take place after the market closes and to be consistent with the existing literature (e.g., Ikenberry and Vermaelen, 1996).[9]

In the subsequent long-run return tests, abnormal long-run returns are computed using CARs, with a non-announcing REIT index as the benchmark (Exhibit 5). CARs were selected for three primary reasons. First, the long-run analysis uses CARs for comparability with the existing literature (e.g., Ikenberry, Lakonishok, and Vermaelen, 2000). Second, Fama (1998) argues for the use of CARs as opposed to buy-and-hold abnormal returns. Fama argues that ". . .theoretical and

Exhibit 2 | Frequency of Real Estate Investment Trust Open Market Share Repurchase Announcements: 1989–2001

Announcement Year	# of Announcements	Percentage	Cumulative Announcement	Cumulative Percentage
1989	5	3.36	5	3.36
1990	10	6.71	15	10.07
1991	5	3.36	20	13.42
1992	10	6.71	30	20.13
1993	7	4.70	37	24.83
1994	7	4.70	44	29.53
1995	9	6.04	53	35.57
1996	13	8.72	66	44.30
1997	9	6.04	75	50.34
1998	36	24.16	111	74.50
1999	29	19.46	140	93.96
2000	8	5.37	148	99.33
2001	1	0.67	149	100

Notes: The sample is drawn from the Security Data Company's Merger and Acquisition database (SDC) and includes all REIT open market share repurchase announcements with available Compustat and CRSP data.

statistical considerations alike suggest that formal inferences about long-term returns should be based on averages or sums of short-term abnormal returns (AARs or CARs) rather than the currently popular buy-and-hold abnormal returns (BHARs).'' Third, CARs are used instead of the Lyon, Barber, and Tsai (1999) characteristic matching method because characteristic matching is not well-specified when the benchmark sample is from one four-digit SIC code (such as REITs).[10] A period of two years was chosen after the announcement based on the theoretical work of Ikenberry and Vermaelen (1996, Table 1).

Results

Direction and Magnitude of the Announcement Reaction

Exhibit 3 shows the aggregate announcement period reaction to the sample repurchase announcements. Consistent with all three hypotheses, the data show a positive announcement stock effect. Panel A reports the abnormal returns for a 21-day window around the announcement date. The positive share price reactions

Exhibit 3 | Event Study Abnormal Returns where Day 0 is the Announcement of an Open Market Share Repurchase by a Real Estate Investment Trust: 1989–2001

Panel A: Abnormal returns

Day	Mean Abnormal Return	*t*-Stat
−10	−0.23%	−1.53
−9	−0.23%	−0.13
−8	−0.16%	−0.76
−7	0.02%	−0.97
−6	0.00%	−1.42
−5	−0.28%	0.81
−4	−0.22%	−0.20
−3	−0.17%	−1.30
−2	−0.05%	−1.24
−1	0.13%	0.04
0	0.20%	3.37
1	0.33%	2.97
2	0.06%	0.04
3	−0.02%	1.73
4	0.00%	1.09
5	−0.05%	0.20
6	−0.06%	−0.17
7	−0.03%	−2.13
8	−0.10%	−1.07
9	−0.44%	−5.07
10	0.18%	−0.68

Panel B: Cumulative abnormal returns

Measurement Period	Mean Abnormal Return	*t*-Stat
$CAR_{0,+1}$	0.53%	5.30
$CAR_{-1,+0}$	0.33%	3.21
$CAR_{1,+0,+1}$	0.66%	5.36
$CAR_{0,+1,+2}$	0.59%	6.38
$CAR_{-2,+2}$	0.67%	5.07

Notes: The sample is drawn from the Security Data Company's Merger and Acquisition database (SDC) and includes all REIT open market share repurchase announcements with available CRSP and Compustat data from 1989 to 2001. Abnormal returns are calculated using market-adjusted event-study methodology with a REIT index of non-announcing REITs as the market proxy. A 21-day event window surrounding the announcement is used. In Panel B, CARs are cumulative abnormal returns over the specified period. The *t*-Statistic is for the null hypothesis that the abnormal return or CAR for the respective day(s) equals zero. 0 is the announcement day.

Exhibit 4 | OLS Regressions for the Exchange Option Hypothesis

	Volatility	Repurchase Size	REIT R^2	Market Volatility	REIT Index Volatility
Model 1	2.073				
	(0.030)				
Model 2		0.003			
		(0.936)			
Model 3			−0.101		
			(0.734)		
Model 4	1.837	0.003	−0.076		
	(0.053)	(0.937)	(0.796)		
Model 5	1.718	0.003	−0.040	−0.904	
	(0.072)	(0.933)	(0.897)	(0.370)	
Model 6	2.112	0.003	−0.065		0.049
	(0.028)	(0.933)	(0.825)		(0.793)

Notes: The sample is drawn from the Security Data Company's Merger and Acquisition database (SDC) and includes all REIT open market share repurchase announcements with available CRSP and Compustat data from 1989 to 2001. The dependent variable is the five-day cumulative abnormal return.

on days 0 and +1 are statistically significant (20 and 33 basis points respectively). Panel B shows the cumulative abnormal returns (CARs). Over days −2 to +2 (i.e., a 5-day CAR), there is an abnormal return of 67 basis points. This CAR, which is highly significance (t = 5.06), is similar to results in other studies (e.g., see Dann, 1981; and Ikenberry and Vermaelen, 1996).[11]

The data in Exhibit 3 show that the announcement period response is positive. However, all three theories predict the positive announcement period return. Hence, the positive reaction provides evidence that REIT and non-REIT samples respond similarly to the announcement, but does not validate one hypothesis over another.

The Announcement Reaction and Option Valuation Determinants

Under the signaling hypothesis, the magnitude of the announcement period reaction is invariant to option pricing parameters. Conversely, both the exchange option hypothesis and the straddle hypothesis predict that the magnitude of the announcement reaction varies with standard option valuation determinants.

Margrabe (1978) derives a closed form solution for exchange option valuation. While best viewed as a first-order approximation of the option to repurchase

Exhibit 5 | Long-Run Abnormal Returns for REITs Announcing an Open Market Share Repurchase

Month	AR	*t*-Stat	CAR	*t*-Stat
1	0.17%	0.167	0.17%	0.167
2	0.35%	0.865	0.54%	0.490
3	1.09%	1.601	1.50%	1.529
4	−0.96%	−0.938	0.76%	0.458
5	−0.10%	−0.182	0.47%	0.321
6	1.18%	0.932	1.41%	1.102
7	−0.42%	−0.758	0.87%	0.531
8	−1.70%	−2.710	−0.70%	−0.437
9	−1.35%	−1.610	−1.93%	−0.950
10	−1.11%	−2.009	−3.39%	−1.805
11	−0.84%	−1.493	−3.98%	−1.995
12	0.94%	−1.004	−1.86%	−0.552
13	−1.08%	−2.254	−3.04%	−1.009
14	0.13%	0.289	−3.12%	−1.155
15	0.35%	0.917	−2.67%	−0.927
16	−0.99%	−2.137	−4.20%	−1.516
17	−0.08%	−0.124	−4.62%	−1.481
18	−1.84%	−2.082	−6.75%	−2.676
19	−0.12%	−0.182	−7.22%	−2.935
20	−0.31%	−0.666	−7.78%	−2.911
21	−1.12%	−1.213	−9.29%	−2.596
22	−0.55%	−1.136	−9.82%	−3.579
23	−0.45%	−0.396	−10.18%	−2.960
24	−1.16%	−2.086	−11.25%	−3.312

Notes: The sample is drawn from the Security Data Company's Merger and Acquisition database (SDC) and includes all REIT open market share repurchase announcements with available CRSP and Compustat data from 1989 to 2001. AR is the abnormal return using a non-announcing REIT-index as the benchmark. The CAR is the cumulative abnormal return. The first *t*-Stat is for the AR and the second *t*-Stat is for the CAR.

shares, Margrabe's model indicates that the value of the option created by a repurchase announcement should be positively related to three factors: (1) the volatility of the underlying asset (i.e., the announcing REIT); (2) the size of the repurchase program; and (3) the correlation between the observed returns on the underlying asset and the true returns on the underlying asset. Accordingly, announcing a REIT's volatility, *VOLATILITY*, should positively impact the option

value and, therefore, the magnitude of the announcement reaction. Following Ikenberry and Vermaelen (1996), *VOLATILITY* is defined here as the standard deviation of monthly returns estimated in the 36 months prior to the announcement. Ikenberry and Vermaelen also estimate the relationship between *VOLATILITY* and repurchase announcement size for their sample of operating firms. Additionally, they include estimates of the relationship between announcement size and a proxy for the correlation between observed returns and true returns. For consistency with Margrabe and comparability with Ikenberry and Vermaelen, the size of the announced repurchase program is tested to see whether the correlations between observed and true returns on the stock are significant determinants of the announcement reaction. The size of the repurchase program, *SIZE*, is measured in similar fashion to Ikenberry and Vermaelen as the percentage of outstanding shares announced in the repurchase program. Obviously, the correlation between observed and true returns on the announcing REIT is not observable. Again following Ikenberry and Vermaelen, this unobservable variable is proxied as the R^2 from a regression of the returns of the announcing REIT on the returns on the REIT market (*RSQR*). Under the conditions specified in Ikenberry and Vermaelen, this proxy represents a floor of sorts on the unobservable correlation between observed returns and true returns. The higher the correlation, the lower the potential benefit of the exchange option, and therefore, the lower the magnitude of the share price reaction to the announcement.

Exhibit 4 shows the results of various models estimated to examine the impact of option pricing determinants on the magnitude of the repurchase announcement. Following Ikenberry and Vermaelen (1996), the 5-day CAR is used as the dependent variable in all models. The first three models consider the three option pricing determinants (i.e., *VOLATILITY*, *SIZE*, and *RSQR*) as univariate factors. While *SIZE* and *RSQR* are not statistically significant, *VOLATILITY* is significant with the expected positive coefficient, which indicates that the magnitude of the announcement reaction increases as the volatility of the underlying asset increases. Unlike Ikenberry and Vermaelen, *SIZE* and *RSQR* are not significant. The size proxy may be difficult for market participants to assess given that the size of the announced program and the actual implementation of the program are frequently very different. For *RSQR*, the results from the current study's sample and the results provided by Ikenberry and Vermaelen may differ for econometric reasons. Ikenberry and Vermaelen examine a sample of operating firms from many different industries. It is conceivable that the correlation of observed and true returns differ across industries giving their analysis of significant sample variation for the *RSQR* variable. The sample in the current study includes only REITs. Given that all firms in the sample operate in a common industry, the proxy for the correlation between observed and true returns may exhibit comparatively little variation. Since variation is necessary for statistical power, the difference in significance between the findings and the existing literature may simply be an artifact of the industry concentration inherent in the sample. Similar logic might also be extended to the *SIZE* variable. Given that *VOLATILITY* is the most purely measured of the three determinants, the results appear to indicate that the magnitude of the announcement reaction is influenced by option valuation determinants.

Model 4 uses the three option valuation determinants in a multivariate framework and shows that the *VOLATILITY* variable is still significant and positive (*p*-value = .0530). To further assess the robustness of *VOLATILITY* on the magnitude of the reaction, the multivariate relationship was also modeled with control variables for market volatility. Specifically, a proxy for market volatility was added to the regression equation in Model 5. In Model 6, a proxy for REIT market volatility was added to the regression equation. The intuition behind the addition of the control variables is to ensure that the volatility of the announcing REIT is not merely proxying for market volatility. Models 1 and 4 show that the magnitude of the announcement reaction is sensitive to the volatility of the announcing REIT. If the announcing REIT's volatility is merely acting as a proxy for market volatility, one would expect the market volatility proxies to be significant and to subsume the impact of the individual REIT's volatility. As Models 5 and 6 show (Exhibit 4), this is not the case—*VOLATILITY* maintains its statistical significance.

The regression results indicate that the magnitude of the announcement reaction is sensitive to the option valuation determinant that can be closely measured. While this evidence is consistent with both the exchange option hypothesis and the straddle hypothesis, the evidence does not support the validity of the signaling hypothesis.

Post-Announcement Stock Price Performance

When considering the signaling hypothesis, the assumed current underpricing of the announcing REIT may manifest itself as superior performance in the post-announcement period. That is, if the firm is currently undervalued, the signal proffered by the repurchase announcement should serve to align the relevant information sets resulting in a positive announcement period reaction in perfectly efficient markets. However, to the extent that the positive news held by management is not fully conveyed to the market by the repurchase announcement (i.e., incomplete information transfer; see Ikenberry, Lakonishok, and Vermaelen, 1995), the firm may realize superior returns in the post-announcement period as the untransferred positive news impacts observed stock performance. Conversely, the exchange option hypothesis and the straddle hypothesis give no indication that performance in the post-announcement period should be abnormally positive or negative.

When working with a sample (with some time clustering), the post-announcement performance will track the evolution of information asymmetries. That is, if the holders of the option (either the exchange option or the straddle) generally come to possess positive private information, the post-announcement performance in any period will be positive. If the holders of the option generally come to possess negative private information, the post-announcement performance will be abnormally negative. Hence, unlike the signaling hypothesis that inimitably predicts positive post-announcement (i.e., long-run) performance, the option hypotheses would be consistent with any post-announcement outcome. Thus,

if post-announcement performance is unbiased (allowing for the case of informationally efficient markets) or abnormally positive (allowing for incomplete information transfers), the conclusion is that the data do not allow differentiation among the three hypotheses on this dimension. However, if the post-announcement performance is abnormally negative, the conclusion is that this evidence supports the efficacy of the option hypotheses.

The stock price performance of announcing REITs was examined for 24 months following the announcement to assess post-announcement performance. The framework set forth in Ikenberry, Lakonishok, and Vermaelen (2000) was employed to examine long-run return and post-repurchase excess returns. The results, reported in Exhibit 5, show the abnormal monthly returns (based on the REIT index of non-announcing REITS) and the cumulative abnormal returns for announcing REITs. The monthly and cumulative returns are normal for the first seven months after the announcement. However, beginning in the eighth month, both the monthly abnormal return and the CAR become negative. After 24 months, the CAR for announcing REITs is −11.25% and is significant beyond the 0.01 level. As described above, this negative and significant post-announcement performance is inconsistent with the signaling hypothesis.[12]

Repurchase Program Completion Rates

If the signaling hypothesis is valid, the firm's current underpricing would likely lead to high completion rates for announced repurchase programs. This is especially true in an Ikenberry-Lakonishok-Vermaelen (1995) world that assumes underreaction to the announcement. That is, if the underreaction hypothesis is accurate, the observed post-announcement behavior would be biased towards the repurchase option being exercised. Additionally, the establishment of a valid signaling equilibrium is based on actual implementation of the announced program, thus pointing to a high completion rate.

Conversely, the option hypotheses do not assume that the announcer's shares are currently mispriced. With the option hypotheses, the option to repurchase stock will only be exercised when the information sets available to managers and market participants diverge in such a way that firm insiders come to possess superior and positive information. If the information asymmetry evolves in any other manner, the option to repurchase will not be exercised. Hence, high completion rates are posited to be consistent with the validity of the signaling hypothesis and that low completion rates are consistent with the option hypotheses. The problem, of course, with this conjecture is the quantification of what is ''high'' and what is ''low.'' While completion rates of less than 50% are interpreted here as low, the final judgment is left to the reader.

Four completion-rate metrics developed by Stephens and Weisbach (1998) were used to assess completion rates: (1) CRSP decrease in shares outstanding; (2) Compustat decrease in shares outstanding; (3) net dollars spent on repurchases

divided by the low price; and (4) the net dollars spent on repurchases divided by the average price.[13] As with Stephens and Weisbach (1998), each completion-rate metric is examined on a truncated basis (truncation at 0% and 100% of announced repurchase) and on a non-truncated basis. Panel A of Exhibit 6 reports the truncated completion rates for announced repurchase programs over a two-year period. The completion rate for announced programs (using truncated data) is 50% or less. This means that, on average, less than 50% of the shares optioned with the repurchase announcement are actually repurchased. Completion rates in the 50% and below range are consistent with estimates reported elsewhere in the literature (see Endnote 2). This finding is inconsistent with the signaling hypothesis and consistent with both option hypotheses.

Share Issuance in the Post-Announcement Period

The signaling hypothesis leads to no indication that firms would issue shares in the post-announcement period. However, unlike the other four empirical outcomes, the issuance of shares in the post-announcement period is the one empirical implication where the exchange option hypothesis and the straddle hypothesis diverge. Specifically, the exchange option hypothesis focuses on the creation of the call option created by the repurchase announcement. A strict interpretation of this hypothesis offers no rationale for the firm creating a call option only to issue shares. Conversely, the straddle hypothesis explicitly considers both the created call option (i.e., the right to repurchase shares) and the permanent put option (i.e., the right to sell shares) that is available to all firms. Hence, if significant share issuance activity is observed in the post-announcement period, this is interpreted as evidence that the straddle hypothesis is a more robust paradigm in which to view the decision to announce a stock repurchase program and the post-announcement behavior of firm managers.

Again consistent with Stephens and Weisbach (1998), Panel B of Exhibit 6 reports untruncated data on the actual change in shares outstanding for eight quarters after the repurchase announcement.[14] The results are dramatic. Over two-years, announcing firms on average issue approximately twice as many shares as they indicated they would repurchase in the original repurchase announcement. That is, for the average announcing firm, management actually increases shares outstanding in the post-announcement period by roughly twice as many shares as the announcement indicated would be repurchased.

Panel C of Exhibit 6 extends this analysis by reporting the percentage of announcing firms that fall into various completion ranges. The data show that less than a third (32%) of announcing firms repurchase 100% or more of the shares indicated in the original announcement. More than a third (34%) of firms announcing repurchase programs are actually net issuers of shares in the post-announcement period. The existence of a significant percentage of firms that are net issuers in the post-announcement period is inconsistent with both the signaling hypothesis and the exchange option hypothesis. The issuance of additional shares is strong evidence supporting the robustness of the straddle hypothesis.

Exhibit 6 | Estimated Completion Rates for REITs Announcing an Open Market Share Repurchase

	Quarter 0	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Panel A: Truncated at 0 and 100								
CRSP decreases in shares outstanding	0.03	0.23	0.33	0.40	0.44	0.46	0.47	0.47
Compustat decreases in shares outstanding	0.25	0.33	0.39	0.45	0.48	0.47	0.47	0.46
Net dollars spent on repurchases / low price	0.22	0.38	0.47	0.52	0.54	0.55	0.53	0.50
Net dollars spent on repurchases / average price	0.22	0.37	0.46	0.52	0.54	0.54	0.52	0.49
Panel B: Not truncated								
CRSP decreases in shares outstanding	−0.07	−0.14	−0.02	−0.38	−0.87	−1.29	−1.54	−2.01
Compustat decreases in shares outstanding	0.19	−0.14	−0.27	−0.67	−0.96	−1.29	−1.54	−2.31
Net dollars spent on repurchases / low price	−0.89	−1.58	−1.71	−1.81	−2.00	−2.57	−2.88	−3.96
Net dollars spent on repurchases / average price	−0.80	−1.41	−1.53	−1.63	−1.85	−2.36	−2.66	−3.61

Exhibit 6 | (continued)

Estimated Completion Rates for REITs Announcing an Open Market Share Repurchase

	Quarter 0	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6	Quarter 7
Panel C: Percentage of firms buying back the respective amount								
>200%	0.00	0.04	0.08	0.07	0.09	0.10	0.12	0.13
>100%	0.01	0.11	0.17	0.19	0.23	0.26	0.31	0.32
>50%	0.03	0.21	0.30	0.38	0.43	0.43	0.46	0.46
<20%	0.95	0.69	0.52	0.44	0.39	0.39	0.43	0.44
<5%	0.93	0.62	0.44	0.36	0.34	0.33	0.34	0.36
<1%	0.93	0.56	0.38	0.32	0.30	0.31	0.32	0.36
<0%	0.14	0.32	0.28	0.27	0.26	0.28	0.30	0.34

Notes: The sample is drawn from the Security Data Company's Merger and Acquisition database (SDC) and includes all REIT open market share repurchase announcements with available CRSP and Compustat data from 1989 to 2001.

As a final check, correlation between the change in shares outstanding and lagged quarterly stock returns is estimated. The correlation is significant and negative (correlation = −0.10, *p*-value = .0031), which indicates that announcing firms issue shares in the quarter before abnormally negative performance and repurchase shares in the quarter before abnormally positive performance. The negative correlation between share changes and lagged returns again supports the straddle hypothesis and not the two competing hypotheses.

Conclusion

This paper empirically documents the impact of REIT repurchase announcements and evaluates three hypotheses concerning the decision of firms to repurchase shares. The three hypotheses include: (1) the signaling hypothesis; (2) the exchange option hypothesis; and (3) the straddle hypothesis. Each hypothesis has testable implications in five areas, including:

1. The direction of the announcement period stock price reaction;
2. The determinants of the magnitude of the announcement period stock price reaction;
3. The post-announcement (i.e., long-run) stock price performance;
4. The completion rates of the announced repurchase program; and
5. The post-announcement issuance of shares.

With the exception of the first of these implications (direction of announcement period reaction), there are differences in the implications engendered by the hypotheses. The last four implications permit examination of the robustness of the three hypotheses. No support is found in any of the four differentiating implications for the signaling hypothesis. For three of the four testable implications (numbers 2–4 above), the exchange option hypothesis and the straddle hypothesis lead to the same predicted outcome. For each of these three implications, the data support the validity of both option hypotheses.

The exchange option hypothesis and the straddle hypothesis lead to different predicted outcomes only in the post-announcement issuance of shares (testable implication #5). When this implication is evaluated, strong evidence is found in support of the straddle hypothesis. Exhibit 7 summarizes the findings with respect to the four differentiating implications.

The straddle hypothesis is best viewed as an extension of the exchange option hypothesis. However, the explicit recognition of the short leg of the straddle (i.e., the option to issue shares) does provide a more robust understanding of the motivation to announce repurchase programs and the behavior of firm management in the post-announcement period.

Exhibit 7 | Evidence of the Four Differentiating Implications

	Option Determinant Dependent?	Post-Announcement Performance	Repurchase Program Completion Rate	Stock Issuance Rate
Signaling Hypothesis	Inconsistent	Inconsistent	Inconsistent	Inconsistent
Exchange Option Hypothesis	Consistent	Consistent	Consistent	Inconsistent
Straddle Hypothesis	Consistent	Consistent	Consistent	Consistent

Endnotes

[1] SEC Rule 10b-18 expressly allows firms to trade their own stock.

[2] For example, Usem, Shulman, and Brown (1995) report that in their sample announcing firms bought back only 18% of the shares included in the announcement. Additionally, Wiggins (1994) shows that fewer than 50% of announcing firms reported a decrease in shares outstanding of more than 0.5% in the period following the announcement.

[3] For a discussion of the uniqueness of REIT capital structures, see Riddiough (2004) and Ott, Riddiough, and Yi (2005).

[4] Lie (2000) shows that excess cash is a motivating factor in disbursement decisions for operating firms. Brau and Holmes (2006) show that this is not a factor for REITs given the diminished ability of REIT managers to accumulate and misuse cash.

[5] Brau and Holmes (2006) present empirical analysis that allows for the possibility that the traditional hypotheses other than signaling (i.e., agency costs and tax) exist. The reported analysis shows no support for these alternative hypotheses. Since the data sets are the same, their conclusions have direct applicability to the current article.

[6] See Ikenberry and Vermaelen (1996), section I.C. for the formalization of repurchase announcements without signaling and the modeling of the exchange option.

[7] The sample period ends in 2001 to allow for a long enough time span after the announcement to compute long-run returns and repurchase completion rates.

[8] The distribution of announcements across days of the week was also examined to insure that the analysis is not contaminated by the day-of-the-week effect. The intra-week distribution of announcements is fairly constant, with no over-weighting of a particular day.

[9] In unreported tests, the results are robust to alternate CAR measures (2-day CARs using day -1 and day 0 as well as day 0 and day $+1$, the 1-day AR for day 0, and the 2-day CAR for day 0, day $+1$, and day $+2$).

[10] When REIT firms are matched without replacement, benchmark firm matching systematically degrades and paired matches quickly become dissimilar. If matches are made with replacement, then a few non-announcing REITs appear many times in the

benchmark sample. In this case, the results would become a test of a few benchmark firms rather than a test of the announcing sample firms.

[11] See Brau and Holmes (2006, Table 8) for a cross-section analysis of the REIT announcement returns that includes the Wilshire REIT index returns, and one and two month lagged Wilshire REIT index returns to control for possible industry-wide effects.

[12] Having stated the limitations of the Lyon, Barber, and Tsai (1999) method for REITs, the analysis was performed for robustness purposes anyway. The long-run returns via the Lyon, Barber, and Tsai matching method resulted in insignificant (negative) long-run performance. Although definitive conclusions are not made based on the characteristic benchmarking methods, for it is not well-specified for REITs, the insignificant long-run returns do not support the signaling hypothesis, which predicts positive abnormal long-run returns.

[13] Dividing by the low price effective assumes that the repurchase was optimally timed. Hence, this metric likely overstates the extent of completion rates.

[14] Stock splits and stock dividends were controlled for when measuring decreases in shares outstanding.

References

Aharony, J. and I. Swary. Quarterly Dividend and Earnings Announcements and Stockholders Returns: An Empirical Analysis. *Journal of Finance*, 1980, 35, 1–12.

Asquith, P. and D.W. Mullins, Jr. Signaling with Dividends, Stock Repurchases and Equity Issues. *Financial Management*, 1986, 15, 27–44.

Baker, M. and J. Wurgler. Market Timing and Capital Structure. *Journal of Finance*, 2002, 57, 1–32.

Brau, J. and A. Holmes. Why Do REITs Repurchase Stock? Extricating the Effect of Managerial Signaling in Open Market Share Repurchase Announcements. *Journal of Real Estate Research*, 2006, 28, 1–23.

Comment, R. and G. Jarrell. The Relative Signaling Power of Dutch-auction and Fixed-Price Self-tender Offers and Open-market Share Repurchases. *Journal of Finance*, 1991, 46, 1243–71.

Constantinides, G. and B. Grundy. Optimal Investment with Stock Repurchases and Financing as Signals. *Review of Financial Studies*, 1989, 2, 445–66.

Dann, L. Common Stock Repurchases: An Analysis of Returns to Bondholders and Stockholders. *Journal of Financial Economics*, 1981, 9, 113–38.

Fama, E.F. Market Efficiency, Long-Term Returns, and Behavioral Finance. *Journal of Financial Economics*, 1998, 49, 283–306.

Giambona, E., C. Giaccotto, and C.F. Sirmans. The Long-Run Performance of REIT Stock Repurchases. *Real Estate Economics*, 2005, 33, 351–80.

Healy, P.M. and H.G. Palepu. Earning Information Conveyed by Dividend Initiations and Omissions. *Journal of Financial Economics*, 1988, 21, 149–75.

Ikenberry, D., J. Lakonishok, and T. Vermaelen. Market Underreaction to Open Market Share Repurchases. *Journal of Financial Economics*, 1995, 39, 181–208.

——. Stock Repurchases in Canada: Performance and Strategic Trading. *Journal of Finance*, 2000, 55, 2373–97.

Ikenberry, D. and T. Vermaelen. The Option to Repurchase Stock. *Financial Management*, 1996, 25, 9–24.

——. Anomalous Price Behavior Around Repurchase Tender Offers. *Journal of Finance*, 1990, 45, 455–77.

Lie, E. Excess Funds and Agency Problems: An Empirical Study of Incremental Cash Disbursements. *Review of Financial Studies*, 2000, 13, 219–48.

Lyon, J., B. Barber, and C. Tsai. Improved Methods for Tests of Long-Run Abnormal Stock Returns. *Journal of Finance*, 1999, 54, 165–201.

Margrabe, W. The Value of an Option to Exchange One Asset for Another. *Journal of Finance*, 1978, 33, 177–86.

Masulis, R.W. The Effects of Capital Structure Change on Security Prices. *Journal of Financial Economics*, 1980, 8, 139–78.

Nohel, T. and V. Tarhan. Share Repurchases and Firm Performance: New Evidence on the Agency Costs of Free Cash Flow. *Journal of Financial Economics*, 1998, 49, 187–221.

Ofer, A. and A. Thakor. A Theory of Stock Price Responses to Alternative Corporate Cash Disbursement Methods: Stock Repurchases and Dividends. *Journal of Finance*, 1987, 42, 365–94.

Ott, S., T. Riddiough, and H. Yi. Finance, Investment and Investment Performance: Evidence from the REIT Sector. *Real Estate Economics*, 2005, 33, 203–35.

Riddiough, T. Optimal Capital Structure and the Market for Outside Finance in Commercial Real Estate. *Real Estate Finance*, 2004, 21, 3–13.

Stephens, C. and M. Weisbach. Actual Share Reacquisitions in Open-market Repurchase Programs. *Journal of Finance*, 1998, 53, 313–33.

Vermaelen, T. Common Stock Repurchases and Market Signaling. *Journal of Financial Economics*, 1981, 9, 139–83.

——. Repurchase Tender Offers, Signaling and Managerial Incentives. *Journal of Financial and Quantitative Analysis*, 1984, 19, 163–81.

Usem, M.J., D. Shulman, and J.F. Brown. Share Repurchases 1994–Real or Imagined?, Saloman Brothers Mimeo, 1995.

Wiggins, L. Open Market Stock Repurchase Programs and Liquidity. *Journal of Financial Research*, 1994, 17, 217–30.

Gregory L. Adams, Brigham Young University, Provo, UT 84602 or greg_adams@byu.edu.

James C. Brau, Brigham Young University, Provo, UT 84602 or jbrau@byu.edu.

Andrew Holmes, Brigham Young University, Provo, UT 84602 or andrew_holmes@byu.edu.