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The timing of financing decisions: An examination of the correlation in financing waves ☆

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ABSTRACT

Why do corporate financing events occur in waves? We challenge recent evidence of the importance of valuation cycles in driving financing waves by documenting that the aggregate pattern of stock repurchases mirrors that of equity issuance and mergers, despite repurchases involving an opposite transaction. We then show that trends in financing decisions result from differing responses to the same economic stimulus: growth in GDP. Specifically, economic expansion reduces the cost of equity relative to the cost of debt, inducing firms to issue equity, and increases cash flow and also causes varying degrees of uncertainty, increasing stock repurchases. We document similar trends and provide similar motivation for merger waves.

1. Introduction

Why do corporate financing events occur in waves? Brealey and Myers (2003) note that explaining "financial fashions" is one of the main unsolved questions in corporate finance. A number of recent papers investigate the cause and effect of corporate decisions that display pronounced aggregate time-series variation. In particular, Lowry (2003) investigates the determinants of initial public offering waves, Rhodes-Kropf, Robinson, and Viswanathan (2005) analyze merger waves, and Baker and Wurgler (2000) investigate the importance of the time-series patterns in seasoned equity offerings. Each of these papers at least partly explains the pattern of corporate decisions by cycles in corporate valuation. Based on this interpretation, corporate financing events occur in waves because managers time the market to take advantage of an overvalued stock price. Thus, each of these transactions involves the exchange of (possibly overvalued) equity for another asset. In the case of initial and seasoned equity offerings, the asset is cash, and in the case of stock mergers, it is the assets of another firm.

The papers cited above each examine single-phenomenon financing waves. We argue that by studying only a single event, these papers provide only a partial explanation of the aggregate pattern in financing decisions. The goal of this paper is to provide a consistent explanation for the aggregate behavior of public firms. In doing so, we challenge the market-timing hypothesis by comparing the patterns of stock repurchases, equity issuances, and mergers. A repurchase is, in many respects, the opposite of the other financing decisions, in that cash is exchanged

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for equity. If managers can time the market when they offer stock in exchange for an asset, it stands to reason that they can also do so when they exchange cash for stock. Using the logic of the market-timing explanations of aggregate corporate activity, one expects that stock repurchases will occur when firms are undervalued rather than overvalued. Under this hypothesis, we should see a negative correlation between repurchasing and issuing or merging.

What we see, however, is a *positive* correlation between repurchases and equity issues or mergers, suggesting that market timing is unlikely to be driving patterns in corporate financing events. In Fig. 1, Panel A, we depict the total volume of stock repurchases and equity issues from 1971 through 2004. Repurchases and equity issues clearly display a positive correlation–rising through the 1980s, falling off in the late 1980s, rising in the 1990s, and cycling again in the early 2000s. In fact, we show that repurchase and issuance activity are 90% correlated. A similar pattern holds for repurchases net of issues and issues net of repurchases, as well as scaled measures of each. In Panel B, we depict the volume of stock repurchases and mergers from 1981 through 2004. Again, the transactions exhibit similar patterns. Both mergers and repurchases rise through the 1980s, fall off in the late 1980s and early 1990s, rise through the 1990s, and fall off in 2001 and 2002. The evidence suggests that mergers, issues, and repurchases peak at roughly the same time. As far as we are aware, this is the first paper to document the high correlation in these patterns.

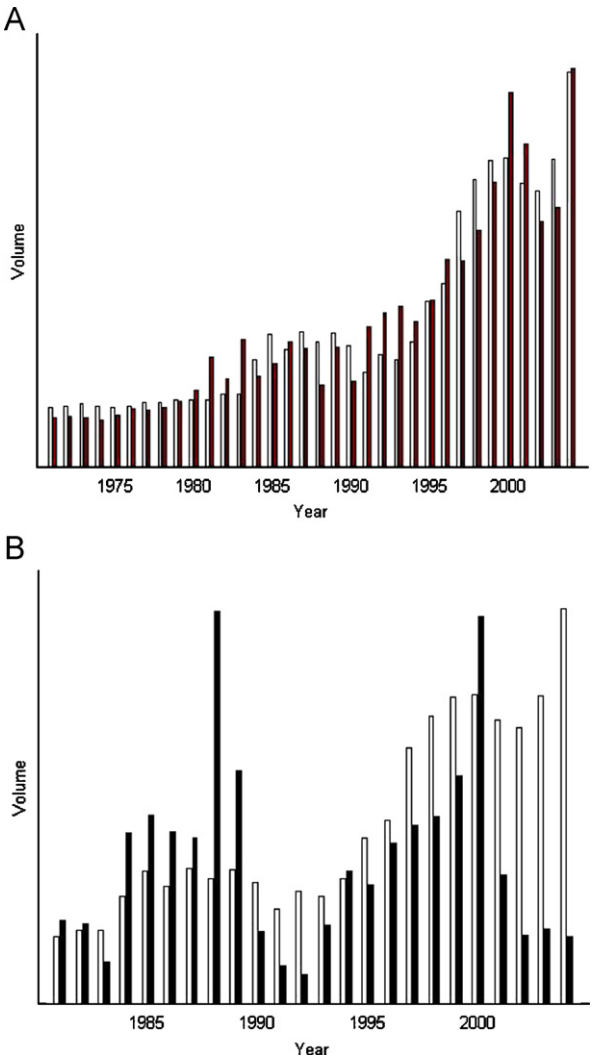

Fig. 1. Depicts volumes of aggregate stock repurchases, equity issues, and merger volumes. Panel A presents repurchases and equity issues, and Panel B presents repurchases and mergers. Data on stock repurchases and equity issues are obtained from Compustat, and data on mergers are obtained from SDC. Each series is standardized by demeaning and dividing by the series' standard deviation. White bars represent stock repurchase volume, black bars represent equity issuance volume and merger volume. Data for stock repurchases and equity issues span the period 1971–2004; data for mergers span the period 1981–2004.

It seems unlikely that waves in aggregate valuation are driving these corporate events. To more formally examine this proposition, we test the effects of market timing on both stock repurchases and equity issuances. Our results show that trends in repurchases are not driven by "cold" market valuation periods. Specifically, while past returns are correlated with growth in repurchase activity, the correlation is positive, rather than negative. That is, high growth in repurchases tends to follow increases in stock market valuations. It is therefore unlikely that undervaluation explains repurchase activity. Moreover, repurchase activity is unrelated to future market returns and past or future market-to-book ratios. We repeat the analysis using several measures of market sentiment or potential market misvaluation, such as the equity share in new security issuances, the number of IPOs in a given year, and the closed-end fund discount, and find similar results. Each of these variables measures potential misvaluation by the entire market, and the results suggest that fluctuations in potential market sentiment do not drive aggregate repurchases.

An alternative possibility is that firms repurchase stock not when the market as a whole is undervalued, but rather when there is a high degree of misvaluation in the market. That is, we consider the possibility that waves in misvaluation cause some firms to be overvalued and others to be undervalued. Specifically, we examine whether the valuation of repurchasers compared to the average firm explains aggregate repurchase activity. We show that the time-series pattern of aggregate repurchases is not explained by the relative market-to-book values or returns of repurchasing firms. We also repeat the analysis on a set of firms more likely to be undervalued: low market-to-book firms. For this subsample, the return in excess of the average firm's return *positively* forecasts repurchasing activity. Again, these results suggest that repurchasing is more likely when valuation is high than low. This evidence indicates that undervaluation does not explain stock repurchase waves and calls into question the importance of market timing in explaining trends in corporate decision making.

If market timing does not explain repurchase waves and the correlation of corporate financing events, what does? Our results indicate that the variation in repurchase

activity is driven by the business cycle. Business cycle variation affects firms' surplus cash, leading to periods of higher and lower repurchase activity. To examine this hypothesis, we investigate the link between growth in GDP and growth in repurchase activity. We show that GDP growth has positive and significant power for predicting future repurchase activity; thus, stock repurchases accelerate after an economic expansion has begun. In addition, repurchase activity grows when repurchasing firms' cash flow is high and/or capital expenditures are low.

We next examine the determinants of growth in aggregate equity issues. This analysis provides our first insight into different determinants of equity issues and stock repurchases. Although the *levels* of both activities are procyclical and highly correlated, we find that GDP growth negatively forecasts *changes* in equity issues, contrasting with its positive forecasting power for stock repurchases. Further analysis reveals that this difference is due to the timing of growth in these transactions over the business cycle. While both repurchases and issues tend to increase over an expansion and decrease over a contraction, growth in issues tends to occur in earlier stages of the cycle than growth in repurchases. This pattern is natural and intuitive; in early stages of the business cycle, cash flow is scarce and investment opportunities are relatively plentiful. Firms issue equity to take advantage of investment opportunities. In later stages of the business cycle, profitable investment opportunities are scarcer, while firms realize cash flows from investments. At this time, growth in stock repurchases surges. Thus, while repurchases and equity issues are both reactions to a common stimulus, explaining their correlation, the timing of, rationale for, and nature of these reactions differ across firms. We also examine mergers and find similar results.

These results strongly suggest that business cycles drive both repurchasing and issuing activity. To fully understand the correlation in these waves, the remaining question is why repurchases and equity issues? While an expanding economy can lead to greater demand for capital and more surplus cash flow, it is less clear why firms choose these particular issuing and distribution mechanisms. In order to address this question, we examine two alternative measures of issuing and repurchase activity: the aggregate share of equity in new issues and the aggregate share of repurchases in total distributions. Baker and Wurgler (2000) show that the former variable, calculated as the fraction of equity in total new issues of debt and equity, has negative forecasting power for aggregate returns. The advantage of these measures is that they control for both the availability of surplus cash and the need for financing and focus instead on the mechanism by which financing is obtained or cash is distributed.

We first repeat our earlier analysis of the relation between measures of economic activity and market valuation using these ratios. The results are unchanged. We further explore the relation between these share measures and returns in a VAR analysis. We show that *both* the equity and the repurchase share respond positively to past returns and have negative forecasting power for future returns, and both variables are procyclical. Baker and Wurgler (2000) interpret the negative forecasting power of the equity share for future returns as evidence that managers are able to time their issues of equity to take advantage of overvaluation. However, the complementary results for the repurchase share suggest that this conclusion might not be valid. We examine an alternative possibility that firms issue relatively more equity than debt when the costs of equity financing are relatively lower. As preliminary evidence, we note that, in our sample, while the equity share forecasts *lower* future returns, there is no evidence to suggest that it forecasts *negative* future returns. Furthermore, mirroring the pattern in the equity share, costs of equity are generally assumed to be countercyclical, while costs of debt are generally assumed to be procyclical.[1] We formally test this hypothesis by examining the relation of the equity share to various measures of the cost of debt and equity, and show that the equity share is positively related to costs of debt, and negatively related to costs of equity.

We then show that repurchase activity and the repurchase share increase during economic expansion. Thus, the same economic stimulus causes firms to issue and repurchase stock. To determine the mechanism by which economic growth stimulates repurchase activity, we examine two primary costs and benefits of repurchases: the need for flexibility and taxes. We show that firms repurchase when the cost of doing so is lower relative to dividends and that economic conditions impact these costs and benefits. Specifically, we predict that economic conditions are more uncertain in the early and late stages of a recovery and examine the impact of economic uncertainty on repurchase activity. We show that growth in GDP and its volatility positively forecast future repurchase share. Thus, one reason that repurchase activity relates to economic growth is the impact of economic conditions on uncertainty.

Our overriding conclusion is that patterns in corporate decision making are driven by changes in the business cycle rather than by changes in relative market valuation. Thus, this paper is similar in spirit to Harford (2005), who shows that economic, technological, and regulatory shocks drive merger waves. We relate the aggregate patterns to economic impact and provide an explanation for the mechanism by which the economy stimulates corporate financing behavior. This paper is also related to Pastor and Veronesi (2005), who provide a model and evidence that IPO waves occur as a response to market conditions but not due to misvaluation.

In addition to providing insight into patterns in a variety of corporate financing activities, this paper also contributes to our understanding of patterns in and determinants of stock repurchases. Trends in repurchase activity (stock repurchase waves) have been documented in the literature beginning with Bagwell and Shoven (1989). Although Grullon and Michaely (2002), Dittmar (2000), and others note the importance of regulatory changes in the early 1980s in explaining the growth of

[1] In untabulated tests, we confirm the pro(counter)cyclicality of the cost of debt and equity. Graphs of the time-series patterns of measures of cost of equity and debt are available from the authors upon request.

stock repurchases, these changes do not explain *cycles* of repurchase activity. Our results directly tie cycles of repurchase activity to the state of the economy. This relation also complements the findings of Massa, Rehman, and Vermaelen (2007), who suggest that repurchase waves can in part be due to firms mimicking repurchase behavior. It is feasible that the correlation in repurchase behavior they observe is driven by the influence of business cycles on cash flow and investment opportunities. Finally, given the natural relation between repurchases and dividends, this paper fits in to the larger literature examining the trends in dividend payment policy (Fama and French, 2001; DeAngelo, DeAngelo, and Skinner, 2004; Skinner, 2008).

The remainder of the paper proceeds as follows. In Section 2, we discuss the hypotheses about why equity issuance and stock repurchases vary over time. In Section 3, we explain our data and empirical design. In Section 4, we present our primary results examining equity issuance and stock repurchases, including robustness tests. We further explore the relation of our results to merger waves and the long-run performance of repurchasers. Section 5 provides concluding remarks.

2. Why does the volume of equity issues and repurchases vary over time?

In this section, we discuss reasons that corporate financing events, particularly equity issuance and stock repurchases, occur in waves. Where possible, we rely on previous studies of aggregates but also discuss reasons that a particular firm might repurchase stock or issue equity in order to develop hypotheses for the time-series behavior of stock repurchases and equity issuance. We provide a similar discussion for mergers in Section 4.4.1.

2.1. Patterns in equity issuance

The procyclical behavior of equity issues has been noted in the literature as early as Hickman (1954). More recently, Choe, Masulis, and Nanda (1993) document procyclical seasoned equity offerings and Lowry (2003) documents procyclical initial public offerings. At issue is *why* these patterns are procyclical. Lowry succinctly delineates the explanations for this pattern into three hypotheses: *capital demand*, *investor sentiment*, and *information asymmetry*.

Under the capital demand hypothesis, firms issue equity simply due to the need to raise external financing. An economic expansion leads to improved investment opportunities and, as a result, a need for capital to finance these opportunities. Under this hypothesis, a firm will calculate the NPV of projects and determine the optimum financing tool on the basis of the costs and benefits of debt and equity. Thus, this hypothesis suggests that waves in equity issuance are largely due to time-varying costs of equity and debt. Lucas and McDonald (1990) and Choe, Masulis, and Nanda (1993), for example, suggest that the patterns are driven by time-varying costs of adverse selection; thus, the capital demand and information asymmetry hypotheses are related. Following Myers and Majluf (1984), Choe, Nanda, and Masulis suggest that managers try to minimize the adverse selection costs of issuing equity. They provide evidence that adverse selection costs fall in expansions resulting in an increased proportion of equity issues relative to debt offerings. The principal difference in these hypotheses is that the information asymmetry argument depends on the supply of available equity financing rather than the demand for financing.

In contrast, the misvaluation hypothesis suggests that managers are not issuing equity in response to rational evaluation of investment opportunities. Rather, managers take advantage of periods of high investor sentiment to issue overvalued equity and avoid issuing during times of low sentiment. Frequently cited evidence in support of this hypothesis (e.g., Loughran and Ritter, 1995) is the tendency of equity offerings to follow periods of high returns. Furthermore, in a survey of financial managers, Graham and Harvey (2001) document that managers view this run-up in the stock price as a "window of opportunity" for issuing equity. Baker and Wurgler (2000) suggest that managers use this window of opportunity to take advantage of shareholder naïveté. They suggest that managers time the aggregate stock market, demonstrating that returns are lower following years in which the proportion of equity to total debt and equity issues is greater. Thus, the authors suggest that overvaluation, rather than a rational demand for capital, drives patterns in issuing activity. However, Butler, Grullon, and Weston (2005) show that the predictive power of the share of equity in total new issues stems from pseudo market timing and not from any abnormal ability of managers to time the equity markets.

2.2. Patterns in stock repurchases

In contrast to the equity issuance literature, less attention has been given to understanding the aggregate patterns of stock repurchases. Bagwell and Shoven (1989) are among the first to document trends in the patterns of stock repurchases. Stephens and Weisbach (1998) point out the procyclical pattern in repurchases. Grullon and Michaely (2004) note the impact of regulation on the changes in repurchases. Dittmar and Dittmar (2004) examine how the potential substitution of repurchases for dividends impacts aggregate repurchase activity, and Dittmar (2000) shows how motives for repurchasing stock fluctuate over time. To understand why stock repurchases occur in waves, we look to the hypotheses developed in the cross-sectional literature on repurchases.

Much of the discussion of the motives for repurchasing stock revolves around correction of undervaluation. As a complement to the misvaluation hypothesis for stock issuance discussed above, the hypothesis conjectures that managers repurchase stock when they find its value to be too low.[2] The misvaluation hypothesis for repurchases is

[2] This undervaluation could be relative to a firm's "true" value or more broadly relative to the firms most likely value and thus substantially less than the value of the firm if it was overvalued but not necessarily undervalued. We thank Jeremy Stein for this explanation of an alternative view of relative valuation.

supported in the survey evidence by Brav, Graham, Harvey, and Michaely (2005). Over 86% of the managers surveyed agreed or strongly agreed that the motivation for repurchasing stock is that the stock is a "good deal." Empirically, much of the literature supporting undervaluation as a motive for stock repurchases arrives at its conclusion by observing returns subsequent to the repurchase announcement. Ikenberry, Lakonishok, and Vermaelen (1995) and Peyer and Vermaelen (2008) find that stock repurchases follow periods of abnormal negative returns for firms. The implication is that the firm's equity price has been driven too low, and managers seek to correct or take advantage of this situation. Jagannathan, Stephens, and Weisbach (2000) show that repurchasing firms have, on average, a negative 1.1% absolute return in the year prior to the repurchase announcement. This abnormal performance is concentrated in small, less-followed stocks. Few papers examine returns relative to actual repurchases due to limited U.S. data availability. Stephens and Weisbach (1998) show that prior-quarter returns negatively predict the percentage of announced shares actually repurchased. Ikenberry, Lakonishok, and Vermaelen (2000) show similar results using more precise Canadian data.

The surplus cash hypothesis provides an alternative view, related to the capital demand hypothesis, stating that repurchases represent a mechanism for distributing cash in excess of profitable investment opportunities. In the survey evidence of Brav, Graham, Harvey, and Michaely (2005), managers suggest that investment policies are set before repurchase policy, and that a major determinant of their repurchase policy is to distribute excess cash. Managers are reluctant to cut dividends and, as a consequence, much of the variation in cash distributions is likely to be observed through repurchases. In the Brav et al. survey, nearly 90% of managers view cuts to dividends as having negative consequences, whereas only approximately 20% of managers view cuts to repurchases as having negative consequences. Similar proportions report maintaining historical payout levels as an important driver of dividend and repurchase policy. Thus, an increase in aggregate repurchases is likely to reflect an increase in funds available to distribute beyond investment opportunities. Skinner (2008) confirms that firms use repurchases as a mechanism to distribute surplus cash.

Firms may also repurchase stock to alter leverage, fend off a takeover, or manage their ESOP programs. Dittmar (2000) shows that though leverage and takeovers prompt some firms in some years to repurchase stock, these are not primary motives. Thus, we do not focus our analysis on these explanations. Fenn and Liang (2001) and Kahle (2002) show that the increased use of stock options impacts the use of stock repurchases. Given the increased use of options over our sample period, this effect is likely to induce an upward trend in aggregate repurchases. We control for this possibility by examining an alternative measure of repurchases that is robust to these considerations.

2.3. Joint determinants of repurchase and issuance

The explanations discussed above suggest that, just as equity issues and stock repurchases are complementary transactions, the explanations for their time-series patterns are also complementary. The capital demand and surplus cash flow hypotheses are rational complements; firms respond to the availability or lack of investment opportunities by issuing equity or repurchasing stock. Similarly, when market sentiment is high, firms issue stock and when sentiment is low, firms repurchase stock. For simplicity, we refer to these hypotheses collectively as the capital and cash flow hypothesis and the misvaluation hypothesis, respectively.

If we view firms in aggregate, as in Baker and Wurgler (2000), the misvaluation hypothesis suggests that issuing and repurchasing activity will be negatively correlated. As shown in Fig. 1, Panel A, this does not appear to be the case; the two activities are over 90% positively correlated. To our knowledge, the coincidence in these patterns has not been investigated. Investigating the joint pattern in equity issues and stock repurchases provides additional (or perhaps confounding) insight into the determinants of these activities.

The coincidence in the patterns suggest that it is unlikely that firms are responding to *aggregate* valuation in making repurchase or issuing decisions. Rather, this correlation suggests that firms are responding differently to a common stimulus. Given the procyclicality of both the equity issue and repurchase decisions, a natural conclusion is that both repurchases and equity issues are responses to economic growth (or contraction). The question at hand, then, is what drives one set of firms to issue equity in the face of growth and another set to repurchase stock? It would seem that there are two possibilities. Under the capital and cash flow hypothesis, economic growth drives firms' cash flows and investment opportunities. Thus, firms with profitable investment opportunities issue equity, and those with surplus cash flow repurchase stock. Alternatively, if economic growth results in some firms being overvalued and others being undervalued, then relative valuation could explain patterns in equity issues and stock repurchases. We discuss our empirical design for examining these hypotheses below.

A remaining question is why firms choose a particular vehicle for issuing securities or distributing cash. While the surplus cash flow and capital demand hypotheses can inform us as to why firms will issue or distribute, they do not explain why firms issue equity rather than debt, or why firms repurchase stock rather than pay dividends. One possibility is misvaluation; even if misvaluation does not drive the level of total equity issues or stock repurchases, it could affect the *proportion* of issues or repurchases. Baker and Wurgler (2000) examine this in the context of equity issues. Alternatively, issuing equity rather than debt or repurchasing stock rather than paying dividends could represent some optimal tradeoff of the costs and benefits of financing and distribution mechanisms. We will discuss these issues and examine them empirically in Section 4.2.

3. Empirical design and data

In this section, we discuss the design for testing the hypotheses discussed above and describe the data used in

these tests. We first discuss tests designed to confirm the procyclicality of repurchases and issues. We then discuss tests of whether misvaluation appears to describe issuing and repurchase activity. Finally, we provide details on our estimation approach to analyzing the joint determinants of repurchase and issue behavior, holding distribution policy and investment policy fixed.

As mentioned previously, the aggregate trends in merger waves mirror those of repurchases and equity issuance. We focus our analysis on the comparison of equity issuance and repurchases for three reasons. First, mergers are not directly opposing transactions to repurchases, unlike equity issuance. Mergers can also involve a sale of stock (like an equity issuance) but they do not involve the sale of stock for cash. Further, some (cash) mergers involve the use of cash; thus, mergers could be a substitute for a stock repurchase rather than an opposing transaction. Second, pre-1980 data on mergers are not as readily available. Finally, in part of the sample period accounting rules might complicate the relation between mergers and repurchases. For completeness, we present evidence on aggregate merger activity in Section 5.

3.1. Determinants of issues and repurchases

Our starting point is a simple economic framework in which managers choose the amount of equity to issue, the amount of stock to repurchase, and the level of investment in response to exogenous shocks to cash flows, the macroeconomy, the investment opportunity set, and potential equity mispricing. At this point, we do not distinguish between stock repurchases and cash dividends as distribution mechanisms, nor between equity and debt as financing mechanisms. For the moment, the assumption is that all distributions and financings take place through stock repurchases equity issues. We do not derive an explicit structural model, but rather consider the following empirical framework:

$$\begin{pmatrix} rep_t \\ iss_t \\ cf_t \\ cap_t \\ gdp_t \end{pmatrix} = \mathbf{a}_0 + \begin{pmatrix} 0 & 0 & a_{13} & a_{14} & a_{15} \\ 0 & 0 & a_{23} & a_{24} & a_{25} \\ a_{31} & a_{32} & 0 & a_{34} & a_{35} \\ a_{41} & a_{42} & a_{43} & 0 & a_{45} \\ a_{51} & a_{52} & a_{53} & a_{54} & 0 \end{pmatrix} \begin{pmatrix} rep_t \\ iss_t \\ cf_t \\ cap_t \\ gdp_t \\ v_t - v_t^* \end{pmatrix} + \begin{pmatrix} b_1 \\ b_2 \\ 0 \\ 0 \\ 0 \end{pmatrix} (v_t - v_t^*) + \mathbf{u}_t, \quad (1)$$

where rep_t is log real repurchases, iss_t is log real equity issues, cf_t is log real cash flows, cap_t is log real investment, and gdp is log real gross domestic product. The term $v_t - v_t^*$ represents potential valuation errors. We repeat the analysis using growth in log per capita aggregate consumption of nondurables and services as an alternative measure of the state of the economy. All results are quantitatively similar.

As shown in Eq. (1), the empirical model treats the repurchasing, issuing, and investment decisions, as well as investment and gross domestic product, as endogenous. We assume that the repurchase and issue decisions are complements. That is, a firm will issue or repurchase, thus the coefficients $a_{12} = a_{21} = 0$. To move to an identifiable empirical relation, we express the levels equation in (1) in a conforming changes representation,

$$\begin{pmatrix} \Delta rep_t \\ \Delta iss_t \\ \Delta cf_t \\ \Delta cap_t \\ \Delta gdp_t \end{pmatrix} = \begin{pmatrix} \alpha_{11} & 0 & \alpha_{13} & \alpha_{14} & \alpha_{15} \\ 0 & \alpha_{22} & \alpha_{23} & \alpha_{24} & \alpha_{25} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} & \alpha_{35} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} & \alpha_{45} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} \end{pmatrix} \begin{pmatrix} \Delta rep_{t-1} \\ \Delta iss_{t-1} \\ \Delta cf_{t-1} \\ \Delta cap_{t-1} \\ \Delta gdp_{t-1} \end{pmatrix} + \begin{pmatrix} \beta_1 \\ \beta_2 \\ 0 \\ 0 \\ 0 \end{pmatrix} (v_{t-1} - v_{t-1}^*) + \varepsilon_t, \quad (2)$$

which represents a vector autoregression (VAR) with all variables de-meaned for convenience.

Empirically, the levels representation, Eq. (1), admits the possibility that the variables in the system are *cointegrated*. That is, the levels representation allows for the possibility that although the levels of the individual variables are nonstationary, a linear combination of the variables is stationary. Under this possibility, the changes VAR needs to include an *error-correction* term. In particular, under the assumption of weak exogeneity of cash flows, capital expenditures, and GDP, the weakly endogenous issues and repurchases could require an error-correction term in their changes representation. The error-correction term is given by the error terms u_{1t} and/or u_{2t} and results in the following changes representation:

$$\Delta rep_t = \alpha_{11}\Delta rep_{t-1} + \alpha_{13}\Delta cf_{t-1} + \alpha_{14}\Delta cap_{t-1} + \alpha_{15}\Delta gdp_{t-1} + \beta_1(v_{t-1} - v_{t-1}^*) + \gamma_1 u_{1,t-1} + \varepsilon_{1t}, \quad (3)$$

$$\Delta iss_t = \alpha_{22}\Delta iss_{t-1} + \alpha_{23}\Delta cf_{t-1} + \alpha_{24}\Delta cap_{t-1} + \alpha_{25}\Delta gdp_{t-1} + \beta_2(v_{t-1} - v_{t-1}^*) + \gamma_2 u_{2,t-1} + \varepsilon_{2t}, \quad (4)$$

The error-correction term is interpreted as the deviation from the long-run relation among either repurchases or equity issues and cash flows, capital expenditures, and gross domestic product. As a stationary variable, the error-correction term corrects the level of repurchases or issues back toward this long-run trend. In our empirical analysis, we formally test for cointegration among the variables using the Johansen (1988) procedure.

The capital and cash flow hypothesis suggests that the primary drivers of issuing and repurchasing activity are the state of the aggregate economy, the availability of cash flow, and the availability of investment opportunities. Thus, under these assumptions, we expect that Δgdp_{t-1}, Δcf_{t-1}, and Δcap_{t-1} will Granger-cause growth in stock repurchases and equity issues. In particular, we expect repurchase activity to respond to the availability of surplus cash flows, controlling for investment opportunities, and thus $\alpha_{13} > 0$. In contrast, we expect issuing

activity to respond to the availability of investment opportunities in excess of available cash flows, and thus $\alpha_{24} > 0$. The impact of the state of the economy on growth in repurchases and issues is more ambiguous. Although both repurchases and equity issues are procyclical, as shown in Fig. 2, their growth rates are not perfectly correlated. Indeed, there is a tendency for equity issues to grow more quickly at early stages in the business cycle and for repurchases to catch up later in the cycle. Insofar as a standard business cycle story suggests greater availability of investment opportunities early in the cycle and realization of surplus cash flows later in the cycle, this pattern is consistent with our hypotheses. However, we cannot unambiguously predict the signs of α_{15} and α_{25}.

Under the misvaluation hypothesis, equity issues and stock repurchases represent reactions to aggregate or firm-level over- and undervaluations, respectively. Hence, we expect to see more issuing activity following periods of overvaluation, that is, $\beta_2 > 0$, and more repurchasing activity following periods of undervaluation, that is, $\beta_1 < 0$. An important aspect of evidence in favor of this hypothesis is the behavior of firm value subsequent to repurchasing or issuing. In particular, the hypothesis suggests that negative performance following an issue is an indicator that overvaluation is present, and positive performance following a stock repurchase is an indication that undervaluation is present. Consequently, in addition to the specifications above, we examine the following regressions:

$$\Delta rep_t = \alpha_{11}\Delta rep_{t-1} + \alpha_{13}\Delta cf_{t-1} + \alpha_{14}\Delta cap_{t-1} + \alpha_{15}\Delta gdp_{t-1} + \delta_1(v_{t+1} - v^*_{t+1}) + \gamma_1 u_{1,t-1} + \varepsilon_{1t}, \quad (5)$$

$$\Delta iss_t = \alpha_{22}\Delta iss_{t-1} + \alpha_{23}\Delta cf_{t-1} + \alpha_{24}\Delta cap_{t-1} + \alpha_{25}\Delta gdp_{t-1} + \delta_2(v_{t+1} - v^*_{t+1}) + \gamma_2 u_{2,t-1} + \varepsilon_{2t}, \quad (6)$$

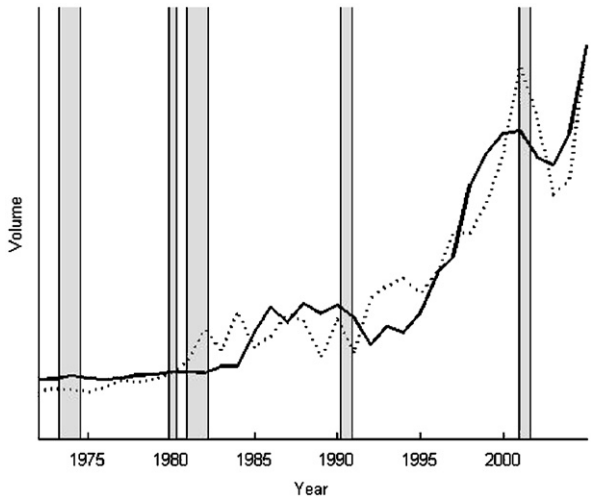

Fig. 2. Business cycles, stock repurchases, and equity issuance. Depicts volumes of aggregate stock repurchases and equity issues with National Bureau of Economic Research (NBER) business cycles. Data on stock repurchases and equity issues are obtained from Compustat. Each series is standardized by de-meaning and dividing by the series' standard deviation. The solid line represents aggregate repurchase volume and the dotted line represents aggregate equity issues. Grey bars indicate NBER recessions. Data span the period 1971–2004.

where $v_{t+1} - v^*_{t+1}$ is a measure of valuation subsequent to the repurchase or issue. Thus, in addition to $\beta_2 > 0$, we expect $\delta_2 < 0$ if issues are related to overvaluation, and $\delta_1 > 0$ if repurchases are related to undervaluation.

3.2. Data

The starting point for our analysis is all firms listed on the CRSP-Compustat merged database over the period 1971 through 2004.[3] Following DeAngelo, DeAngelo, and Skinner (2004), we remove firms in the financial and utilities industries (SIC codes 4000-4949 and 6000-6999) using CRSP SIC codes. Additionally, we omit firms that do not have common shares traded as indicated by CRSP share codes 10 or 11. Finally, we omit firms for which we cannot calculate an annual return due to missing or unavailable data in the year prior to, the year of, or the year subsequent to inclusion in the sample. Imposing these restrictions results in a sample of, on average, 2,882 firms per year, ranging from 1,575 in 1971 to 3,688 in 1996. We further classify firms as net issuers or net repurchasers; if the difference in total equity issued and stock repurchased in the year is positive, the firm is classified as a net issuer and, if negative, a net repurchaser. The construction of repurchase and issue data is discussed further below. Finally, following Harford (2005), we also collect data on the transaction volume of mergers from SDC, using all U.S. acquirors from 1981 to 2004 for which these data are available.

Repurchases in calendar year t, REP_t, are calculated as Compustat data item 115 (purchase of common and preferred stock) less any decrease in preferred stock. Following Fama and French (1992), we measure preferred stock as, in order of preference, data item 56 (redemption value), item 10 (liquidating value), or item 130 (carrying value). Issues in year t are measured by Compustat data item 115 (purchase of common and preferred stock) less any increase in preferred stock, as measured above. Repurchases and issues are treated as if they occur in the calendar year in which the firm's fiscal year ends. As an alternative, we distribute issue and repurchase activity evenly over the firm's fiscal year. For example, a firm with a fiscal year ending in March would have 75% of the total repurchase and/or issue volume assigned to the previous calendar year and 25% to the current calendar year. This procedure yields qualitatively similar results. The data are collected from 1971 through 2004. The standardized volume of equity issues and repurchases is depicted in Fig. 1, Panel A. The dollar volume of repurchases, issues, and mergers per year is also shown in Table 1. In dollar terms, repurchases grow from $726 million in 1971 to over $168.5 billion in 2004.

[3] We repeat much of the analysis on repurchases for the post 10b-18 period of 1983–2004. One consequence of reducing the sample length is deterioration in the power of our tests and we remove some variables of interest to preserve power. We find that the results are robust to this time period. Moreover, as discussed in Section 4.3, we investigate the impact of measuring repurchases by growth in treasury stock, rather than statement of cash flow repurchases. These data are available only after rule 10b-18 and our results are robust to this alternative measure.

Table 1
Issue, merger, and repurchase activity

Presents the nominal dollar volume (in millions) of stock repurchases, equity issues, and mergers by year, the number of firms classified as net issuers or repurchasers, and the number of mergers per year. Net repurchasers are defined as firms whose total repurchase volume exceeds total issue volume in a given year, and net issuers represent firms whose total volume of equity issues exceeds volume of stock repurchases in a given year. Data are collected from Compustat; repurchases are purchase of common and preferred stock (data item 115), net of any decrease in preferred stock, and issues are issues of common and preferred stock, net of any increase in preferred stock. Data cover the period 1971–2004.

Year	Rep vol	Iss vol	Merge vol	No. net rep	No. net iss	No. merge	Year	Rep vol	Iss vol	Merge vol	No. net rep	No. net iss	No. merge
1971	778	3,199		167	616		1988	33,943	11,936	175,827	873	1,414	208
1972	1,124	3,500		233	761		1989	38,369	22,184	100,141	733	1,515	132
1973	2,549	3,231		465	610		1990	32,253	13,019	23,409	859	1,342	50
1974	1,377	2,645		574	647		1991	18,445	27,716	7,031	720	1,445	25
1975	764	4,003		579	841		1992	27,553	31,232	2,446	544	1,738	21
1976	1,333	5,662		541	1,106		1993	24,608	33,022	25,995	575	1,907	44
1977	3,068	5,257		565	1,160		1994	34,079	28,891	51,987	674	2,053	73
1978	3,370	5,996		521	1,272		1995	54,391	34,559	45,297	758	2,167	93
1979	4,579	7,694		554	1,298		1996	63,164	45,405	65,575	802	2,298	84
1980	4,723	10,766		475	1,354		1997	99,626	45,235	73,938	906	2,278	122
1981	4,420	19,288	28,635	468	1,394	50	1998	115,651	53,303	78,037	1,133	2,080	119
1982	7,496	13,768	26,939	581	1,216	57	1999	125,396	66,203	97,308	1,243	1,911	162
1983	7,401	24,160	8,958	407	1,577	45	2000	126,741	90,066	173,804	1,106	1,913	160
1984	24,758	14,492	70,371	566	1,459	91	2001	113,678	76,084	50,287	952	1,923	100
1985	37,443	17,717	78,686	618	1,403	74	2002	109,832	55,572	21,428	813	2,028	67
1986	29,705	23,639	71,123	591	1,601	133	2003	126,252	59,368	24,156	757	1,980	47
1987	39,232	21,762	67,965	732	1,518	124	2004	170,312	96,555	20,780	607	2,037	27

Equity issues range from $2.5 billion in 1974 to $93.2 billion in 2004.

We divide firms into net issuers and net repurchasers, rather than considering the set of all issuers and all repurchasers, to control for firms that issue and repurchase in the same period. Although it is rare for firms to issue seasoned equity in the same period as they repurchase stock, it could occur more frequently due to the use of ESOP programs. In untabulated results, we note that, over the 1971–2004 period, approximately 75% of the number and 93% of the volume of repurchases, on average, are conducted by firms classified as net repurchasers. Of these net repurchasers, approximately 45% of the number and 29% of the volume, on average, are by firms that just repurchase and do not issue. These fractions have decreased over time. In 1975, 74% of the number and 42% of the volume of repurchases were from firms that just repurchased stock. By 2004, these fractions had fallen to 11% and 14%, respectively. Net issuers account for 80% of the number and 83% of the volume of issues, on average. Of these issuers, 85% of the number and 75% of the volume, on average, are by firms that just issue equity and do not repurchase stock. Again, these fractions have changed over time. In 1975, 87% of the number and 93% of the volume of equity issues were from firms that just issued equity. While the proportion of issuing firms stays fairly steady, falling to 82% in 2004, the volume drops markedly to 67%. In later tables, we will present analysis separately for net repurchasers and issuers and all repurchasers and issuers, showing consistent results across these samples. We also note in untabulated results the overlap between repurchasing and merging firms. Though the percentage varies over time, approximately 50% of the merging firms repurchase stock in the year of the acquisition.

In addition to repurchase and issue data, we also collect the following data:

1. MB_t, the market-to-book ratio at the end of calendar year t. This variable is calculated as the ratio of the market value of equity to the book value of equity. Market value is calculated as common shares outstanding (Compustat data item 25) multiplied by calendar year closing price (data item 24). Book value is calculated as the difference between total assets (data item 6) and total liabilities (data item 181). We also compute each firm's market-to-book ratios at times $t-1$ and $t+1$.
2. R_{t-1}, R_t, and R_{t+1}, the holding-period returns from CRSP over the surrounding calendar years.
3. CF_t, firm cash flow, measured as operating income before depreciation (data item 13).
4. $CAPEX_t$, capital expenditures (data item 128).

These data represent the building blocks for our analysis.

Table 2 presents summary statistics for net repurchasing firms, net issuing firms, merging firms, and the aggregate of all firms. As shown in the table, the average net issuing firm's market-to-book ratio in the years surrounding an equity issue are significantly higher than that of the average firm, whereas the market-to-book ratios of repurchasers are significantly lower. These statistics are consistent with the idea that issuers are firms with relatively high valuations, whereas repurchasers are firms with relatively low valuations. They are also consistent with the interpretation that issuing (repurchasing) firms have more (fewer) investment opportunities. Table 2 also shows that net issuers have statistically significantly higher average returns in the year of and

Table 2
Summary statistics

Presents summary statistics for the sample of firms investigated in this study over the period 1971–2004. The column labeled "Net issuers" presents statistics for firms whose issuance of common stock exceeds repurchase of common stock in year t; the column labeled "Net repurchasers" presents statistics for firms whose repurchase of common stock in year t exceeds their issuance of common stock; and the column labeled "Merging firms" represents firms that have acquired another firm (or firms) in year t. The column labeled "All firms" represents the time-series average of each statistic for the set of all firms. The sample is the intersection of CRSP and Compustat, excepting financial firms (SIC codes 6000-6999) and utilities (SIC codes 4000-4949). Asterisks denote that the statistic is statistically significantly different than the all-firm average. MB represents the ratio of market value of equity to book value of equity, R is the holding-period return, OI/S is the ratio of operating income to sales, CX/S is the ratio of capital expenditures to sales, GS is the growth in sales, GCF is the growth in operating income, C/A is the ratio of cash and equivalents to total book value of assets, D/A is total long-term debt to total book value of assets, and $\ln MV$ is the log market value of equity. Statistics are presented for year $t-1$, t, and $t+1$ relative to the year of equity issue, stock repurchase, or merger.

	Net issuers	Net repurchasers	Merging firms	All firms
MB_{t-1}	2.126***	1.468***	1.749***	1.786
MB_t	2.047***	1.436***	1.647***	1.731
MB_{t+1}	1.924***	1.462***	1.611***	1.681
R_{t-1}	0.291***	0.130***	0.200	0.198
R_t	0.242***	0.178	0.173	0.205
R_{t+1}	0.161***	0.218**	0.184	0.192
OI_{t-1}/S_{t-1}	0.142	0.159***	0.162***	0.143
OI_t/S_t	0.141	0.158***	0.144	0.142
OI_{t+1}/S_{t+1}	0.142	0.155***	0.142*	0.142
CX_{t-1}/S_{t-1}	0.077***	0.072	0.063	0.072
CX_t/S_t	0.076***	0.070	0.057	0.071
CX_{t+1}/S_{t+1}	0.075***	0.068	0.056	0.069
$GS_{t-1,t}$	0.121**	0.097	0.274***	0.102
$GS_{t,t+1}$	0.108**	0.098	0.138	0.097
$GCF_{t-1,t}$	0.124***	0.091	0.129	0.098
$GCF_{t,t+1}$	0.116***	0.074***	0.124	0.093
C_{t-1}/A_{t-1}	0.068	0.074	0.093*	0.073
C_t/A_t	0.073	0.073	0.085	0.075
C_{t+1}/A_{t+1}	0.076	0.073	0.086	0.077
D_{t-1}/A_{t-1}	0.199***	0.154***	0.172*	0.184
D_t/A_t	0.199***	0.160***	0.218	0.186
D_{t+1}/A_{t+1}	0.198***	0.165***	0.219	0.188
$\ln MV_{t-1}$	11.776***	12.051***	14.397***	11.470

*,**,*** Significant at the 10%, 5%, and 1% critical level, respectively.

prior to issuing, whereas repurchasers have significantly lower returns in the year prior to repurchasing, compared to the average firm. In contrast, issuers have statistically significantly lower returns in the year subsequent to issuing, and repurchasers have marginally statistically significantly higher returns in the year subsequent to repurchasing, compared to the average firm. Again, these results are broadly consistent with past evidence that has been interpreted as suggesting that issuers are relatively high-valuation firms and repurchasers are relatively low-valuation firms.

In addition to these statistics, we present a number of additional summary statistics in Table 2. Repurchasers tend to be more profitable (as measured by operating margin), less levered (measured by the ratio of total debt to book value of assets), and larger (based on the market value of equity) than the average firm. Issuers are more capital-intensive (as measured by the ratio of capital expenditures to sales), have higher sales and cash flow growth, have more cash as a proportion of assets, and are larger than the average firm. Merging firms are more profitable in the year prior to merging, but not in the year of or subsequent to the merger, compared to the average firm. These firms also have higher past sales growth, lower cash as a fraction of total assets, more leverage, and higher market values than the average firm. Based on these statistics, the average issuer would be characterized as a large, capital-intensive firm with high growth in sales and cash flow. The average repurchaser is a large, profitable firm with low leverage.[4]

The summary statistics are consistent with some basic stylized facts in the literature. In particular, these statistics are consistent with hypotheses that suggest that firms repurchase stock when they are undervalued and issue equity when they are overvalued. Repurchasers have lower market-to-book ratios and returns than issuers in the year prior to engaging in a repurchase. Issuers have lower returns than repurchasers in the year subsequent to issuing stock. To the extent that returns and market-to-book ratios capture potential misvaluations, these results are consistent with those presented in Ikenberry, Lakonishok, and Vermaelen (1995) and Baker and Wurgler (2000). In the next section, we take a closer look at these firms to attempt to further disentangle whether repurchases and issues are related to valuation.

4. Empirical results

4.1. Drivers of issuing and repurchasing activity

In this section, we discuss the results of our empirical specifications, Eqs. (3)–(6). Results of the Johansen (1988) test suggest that repurchases, cash flows, capital expenditures, and gross domestic product are cointegrated, but that issues are not cointegrated with these variables.[5] Therefore, in our tests, we include an error-correction term in the repurchase specifications. We present results only for the repurchase and issue equations in specifications (3)–(6) for brevity. Throughout, all standard errors are corrected for heteroskedasticity and autocorrelation using the Newey and West (1987) procedure. Additionally, throughout this section, variables are de-meaned and standardized to unit variance to simplify interpretation of the coefficients.

4.1.1. Determinants of repurchasing activity

Results for growth in repurchases are presented in Tables 3 and 4. In Panel A of Table 3, we analyze specifications for all firms. That is, we regress growth in

[4] Ratios are computed by aggregating (summing) data across firms in the different types over the calendar year, and then computing ratios at the aggregate level. The data used are operating income (data item 13), net sales (data item 12), capital expenditures (data item 128), cash and equivalents (data item 1), book value of assets (data item 6), and total debt (data item 9). Market value is computed from CRSP market values.

[5] Results of these tests are not reported for brevity, but are available from the authors upon request.

Table 3
Determinants of growth in repurchases
Presents results of the regression

$$\Delta rep_t = b_1 \Delta rep_{t-1} + b_2 \Delta cf_{t-1} + b_3 \Delta cap_{t-1} + b_4 \Delta gdp_{t-1} + b_5 ec_{t-1} + b_6 TAX_t + b_7 v_{t-1/t+1} + e_t,$$

where Δrep_t is growth in log real repurchases, Δcf_{t-1} is growth in log real operating income, Δcap_{t-1} is growth in log real capital expenditures, Δgdp_{t-1} is growth in log real gross domestic product, TAX_t is the difference in ordinary and capital gains tax rates, and $v_{t-1/t+1}$ is a measure of valuation. Panel A presents results using repurchases, cash flows, capital expenditures, and measures of valuation for all firms in the sample. Panel B repeats the analysis using only firms classified as "net repurchasers," that is, firms whose repurchasing activity exceeds issuing activity during the year. Specification (1) omits the valuation term, specification (2) uses the lagged log real return, r_{t-1}, specification (3) uses the lead log real returns, r_{t+1}, specification (4) uses the lagged log market-to-book ratio, mb_{t-1}, and specification (5) uses the lead log market-to-book ratio. In Panel B, specifications (6)–(9) use returns and market-to-book ratios in excess of the returns on all firms; specification (6) uses excess lagged returns, (7) excess lead returns, (8) excess lagged market-to-book ratio, and (9) excess lead market-to-book ratio. The term ec_{t-1} is an error-correction term from the first-stage regression

$$rep_t = \delta_0 + \delta_1 cf_t + \delta_2 cap_t + \delta_3 gdp_t + ec_t.$$

Data are converted to real using the GDP deflator, and standard errors are corrected for heteroskedasticity and autocorrelation using the Newey and West (1987) procedure. Data cover the period 1971–2004 for 34 annual observations.

Panel A: All firms

Specification:	(1)	(2)	(3)	(4)	(5)
Δrep_{t-1}	−0.072	−0.083	−0.088	−0.076	−0.078
SE	(0.142)	(0.140)	(0.146)	(0.144)	(0.146)
Δcf_{t-1}	0.124	0.139	0.083	0.133	0.134
SE	(0.120)	(0.094)	(0.124)	(0.129)	(0.114)
Δcap_{t-1}	−0.522	−0.445	−0.474	−0.518	−0.527
SE	(0.132)	(0.120)	(0.124)	(0.127)	(0.132)
Δgdp_{t-1}	0.649***	0.647***	0.663***	0.643***	0.647***
SE	(0.093)	(0.083)	(0.093)	(0.090)	(0.093)
ec_{t-1}	−0.654***	−0.584***	−0.673***	−0.655***	−0.650***
SE	(0.143)	(0.143)	(0.149)	(0.144)	(0.146)
TAX_t	0.025	0.054	0.010	0.057	0.055
SE	(0.132)	(0.128)	(0.135)	(0.164)	(0.176)
v_{t-1}		1.083**		0.106	
SE		(0.447)		(0.356)	
v_{t+1}			−0.873		0.037
SE			(0.569)		(0.132)
$\bar{R}^2$	0.541	0.589	0.561	0.524	0.523

Panel B: Net repurchasers

Specification:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δrep_{t-1}	−0.667***	−0.699***	−0.632***	−0.688***	−0.717***	−0.665***	−0.670***	−0.664***	−0.645***
SE	(0.187)	(0.173)	(0.181)	(0.185)	(0.201)	(0.188)	(0.175)	(0.188)	(0.196)
Δcf_{t-1}	1.028***	1.056***	0.910**	1.012***	1.079***	1.031***	1.191***	1.021***	0.837***
SE	(0.331)	(0.281)	(0.370)	(0.319)	(0.337)	(0.332)	(0.384)	(0.331)	(0.472)
Δcap_{t-1}	−0.442	−0.417	−0.379	−0.410	−0.456	−0.447	−0.583	−0.438	−0.287
SE	(0.317)	(0.268)	(0.353)	(0.302)	(0.286)	(0.322)	(0.353)	(0.315)	(0.409)
Δgdp_{t-1}	0.473***	0.502***	0.471***	0.477***	0.489***	0.472***	0.427***	0.474***	0.505***
SE	(0.083)	(0.085)	(0.085)	(0.081)	(0.086)	(0.081)	(0.089)	(0.083)	(0.088)
ec_{t-1}	1.032***	0.904***	1.007***	1.022***	1.018***	1.031***	1.050***	1.030***	1.009***
SE	(0.102)	(0.089)	(0.097)	(0.103)	(0.107)	(0.102)	(0.099)	(0.103)	(0.120)
TAX_t	0.090	0.101	0.095	0.148	0.181	0.089	0.135	0.084	0.050
SE	(0.080)	(0.080)	(0.077)	(0.104)	(0.124)	(0.079)	(0.112)	(0.081)	(0.100)

Table 3. (*continued*)

V_{t-1}		1.305***		0.233		0.082		0.1488	
SE		(0.458)		(0.282)		(0.732)		(0.324)	
V_{t+1}			−0.483		0.332		−1.7806		0.0893
SE			(0.438)		(0.315)		(1.717)		(0.108)
$\bar{R}^2$	0.722	0.761	0.718	0.715	0.720	0.710	0.720	0.711	0.716

,* Significant at the 5% and 1% critical level, respectively.

Table 4

Aggregate sentiment and repurchases

Presents regressions of the growth in real log repurchases on a number of measures of market sentiment. The measures of sentiment are $SENTORTH_t$, the orthogonalized first principal component of a number of sentiment measures from Baker and Wurgler (2006), $SENT_t$, the raw first principal component of these measures, $DIVPREM_{t-1}$, the difference in returns on dividend- and non-dividend-paying stocks, $nipo_t$, the log number of initial public offerings (IPOs), $ripo_t$, the log average first-day returns on IPOs, $cefd_t$, the log closed-end fund discount, es_t, the log share of equity in new issues, and $TURN_{t-1}$, lagged NYSE turnover. The sentiment measures are taken from Jeffrey Wurgler's website. Panel A presents results for log growth in repurchases of all firms; Panel B presents similar results for log growth in repurchases of only net repurchasing firms. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey and West (1987) procedure. Data cover the period 1971–2004 and are sampled at an annual frequency.

Panel A: All firms

Specification:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δrep_{t-1}	−0.072	−0.096	−0.078	−0.145	−0.075	−0.068	−0.105	−0.077
SE	(0.146)	(0.154)	(0.146)	(0.142)	(0.139)	(0.140)	(0.153)	(0.144)
Δcf_{t-1}	0.124	0.152	0.137	0.242	0.119	0.112	0.130	0.160
SE	(0.128)	(0.133)	(0.132)	(0.134)	(0.119)	(0.126)	(0.123)	(0.121)
Δcap_{t-1}	−0.522***	−0.507***	−0.523***	−0.529***	−0.529***	−0.529***	−0.530***	−0.487***
SE	(0.132)	(0.128)	(0.131)	(0.117)	(0.128)	(0.139)	(0.133)	(0.127)
Δgdp_{t-1}	0.649***	0.653***	0.646***	0.621***	0.653***	0.651***	0.668***	0.653***
SE	(0.094)	(0.094)	(0.090)	(0.082)	(0.095)	(0.094)	(0.103)	(0.092)
ec_{t-1}	−0.655***	−0.656***	−0.650***	−0.627***	−0.649***	−0.654***	−0.621***	−0.703***
SE	(0.144)	(0.142)	(0.142)	(0.143)	(0.145)	(0.141)	(0.137)	(0.140)
TAX_t	0.290	0.297	0.372	1.501	0.445	0.238	−0.505	1.392
SE	(1.509)	(1.439)	(1.463)	(1.306)	(1.605)	(1.460)	(2.208)	(1.786)
$SENTORTH_t$	0.002							
SE	(0.131)							
$SENT_t$		0.091						
SE		(0.156)						
$DIVPREM_{t-1}$			−0.229					
SE			(0.821)					
$nipo_t$				0.183*				
SE				(0.103)				
$ripo_{t-1}$					- 0.781			
SE					(0.907)			
$cefd_t$						0.034		
SE						(0.108)		
es_{t-1}							0.246	
SE							(0.351)	
$TURN_{t-1}$								0.327
SE								(0.326)
$\bar{R}^2$	0.522	0.529	0.524	0.564	0.532	0.523	0.528	0.537

Table 4. (*continued*)

Panel B: Net repurchasers

Specification:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δrep_{t-1}	−0.664***	−0.663***	−0.665***	−0.675***	−0.665***	−0.634***	−0.673***	−0.686***
SE	(0.184)	(0.188)	(0.186)	(0.189)	(0.185)	(0.210)	(0.193)	(0.193)
Δcf_{t-1}	1.043***	1.030***	1.026***	1.036***	1.093***	1.018***	1.039***	1.035***
SE	(0.334)	(0.331)	(0.331)	(0.328)	(0.318)	(0.332)	(0.343)	(0.331)
Δcap_{t-1}	−0.450	−0.445	−0.442	−0.460	−0.505	−0.464	−0.439	−0.433
SE	(0.320)	(0.318)	(0.318)	(0.310)	(0.313)	(0.323)	(0.312)	(0.310)
Δgdp_{t-1}	0.467***	0.471***	0.472***	0.476***	0.462***	0.461***	0.469***	0.477***
SE	(0.085)	(0.091)	(0.085)	(0.086)	(0.085)	(0.092)	(0.081)	(0.086)
ec_{t-1}	1.040***	1.035***	1.033***	1.006***	1.031***	1.043***	1.040***	1.031***
SE	(0.106)	(0.109)	(0.104)	(0.101)	(0.108)	(0.104)	(0.107)	(0.102)
TAX_t	(1.048)	(1.033)	(1.022)	(1.289)	(1.209)	(0.934)	(1.197)	(1.409)
SE	(0.942)	(0.923)	(0.920)	(0.891)	(0.940)	(0.992)	(1.682)	(1.314)
$SENTORTH_t$	−0.045							
SE	(0.081)							
$SENT_t$		−0.012						
SE		(0.091)						
$DIVPREM_{t-1}$			0.0384					
SE			(0.441)					
$nipo_t$				0.046				
SE				(0.068)				
$ripo_{t-1}$					−0.7252			
SE					(0.544)			
$cefd_t$						0.068		
SE						(0.122)		
es_{t-1}							−0.0437	
SE							(0.269)	
$TURN_{t-1}$								0.0974
SE								(0.200)
$\bar{R}^2$	0.712	0.710	0.710	0.713	0.718	0.713	0.710	0.712

*** Significant at the 1% critical level.

all firms' repurchases on its own lag as well as growth in all firms' cash flows and capital expenditures, growth in gross domestic product, a measure of all firms' valuation, and the error correction term. We examine two measures of valuation before and after repurchase activity: the holding-period return over the prior (subsequent) year and the market-to-book ratio in the prior (subsequent) year. In Panel B, we repeat the analysis for firms that we classify as net repurchasers. For net repurchasers, we also examine measures of *relative* valuation. In particular, we examine net repurchasers' past and future returns and market-to-book ratios in excess of those of the all-firm average. In untabulated results, we calculate the relative valuation of repurchasers to issuers and issuers to repurchasers and obtain similar results. In Table 4, we further test the misvaluation hypothesis including measures of market sentiment.[6] In addition to

[6] We thank Jeff Wurgler for making the sentiment measures available on his website.

these variables, we include the differential in marginal ordinary and capital gains taxes, TAX_t.

The results in Panel A of Table 3 show that, across all specifications, aggregate capital expenditures strongly negatively predict aggregate repurchasing activity, and macroeconomic growth (GDP) positively predicts repurchasing activity. These results are generally consistent with the capital and cash flow hypothesis for stock repurchases. Economic growth (GDP) represents a positive stimulus for excess cash flow and thus stock repurchase activity, whereas when capital investment is high in aggregate, repurchase growth tends to slow. The results therefore suggest that, controlling for investment policy, economic growth acts as a stimulus to repurchasing activity. Coefficients on cash flow growth are also positive, but not statistically significant. Further, the negative and significant coefficient on the error-correction term indicates that when repurchases are above their long-run trends with cash flows, capital expenditures, and GDP, repurchases tend to revert to the trend. All coefficients are statistically significant at the 1% level. These results show that repurchases will peak following periods of economic expansion. Fig. 2 shows the pattern of repurchases with the peaks and troughs in the business cycle indicated. This figure illustrates that repurchases are procyclical but that a period of economic expansion typically precedes the initial increase in stock repurchases.

The results are less supportive of a misvaluation explanation for aggregate repurchase activity. Columns 2 and 4 of Table 3 present results using lagged returns and market-to-book ratios, respectively, as measures of aggregate valuation. As shown, both measures *positively* predict future repurchase activity, although only the coefficient on lagged returns is statistically significant. Thus, the evidence suggests that firms tend to have above-average stock repurchase growth following times when market returns are above average. To the extent that high market returns (and market-to-book ratios) capture aggregate overvaluation, this result suggests that managers are more likely to repurchase stock when markets are overvalued rather than undervalued. The specifications in columns 3 and 5 repeat the analysis using the lead of returns and market-to-book ratio. As shown in the columns, the coefficients on both variables are statistically indistinguishable from zero. Moreover, although statistically insignificant, the point estimate of the coefficient on future return is negative, suggesting that an increase in stock repurchase activity leads to relatively lower rather than higher valuation.

One possible reason for these findings is that managers respond not to aggregate valuation in making repurchase decisions, but rather to their own firm's valuation. Results in Panel B repeat the analysis using data for net repurchasers. Columns 1 through 5 mimic those in Panel A, except that all variables (except GDP) are for only net repurchasing firms. Columns 6 through 10 repeat Columns 2 through 5 but replace each valuation measure with a relative valuation measure (i.e., value in excess of all firms). As shown in the table, growth in economic activity continues to have strong positive forecasting power for stock repurchase activity; across all nine specifications in the table, the coefficient is positive and statistically significant at the 1% level. Thus, as in Panel A, the table suggests that net repurchasers' repurchasing activity responds positively to economic growth. In contrast to the results in Panel A, growth in net repurchasers' cash flow is also positively and statistically significantly related to future repurchasing activity across all specifications. Thus, controlling for economic growth and investing policy, above-average cash flow growth stimulates above-average growth in repurchases. As discussed above, this result suggests that repurchase activity is driven by growth in cash flows through economic stimulus and growth in firm-specific cash flow.

Of additional note in the table, the coefficient on lagged repurchase growth is statistically significantly negative across all specifications and the coefficient on the error-correction term is statistically significantly positive. The negative coefficient on lagged repurchase growth suggests that repurchases tend to revert to the mean; in the absence of a macroeconomic or firm-specific stimulus to cash flow, a period of higher-than-average repurchase growth tends to be followed by a period of lower-than-average repurchase growth. However, the positive coefficient on the error-correction term suggests that this reversion is attenuated when repurchase activity is above its long-run relation with cash flows, investment, and economic activity. These deviations tend to persist, suggesting perhaps that managers are reluctant to reverse repurchasing decisions.

Results for the valuation measures for net repurchasers mirror those of firms in the aggregate. Net repurchasers' repurchases grow at a faster-than-average rate following above-average stock returns. Again, if these above-average stock returns capture potential overvaluation, the results suggest that these firms are repurchasing stock when their firms are relatively overvalued. However, in Column 6 we repeat the analysis using the *relative* return on net repurchasers, that is, the return in excess of the all-firm average. The coefficient on this term remains positive but is insignificant. Further, the relative market-to-book ratio of these firms tends to be higher prior to a repurchase, which is also inconsistent with a valuation motive for stock repurchases. Finally, future absolute and relative returns and market-to-book ratios are not statistically significantly related to repurchase growth. As shown in Columns 3 and 7, future absolute and relative returns are *negatively* related to repurchasing activity. Although future absolute and relative market-to-book ratios are positively related to repurchasing activity, as shown in Columns 5 and 9, neither coefficient is statistically significant. In all, the table provides little evidence to suggest that repurchase activity is related to overall valuation or to the valuation of firms that are net repurchasers of stock.

Misvaluation is a difficult concept to capture, as it is presumably difficult to detect. We therefore follow existing literature on security issuance and sentiment (Baker and Wurgler, 2000, 2006; Lowry, 2003; Lee, Shleifer, and Thaler, 1991) and examine additional variables that might measure relative valuation in markets. Our candidate measures are $SENTORTH_t$, the orthogonalized first principal component of a number of sentiment measures from Baker and

Wurgler (2006); $SENT_t$, the raw first principal component of these measures; $DIVPREM_{t-1}$, the difference in returns on dividend- and non-dividend-paying stocks; $nipo_t$, the log number of initial public offerings (IPOs); $ripo_t$, the log average first day returns on IPOs; $cefd_t$; the log closed-end fund discount; es_t, the log share of equity in new issues; and $TURN_{t-1}$, lagged NYSE turnover. Based on prior interpretations, each of these measures, with the exception of $DIVPREM_{t-1}$ and $cefd_t$, are positively related to sentiment and potential market overvaluation. $DIVPREM_{t-1}$ and $cefd_t$ are negatively related to sentiment. The misvaluation hypothesis therefore predicts that firms will repurchase more stock when sentiment and valuations are low. Table 4 presents the results from replacing the valuation measures from Table 3 with these measures of market sentiment. The results provide no additional support for the misvaluation hypothesis as the coefficients on all variables are insignificant, with the exception of $nipo_t$. The coefficient on $nipo_t$ is positive and significant, suggesting that firms repurchase stock when markets are overvalued, rather than undervalued. However, in Panel B, this variable is also insignificant. Additionally, the results supporting the capital and cash flow hypothesis remain after controlling for the sentiment measures.

4.1.2. Determinants of equity issues

We repeat the analysis above for growth in equity issues and report the results in Tables 5 and 6. As above, we present results for all firms in aggregate in Panel A; that is, we examine the predictive power of aggregate cash flow growth, capital expenditure growth, and measures of valuation for growth in total equity issues across all firms. In Panel B, we focus on net issuers. Thus, in Panel B, we examine the relation between the growth of new issues for net issuers and the growth in these firms' cash flows, capital expenditures, and valuation. In contrast to the results for repurchases, no error-correction term is indicated, suggesting that a standard VAR is appropriate to analyze the relation among issues, capital expenditures, cash flows, and gross domestic product. In Table 6, we report results using several of the sentiment measures.

The results in Panel A of Table 5 are generally supportive of the capital and cash flow hypothesis. In all five specifications, GDP growth negatively and significantly forecasts growth in issues. As noted above, the sign on the GDP growth coefficient is less obvious for issues than repurchases due to the timing of issues in the business cycle. As indicated in Fig. 2, issues tend to increase the most after a contraction, consistent with the negative coefficient, but increases in equity issues occur during expansions.[7] In untabulated results, we augment the regressions with concurrent GDP growth. We find that the coefficient on past GDP growth remains negative and significant, and that the coefficient on concurrent GDP growth is positive and significant. Thus, the results indicate that, while procyclical, growth in issues occurs early in the business cycle, consistent with the capital and cash flow hypothesis. Additionally, the coefficient on cash flow growth is negative and the coefficient on capital expenditure growth is positive in all five specifications. Although the coefficients on capital expenditure growth are significant only in specifications (2) and (3), and none of the coefficients on cash flow growth are statistically significant, their signs are consistent with the capital demands hypothesis.

In specifications (2) and (3), we demonstrate, consistent with past literature, that above-average past returns forecast above average-issuing activity, and above-average issuing activity appears to be negatively related to future returns. To the extent that returns reflect misvaluation, this result is consistent with the notion that managers issue equity in response to overvaluation and that the market responds by correcting the overvaluation in the subsequent period. However, these patterns are also reflected in aggregate repurchasing activity, as shown in Table 3. Thus, following higher-than-average returns, firms issue and repurchase stock, and higher repurchase and issuing activity tends to be followed by lower returns. The evidence in Columns 4 and 5 indicates that high issuing activity follows relatively high market-to-book ratios and that these high valuations tend to persist after issuing. Although these coefficients are not statistically significant, the results suggest that, although returns might be low, valuations do not appear to change significantly. The evidence in support of a valuation explanation for issuing activity again seems somewhat indirect.

As in the case of repurchasing activity, one possibility is that managers are issuing in order to capture overvaluation of their own stock values, rather than aggregate overvaluation. In Panel B, we examine results for net issuers. The results for net issuers support the capital and cash flow hypothesis more strongly than for firms in aggregate. As shown in the table, gross domestic product continues to have negative and statistically significant forecasting power for future issuing activity, but concurrent GDP growth continues to be positively related to growth in the issues of net issuers. In contrast to the aggregate results, however, issuing activity responds positively to capital investment in all nine specifications and is statistically significant in eight of the nine specifications. Thus, growth in equity issues appears to respond to the investment policies of issuers, rather than of firms in aggregate. When these firms' capital demands are high, at the emergence of the economy from a contraction, we observe higher growth in equity issues. This evidence supports our prediction that issues and repurchases are procyclical but occur at different stages of the business cycle as firms have different demands for capital.

Support for the misvaluation hypothesis weakens in the specification for net issuers. Issues respond positively to past absolute returns of net issuers and returns in excess of the average firm, as shown in Columns 2 and 6. Again, taking the past return as a measure of potential overvaluation, this result could be consistent with managers taking advantage of overvaluation to issue

[7] Rau and Stouraitis (2008) document a similar pattern, noting that issuance waves tend to precede merger waves, which are followed by repurchase waves.

Table 5
Determinants of growth in equity issues
Presents results of the regression

$$\Delta iss_t = b_1\Delta iss_{t-1} + b_2\Delta cf_{t-1} + b_3\Delta cap_{t-1} + b_4\Delta gdp_{t-1} + b_5 TAX_t + b_6 v_{t-1/t+1} + e_t,$$

where Δiss_t is growth in log real equity issues, Δcf_{t-1} is growth in log real operating income, Δcap_{t-1} is growth in log real capital expenditures, Δgdp_{t-1} is growth in log real gross domestic product, TAX_t is the difference in ordinary and capital gains tax rates, and $v_{t-1/t+1}$ is a measure of valuation. Panel A presents results using issues, cash flows, capital expenditures, and measures of valuation for all firms in the sample. Panel B repeats the analysis using only firms classified as "net issuers," that is, firms whose issuing activity exceeds repurchasing activity during the year. Specification (1) omits the valuation term, specification (2) uses the lagged log real return, r_{t-1}, specification (3) uses the lead log real returns, r_{t+1}, specification (4) uses the lagged log market-to-book ratio, mb_{t-1}, and specification (5) uses the lead log market-to-book ratio. In Panel B, specifications (6)–(9) use returns and market-to-book ratios in excess of the returns on all firms; specification (6) uses excess lagged returns, (7) excess lead returns, (8) excess lagged market-to-book ratio, and (9) excess lead market-to-book ratio. Data are converted to real using the GDP deflator and standard errors are corrected for heteroskedasticity and autocorrelation using the Newey and West (1987) procedure. Data cover the period 1971–2004 for 34 annual observations.

Panel A: All firms

Specification:	(1)	(2)	(3)	(4)	(5)
Δiss_{t-1}	−0.444**	−0.679***	−0.390***	−0.492***	−0.444**
SE	(0.168)	(0.166)	(0.126)	(0.179)	(0.174)
Δcf_{t-1}	−0.142	−0.145	−0.216	−0.106	−0.106
SE	(0.246)	(0.244)	(0.197)	(0.237)	(0.230)
Δcap_{t-1}	0.234	0.372**	0.339**	0.250	0.221
SE	(0.164)	(0.137)	(0.146)	(0.161)	(0.161)
Δgdp_{t-1}	0.277**	0.193*	0.292**	0.314***	0.288**
SE	(0.117)	(0.097)	(0.108)	(0.106)	(0.114)
TAX_t	0.044	0.084	0.014	0.207	0.132
SE	(0.113)	(0.088)	(0.103)	(0.148)	(0.155)
v_{t-1}		2.393***		0.538	
SE		(0.473)		(0.412)	
v_{t+1}			−1.741***		0.120
SE			(0.619)		(0.190)
$\bar{R}^2$	0.223	0.462	0.340	0.241	0.201

Panel B: Net issuers

Specification:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δiss_{t-1}	−0.445***	−0.644***	−0.421***	−0.531***	−0.475**	−0.533***	−0.440***	−0.517***	−0.465***
SE	(0.155)	(0.125)	(0.131)	(0.178)	(0.173)	(0.140)	(0.152)	(0.145)	(0.146)
Δcf_{t-1}	−0.405	−0.714**	−0.358	−0.406	−0.406	−0.369*	−0.419*	−0.382	−0.387
SE	(0.257)	(0.267)	(0.274)	(0.264)	(0.250)	(0.211)	(0.240)	(0.245)	(0.249)
Δcap_{t-1}	0.509**	0.707***	0.432	0.533**	0.547**	0.412**	0.528**	0.507**	0.509**
SE	(0.243)	(0.231)	(0.279)	(0.245)	(0.225)	(0.185)	(0.228)	(0.230)	(0.219)
Δgdp_{t-1}	−0.312**	−0.230**	−0.330***	−0.340***	−0.307**	−0.323**	−0.318***	−0.348***	−0.324***
SE	(0.115)	(0.105)	(0.097)	(0.119)	(0.115)	(0.110)	(0.122)	(0.103)	(0.106)
TAX_t	0.054	0.080	0.050	0.200	0.190	0.098	0.059	0.109	0.090
SE	(0.133)	(0.117)	(0.143)	(0.183)	(0.192)	(0.129)	(0.137)	(0.145)	(0.151)
v_{t-1}		2.093***		0.420		6.992**		1.0556	
SE		(0.495)		(0.319)		(2.532)		(0.890)	
v_{t+1}			−0.8911		0.3872		0.9054		0.0909
SE			(0.596)		(0.376)		(3.558)		(0.162)
$\bar{R}^2$	0.181	0.380	0.196	0.197	0.174	0.283	0.149	0.184	0.156

*,**,*** Significant at the 10%, 5% and 1% critical level, respectively.

Table 6
Aggregate sentiment and equity issues

Presents regressions of the growth in real log equity issues on a number of measures of market sentiment. The measures of sentiment are $DIVPREM_{t-1}$, the difference in returns on dividend- and non-dividend-paying stocks, $ripo_t$, the log average first-day returns on IPOs, $cefd_t$, the log closed-end fund discount, and $TURN_{t-1}$, lagged NYSE turnover. The sentiment measures are taken from Jeffrey Wurgler's website. Panel A presents results for log growth in issues of all firms; Panel B presents similar results for log growth in issues of only net issuing firms. Standard errors are corrected for heteroskedasticity and autocorrelation using the Newey and West (1987) procedure. Data cover the period 1971–2004 and are sampled at an annual frequency.

Panel A: All firms				
Specification:	(1)	(2)	(3)	(4)
Δiss_{t-1}	−0.485***	−0.498***	−0.442**	−0.440**
SE	(0.156)	(0.163)	(0.161)	(0.166)
ΔCF_{t-1}	−0.066	−0.145	−0.098	−0.133
SE	(0.249)	(0.239)	(0.246)	(0.236)
ΔCAP_{t-1}	0.227	0.241	0.261	0.245
SE	(0.176)	(0.161)	(0.181)	(0.171)
ΔGDP_{t-1}	−302***	−0.285**	−0.293**	−0.284**
SE	(0.106)	(0.111)	(0.117)	(0.120)
TAX_t	0.933	0.185	0.681	0.863
SE	(1.323)	(1.249)	(1.365)	(1.927)
$DIVPREM_{t-1}$	−1.462*			
SE	(0.824)			
$ripo_{t-1}$		2.144**		
SE		(0.956)	−0.129	
$cefd_t$				
SE			(0.184)	
$TURN_{t-1}$				0.096
SE				
$\bar{R}^2$	0.247	0.262	0.203	0.193
Panel B: Net issuers				
Specification:	(1)	(2)	(3)	(4)
Δiss_{t-1}	−0.524***	−0.498***	−0.456***	−0.445**
SE	(0.140)	(0.153)	(0.156)	(0.163)
Δcf_{t-1}	−0.374	−0.368	−0.411	−0.406
SE	(0.276)	(0.248)	(0.263)	(0.254)
Δcap_{t-1}	0.517*	0.452*	0.517*	0.510*
SE	(0.253)	(0.238)	(0.255)	(0.249)
Δgdp_{t-1}	−0.302***	−0.329***	−0.307**	−0.312**
SE	(0.107)	(0.106)	(0.112)	(0.114)
TAX_t	0.960	0.379	0.677	0.620
SE	(1.594)	(1.527)	(1.524)	(2.471)
$DIVPREM_{t-1}$	−1.370*			
SE	(0.750)			
$ripo_{t-1}$		2.053*		
SE		(1.022)		
$cefd_t$			−0.0561	
SE			(0.155)	

Table 6. (*continued*)

$TURN_{t-1}$				0.002
SE				(0.501)
$\bar{R}^2$	0.198	0.210	0.151	0.148

*,**,*** Significant at the 10%, 5% and 1% critical level, respectively.

equity. However, issuing activity is not significantly related to the future returns of net issuing firms, as shown in Columns 3 and 7. The coefficient on future absolute return is negative, but the coefficient on the relative return is positive, and both are insignificant. While issuing firms could be issuing equity prior to poor absolute returns, they are doing so when the future return on their firm's equity is likely to be high relative to other firms. Thus, at the time of issue, the relative future valuation of their firm's equity tends to be high. Market-to-book ratios tend to be high in both absolute and relative terms both before and after issuance growth, leading to no clear conclusion about valuation and issuing activity. In summary, the results are not particularly supportive of a misvaluation motive for issuing equity.

Table 6 presents the results from replacing the valuation measures from Table 5 with measures of market sentiment. Since many of the sentiment measures are directly related to the volume of equity issuance, we only include sentiment measures that are not directly related to the volume of issuances. This limits our analysis to $DIVPREM_{t-1}$, $ripo_t$, $cefd_t$, and $TURN_{t-1}$. According to the misvaluation hypothesis, the coefficients on $DIVPREM_{t-1}$ and $cefd_t$ should be negative and significant, and those on $ripo_t$ and $TURN_{t-1}$ should be positive and significant. We find that $DIVPREM_{t-1}$ and $ripo_t$ have the predicted sign and are significant at the 10% level in Panels A and B. Alternatively, $cefd_t$ and $TURN_{t-1}$ are both insignificant. Thus, similar to the evidence using returns, the evidence using sentiment measures provides mixed support for the misvaluation hypothesis. Perhaps more importantly, the results in Table 6 continue to support the capital and cash flow hypothesis after controlling for the sentiment measures.

The only clear pattern in terms of valuation is that both activities appear to follow above-average returns and two of the sentiment measures predict issuance activity. Although this could speak to an overvaluation motive for issuing, it contradicts an undervaluation motive for repurchasing. Further, there is little evidence that any potential misvaluation is corrected. Consequently, we ask if there is reason to believe that the positive relation of repurchase and issuing activity to past returns reflects something other than misvaluation. We explore this issue in the next section, building on the fundamental hypothesis that the stock market in the aggregate (and thus past returns) reflects investors' beliefs about the state of the economy rather than misvaluation. In particular, a commonly shared view among academics is that equity risk premia are countercyclical (see, e.g., Cochrane, 2007). Further, as discussed above, cash flow growth tends to be procyclical. Thus, an economic expansion tends to lead to a reduction in equity risk premia and an increase in the realization of cash flow growth. Both of these effects have a positive impact on stock returns and thus it is important to disentangle misvaluation from the effects of time-varying discount rates. In the next section, we investigate whether issuing and repurchase behavior reflects business cycle determinants of risk premia and cash flow growth, rather than representing a response to misvaluation.

4.2. Understanding the drivers of financing decisions

The preceding section documents little evidence of a valuation-based explanation for equity issues and stock repurchases and suggests that business cycles drive waves in issuing and repurchasing activity. However, a lingering question is why do firms choose repurchases and equity issues? That is, if the demand for capital drives issuing behavior, why do managers choose equity rather than debt? Similarly, if surplus cash flows determine repurchasing activity, why do managers choose stock repurchases rather than dividends? In this section, we examine these questions. To do so, we focus on the log *equity share*, es_t, of Baker and Wurgler (2000), which represents equity's share of total new security (debt and equity) issues. This variable controls for overall capital demand by focusing on the choice between debt and equity in financing the demand. Similarly, we examine the log *repurchase share*, rs_t, which represents the share of total distributions (repurchases and dividends) that consist of stock repurchases. These measures allow us to examine issue and distribution choice while controlling for the overall demand for capital, enabling us to more clearly identify the components of economic growth driving equity issuance and stock repurchase waves. In untabulated results, we confirm all previous findings using the change in rs_t and es_t rather than the change in aggregate repurchases and issuances.

Baker and Wurgler (2000) demonstrate that the equity share has negative forecasting power for returns. Through a number of empirical exercises, the authors conclude that the equity share captures managers' ability to time aggregate stock markets by issuing equity. We suggest that if indeed the equity share represents managers' ability to time markets, then managers should be able to time markets by their repurchase decisions as well, and the repurchase share should have positive forecasting power for returns. We address this question by examining

the following predictive regressions:

$$r_{t+1} = \delta_{11} r_t + \delta_{12} es_t + \delta_{13} rs_t + w_{1,t+1}, \quad (7)$$
$$es_{t+1} = \delta_{21} r_t + \delta_{22} es_t + \delta_{23} rs_t + w_{2,t+1}, \quad (8)$$
$$rs_{t+1} = \delta_{31} r_t + \delta_{32} es_t + \delta_{33} rs_t + w_{3,t+1}, \quad (9)$$

where r_{t+1} is the log real equally weighted return on all firms in the sample, es_{t+1} is the log equity share, and rs_{t+1} is the log repurchase share. As shown, these regressions represent a VAR, where all variables are de-meaned for convenience. Throughout, we linearly detrend the repurchase share, which is equivalent to including a linear trend in the regression. While dividend growth has remained relatively constant over the sample, repurchase growth has accelerated. Consequently, without detrending, the repurchase share simply reflects aggregate repurchasing activity.

Results of the VAR estimation are shown in Table 7. Consistent with Baker and Wurgler (2000), the table demonstrates that the equity share has negative forecasting power for future returns, with a statistically significant point estimate of −0.258. However, the repurchase share also statistically significantly and negatively forecasts future returns, with a point estimate of −0.215. Thus, both the equity share and the repurchase share predict lower returns with similar economic significance. On the surface, these results appear at odds with the long-run performance literature on repurchases discussed in Ikenberry, Lakonishok, and Vermaelen (1995). In Section 4.4.2, we will discuss this issue and reconcile our results with the long-run performance literature. As in the case of repurchase growth, managers seem to be repurchasing relatively more equity in advance of relatively lower returns. Once again, this result seems at odds with an interpretation of market timing; managers are *issuing* relatively more overpriced equity but also *repurchasing* relatively overpriced equity. Finally, as shown in the table, both the equity share and repurchase share are positively predicted by lagged returns, although only the former bears a statistically significant coefficient.

Though these results are consistent with the interpretation that managers are issuing equity in response to an overvalued equity price, the similar results with repurchases cause us to question this interpretation. Indeed, the results for both the equity and the repurchase share indicate simply that returns are below average following relatively high equity and repurchase shares. If issuing firms are overvalued, one would expect negative (not just lower) returns following high equity shares, as prices begin to correct after a period of overvaluation. We therefore examine returns following equity issuance (and repurchase) peaks to determine if they are negative or if the forecasting power might simply reflect lower conditionally expected returns (discount rates). In our sample, returns are negative in ten of 34 years. In Fig. 3, we depict these nine negative returns and the equity and repurchase shares in excess of their means in the prior year. The prior year equity share is above the mean in five of these cases—1973, 1974, 1981, 1984, and 1987—and below the mean in the remaining five. The prior year repurchase share is above the mean in five cases—1974, 1987, 1990, 1998, and 2000—and below the mean in the remaining five. Thus, conditional on the equity share or repurchase share being above the mean in a given year,

Table 7
Returns and the equity and repurchase shares
Presents results of the vectorautoregression (VAR):

$$r_{t+1} = \delta_{11} r_t + \delta_{12} es_t + \delta_{13} rs_t + w_{1,t+1},$$
$$es_{t+1} = \delta_{21} r_t + \delta_{22} es_t + \delta_{23} rs_t + w_{2,t+1},$$
$$rs_{t+1} = \delta_{31} r_t + \delta_{32} es_t + \delta_{33} rs_t + w_{3,t+1},$$

where r_t is the log real equally weighted equity return, es_t is the share of equity in new issues (new equity issues divided by the sum of new equity and debt issues), and rs_t is the share of repurchases in total distributions (repurchases divided by the sum of repurchases and dividends). The repurchase share is linearly detrended. All variables are de-meaned. The table reports point estimates and standard errors corrected for heteroskedasticity and autocorrelation using the Newey and West (1987) procedure. Data are sampled at an annual frequency and cover the period 1971–2004.

Dep. Var:	r_{t+1}	es_{t+1}	rs_{t+1}
r_t	−0.233	0.387**	0.397
SE	(0.188)	(0.159)	(0.259)
es_t	−0.258***	0.480***	0.423***
SE	(0.085)	(0.106)	(0.114)
rs_t	−0.215**	−0.140	0.731***
SE	(0.086)	(0.143)	(0.085)
$\bar{R}^2$	0.234	0.313	0.611

,* Significant at the 5% and 1% critical level, respectively.

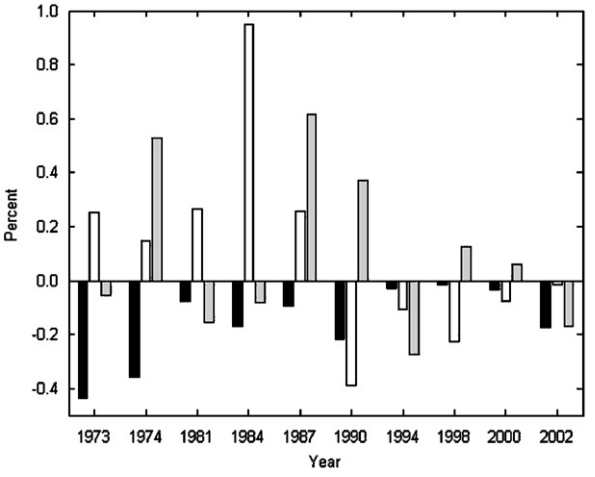

Fig. 3. Negative returns and the equity and repurchase shares. Depicts the log real equally-weighted return on all firms in years in which the return is negative, the prior year de-meaned log equity share (the ratio of equity issues to the total of equity and debt issues), and the prior rear detrended and de-meaned log repurchase share (the ratio of repurchases to the total of repurchases and dividends). Returns are depicted as a black bar, the equity share a white bar, and the repurchase share as a grey bar. Data on equity issues, debt issues, repurchases, and dividends are from Compustat. Data on returns are from CRSP. Data are sampled at an annual frequency over the period 1971–2004.

the ex post probability of a negative return in the following year is roughly 50%.

Since both the equity and the repurchase share negatively forecast future returns, but it is not clear that they predict *negative* returns, we suggest that these variables are merely forecasting lower returns. This forecasting power could suggest that the variables forecast lower equity discount rates. In the next sections, we attempt to understand the determinants of the repurchase and equity share by connecting these variables to measures of the costs of equity and debt, thus providing additional insight into whether our return results reflect misvaluation or time-varying equity discount rates.

4.2.1. Determinants of the equity share

In this section, we more closely examine whether time-varying costs of equity and debt contribute to the determination of the equity share. Since the cost of equity (debt) is counter (pro) cyclical, this examination will shed light on the economic forces that drive the relation between the growth in GDP, equity issuances, and stock repurchases thus helping us understand the correlation between equity issuances, repurchases, and returns.[8]

We first examine the contemporaneous relation between the equity share and measures of the cost of debt and equity. Based on the capital and cash flow hypothesis, firms issue debt and equity due to the need to raise external financing and choose their source of financing based on time-varying costs of equity and debt. Specifically, as the difference in the cost of equity and debt decreases, all else equal, a firm is more likely to issue equity because the relative cost of doing so has declined. The importance of the cost of financing is supported by Lucas and McDonald (1990) and Choe, Masulis, and Nanda (1993) and consistent with Myers and Majluf (1984).

To capture the cost of debt, we focus on the log real level of interest rates, i_t, and the spread between long-term and short-term interest rates (term spread) ts_t. We measure the level of interest rates as the yield on constant-maturity 1-year Treasury securities, obtained from the Federal Reserve's H.15 report, available at FRED from the Federal Reserve Bank of St. Louis. The spread is measured as the difference between the yield on 10-year constant-maturity Treasury securities, also taken from the H.15 report, and the yield on 1-year securities. We choose these two variables because Litterman and Scheinkman (1991) show that two state variables, typically interpreted as the level of short-term rates and the slope, capture most of the variation in the term structure. Finally, we also examine the spread between Moody's Aaa-rated bonds and 10-year Treasury securities, cs_t, the corporate spread. This variable captures possible default, liquidity, or convenience premia embedded in the yields of corporate securities. The Aaa-rated yield data are also from the H.15 report.

A more difficult task is to capture proxies for the cost of equity. In the absence of a consensus pricing model, particularly one with a time-varying cost of equity, it is difficult to accurately identify the equity discount rate. A natural candidate is the price-dividend ratio since, under rational expectations, it incorporates expectations of future discount rates and cash flow growth rates. However, this is a valuation-driven variable and, if misvaluation is present, one cannot disentangle any potential explanatory power attributable to time-variation in discount rates versus misvaluation. Consequently, we turn to a proxy for the risk premium that is not directly related to equity valuation and thus cannot be interpreted as evidence of misvaluation: the default spread, ds_t. This variable is measured as the difference between Moody's Baa-rated and Aaa-rated bonds, the data for which are also from the Federal Reserve's H.15 report. In using this variable as a measure of the equity discount rate, we follow Jagannathan and Wang (1996), who use it to capture variation in the equity premium. The intuition for using the default spread as a measure of the cost of equity can be understood in a CAPM setting where the interest rate variables, i_t, ts_t, an cs_t, capture the risk-free portion of the cost of financing that does not vary in the cross-section or across securities and the default spread captures variation in the risk premium due to differing sensitivity to that risk premium. If the risk-free portion goes up and the risk premium goes down in an expansion and equity betas are higher than debt betas, the ratio of the cost of equity to the cost of debt will go down. Assuming that managers prefer equity financing coming out of a recession due to relatively high recession-induced leverage levels, they will take advantage of the decreasing relative cost of equity in the early stages of the expansion.

The final variable that we include to capture differences in the cost of debt and equity financing is TAX_t, the difference between personal ordinary and capital gains tax rates. Our rationale for using this variable follows Graham (1999), who shows that differences in personal tax rates on interest and capital gains affect capital structure decisions. Our analysis includes TAX_t to capture this notion of the relative advantages of issuing equity or debt. Note that in doing so, we focus more on the capital demand side of issuing decisions than on the manager's capital structure decisions. That is, TAX_t captures the market's demanded price of debt and equity rather than the typical tradeoff notions of the benefits and costs of debt to firms. Thus, TAX_t captures a potential additional component of the cost of debt and equity that could be reflected in required returns demanded by investors.

Our hypothesis is that a negative relation exists between the equity share and the default spread, ds_t. That is, when equity is relatively more costly (the default spread is high), we expect firms to rely more on debt financing than on equity financing. In contrast, we expect a positive relation between the equity share and the cost of debt financing, captured by the interest rate, i_t, term spread, ts_t, corporate spread, cs_t, and the tax differential, TAX_t. If confirmed, we can interpret these hypotheses in

[8] The countercyclicality of the equity risk premium is considered a regularity in much of the asset pricing literature (see, e.g., Campbell and Cochrane, 1999). As discussed in footnote 1, we verify the countercyclicality of our measure of the cost of equity and procyclicality of our measure of the cost of debt. These results are available from the authors upon request.

two (not mutually exclusive) ways. First, an increase in the cost of debt results in debt-reliant firms finding previously profitable investment opportunities unprofitable. Thus, the positive relation between the equity share and the financing costs of debt could be due to a reduction in debt financing rather than an increase in equity financing. Alternatively, confirming the hypotheses suggests that firms tilt their issuing decisions toward equity and away from debt when the cost of equity is favorable relative to debt.

Table 8 presents the results of this analysis. Consistent with our predictions, the equity share is negatively related to the default spread and positively related to interest rates, the term spread, and the tax differential. These results suggest that the equity share of total new issues increases when debt costs are higher, as indicated by the positive coefficients on the level of interest rates, the term spread, and the tax differential, and decreases when the risk premium rises, as indicated by the negative coefficient on the default risk premium. Thus, one possible reason that equity issues are related to economic growth is the procyclicality of the cost of debt and the countercyclicality of the cost of equity.

However, financing costs do not drive out the power of past returns to predict the equity share, nor do they drive out the positive predictive power of the equity share for future returns. As stated above, equity issues tend to follow high returns, so we augment the regression above with the lagged aggregate return. The results presented in the second column of Table 8 suggest that, while the findings in the first column are robust, the lagged return continues to have statistically significant positive forecasting power for the equity return, although the significance is markedly reduced. Thus, these results suggest that there is residual information in the lagged return for forecasting future returns. Additionally, in the third column, we use these variables and the equity share to predict future returns. Only the equity share appears to significantly forecast future returns, and it does so with a negative coefficient.

Unfortunately, the results do not indicate definitively whether the equity share captures misvaluation or time-varying costs of equity and debt. Equity share is clearly related to proxies for these costs of financing; however, it retains forecasting power for future returns. This result might reflect managers' ability to time markets, although given the evidence that the equity share does not reliably predict negative returns, and the evidence that the repurchase share negatively predicts returns as well, we consider this explanation doubtful. In contrast, the forecasting power of the equity share could reflect that it is a better measure of expected future discount rates than these other variables. Alternatively, the equity share could capture information about expected future growth rates in cash flows. In general, there is evidence that demand for capital notwithstanding, managers are reluctant to issue equity under conditions that they view as unfavorable, which is consistent with the windows-of-opportunity story. Thus, there is a role for pre-issue stock returns and sentiment variables, but it is not clear whether these measures capture misvaluation or time-variation in the price of risk, which affects the issuance decision and especially the equity versus debt choice. To investigate this proposition, we examine the correlations between the financing costs variables and the sentiment variables. As indicated by our conjecture, the correlations are quite high, suggesting that the sentiment measures capture time variation in the price of risk.

Table 8
Financing costs and the equity share

Examines the relation among various costs of financing and the equity share. The results presented are for the regression

$$es_t = \beta_1 i_t + \beta_2 ts_t + \beta_3 cs_t + \beta_4 ds_t + \beta_5 TAX_t + \nu_t,$$

where es_t is the log share of equity in new issues, i_t is the level of the real yield on 10-year constant-maturity Treasury securities, ts_t is the difference in the yield on 1-year constant-maturity Treasury securities and 1-year Treasuries, cs_t is the spread between Moody's Aaa-rated corporate bond yields and 10-year constant-maturity Treasuries, ds_t is the spread between Moody's Baa-rated corporate bond yields and Aaa-rated yields, and TAX_t is the difference in marginal ordinary income and capital gains tax rates. All variables are de-meaned. Data are sampled at an annual frequency and cover the period 1971–2004, for 34 annual observations. The equity share is constructed from Compustat data, the interest rate data are from the Federal Reserve H.15 report, and the tax data are obtained from NBER. Standard errors are corrected for autocorrelation and heteroskedasticity using the Newey and West (1987) procedure.

Dep. Var:	es_t	es_t	r_{t+1}
es_t			−0.491***
SE			(0.146)
i_t	0.403**	0.314**	0.066
SE	(0.149)	(0.153)	(0.138)
ts_t	0.391**	0.369**	0.056
SE	(0.147)	(0.136)	(0.161)
cs_t	−0.020	−0.036	0.241
SE	(0.157)	(0.152)	(0.151)
ds_t	−0.360**	−0.250*	0.292
SE	(0.138)	(0.146)	(0.223)
TAX_t	0.927***	0.870***	0.167
SE	(0.184)	(0.192)	(0.274)
r_{t-1}		0.257*	
SE		(0.135)	
$\bar{R}^2$	0.472	0.516	0.177

*,**,*** Significant at the 10%, 5% and 1% critical level, respectively.

4.2.2. Determinants of the repurchase share

Theories of the tradeoffs between the costs and benefits of debt and equity are well developed, and help guide hypotheses as to the explanations for the equity share of total new issues. To understand the time-varying costs and benefits of stock repurchases relative to dividends, we rely on three primary motivations for repurchasing stock: the tax benefit of repurchases over dividends, the potential undervaluation of the stock price,

and the flexibility of repurchases. In their survey of corporate financial managers, Brav, Graham, Harvey, and Michaely (2005) find that over 80% of managers dividend policy decisions consider the potential negative consequences to reducing dividend payouts and the consistency of their payout policy. In contrast, only approximately 20% of managers cite the same considerations for repurchases. These answers suggest that flexibility will be an important motive for shifting payouts toward repurchases. Skinner (2008) shows that the correlation between payouts and earnings has increased over time and that this increase is driven by fluctuations in the level of repurchases, as dividend usage has been relatively stable. Skinner's results highlight the importance of the change in earnings in determining repurchases. Further, the evidence in Skinner (2008) and Dittmar and Dittmar (2004) indicates the substitutability of repurchases and dividends. We therefore examine the relative importance of taxes and flexibility to understand why repurchase activity is procyclical.

We hypothesize the following empirical relation between the repurchase share and its determinants:

$$rs_t = \gamma_0 + \gamma_1 rs_{t-1} + \gamma_2 \Delta gdp_t + \gamma_3 \Delta gdp_t^2 + \gamma_4 TAX_t + \upsilon_t, \tag{10}$$

where rs_t is the de-meaned repurchase share discussed above, Δgdp_t is the de-meaned growth in gross domestic product, Δgdp_t^2 is the square of this de-meaned growth, and TAX_t is the difference between the marginal ordinary and capital gains tax rates. As stated above, managers prefer to keep their dividend policy consistent and have some preference for keeping repurchase policy consistent; hence we expect $\gamma_1 > 0$. We expect that economic growth is more uncertain at the early and late stages of a recovery. Further, we expect repurchases to respond more negatively to a decrease in economic growth than positively to an increase in economic growth. Hence, we predict $\gamma_2 > 0$. Our third variable is a crude measure of conditional volatility or uncertainty in the economy, hence we expect $\gamma_3 > 0$. Finally, since repurchases are capital gains tax-advantaged, we expect $\gamma_4 > 0$.

Results from this regression are presented in Table 9. As shown in the table, our proxies for economic uncertainty explain the variation in the repurchase share. Growth in gross domestic product and its volatility positively and statistically significantly forecast the future repurchase share. Further, as shown in the second column, when GDP growth and volatility are included, the past return no longer significantly predicts the repurchase share. Finally, the final column presents regressions of returns on the lag of the repurchase share, GDP growth, its volatility, and the tax differential. In this specification, only GDP growth enters significantly. Eliminating the volatility of GDP growth and the tax rate substantially reduces the standard errors, and the results suggest that the repurchase share's forecasting power is subsumed by GDP growth. These results indicate that fluctuations in cash flow and uncertainty, rather than stock prices, determine the timing of stock repurchases.

Table 9
Uncertainty and the repurchase share

Examines the relation between the repurchase share and potential determinants. The results presented are for the regression

$$rs_t = \gamma_0 + \gamma_1 rs_{t-1} + \gamma_2 \Delta gdp_t + \gamma_3 \Delta gdp_t^2 + \gamma_4 TAX_t + \upsilon_t,$$

where rs_t is the log share of repurchases in total distributions, Δgdp_t the de-meaned growth in log real gross domestic product, and TAX_t is the difference in marginal ordinary income and capital gains tax rates. The constant term is not reported for brevity. Data are sampled at an annual frequency and cover the period 1971–2004, for 34 annual observations. The repurchase share is constructed from Compustat data, the gross domestic product data are from the NIPA tables at the Bureau of Economic Analysis, and the tax data are obtained from NBER. Standard errors are corrected for autocorrelation and heteroskedasticity using the Newey and West (1987) procedure.

	rs_t	rs_t	r_{t+1}	r_{t+1}
rs_{t-1}	0.696**	0.784**		
SE	(0.090)	(0.094)		
rs_t			−0.110	−0.091
SE			(0.087)	(0.089)
Δgdp_t	0.476**	0.565***	0.397*	−0.376**
SE	(0.184)	(0.100)	(0.231)	(0.175)
Δgdp_t^2		0.361**	−0.040	
SE		(0.150)	(0.199)	
TAX_t	0.075	−0.061	−0.057	
SE	(0.087)	(0.090)	(0.111)	
r_{t-1}		0.147**		
SE		(0.142)		
$\bar{R}^2$	0.615	0.675	0.032	0.090

*,**,*** Significant at the 10%, 5% and 1% critical level, respectively.

4.3. Robustness

In this section, we examine two alternative measures of repurchases and two subsamples that are more likely undervalued. We repeat the analysis presented in Sections 4.1 and 4.2 with these alternative measures and samples. For brevity, results of these tests are not tabulated, but are available from the authors upon request.

First, we conduct tests to verify the robustness of our results using the change in treasury stock (Compustat data item 226) as an alternative measure of repurchases and issuances. Fama and French (2001) argue that the standard Compustat measure of stock repurchases, purchase of common and preferred stock (Compustat data item 115), is overstated because it includes purchase of stock for ESOPs, mergers and acquisitions, and stock options. The authors advocate using instead the change in treasury stock, which will control for the significant effect of ESOPs on repurchases as documented in Fenn and Liang (2001) and Kahle (2002). Unfortunately, these data are available only from 1982 onward, reducing our sample period by 10 years. This limitation severely impacts the power of our hypothesis tests. Since GDP growth is the

reliably robust variable in our earlier analysis, we focus on a VAR of repurchase growth and GDP growth. Our conclusions are qualitatively unchanged. We also repeat our original analysis for the time period after the 1982 regulatory change that increased the use of repurchases and show similar findings.

Second, we investigate whether the lack of support for the misvaluation hypothesis for repurchases is related to data frequency. It is possible that the sampling frequency for the data used in the previous section is too coarse to detect any valuation effects. As a result, we construct a monthly measure of repurchase activity using CRSP data. Details of the construction of this measure are available in Bansal, Dittmar, and Lundblad (2005) and are similar to those employed in Stephens and Weisbach (1998). We conduct two analyses. First, we regress the equally weighted return on the CRSP index on 12 lags of growth in monthly repurchases, individually and collectively. We find that none of the coefficients of these regressions are statistically distinguishable from zero. Second, we regress growth in monthly repurchases on 12 lags of the CRSP equally weighted market index return. Again, we find no statistically significant coefficients. Thus, these data provide no more support for an undervaluation-based explanation of aggregate repurchase activity than do the annual Compustat data.

Finally, we investigate the possibility that the reason that we find so little support for misvaluation as a motive for stock repurchases or issuances is that we do not focus on those firms most likely to be undervalued. Low market-to-book firms are a natural candidate for undervaluation; for example, Lakonishok, Shleifer, and Vishny (1994) suggest that low market-to-book firms become so as a result of over-extrapolation of forecasts of poor future performance. Similarly, due to factors such as low analyst coverage, many researchers suggest that small firms are more likely to be misvalued by the market. Consequently, we repeat our analysis of the determinants of repurchase growth for low market-to-book and small firms. We divide our sample into quartiles on the basis of beginning-of-year market-to-book and market values of equity, and examine results for firms in the lowest quartiles of each of these variables.

Throughout our analysis, and consistent with the results reported above, we find that GDP growth is a positive and statistically significant forecaster of future repurchase growth for small and low book-to-market firms. This evidence suggests that our results in support of excess cash flow as a motive for stock repurchases are not limited to large or high market-to-book firms. Further, we find no additional support for the hypothesis that undervaluation drives repurchasing activity. For both small firms and low market-to-book firms, we find that the prior-year return, relative to aggregate, *positively* and significantly predicts future repurchase activity, in contrast with the predicted negative sign. Future returns relative to the aggregate are not significantly related to repurchase activity, and neither past nor future market-to-book ratios relative to the aggregate are significantly related to repurchase activity. Thus, our results using these subsamples suggest that the capital and cash flow hypothesis holds for the most likely misvalued firms, and that misvaluation seems to play no greater role in determining these firms' repurchasing activity.

4.4. Further implications

Thus far, we have focused on the implications of our hypotheses for waves in equity issues and stock repurchases. However, our results also have implications for other dimensions of the literature. In this section, we briefly explore and discuss two of these issues. First, we examine the implications of our results for patterns in aggregate merger activity. Second, we consider the relation of our results to the long-run performance of repurchasing firms.

4.4.1. Mergers

As shown in Fig. 1 and Table 1, aggregate merger activity follows a pattern similar to that of equity issuance and stock repurchases. We follow Harford (2005) and use the transaction value for all mergers from 1981 to 2004 from Securities Data Corporation (SDC) to measure merger activity. This pattern has been previously documented in Harford (2005) and Rhodes-Kropf, Robinson, and Viswanathan (2005). In this paper, we document and attempt to explain the correlation between the waves in mergers, equity issuances, and repurchases. We further provide summary statistics for acquirors in Table 2, discussed in Section 3.2.

Harford (2005) suggests that mergers are procyclical because firms are less financially constrained during economic peaks and thus have more (or possibly cheaper) sources of capital. This capital facilitates a neoclassical motive for the reallocation of assets, similar to the earlier model of procyclical merger activity in Maksimovic and Phillips (2001). Thus, mergers could occur during periods when firms have surplus cash, similar to stock repurchases. Additionally, merger waves could coincide with equity issuance waves because they occur when the cost of financing is low. Harford (2005) provides evidence to support these hypotheses for merger waves. Alternatively, Rhodes-Kropf, Robinson, and Viswanathan (2005), Rhodes-Kropf and Viswanathan (2004), and Shleifer and Vishny (2003) suggest that merger waves occur due to stock market misvaluation, although the mechanism leading to the misvaluation differs in the models in Rhodes-Kropf and Viswanathan (2004) and Shleifer and Vishny (2003). These hypotheses relate to the misvaluation hypothesis of equity issuances, where firms issue equity or merge when a firm is overvalued. Rhodes-Kropf, Robinson, and Viswanathan (2005) provide support for this hypothesis of merger waves.

To test these hypotheses and compare merger waves to repurchase and equity issuance waves, we repeat the analysis in Panel B of Tables 3 and 5 for mergers. These results are presented in Table 10. We show that, similar to stock repurchases, macroeconomic growth (GDP) positively predicts merger activity. These results are generally consistent with the liquidity hypothesis for mergers and relate to the capital and cash flow

Table 10
Determinants of growth in merger activity
Presents results of the regression

$$\Delta mrg_t = b_1\Delta mrg_{t-1} + b_2\Delta cf_{t-1} + b_3\Delta cap_{t-1} + b_4\Delta gdp_{t-1} + b_5 ec_{t-1} + b_6 TAX_t + b_7 v_{t-1/t+1} + e_t,$$

where Δmrg_t is growth in log real dollar volume of merger transactions, Δcf_{t-1} is growth in log real operating income, Δcap_{t-1} is growth in log real capital expenditures, Δgdp_{t-1} is growth in log real gross domestic product, TAX_t is the difference in ordinary and capital gains tax rates, and $v_{t-1/t+1}$ is a measure of valuation. Specification (1) omits the valuation term, specification (2) uses the lagged log real return, r_{t-1}, specification (3) uses the lead log real returns, r_{t+1}, specification (4) uses the lagged log market-to-book ratio, mb_{t-1}, and specification (5) uses the lead log market-to-book ratio. Specifications (6)–(9) use returns and market-to-book ratios in excess of the returns on all firms; specification (6) uses excess lagged returns, (7) excess lead returns, (8) excess lagged market-to-book ratio, and (9) excess lead market-to-book ratio. The term ec_{t-1} is an error-correction term from the first-stage regression

$$mrg_t = \delta_0 + \delta_1 cf_t + \delta_2 cap_t + \delta_3 gdp_t + ec_t.$$

Data are converted to real using the GDP deflator and standard errors are corrected for heteroskedasticity and autocorrelation using the Newey and West (1987) procedure. Data cover the period 1981–2004 for 24 annual observations.

Specification:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δmrg_{t-1}	−0.956***	−1.008***	−0.996***	−1.074***	−0.977***	−0.972***	−0.944***	−1.019***	−0.945***
SE	(0.239)	(0.254)	(0.246)	(0.229)	(0.262)	(0.239)	(0.191)	(0.214)	(0.347)
Δcf_{t-1}	1.374**	1.246**	1.527***	1.748**	1.451**	1.580***	2.177***	1.621**	1.356**
SE	(0.469)	(0.433)	(0.481)	(0.604)	(0.583)	(0.443)	(0.541)	(0.589)	(0.597)
Δcap_{t-1}	−0.904**	−0.784**	−1.036**	−1.178**	−0.962*	−1.008**	−1.672***	−1.152**	−0.894*
SE	(0.384)	(0.329)	(0.361)	(0.501)	(0.473)	(0.355)	(0.429)	(0.511)	(0.437)
Δgdp_{t-1}	0.369**	0.417***	0.369**	0.361**	0.360**	0.280	0.310**	0.350**	0.371**
SE	(0.138)	(0.134)	(0.130)	(0.155)	(0.139)	(0.161)	(0.108)	(0.149)	(0.132)
ec_{t-1}	0.436**	0.321	0.425*	0.495**	0.467**	0.495**	0.995***	0.517**	0.437**
SE	(0.191)	(0.204)	(0.220)	(0.229)	(0.210)	(0.186)	(0.256)	(0.206)	(0.190)
TAX_t	0.221	0.301	0.248	0.232	0.211	0.174	0.116	0.247	0.215
SE	(0.265)	(0.267)	(0.247)	(0.234)	(0.253)	(0.280)	(0.201)	(0.242)	(0.302)
v_{t-1}		−0.912		−0.660**		0.774		−0.761**	
SE		(0.964)		(0.226)		(0.670)		(0.336)	
v_{t+1}			0.763		−0.182		3.903**		0.0129
SE			(0.917)		(0.424)		(1.400)		(0.197)
$\bar{R}^2$	0.397	0.378	0.386	0.487	0.359	0.369	0.523	0.441	0.354

*,**,*** Significant at the 10%, 5% and 1% critical level, respectively.

hypothesis for repurchases. Economic growth (GDP) represents a positive stimulus for excess cash flow and thus merger activity. Thus, like repurchases, mergers are procyclical, with increases occurring later in the business cycle. The results also show that merger activity responds positively to capital investment and negatively to cash flow, controlling for business cycle effects. These results are more consistent with those of equity issuers. Perhaps most importantly, Table 10 presents little support for the importance of potential misvaluation in explaining merger waves. Thus, the correlation between merger, equity issuance, and repurchase waves is most likely driven by economic forces rather than potential misvaluation.

4.4.2. Long-run performance of repurchasing firms

The focus of this paper is on aggregate patterns in stock repurchases. However, the evidence in this paper could relate to the literature on the performance of repurchasing firms. Lakonishok and Vermaelen (1990), Ikenberry, Lakonishok, and Vermaelen (1995), and Peyer and Vermaelen (2008) show that firms that announce a stock repurchase have positive abnormal stock returns up to 4 years following the repurchase announcement. This evidence not only challenges market efficiency but is often interpreted as evidence that managers successfully time the market when the firm repurchases its stock. In contrast to these papers, we find little evidence to suggest that potential mispricing impacts the growth in or prevalence of aggregate stock repurchases. Rather, we suggest that changes in economic conditions drive these patterns.

How do we reconcile these apparently contradictory results? That is, why does a portfolio of repurchasing firms outperform the market if valuation motives and timing do not explain aggregate repurchasing activity? First, we note that the long-run literature shows that *some* repurchasing

firms outperform the market. Specifically, the abnormal performance is most concentrated in small and low market-to-book firms. Although a trading strategy based on small and low market-to-book could be profitable, it does not indicate that most, and therefore aggregate, repurchases are transacted at below-fundamental values. Further, since the performance of these strategies is strongest in small firms, while large firms are the dominant repurchasers (see Dittmar, 2000), this behavior is unlikely to drive repurchase waves. Massa, Rehman, and Vermaelen (2007) highlight that many firms neither time the market nor have abnormal stock performance. Second, in this paper, we focus on *actual* repurchases, whereas the long-run performance literature examines performance following *announcements*. As 75% of repurchases are not completed, and many announced repurchase programs are not even initiated, this distinction could also account for the difference in the results.

5. Conclusion

Why do corporate financing events occur in waves and why do these waves, particularly for 'opposing' transactions, mirror each other? In this paper, we document the correlation between stock repurchases, equity issuance, and mergers. We then investigate why stock repurchases and equity issuances (and to some extent mergers) occur in correlated waves. In doing so, we call into question previous findings that issuance and merger waves occur due to patterns of misvaluation.

We provide additional evidence against the misvaluation hypothesis using a VAR analysis of repurchases, issuances, returns, and growth in the economy. Though we are able to replicate some of the patterns of returns around equity issuance, we show a similar pattern around stock repurchases. That is, if firms issue equity following a stock price run-up due to market overvaluation, then they also repurchase stock after a period of market overvaluation. Additional tests of the impact of relative misvaluation indicate that misvaluation does not drive equity issues and repurchases. Additionally, we show that though the returns following issuances (and repurchases) are lower than in other periods, they are not negative as one would expect during a market correction. Thus, at best we can say that equity issuance (and repurchases) predicts lower returns and likely reflects time-varying costs of capital rather than misvaluation.

What does explain the correlation in waves of financing activity? We argue that these waves result from differing responses to the same economic stimulus. Growth in GDP significantly explains both repurchase and issuance activity. Specifically, economic expansion reduces the cost of equity relative to the cost of debt, inducing many firms to issue equity. Economic expansion also causes varying degrees of uncertainty, thus increasing the need for flexibility or repurchases during more uncertain periods. We provide evidence consistent with each of these explanations. Volatility in GDP growth positively and significantly explains repurchase activity, and changes in several measures of the cost of equity and cost of debt significantly explain aggregate equity issuance. Given that economic growth relates to each of these factors, our results show that the costs and benefits of equity issuance and repurchases fluctuate due to changes in the business cycles in ways that induce a correlation between these financing activities. Thus, changes in economic conditions drive corporate financing waves and lead to much of the correlation with past and future returns attributed to misvaluation.

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