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Patterns in the Timing of Corporate Event Waves

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Abstract

Corporate events happen in waves. In this paper, we examine the timing patterns of 5 different types of corporate event waves (new stock and seasoned equity issues, stock- and cash-financed acquisitions, and stock repurchases) using a comprehensive data set of more than 151,000 corporate transactions over the 25-year period from 1980 to 2004. We document a distinctive pattern, previously not found in the literature, in the way stock-related waves form. Corporate waves seem to start with new issue waves (seasoned equity offering preceding initial public offering waves), followed by stock-financed merger waves, followed in turn by repurchase waves. Our results hold over separate decades and across industries. Our results seem consistent with both the neoclassical efficiency hypothesis and the misvaluation hypothesis, and there are distinct periods when one or the other appears dominant.

I. Introduction

It has been extensively documented that corporate events occur in waves. This is true for mergers (Weston, Mitchell, and Mulherin (2004), Andrade, Mitchell, and Stafford (2001), Rhodes-Kropf, Robinson, and Viswanathan (2005), Harford (2005), and Dong, Hirshleifer, Richardson, and Teoh (2006)), initial

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public offerings (IPOs) (Ritter (1984), Maksimovic and Pichler (2001), and Lowry (2003)), seasoned equity offerings (SEOs) (Lucas and McDonald (1990), Choe, Masulis, and Nanda (1993), and Bayless and Chaplinsky (1996)), and stock repurchases (Dittmar and Dittmar (2008)). Almost every empirical study so far has examined individual types of waves separately.

It is plausible, however, that a relation exists between the different types of corporate events. Our starting point is the observation that most corporate events are combinations of 2 activities that have been central to corporate finance: financing decisions and investment decisions. What distinguishes the events is the extent to which they involve either the financing decision or the investment decision. We consider pure financing decisions—SEOs, IPOs, and stock repurchases—to be related, in that the former two both involve firms issuing equity, while the latter involves buying back equity. A stock-financed acquisition is a combination of a financing activity (an SEO) and an investment activity (an acquisition). A cash-financed acquisition is more likely to be a pure investment.[1] Theories that describe why firms choose investment or financing decisions imply that related corporate events should be affected by the same factors. Examining the relation between waves of different types of corporate events may therefore help in establishing the validity of these theories.

More specifically, the academic literature has traditionally argued that corporate event waves are driven by 1 of 2 hypotheses. Though these theories have been postulated for event waves in isolation, we extend them to derive implications as to the relationship between event waves. The neoclassical *efficiency* hypothesis (see, e.g., Gort (1969)) suggests that managers undertake corporate transactions for efficiency reasons, issuing equity or buying targets to take advantage of growth opportunities or to invest in positive net present value (NPV) projects. These opportunities may arise in the normal course of the business cycle or due to industry-level shocks to productivity, such as technological innovation or deregulation. Repurchases are undertaken when there are no such opportunities. According to this hypothesis, the method of payment should not matter when firms make acquisitions. Hence equity issuance and cash- and stock-financed acquisition waves should occur close together. Repurchase waves should not occur simultaneously with stock issue waves.

The alternative, the *market misvaluation* hypothesis (see Shleifer and Vishny (2003) or Baker, Stein, and Wurgler (2003)) suggests that rational managers take advantage of irrational market misvaluations by issuing stock in exchange for cash or other firms. According to this hypothesis, equity issuance waves (IPOs and SEOs) should occur simultaneously with stock-financed acquisitions. Cash-financed acquisitions and repurchase waves should not occur simultaneously with equity issuance waves or stock-financed acquisitions.

[1]There are alternative ways to describe how corporate events might be related. For example, a cash-financed acquisition is equivalent to a stock-financed acquisition followed by a repurchase, if the acquirer wishes to finance the deal with cash but the target shareholders prefer stock for tax purposes. Acquisitions (both stock- and cash-financed) can also be distinguished from other events by noting that acquisitions change the number of firms operating in industries (the organizational structure of the industry), while other events do not.

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In this paper, we examine the timing of 5 different types of corporate events (new issues (both IPOs and SEOs), mergers (both stock- and cash-financed), and share repurchases) using a comprehensive data set of corporate transactions over a 25-year period (1980–2004) to examine the relation between the waves and determine whether they occur in a particular pattern.

The first part of our analysis consists of 3 tests that explore the correlation structure of event activity, that is, how activity in one type of event correlates with activity in other events. First, we find strong positive correlations at the industry level in *contemporaneous* activity within stock issuance events of different types (SEOs, IPOs, and stock-financed mergers and acquisitions (M&As)), and negative correlations between all 3 stock issuance events and stock repurchases. Similarly, there is a positive but weaker correlation between the 2 organizational events (cash- and stock-financed M&As). There is no correlation between cash-financed M&A activity and SEO, IPO, or repurchase activity.

Second, using vector autoregressive (VAR) models, we show that there is also a distinct pattern in *lagged* activity. Granger *F*-tests show that lagged SEO volume predicts future IPO volume, and that lagged SEO and IPO volume both predict future stock-financed M&A volume. In other words, stock issue volume seems to precede future stock-financed M&A volume. In turn, lagged stock-financed acquisition activity predicts future repurchase activity. However, cash-financed acquisitions seem unrelated to other corporate events—lagged volumes of other events do not predict cash-financed acquisitions nor vice versa. We observe these patterns both at the aggregate level and at individual industry levels, both in the 1980s and in the 1990s.

Third, we examine patterns in *waves* of corporate activity, both at the aggregate level and within industries. Using a bootstrap simulation approach, we classify periods when actual event activity exceeds the maximum of a simulated distribution of corporate event activity as potential waves. In line with the contemporaneous correlation results, we show that there is considerable overlap between all types of stock-related waves. However, similar to our results from the VAR models, waves do not overlap completely. Stock issue waves start first, with SEO waves preceding IPO waves, followed by stock-financed M&A waves, and finally by stock repurchase waves. Stock-financed M&A waves continue well after SEO and IPO waves have ended. In addition, especially in the 1990s, stock repurchase waves continue after stock-financed M&A waves have ended. Within industries, the broad pattern of events follows a strikingly similar pattern to the aggregate pattern discussed above.

What does this first part of our analysis tell us about the neoclassical efficiency and the misvaluation hypotheses? The pattern we document in corporate event waves is broadly consistent with the neoclassical efficiency hypothesis, though some aspects are consistent with the misvaluation hypothesis. We find strong correlations in contemporaneous activity between stock issuance events (SEOs, IPOs, and stock-financed M&As), and weaker correlation between organizational events (cash- and stock-financed M&As). Repurchases occur after waves in all other events have ended. The neoclassical hypothesis is silent on why there should be only a weak relation between stock- and cash-financed acquisition activity, which suggests that stock issuance events may be associated with

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some form of misvaluation.[2] Our results are not consistent with explanations of waves that suggest that waves of different events form when firms carry out 2 separate transactions in place of 1 (e.g., raising cash in an SEO in order to do a cash-financed acquisition). When we eliminate such combinations of events, our results are unaffected, suggesting that these explanations do not cause the patterns that we observe.

The second part of our analysis involves regressions where we explain the likelihood of different types of waves using explanatory variables that proxy for neoclassical efficiency or misvaluation factors. We use 5 sets of variables that proxy for either neoclassical (fundamental valuation, liquidity, and strategic interaction variables) or market misvaluation factors, respectively. This analysis sheds some light on a puzzle that has plagued a large part of the research on waves of corporate events, with different researchers finding support for either the neoclassical or the misvaluation hypothesis for the same event. Our analysis suggests that waves are driven by both neoclassical and misvaluation factors and that the relative importance of these factors changes in different periods, leading to differing conclusions in the different studies.

In general, while the same neoclassical factors (low unemployment, high future capital expenditures, and low cash holdings) appear important in explaining the occurrence of equity issuance waves, 2 misvaluation factors (industry- and firm-specific overvaluation components of the market-to-book ratio) are also significant in explaining the occurrence of these waves. In contrast, cash-financed M&A waves occur in industries with low growth opportunities (negative long-run component of the market-to-book ratio and no relation to forward capital expenditure), and repurchase waves occur when the firm-specific error component of the market-to-book ratio is negative, suggesting that repurchase waves occur when firms are undervalued.

However, there are also distinct periods when the waves seem to be influenced by different factors. For example, when we examine periods of time when waves of different types overlap (as documented in the first part of the analysis), we find that although stock issuance waves are generally associated with high firm-specific misvaluation and are not related to the long-run component of the market-to-book ratio that proxies for growth opportunities, there are distinct periods when growth opportunities become significant and/or firm-specific misvaluation appears absent. Similarly, cash-financed M&A waves are not driven by misvaluation when they occur on their own. However, periods when cash-financed M&A waves overlap with stock-financed M&A waves are associated with misvaluation. In general, periods when waves of events overlap are also periods when either the efficiency shock or the misvaluation is more pronounced. Less pronounced efficiency shocks or less severe misvaluation give rise to waves in only one, but not all, events.

Overall, we describe a previously undocumented pattern between waves of different types of corporate events. The patterns we document account for a very

[2] Alternatively, in the presence of uncertain growth opportunities, acquirers might prefer to pay with stock rather than cash to avoid the winner's curse problem, thus forcing target shareholders to share the potential costs of overvaluing the growth opportunity.

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large proportion of total activity across the 25-year period. Our analysis offers a partial explanation to a puzzle in previous research: namely, that different studies find support for different hypotheses. We show that support for the hypotheses depends on whether the event in question occurs earlier or later in the business cycle, and whether it occurs separately or concurrently with other events.

The paper most similar to ours is a concurrent study conducted by Dittmar and Dittmar (2008). They find a positive relation between levels of aggregate repurchase activity and levels of aggregate stock issuance or merger activity, which they interpret as evidence against the presence of misvaluation. However, the correlations that they report are likely caused by the presence of unit roots in the levels series. When we conduct the analysis on first differences, there is a *negative* correlation between stock issuance activity and stock repurchases. In addition, Dittmar and Dittmar (2008) use aggregate marketwide activity series, whereas we use industry activity series. When we use aggregate activity, we also find a significant overlap of several quarters when stock issuance and stock repurchase waves overlap. However, this is because the stock issuance and the stock repurchase waves are happening simultaneously in *different* industries. There is not a single industry where repurchase waves overlap with SEO, IPO, or stock-financed acquisition waves. Therefore, our industry analysis suggests that misvaluation probably drives stock issuance activity, since this activity occurs in different industries than stock repurchase activity.

The paper is organized as follows. Section II describes the hypotheses behind the relationship between corporate event waves. Section III describes the data, and Section IV reports descriptive statistics. Section V investigates the correlations between different types of corporate event waves. Section VI reports regressions of activity and waves where the likelihood of different types of waves is explained by explanatory variables that proxy for neoclassical efficiency or misvaluation factors. Section VII concludes.

II. Hypotheses behind the Relationship between Event Waves

To the best of our knowledge, there is *no* literature, theoretical or otherwise, that offers any priors on the relation between corporate events of different types. However, as we argue in the Introduction, a priori there is reason to believe that a relation should exist. Most of the literature has focused on one particular type of wave at a time, though a handful of recent papers discuss possible patterns between corporate events.

We begin the analysis with the observation that most corporate events are combinations of 2 activities that are central to corporate finance: financing decisions and investment decisions. What distinguishes the events is the extent to which they involve either the financing decision or the investment decision. We consider pure financing decisions—SEOs, IPOs, and stock repurchases—to be related, in that the former two both involve firms issuing equity, while the latter involves buying back equity. Therefore, factors that cause spikes in equity issuance should affect the first two in similar ways but repurchases in opposite ways. A stock-financed acquisition is a combination of a financing activity

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(an SEO) and an investment activity (an acquisition). Therefore, factors that affect the levels of equity issuance should affect SEO and stock-financed acquisition activity similarly, but factors related to, say, technological or organizational innovation should affect the latter but not necessarily the former (depending on how the proceeds from the SEO are used). A cash-financed acquisition is more likely to be a pure investment decision (unless the cash was raised through an SEO). Financing considerations, if involved, will affect these waves in opposite directions to stock-financed acquisitions.

An alternate but related taxonomy is to define stock issuance events as any kind of corporate activity that involves a manager issuing equity to a public capital market. SEOs, IPOs, and stock-financed acquisitions can be classified as stock issuance events. Stock repurchases are in the same category but involve firms buying back stock. We also define organizational waves as any kind of activity that involves a change in the number of firms that are publicly traded at a given point in time in an industry. Cash- and stock-financed acquisitions are organizational waves. We note that, as is also the case when we distinguish between financing and investment activities, this taxonomy is not clean. Stock-financed acquisitions involve both stock issuance and organizational activity.

Given the neoclassical efficiency and the misvaluation explanation of event waves discussed in the Introduction, what does the above taxonomy of events suggest i) for the timing in corporate event activity, and ii) for the variables that should be significant in explaining event waves? With respect to timing, we note that we may observe 2 possible relationships. First, we may observe correlations across contemporaneous corporate event activity, which may also be observable in an overlap between 2 or more different types of event waves. Second, we may observe correlations in lagged activity between events, which may also be observable as a specific sequence in which event waves occur.

Stock issuance or financing waves (SEOs, IPOs, and stock-financed M&As) should be affected mostly by similar factors. According to the neoclassical efficiency hypothesis (see, e.g., Gort (1969)), *contemporaneous activity* between SEOs, IPOs, stock-financed M&As, and cash-financed M&As should be positively correlated, since all these events are responses to common efficiency shocks. Contemporaneous stock issuance activity should be negatively correlated with repurchases.

The neoclassical hypothesis does not make any consistent predictions about correlations in *lagged activity* or sequence in waves. Predictions for correlations in lagged activity will depend on the nature of the efficiency shock (Andrade et al. (2001), Holmström and Kaplan (2001), Weston et al. (2004), Choe et al. (1993), Lucas and McDonald (1990), and Bayless and Chaplinsky (1996)). If the shock is technological and innovation starts in existing firms, then SEOs may precede other types of events. If the shock is technological and innovation starts in nascent start-up firms (e.g., computer software, Internet, biotechnology), then IPOs may precede cash- and stock-financed M&As, which in turn may precede SEOs. A similar pattern may be expected according to a life cycle hypothesis (Lyandres, Zhdanov, and Hsieh (2011)), which suggests that firms are born and then engage in other activities or are taken over. This suggests that IPOs

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should precede other types of events. According to the life cycle hypothesis, the correlation in lagged activity should disappear after eliminating future transactions by earlier IPO firms. If the shock is due to deregulation (e.g., banking) or overcapacity, then cash- and stock-financed acquisitions may occur without other events. Correlations in lagged activity between stock issuance events and repurchases are possible if repurchases follow at different stages in the business cycle.

Other correlations in lagged activity may also be possible if transaction costs are lower for SEOs compared to IPOs, compared to cash- and stock-financed M&As. Book-building and marketing for SEOs is simpler than for IPOs. Acquisitions, which involve identifying appropriate targets, negotiating with management, and potentially going through a public offer, may take even longer to initiate than either SEOs or IPOs. Therefore, even if all stock issuance events are responses to a common shock, the timing of the events may differ, which may lead to different relationships between the events in question and business cycle variables.

The neoclassical efficiency hypothesis for the *variables* explaining waves suggests that stock issuance waves should be associated with economic expansions and should exhibit a positive relationship with future capital expenditures. We expect a positive relationship with past stock returns and the component of the market-to-book ratio that proxies for growth opportunities. In addition, we expect a positive relationship with the dispersion of market-to-book ratios within the industry, since efficiency shocks alter the valuation rankings of those firms in possession of the growth opportunity relative to other firms (Maksimovic and Phillips (2001) or Jovanovic and Rousseau (2002)). In contrast, there should be no relationship between waves and the sector or firm-specific misvaluation component of the market-to-book ratio or investor sentiment. Repurchases should be negatively related to the factors above. They should show a negative relation with past stock returns and past market-to-book ratios and a positive relation to future market-to-book ratios (Vermaelen (1984)).

According to the misvaluation hypothesis (Shleifer and Vishny (2003)), contemporaneous activity should be a priori positively correlated across stock issuance events only (SEOs, IPOs, and stock-financed M&As). Stock issuance contemporaneous activity should not be correlated with cash-financed M&As and should be negatively correlated with repurchases. Correlations in lagged activity are possible if misvaluation changes over time or if transactions costs are lower for SEOs than for IPOs, than for stock-financed M&As. The latter relationship suggests that SEO waves should be followed by IPO waves, which will then be followed by stock-financed M&A waves. Repurchase waves may follow after the misvaluation is corrected.

The misvaluation hypothesis for the *variables* explaining waves suggests that stock issuance waves should be associated with economic expansions. The relationship with future capital expenditures is unclear. A priori there should be no relationship, since there is no efficiency shock to create investment opportunities. However, the relationship could be potentially positive if early misvaluation is misinterpreted by managers as growth opportunities, which may lead them to overinvest. For example, Chirinko and Schaller (2001) show that equity issuance

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and fixed investment increased substantially during the bubble of the late 1980s in Japan. Baker et al. (2003) show that financing and investment of equity-dependent firms is sensitive to the nonfundamental component of stock prices. However, Pagano, Panetta, and Zingales (1998) find that companies appear to go public not to finance future investments and growth, but to rebalance their accounts after high investment and growth.

There should be a positive relationship between stock issuance waves, past stock returns, and the sector or firm-specific misvaluation components of the market-to-book ratio (Rhodes-Kropf et al. (2005), Dong et al. (2006)). The relationship between stock issuance waves and future market-to-book ratios can be positive or negative depending on whether the misvaluation persists or whether it is corrected (e.g., if managers time the market, they may issue stock when valuations are at their highest, with valuations subsequently declining). According to the misvaluation hypothesis, there should be no relationship between stock issuance waves and the dispersion in market-to-book ratios within the industry, since marketwide misvaluation is more likely to affect all firms in the industry. There should also be a positive relationship between waves and investor sentiment (Lee, Shleifer, and Thaler (1991), Rajan and Servaes (1997)).

We note that some of the differences between cash- and stock-financed acquisitions may also be explained by considering the misvaluation in the target as well as the acquirer (Rhodes-Kropf and Viswanathan (2004)). Differences between uncertainties about synergies and stand-alone values may also affect acquisitions patterns (Brusco, Lopomo, Robinson, and Viswanathan (2007)). Fuller, Netter, and Stegemoller (2002) find that acquirers are more likely to overpay for publicly listed (as opposed to private) targets. A high proportion of publicly listed targets may serve as an additional proxy of potential misvaluation within an industry.

Repurchases should be related to these variables in the opposite direction from stock issuance. In addition, Massa, Rehman, and Vermaelen (2007) argue that repurchase waves may also occur when firms respond strategically to other firms' actions in concentrated industries, suggesting that the industry's Herfindahl index should be positively related to wave activity.

When we turn our attention to organizational events or investment activities, the taxonomy suggests that both cash- and stock-financed acquisitions should be the result of neoclassical efficiency shocks (i.e., there is no place for misvaluation in cash-financed acquisitions) and should occur together. The same factors that affect events under the neoclassical efficiency hypothesis should affect cash- and stock-financed M&As in similar ways.

In addition to neoclassical and misvaluation factors, waves may also critically depend on liquidity in the capital markets. Liquidity may accentuate the presence of neoclassical or misvaluation motivations. For example, it has been shown that acquisition waves may require liquidity in the capital market as well as the remaining efficiency variables, suggesting significant overlap in cash- and stock-financed M&A waves (Schlingemann, Stulz, and Walkling (2002), Eisfeldt and Rampini (2006), Lowry (2003), and Harford (2005)). In contrast, the lack of liquidity may hinder transactions. Many of the transactions under consideration are intermediated transactions, which necessitate the presence of underwriters.

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It has been suggested that waves may occur when investment bankers bundle together transactions for presentation to a common investor pool (Benveniste, Busaba, and Wilhelm (2002) or Benveniste, Ljungqvist, Wilhelm, and Yu (2003)). Liquidity in the capital markets may be manifested in the form of correlations between different types of M&A transactions (Schlingemann et al.) or in the form of lower interest rate spreads for raising capital. Furthermore, some industries may be characterized by cash hoarders who may prefer internal rather than external sources of capital.

Finally, since corporate events might also be simple combinations of other types of events, these relationships might just occur in a purely mechanical fashion. For example, the cash used in a cash-financed acquisition may have been raised in a prior SEO. This would create a mechanical positive relationship between SEO and cash-financed M&A activity. Similarly, a stock-financed acquisition is essentially a combination of an SEO and a cash-financed acquisition. Therefore, to the extent that the proceeds from SEOs are used to finance acquisitions, contemporaneous activity between SEOs and cash- and stock-financed M&As should be positively correlated and their waves should overlap. Finally, the combination of a stock-financed merger and a repurchase should be equivalent to a cash-financed merger, if the acquirer prefers to pay cash but the target shareholders prefer to receive stock for tax reasons (Fama and French (2001)). This would also give rise to mechanical positive correlations in contemporaneous activity in cash-financed M&As, stock-financed M&As, and repurchases. However, these correlations should disappear after eliminating cash-financed acquisitions by firms that have recently raised cash in SEOs or after eliminating repurchases by firms that conduct stock-financed acquisitions.

III. Data and Methodology

We obtain our sample by searching the Securities Data Company (SDC) database for transactions undertaken by U.S. firms during 1980–2004. We download data on corporate acquisitions, equity issues, and stock repurchases taking place in the U.S. markets and with U.S. target firms. We analyze the entire universe of completed deals (including both public and private firms). We cross-check the data to ensure that no deal is classified in more than 1 category. Our M&A sample includes M&As of stand-alone firms, acquisitions of divested assets (transactions designated as divestitures by SDC and transactions where the target's public status is designated as a subsidiary), tender offers, leveraged buyouts (LBOs), acquisitions of noncontrolling stakes, and acquisitions of remaining interests. We exclude from the sample transactions by bankrupt firms (in liquidation or Chapter 11 proceedings) and the formation of joint ventures. We record the method of payment, classifying deals into 100% cash deals, 100% stock deals, deals where the consideration contains some cash, and deals where the consideration contains some stock.[3] Our common stock issues sample includes all IPOs, all public issues (SEOs), private placements, and Rule 144A issues. Our

[3]In many cases, SDC misclassifies the status, method of payment, etc. for deals, especially in the 1980s. Therefore we hand-correct the variables reported by SDC for such errors by referencing the

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stock repurchases sample includes all stock repurchases and self-tender offers. We exclude shelf registrations and issues by real estate investment trusts (REITs); investment funds; federal, national, regional, city and nongovernmental agencies; regional and city governments; religious organizations; universities; nonprofit organizations; and professional associations.

We obtain macroeconomic, stock return, and accounting data for the universe of U.S. publicly listed firms from International Financial Statistics (IFS), Center for Research in Security Prices (CRSP), Compustat, and Datastream. We obtain credit ratings from the Standard and Poor's (S&P) credit rating database maintained by Wharton Research Data Services (WRDS), and interest rates (corporate bond yields and Treasury bill rates) from the Mergent Fixed Income Securities Database (FISD) and from the database maintained by the Federal Reserve Bank of Saint Louis.

Our methodology for identifying waves is based on simulations of total aggregate activity. We create a simulated distribution for each event by randomly assigning each actual deal to a quarter within our sample period. The probability of being assigned to a specific quarter depends on the actual total number of NYSE-/AMEX-/NASDAQ-listed firms during that quarter. Therefore, periods with more listed firms will be assigned more events by our simulations. Since there are many more events in the 1990s compared to the 1980s, we do the simulations separately for 1980–1990 and for 1991–2004.[4] The following example serves to clarify the procedure. There were 24,854 cash-financed M&A deals in the 56 quarters from 1991 to 2004. We assign these deals randomly to the 56 quarters. However, even in the absence of waves, we should a priori expect more deals to occur in some quarters, simply because there are more firms listed, making a potentially larger pool of firms available to engage in M&As. There were 6,659 firms listed in the 1st quarter of 1991, 9,113 in the 4th quarter of 1997, and 6,733 in the 4th quarter of 2004. Consequently, the probabilities of our simulation assigning a deal to each of the 3 quarters are 1.52%, 2.09%, and 1.54%, respectively. We repeat the procedure 1,000 times in order to generate 1,000 randomly drawn series for each event. Any quarter where actual activity (measured as the number of deals) exceeds the maximum of the simulated distribution is designated as a potential aggregate wave quarter.

An example of this procedure appears in Figure 1, where we illustrate the process for stock repurchases. The procedure for identifying the waves in the other types of events is similar. The figure shows the actual and simulated levels of stock repurchase activity during 1980–1990 (Graph A) and 1991–2004 (Graph B). The shaded area represents the minimum and maximum number of repurchases for

synopsis of the transaction. We also note that the exclusion of bankrupt firms from the analysis does not impart a bias on the results. Adding acquisitions of bankrupt targets would increase our overall M&A sample by less than 3%. We also check the industry classification of the acquirers of bankrupt firms and find that the frequency of such deals across industries does not differ significantly from the frequency for the remaining sample.

[4]This is especially true for M&A transactions (as reported in Table 1). Using data over the entire 1980–2004 period to simulate M&A activity gives rise to very few wave quarters during the 1980s. Most empirical research uses 10-year periods to examine merger activity, since it is easier to characterize the mergers as belonging to the 1980s, the 1990s, etc.

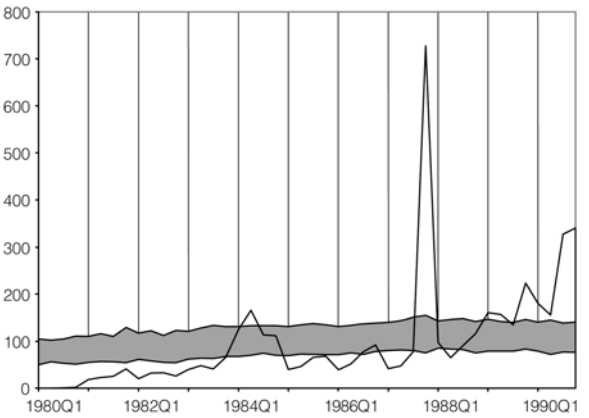
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FIGURE 1

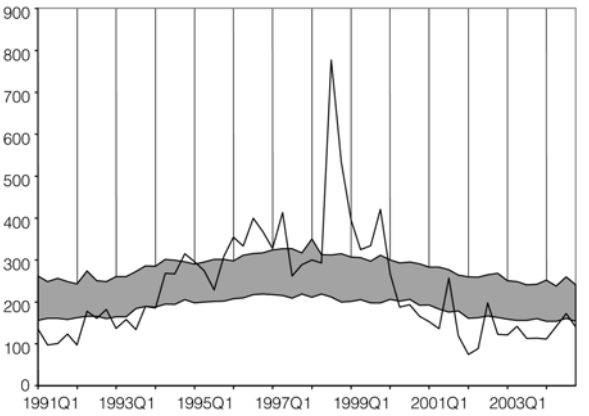
Example of Actual and Simulated Activity: Aggregate Repurchases (1980–2004)

Figure 1 shows the actual and the simulated levels of aggregate stock repurchase activity during 1980–2004. Graph A depicts activity during 1980–1990, and Graph B depicts activity during 1991–2004. We create a simulated distribution for each event by randomly assigning each actual deal to a quarter within our sample period, where the probability of being assigned to a specific quarter depends on the actual total number of NYSE-/AMEX-/NASDAQ-listed firms during that quarter. We repeat the procedure 1,000 times, separately for each of the 2 periods 1980–1990 and 1991–2004, in order to generate 1,000 randomly drawn series for each event each period. The shaded area represents the quarterly minimum and maximum number of repurchases derived from the simulated distribution of these 1,000 series. The solid line represents the actual quarterly number of repurchases during the same period. Our actual sample consists of 17,342 stock repurchases undertaken by U.S. firms during 1980–2004 and obtained from the SDC database.

Graph A. 1980–1990



Graph B. 1991–2004



each quarter derived from the simulated distribution of the 1,000 series. The solid line represents the actual quarterly number of repurchases during the same period. Whenever the solid line exceeds the maximum value of the simulated distribution, we define this as a period of excess activity or a "wave."

We can make a number of observations by looking at these graphs. First, the simulated activity changes over time and is higher during periods when more firms are publicly listed. This is because the pool of firms that may potentially engage in repurchases is higher during such periods. Second, since the range of

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the simulated distribution is relatively narrow, changing the cutoffs for identifying the waves would not have a serious impact on our results. Third, we identify with precision quarters with excess activity, and we do not artificially constrain our waves to last for a certain number of consecutive quarters. Ultimately, how many consecutive quarters of excess activity make a "wave" is a matter of interpretation rather than empirical fact. For example, Harford (2005) constrains merger waves to last for 2 years. Had we applied the same methodology, we would get a 2-year "wave" of repurchase activity straddling the 4th quarter of 1987 (see Graph A of Figure 1). However, that would be misleading. All excess repurchase activity was concentrated during this single quarter in the aftermath of the stock market crash, and there is no excess activity in the years either preceding or following this single quarter. Furthermore, there is no reason to expect a priori that waves for all the types of corporate events that we examine must last for the same number of quarters.

We follow the same approach for identifying waves at the industry level for each of 59 industries in which we classify the firms in our sample.[5] For the industry simulations, we assign the actual number of deals in each industry into quarters, where the probability of an event being assigned to a given quarter depends on the number of actual listed firms belonging to the industry in question.

There are 2 possible approaches to structuring an examination of the relationship between different types of waves in corporate events. Both have advantages and disadvantages, so we report our analysis using both. One approach is to combine all stock issuance events (SEOs, IPOs, stock-financed M&As, with repurchases representing negative net stock issuance) and all organizational events (cash- and stock-financed M&As) by aggregating all such transactions and treating them as a single type of event (the same can be done with financing and investment events). This approach can establish the commonality between different corporate events. Since all stock issuance (or organizational) events are inherently similar, they should be driven by common factors, so aggregating them will highlight the similarities between them.

However, 2 types of problems are associated with this approach, both practical and theoretical. On the practical side, the number of transactions in each event differs. For example, cash-financed acquisitions in our sample outnumber stock-financed acquisitions by a ratio of 3 to 1. If we combine the two as a single type of organizational transaction, then any wave of activity that we identify will be driven entirely by cash-financed M&As, and the inclusion of stock-financed transactions will have no impact. On the theoretical side, despite their similarities, even stock issuance events do have differences. SEOs and stock-financed acquisitions are carried out by firms that are already publicly listed, whereas IPOs are carried out by nonlisted firms. The characteristics of these firms are different. Moreover, as discussed in the previous section, transaction costs also differ across corporate events. Finally, combining all stock issuance events implies that these events occur at the same time. This, however, should be a matter of empirical

[5]Our industrial classification mainly follows the 2-digit Standard Industrial Classification (SIC) code and is available from the authors.

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observation and test rather than an assumption. Even if all stock issuance events are responses to a common shock, the timing of the events may differ, which may lead to different relationships between the events in question and business cycle or misvaluation variables. Such differences will be lost if we aggregate events within each category. Consequently, we report both event-by-event analysis and analysis of combinations of events of similar type.

Finally, our aim is to capture managerial intent. To reduce the impact of spurious patterns due to differing transactions costs and completion delays, we base our analysis on initial announcements of events rather than on completion.

IV. Descriptive Statistics

Table 1 presents annual levels of the main corporate events in our sample during the period 1980–2004. During this 25-year period, there are a total of 23,389 common stock issues (of which 10,077 are SEOs and 8,985 are IPOs), a total of 110,580 M&A transactions (which consist of 56,489 mergers or acquisitions, 36,071 divestitures or partial-firm acquisitions, 11,346 acquisitions of noncontrolling stakes, 3,989 LBOs, 1,468 tender offers, and 1,217 acquisitions of remaining interests), and a total of 17,342 stock repurchases. With respect to the M&A transactions, there are 10,743 deals where the consideration was entirely paid in acquirer common stock and 31,194 deals where the consideration was entirely paid in cash. These totals are based on SDC data, corrected for errors in the way the method of payment is reported.

We can make 4 main observations from Table 1. First, most types of corporate events appear to have 2 cycles with peaks in the late 1980s and the late 1990s and 2 troughs coinciding with the economic downturns during 1990–1991 and 2001–2002. The 2nd cycle consists of substantially more transactions than the 1st cycle. For most events, there are more transactions even in the trough of 2001–2002 than there are at the peak of the late 1980s.

Second, the number and value of stock issuance events (SEOs and IPOs) is several orders of magnitude smaller than the number and value of cash-financed acquisitions. Even if the entire proceeds from *all* SEOs and IPOs were used to finance acquisitions, these figures suggest that the majority of cash-financed M&A activity still would not be financed through stock issuance activity.

Third, it is informative to compare the number and value of pure stock issues (where stock is issued in exchange for cash) and stock-financed acquisitions (where stock is issued in exchange for assets with uncertain value). Consistent with the misvaluation explanation, the 2 series follow similar patterns. In addition, the 2 series also appear of the same order of magnitude, with the value of pure stock issues exceeding the value of stock-financed acquisitions up to 1994. Thereafter, the value of stock-financed acquisitions is considerably larger than the value of stock issues, with the pattern reversing only after 2002.

Finally, it is interesting to compare stock repurchases with the remaining series in the table. During the 1980s, the number of repurchases peaks in 1987 (when there were 894 stock repurchases) and in 1990 (when there were 1,006). The 1987 peak coincides with the stock market crash in the 4th quarter of 1987, and almost all stock repurchases in 1987 occur in that quarter. The 3-year period

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TABLE 1

Annual Series of M&A and Financing Transactions

Table 1 reports descriptive statistics for a sample of 151,311 corporate events (110,580 merger and acquisition (M&A) transactions, 23,389 common stock issues—of which 8,985 are IPOs and 10,077 are SEOs—and 17,342 stock repurchases) undertaken by U.S. firms during 1980–2004 and obtained from the SDC database. All categories are mutually exclusive, and no deal is classified in more than 1 category. Our M&A sample includes M&As of stand-alone firms, acquisitions of divested assets (defined as transactions designated as divestitures by the SDC and transactions where the target's public status is designated as a subsidiary), tender offers, leveraged buyouts (LBOs), acquisitions of noncontrolling stakes, and acquisitions of remaining interests. We exclude from the sample transactions by bankrupt firms (in liquidation or Chapter 11 proceedings) and the formation of joint ventures. We include only completed deals in the sample. Our common stock issues sample includes all IPOs, all public issues (SEOs), private placements, and Rule 144A issues. Finally, our stock repurchase sample includes all stock repurchases and self-tender offers. We exclude from the stock issue samples, shelf registrations, and issues by REITs; investment funds; federal, national, regional, city, and nongovernmental agencies; regional and city governments; religious organizations; universities; nonprofit organizations; and professional associations.

	All Common Stock Issues		Initial Public Offerings (IPOs)		Seasoned Equity Offerings (SEOs)		All M&A Transactions		All Fully Stock-Based M&A Transactions		All Fully Cash-Based M&A Transactions		Stock Repurchases and Self-Tender Offers	
Year	Number (1)	($ bil) Value (2)	Number (3)	($ bil) Value (4)	Number (5)	($ bil) Value (6)	Number (7)	($ bil) Value (8)	Number (9)	($ bil) Value (10)	Number (11)	($ bil) Value (12)	Number (13)	($ bil) Value (14)
1980	522	13	143	1	379	11	79	14	28	6	8	3	3	0
1981	817	15	339	3	418	12	874	69	190	8	16	16	107	2
1982	610	16	119	1	436	15	1,560	52	234	7	44	1	111	2
1983	1,552	38	667	12	798	25	2,673	72	361	11	77	1	195	9
1984	657	10	338	3	240	6	2,856	124	320	8	154	12	517	37
1985	909	25	322	6	378	15	1,643	165	87	15	606	81	220	33
1986	1,361	44	684	17	476	20	2,421	155	152	14	1,024	96	261	32
1987	946	32	495	13	283	12	2,360	131	152	12	916	69	894	57
1988	558	19	205	4	126	6	2,689	190	114	9	1,155	128	369	47
1989	637	30	195	5	208	8	3,386	178	236	27	1,264	81	677	70
1990	497	22	167	4	176	9	3,366	96	212	22	1,076	49	1,006	40
1991	910	48	355	15	442	30	3,366	85	306	25	991	32	458	21
1992	1,075	56	475	20	464	30	3,919	103	441	23	1,192	39	618	38
1993	1,370	71	605	28	642	39	4,645	181	556	45	1,475	53	618	40
1994	1,045	48	507	16	377	23	5,676	228	667	53	1,863	105	1,036	75
1995	1,163	76	520	24	517	42	6,829	329	724	121	2,204	113	1,109	97
1996	1,491	101	766	38	612	50	7,843	469	838	129	2,600	136	1,455	173
1997	1,190	98	514	27	527	51	8,575	686	973	220	2,543	170	1,292	179
1998	841	113	314	29	372	47	9,321	1,220	949	659	2,568	202	1,903	229
1999	1,027	161	478	53	397	76	8,100	1,103	876	413	2,110	219	1,475	155
2000	917	194	354	49	362	90	7,512	1,171	941	571	1,784	191	814	167
2001	748	131	83	30	311	58	5,174	542	537	108	1,273	121	665	155
2002	736	97	79	22	313	52	4,824	320	348	91	1,296	119	485	120
2003	792	79	70	10	378	55	5,244	416	284	110	1,472	149	490	103
2004	1,018	111	191	32	445	68	5,645	443	217	108	1,483	228	564	232
Total	23,389		8,985		10,077		110,580		10,743		31,194		17,342	

until the 2nd peak in 1990 coincides with declines in the general level of stock prices (and low levels of M&A transactions and stock issuance activity), suggesting that in this period, companies may be buying back their stock because they believe they are undervalued. However, in the 1990s, consistent with Dittmar and Dittmar (2008), stock repurchases appear highly positively correlated with the remaining series and peak in 1998 (when there were 1,903 repurchases), when general stock price levels were high and M&A activity and stock issuance were also at their peak. In contrast, there were less than 500 repurchases annually at the market downturn of 2001 and 2002.

We next check if the activity we document in Table 1 is economically significant. If we are documenting large numbers of very small transactions, then our results may not be important from an economic viewpoint. We therefore compute correlation coefficients between the quarterly value and the quarterly number of

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transactions for different types of transactions (not reported in the tables). The coefficients between the aggregate value and the total number of transactions for all series, mergers, stock issues, and repurchases are highly positive and statistically significant. Similarly, we also compute correlations in the aggregate number and value series separately between different subtypes of corporate events (mergers, tender offers, acquisitions of noncontrolling stakes, and acquisitions of remaining interest) with each other and separately for M&A transactions and for financing transactions. Again, we observe high and statistically significant correlations across different types of events. The correlations are not affected by including all deals or deals by publicly listed firms. In fact, the correlations in the series between all deals and deals by publicly listed firms is almost 1. We conclude that our results are not likely to be driven by large numbers of very small transactions.

In the rest of our analysis, therefore, we focus on the numbers of transactions undertaken by all firms, whether public or private, for 2 reasons. When waves of activity are discussed in the academic literature or the popular press, the number of events is always used as the relevant measure. It is also difficult to define a wave in terms of the aggregate *value* of deals undertaken.

V. Correlations of Event Activity and Waves

Our first test is to examine the correlations between different types of events, that is, how activity of one type of event correlates with activity in other events. If correlations are absent, this would cast doubt on our predictions about waves of similar types. First, we examine correlations in contemporaneous and lagged aggregate volume of transactions, without distinguishing between wave and nonwave periods (Section V.A). Subsequently, we examine whether the same correlations are observable in the overlapping pattern of waves (Section V.B). Our second test involves regressions of activity and waves where we explain the likelihood of different types of waves using independent variables that proxy for neoclassical efficiency or misvaluation factors (Section VI). If our earlier predictions are correct, then the same factors should affect waves of the same type in similar ways.

A. Correlations of Event Activity

Panel A of Table 2 reports correlations of contemporaneous activity across different types of corporate events separately for 1980–2004, 1980–1990, and 1991–2004. Augmented Dickey-Fuller tests suggest the presence of unit roots in the cash-financed M&A, stock-financed M&A, SEO, and repurchase series. Therefore, we conduct our analysis on first differences (the tests reject the null hypothesis of unit roots in all the differenced series at the 1% level). To test the statistical significance of the correlations, we report p-values based on our simulated distributions. More specifically, for each event we use the simulated series in order to generate 1,000 series of simulated first differences. Subsequently, we generate 1,000 simulated cross-correlations of first differences for each pair of events A and B by computing the correlation between each simulated series of event A with the corresponding simulated series of event B. We compute the statistical

significance of the actual cross-correlations in the table by comparing them with the simulated distribution.

In Panel A of Table 2, contemporaneous volume in stock issuance transactions (SEOs and IPOs) is significantly positively correlated across both time periods. In the 1990s, stock- and cash-financed acquisitions are also positively correlated with stock issuance activities, although the correlation between cash-financed M&As and SEOs is relatively weak. In contrast, stock repurchases are mostly significantly negatively correlated with stock issues. There is no correlation between stock repurchases and cash-financed acquisitions. All correlations are stronger during the 1990s than the 1980s. This is not surprising, since corporate

TABLE 2

Correlations of First Differences between All Types of Activity
(based on number of transactions)

Panels A and B of Table 2 report correlations between first differences of contemporaneous quarterly numbers series across different types of transactions for a sample of 151,311 corporate events (110,580 merger and acquisition (M&A) transactions, 23,389 common stock issues—of which 8,985 are IPOs and 10,077 are SEOs—and 17,342 stock repurchases) undertaken by U.S. firms during 1980–2004 and obtained from the SDC database. Panel C reports results for 3rd-order vector autoregressive (VAR) models on 3 lags of first differences for different corporate events series. All categories are mutually exclusive, therefore no deal is classified in more than 1 category. Our M&A sample includes M&As of stand-alone firms, acquisitions of divested assets (defined as transactions designated as divestitures by the SDC and transactions where the target's public status is designated as a subsidiary), tender offers, leveraged buyouts (LBOs), acquisitions of noncontrolling stakes, and acquisitions of remaining interests. We exclude from the sample transactions by bankrupt firms (in liquidation or Chapter 11 proceedings) and the formation of joint ventures. We include only completed deals in the sample. Our common stock issues sample includes all IPOs, all public issues (SEOs), private placements, and Rule 144A issues. Finally, our stock repurchase sample includes all stock repurchases and self-tender offers. We exclude from the stock issue samples, shelf registrations, and issues by REITs; investment funds; federal, national, regional, city, and nongovernmental agencies; regional and city governments; religious organizations; universities; nonprofit organizations; and professional associations. In Panel A, significance levels (*p*-values) for a 2-tailed test based on our simulated distribution are reported in parentheses. We create the simulated distribution for each event by randomly assigning each actual deal to a quarter within our sample period, where the probability of being assigned to a specific quarter depends on the actual total number of NYSE-/AMEX-/NASDAQ-listed firms during that quarter. We repeat the procedure 1,000 times, in order to generate 1,000 randomly drawn series for each event. We use these series in order to generate the series of simulated first differences. Subsequently, we generate 1,000 simulated cross-correlations of first differences for each pair of events A and B by computing the correlation between each simulated series of event A with a corresponding simulated series of event B. We compute the statistical significance of the actual cross-correlations in the table by comparing them with the simulated distribution. In Panels B and C, we classify the corporate transactions in our sample into 59 industries and estimate pooled regressions including industry fixed effects. Panel B reports regressions of contemporaneous activity of each type of transaction on contemporaneous activity of all other types of transactions. Panel C reports regressions of activity of each type of transaction on lagged values of activity of all other types. Intercepts and industry fixed effects are estimated but not reported. The adjusted R^2 incorporates the impact of fixed effects. Significance levels (*p*-values) in parentheses are based on the Newey-West (1987) standard errors corrected for heteroskedasticity and autocorrelation. The *p*-values for the Granger causality tests (*F*-tests) are also corrected for heteroskedasticity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Cross-Correlations of Contemporaneous Aggregate Marketwide Activity

Events		IPOs $[Q(0)-Q(-1)]$ (1)	Stock-Financed M&A Transactions $[Q(0)-Q(-1)]$ (2)	Cash-Financed M&A Transactions $[Q(0)-Q(-1)]$ (3)	Stock Repurchases $[Q(0)-Q(-1)]$ (4)
SEOs$_{[Q(0)-Q(-1)]}$	1980–2004	0.56 (0.00)***	0.28 (0.03)**	0.19 (0.15)	–0.26 (0.03)**
	1980–1990	0.43 (0.02)**	–0.10 (0.63)	0.01 (0.97)	–0.11 (0.52)
	1991–2004	0.67 (0.00)***	0.45 (0.01)***	0.33 (0.06)*	–0.44 (0.00)***
IPOs$_{[Q(0)-Q(-1)]}$	1980–2004		0.34 (0.00)***	0.32 (0.01)**	–0.25 (0.04)**
	1980–1990		0.18 (0.33)	0.27 (0.18)	–0.32 (0.08)*
	1991–2004		0.44 (0.00)***	0.37 (0.02)**	–0.16 (0.27)
Stock-financed M&A transactions$_{[Q(0)-Q(-1)]}$	1980–2004			0.39 (0.00)***	–0.04 (0.57)
	1980–1990			0.00 (0.97)	–0.09 (0.60)
	1991–2004			0.53 (0.00)***	–0.06 (0.54)
Cash-financed M&A transactions$_{[Q(0)-Q(-1)]}$	1980–2004				–0.13 (0.23)
	1980–1990				0.02 (0.99)
	1991–2004				–0.26 (0.08)*

(continued on next page)

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TABLE 2 (continued)

Correlations of First Differences between All Types of Activity (based on number of transactions)

Dependent Variable	SEOs $[Q(0)-Q(-1)]$ (1)	IPOs $[Q(0)-Q(-1)]$ (2)	Stock-Financed M&As $[Q(0)-Q(-1)]$ (3)	Cash-Financed M&As $[Q(0)-Q(-1)]$ (4)	Stock Repurchases $[Q(0)-Q(-1)]$ (5)
Panel B. Regressions of Contemporaneous Industry Activity of Each Type of Event on Contemporaneous Activity of Other Types of Events					
$SEOs_{[Q(0)-Q(-1)]}$		0.142 (0.000)***	0.098 (0.010)***	0.060 (0.115)	−0.130 (0.003)***
$IPOs_{[Q(0)-Q(-1)]}$	0.162 (0.000)***		0.053 (0.106)	0.071 (0.163)	−0.107 (0.001)***
Stock-financed $M\&As_{[Q(0)-Q(-1)]}$	0.099 (0.005)***	0.047 (0.117)		0.163 (0.086)*	−0.119 (0.002)***
Cash-financed $M\&As_{[Q(0)-Q(-1)]}$	0.016 (0.194)	0.016 (0.101)	0.043 (0.012)**		0.004 (0.823)
Stock repurchases $[Q(0)-Q(-1)]$	−0.048 (0.004)***	−0.034 (0.001)***	−0.043 (0.009)***	0.006 (0.827)	
Intercept and industry fixed effects included	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.04	0.03	0.02	0.01	0.01
Number of observations	5,841	5,841	5,841	5,841	5,841
Panel C. Vector Autoregressive (VAR) Models of Industry Activity for Each Type of Event on Lagged Volume of Other Types of Events					
Endogenous Variables					
$SEOs_{[Q(-1)-Q(-2)]}$	−0.562 (0.000)***	0.153 (0.000)***	0.085 (0.002)***	−0.019 (0.576)	−0.095 (0.006)***
$SEOs_{[Q(-2)-Q(-3)]}$	−0.317 (0.000)***	0.262 (0.000)***	0.040 (0.192)	0.016 (0.723)	0.003 (0.936)
$SEOs_{[Q(-3)-Q(-4)]}$	−0.199 (0.000)***	0.133 (0.000)***	0.012 (0.594)	0.028 (0.515)	−0.003 (0.945)
$IPOs_{[Q(-1)-Q(-2)]}$	0.029 (0.353)	−0.439 (0.000)***	0.078 (0.029)**	0.012 (0.759)	0.054 (0.144)
$IPOs_{[Q(-2)-Q(-3)]}$	0.026 (0.508)	−0.192 (0.000)***	0.089 (0.047)**	0.006 (0.872)	0.032 (0.398)
$IPOs_{[Q(-3)-Q(-4)]}$	−0.013 (0.757)	−0.092 (0.001)***	0.100 (0.014)**	−0.017 (0.670)	−0.074 (0.128)
Stock-financed $M\&As_{[Q(-1)-Q(-2)]}$	−0.027 (0.378)	0.009 (0.719)	−0.526 (0.000)***	−0.015 (0.792)	0.130 (0.013)**
Stock-financed $M\&As_{[Q(-2)-Q(-3)]}$	−0.011 (0.656)	−0.007 (0.795)	−0.294 (0.000)***	0.018 (0.682)	0.156 (0.000)***
Stock-financed $M\&As_{[Q(-3)-Q(-4)]}$	−0.001 (0.955)	0.003 (0.853)	−0.068 (0.111)	0.067 (0.235)	0.152 (0.001)***
Cash-financed $M\&As_{[Q(-1)-Q(-2)]}$	−0.001 (0.861)	0.004 (0.623)	−0.002 (0.902)	−0.386 (0.000)***	0.025 (0.027)**
Cash-financed $M\&As_{[Q(-2)-Q(-3)]}$	−0.007 (0.503)	0.014 (0.195)	−0.008 (0.548)	−0.032 (0.700)	0.024 (0.145)
Cash-financed $M\&As_{[Q(-3)-Q(-4)]}$	−0.004 (0.643)	0.003 (0.777)	−0.001 (0.943)	0.010 (0.888)	−0.002 (0.938)
Stock repurchases $[Q(-1)-Q(-2)]$	−0.070 (0.000)***	−0.039 (0.001)***	−0.051 (0.033)**	−0.008 (0.846)	−0.515 (0.000)***
Stock repurchases $[Q(-2)-Q(-3)]$	−0.022 (0.066)*	−0.010 (0.310)	−0.028 (0.258)	−0.025 (0.509)	−0.320 (0.000)***
Stock repurchases $[Q(-3)-Q(-4)]$	−0.012 (0.242)	0.002 (0.847)	−0.029 (0.076)*	0.003 (0.905)	−0.173 (0.000)***
Granger Causality Tests (F-tests)					
Dependent variable explained by lagged SEOs		(0.000)***	(0.031)**	(0.790)	(0.349)
Dependent variable explained by lagged IPOs	(0.683)		(0.009)***	(0.984)	(0.895)
Dependent variable explained by lagged stock-financed M&As	(0.500)	(0.910)		(0.499)	(0.000)***
Dependent variable explained by lagged cash-financed M&As	(0.452)	(0.318)	(0.648)		(0.205)
Dependent variable explained by lagged stock repurchases	(0.000)***	(0.054)*	(0.072)*	(0.747)	
Intercept and industry fixed effects included	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.24	0.17	0.22	0.13	0.23
Number of observations	5,664	5,664	5,664	5,664	5,664

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governance was different in the 2 decades, which could have far-reaching impacts on managerial actions.

However, correlations that might be observed in the aggregate might not apply at the industry level. For example, a merger wave may be happening in industry A, whereas the SEO wave may be happening in industry B. At the aggregate level, this would produce a correlation between the 2 waves, while such a pattern may not actually exist at the industry level. In Panel B of Table 2, we explore the same question by estimating regressions of contemporaneous activity in each event on contemporaneous activity in all other types of events after pooling observations at the industry (not the aggregate) level and controlling for industry fixed effects. Significance levels are based on the Newey-West (1987) standard errors that are consistent with heteroskedasticity and autocorrelation.

These results confirm the strong correlations in contemporaneous activity between stock issuance events with each other (SEOs, IPOs, and stock-financed M&As) and the negative correlation between all 3 stock issuance events and stock repurchases at the industry level. Similarly, there is a positive but weaker correlation between the 2 organizational events (cash- and stock-financed M&As). In contrast, there is no correlation between cash-financed M&A activity and SEO, IPO, or repurchase activity.

In Panel C of Table 2, we use 3rd-order VAR models to check specifically what correlations exist in the *lagged* series of first differences during our sample period.[6] These models allow for serial correlation in the corporate event variables, and also allow tests of the incremental predictive ability of lagged volume in one type of activity to predict the volume of the other (Granger F-tests). We report the results from 5 models where activity in each corporate event is explained by lagged values of activity in *all* other events simultaneously. Again, the specifications include industry fixed effects (we note that in results that we do not report for brevity, if we use total aggregate activity series as opposed to industry series, we obtain results that are qualitatively similar to those reported later).

In column 1 of Panel C in Table 2, lagged values of other events have no explanatory power for future SEO activity (with the exception of repurchases where the relationship is negative). In column 2, lagged values of SEOs have incremental predictive ability for future values of IPOs (whereas lagged volume of IPOs *was not* related to higher volume of future SEOs in the previous column). Higher lagged SEO activity is associated with higher future IPO activity, suggesting that SEO activity picks up before IPO activity. Lagged values of other types of transactions have no explanatory power for future IPO activity. In column 3, lagged values of both SEOs and IPOs have explanatory power for future values of stock-financed M&A activity (while the reverse relationship was not true in the previous columns). Higher lagged SEO and IPO activity is associated with higher future stock-financed M&A activity, again suggesting that SEO and IPO activity pick up before stock-financed M&A activity. In column 4, lagged values of other types of events have no explanatory power for cash-financed M&A activity. Finally, in column 5, lagged values of stock-financed M&A activity have

[6]We use 3rd-order models because, as documented in Table 3 later on, corporate event waves last 2–3 quarters on average.

significant explanatory power for future stock repurchase activity, suggesting that higher lagged volume of stock-financed M&A activity is associated with higher volume of future repurchase activity. The adjusted R^2 in the models is high, usually above 0.20, suggesting that activity in some events does a reasonably good job in explaining the patterns of activity in other events. The smallest value is for cash-financed acquisitions, which seem unrelated to other types of activity.[7]

To summarize, the overall correlation structure appears to suggest that there is a strong correlation between different types of *contemporaneous* stock issuance activity (SEOs, IPOs, and stock-financed M&As). There is a weaker correlation between contemporaneous stock issuance activity and cash-financed M&A activity, and negative or no correlation between other types of activity and stock repurchase activity. However, it also appears that there is more to this relationship than simple cross-correlations in contemporaneous activity. *Lagged* activity in some events predicts *future* activity in others. There appears to be a pattern whereby increased SEO activity is followed by increased IPO activity, followed by increased stock-financed M&A activity, in turn followed by increased repurchase activity. Cash-financed M&A activity appears unrelated to lagged volume of any other type of activity.

As noted earlier, some of the correlations in activity may be because firms conduct 2 transactions in place of 1 transaction. To investigate these possibilities, we conduct 3 additional tests. First, we eliminate from the analysis all cash-financed M&A transactions undertaken by firms that have issued stock through an SEO in the 12 months preceding and the 12 months following the acquisition (resulting in the elimination of 4,551 deals or 15% of our cash-financed M&A sample). Second, we also eliminate cash- and stock-financed acquisitions of targets that went public through an IPO during the 24 months preceding the acquisition (resulting in the elimination of 851 cash-financed M&A deals representing 3% of our cash-financed M&A sample and 263 stock-financed M&A deals representing 2% of our stock-financed M&A sample). Finally, we eliminate repurchases by firms that announce stock-financed M&As up to 24 months earlier (resulting in the elimination of 1,574 repurchases or 9% of our repurchase sample). Our results are not affected, which suggests that these explanations are not strong enough to explain the patterns that we observe. In addition, SEO activity picks up before IPO activity, which is not consistent with the specific life cycle hypothesis discussed by Lyandres et al. (2011).

[7]In analysis that we do not report in the tables for brevity, we estimate additional specifications. Overall, we estimate 365 models, which we do not report owing to space constraints, since they give qualitatively similar results. Specifically, we control for periods with above- or below-median activity. We estimate regressions with aggregate activity variables with and without macroeconomic controls, and finally we estimate vector error correction models with cointegrating vectors for aggregate activity variables (with and without macroeconomic controls). We also estimate similar pairwise specifications for all combinations of pairs after controlling for macroeconomic factors. Our results are consistent with Panel C. One interesting result is that lagged stock-financed M&A activity has a stronger incremental predictive ability for future repurchases in the 1990s. One reason for the weaker relationship in the 1980s is the massive spike in share repurchases that occurred in the 4th quarter of 1987 immediately after the crash. Examining only the 7-year period leading up to the crash from 1980–1986 gives results similar to the 1990s (a higher volume of stock-financed M&As is followed by a higher volume of share repurchases).

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B. Overlap of Wave Activity

As a robustness test, we investigate whether *waves* in activity follow the same patterns as those suggested by correlations in aggregate volumes of activity. We define wave periods for each event as all quarters when actual aggregate activity exceeds the maximum of the simulated distribution. The industry waves are identified by running our bootstrap simulations of activity at the industry level.

We document the marketwide aggregate pattern and the industry patterns for the 59 industries in our sample in Table 3. Panel A reports descriptive statistics on industry waves. The number of industries experiencing at least 1 wave ranges between 23 (for SEOs) and 47 (for repurchases), with these industries representing, respectively, between 69% and 97% of total activity. On average, the total number of wave quarters experienced by industries for each event ranges between 1.8 quarters (for stock-financed M&As) and 3 quarters (for SEOs).

Panel B of Table 3 reports the number of wave quarters of one type of event preceding the beginning of a wave of another event, overlapping with quarters of another event, or following the end of the wave of another event. Whenever the direction of the relationship goes in the opposite direction than that stated in the table, we report the number of quarters as a negative number. The aggregate pattern is reported in column 1 and industry patterns in columns 2–6.

TABLE 3

Overlap of Corporate Events across Industries

Table 3 reports descriptive statistics on waves and the overlap of waves of different corporate events. Panel A reports the number of industries experiencing waves, the average wave length, and the proportion of total activity attributed to industries that experience waves. Panel B reports the overlap of waves of different corporate events. Our event samples are described in Table 1. No deal is classified in more than 1 category. We define aggregate activity waves for each corporate event and each industry using the bootstrap simulation approach described in Table 2. The table reports the number of wave quarters of 1 type of event preceding the beginning of a wave of another event, overlapping with quarters of another event or following the end of the wave of another event. For example, whenever 1 quarter of event A is part of a wave and the same quarter of event B is also a part of a wave, then this quarter is counted as part of an overlapping wave between events A and B. For all quarters when there are nonoverlapping waves between A and B, we count how many nonoverlapping quarters of an A wave precede the beginning of a B wave, and classify these quarters as quarters when an A wave precedes the beginning of a B wave (for nonoverlapping quarters following a wave we count how many nonoverlapping quarters of an A wave follow the end of a B wave, and classify these quarters as quarters when an A wave follows the end of a B wave). Whenever there is a wave of A preceding a wave of B with no overlapping quarters between the 2 waves, we count how many quarters of A precede the beginning of B. We classify these quarters as quarters when A precedes the beginning of B. At the same time, we count the same number of quarters as quarters when B follows the end of A. We follow this approach separately for the periods 1980–1990 and 1991–2004. Subsequently, we count how many preceding, overlapping, and following quarters have been identified over the entire 25-year period and report them in the table. If there are some quarters when a wave in A precedes a wave in B and some when a wave in B precedes a wave in A during the entire sample period, we report the difference between the 2 quarters. Whenever the direction of the relationship goes in the opposite direction than the direction stated in the table, we report the number of quarters in parentheses.

Panel A. Aggregate Activity

Events	No. of Industries Experiencing at Least 1 Wave (1)	Average Wave Length (no. of quarters) (2)	Proportion of Total Activity Represented by Industries Experiencing Waves (3)	No. of Industries Experiencing No Wave (4)
SEOs	23	3.0	69%	36
IPOs	36	2.6	85%	23
Stock-financed M&As	26	1.8	86%	33
Cash-financed M&As	28	2.9	85%	31
Repurchases	47	2.9	97%	12

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TABLE 3 (continued)

Overlap of Corporate Events across Industries

Panel B. Industry Activity

		Aggregate Activity	Industry Activity				
Comparison	Event	Total No. of Qtrs. when (1)	Mean No. of Qtrs. when (2)	No. of Industries Exhibiting the Pattern (3)	Proportion of Total Aggregate Activity Represented by Industries Exhibiting the Pattern (4)	No. of Industries Exhibiting No Pattern (5)	No. of Industries Exhibiting Opposite Pattern (6)
SEO vs. IPO	SEO wave precedes the start of IPO wave	1	1.8	9	41% (SEO); 32% (IPO)	46	4
	Both overlap	13	1.8	8	37% (SEO); 42% (IPO)	51	
	IPO wave continues after end of SEO wave	6	1.5	11	39% (SEO); 47% (IPO)	46	2
SEO vs. stock-financed M&A	SEO wave precedes the start of stock M&A wave	10	2.2	9	38% (SEO); 50% (Stock-financed M&A)	48	2
	Both overlap	6	1.2	5	23% (SEO); 47% (Stock-financed M&A)	54	
	Stock M&A wave continues after end of SEO wave	0	2.3	7	29% (SEO); 35% (Stock-financed M&A)	51	1
IPO vs. stock-financed M&A	IPO wave precedes the start of stock M&A wave	10	2.5	13	56% (IPO); 51% (Stock-financed M&A)	43	3
	Both overlap	8	1.4	5	23% (IPO); 19% (Stock-financed M&A)	54	
	Stock M&A wave continues after end of IPO wave	4	1.3	9	37% (IPO); 37% (Stock-financed M&A)	46	2
Cash- vs. stock-financed M&A	Cash M&A wave precedes the start of stock M&A wave	(6)	5.2	5	45% (Cash-M&A); 32% (Stock-M&A)	48	6
	Both overlap	8	1.5	2	39% (Cash-M&A); 19% (Stock-M&A)	57	
	Stock M&A wave continues after end of cash M&A wave	3	2.0	6	18% (Cash-M&A); 48% (Stock-M&A)	48	5
SEO vs. stock repurchases	SEO wave precedes the start of repurchase wave	15	2.8	16	57% (SEO); 55% (Repurchase)	42	1
	Both overlap	2	0.0	0	na	59	
	Repurchase wave continues after end of SEO wave	7	3.3	17	61% (SEO); 59% (Repurchase)	41	1
IPO vs. stock repurchases	IPO wave precedes the start of repurchase wave	14	2.2	24	70% (IPO); 62% (Repurchase)	33	2
	Both overlap	7	1.0	2	5% (IPO); 14% (Repurchase)	57	
	Repurchase wave continues after end of IPO wave	8	2.4	25	62% (IPO); 71% (Repurchase)	33	1
Stock-financed M&A vs. stock repurchases	Stock M&A wave precedes the start of repurchase wave	5	1.7	14	48% (Stock-financed M&A); 39% (Repurchase)	38	7
	Both overlap	7	0.0	0	na	59	
	Repurchase wave continues after end of stock M&A wave	(1)	2.9	16	57% (Stock-financed M&A); 52% (Repurchase)	38	5

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Column 1 of Panel B in Table 3 indicates that for aggregate activity, there is considerable overlap between waves of all types of activity. The overlap is more pronounced between SEO and IPO waves (13 quarters) and least pronounced between SEO and repurchase waves (2 quarters). However, the waves do not overlap completely. SEO waves precede the beginning of IPO waves by 1 quarter when examining aggregate activity in column 1, and by an average of 1.8 quarters in the 9 industries that exhibit this pattern in column 3. In contrast, only 4 industries show the opposite pattern (that IPO waves precede SEO waves). After the SEO wave is over, 6 additional quarters of IPO waves follow (for aggregate activity in column 1), and in 11 industries (only 2 industries show the opposite pattern).

SEO waves also precede the beginning of stock-financed M&A waves by 10 quarters for aggregate activity in column 1, and by 2.2 quarters on average in the 9 industries that exhibit this pattern in column 3. Only 2 industries show the opposite pattern. After the SEO wave is over, stock-financed M&A waves continue in 7 industries (we observe the opposite pattern in only 1 industry). Similarly, IPO waves precede stock-financed M&A waves in 13 industries, and stock-financed M&A waves continue after IPO waves are over in 9 industries (the opposite patterns are observed in 3 and 2 industries, respectively).

Consistent with our earlier results, there is no clear pattern between stock- and cash-financed acquisitions. There are about an equal number of industries where stock-financed acquisitions precede cash-financed acquisitions and vice versa. On average, cash-financed waves precede the stock-financed waves by 5.2 quarters, over twice the average for the time difference between other types of corporate events. Since the average length of a cash-financed wave is 2.9 quarters, this suggests that cash-financed acquisition waves in those industries are at best weakly related to stock-financed acquisition waves.

Finally, all other types of waves precede the beginning of repurchase waves across most industries. SEO waves precede repurchase waves in 16 industries, IPO waves precede the beginning of repurchase waves in 24 industries, and stock-financed M&A waves precede the beginning of repurchase waves in 14 industries. The opposite patterns (that repurchase waves precede the beginning of the other waves) are observed in only 1, 2, and 7 industries, respectively. We also note that there is not a single industry where a stock repurchase wave overlaps with an SEO or stock-financed acquisition wave, and only 2 industries where a stock repurchase wave overlaps with an IPO wave.

The same pattern is not followed across all industries (because the industry had no wave of IPOs when it experienced an SEO wave, e.g., see column 5). However, the industries where these patterns do occur represent a significant proportion of total activity. Depending on the types of event examined, overall these industries represent between 19% and 71% of total aggregate activity (column 4).

The industry wave analysis that we report in this section is in line with our earlier results on the sequence of the occurrence of waves, with SEO waves preceding IPO waves, in turn preceding M&A waves, in turn preceding repurchase waves. The pattern is broadly consistent with the neoclassical efficiency hypothesis. We find stronger correlations in contemporaneous activity between stock issuance events (SEOs, IPOs, and stock-financed M&As), and weaker correlation

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between organizational events (cash- and stock-financed M&As). Repurchases occur after waves in all other events have ended.

It is less clear why there should be only a weak relation between stock- and cash-financed acquisition activity. In the presence of uncertain growth opportunities, acquirers may prefer to pay with stock rather than cash to avoid the winner's curse problem. By paying with stock, the acquirer forces the target shareholders to share the potential costs of overvaluing the growth opportunity. Alternatively, the strong correlation between stock issuance events and the weaker correlation between organizational events suggests that some form of misvaluation may also be present.[8]

C. Are Our Results Consistent with Dittmar and Dittmar?

The paper most similar to ours is a concurrent study by Dittmar and Dittmar (2008). They find a positive relation between aggregate repurchase activity and aggregate stock issuance activity and merger activity. They argue that this correlation is evidence that misvaluation does not drive stock issuance activity. They also argue that waves result from differing response speeds to the same economic stimulus, not because of misvaluation. In their framework, growth in gross domestic product (GDP) significantly explains both repurchase and issuance activity. It is important to note, however, that they do not distinguish between stock- and cash-financed acquisitions or between SEOs and IPOs. They also examine aggregate activity without going down to the industry level.

In our analysis, in Table 1, stock repurchases also appear highly positively correlated with the remaining series during the 1990s and peak in 1998 (when there were 1,903 repurchases), when M&A activity and stock issuance were also high. However, the correlation is likely caused by the presence of unit roots in the levels series. As we note, in Table 2, when we conduct the analysis on first differences, there is a *negative* correlation between stock issuance activity and stock repurchases. We also note that, in Table 3, there is not a single industry where a

[8]Our waves of M&A activity are not directly comparable with the waves reported by Harford (2005) for 3 reasons. First, Harford does not distinguish between cash-financed and stock-financed M&As, whereas for the purposes of our study it makes sense to treat them as separate types of transactions. Second, Harford determines the industries experiencing waves by giving credit to the industries of both the acquirer and the target. For our purposes, it does not make sense to focus on targets. The relevant unit of analysis is the acquirer, the entity that issues the stock or pays the cash, so that the transactions can be compared with the issuers of stock in SEOs and IPOs. Third, there are a number of smaller differences between Harford's methodology and ours. Harford excludes acquisitions of divested assets and keeps constant the "normal" number of transactions that provide the thresholds for identifying waves in the simulations irrespective of variations in the actual number of listed firms. In addition, he constrains waves to last for 2 years and allows only one 2-year period per decade per industry to be identified as a wave. The last criterion results in only 35 periods identified as waves across all industries over the entire sample period. When we compare our waves with those in Harford, we find that approximately half of the waves identified by Harford coincide with either a cash- or a stock-financed M&A wave in our study as well. Another quarter of Harford's waves coincide with periods of high activity in our sample but below the actual thresholds for identifying waves. In addition, we identify waves in almost double the number of industries compared to Harford due to Harford's 2-year constraint. Imposing such a constraint would miss a large fraction of the waves in our analysis. Half the additional waves that we identify represent wave quarters in a decade and industry where Harford already identifies a wave but lie outside the selected 2-year period. The other half represent small 1–2 quarter waves that Harford's methodology cannot detect.

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stock repurchase wave overlaps with an SEO or stock-financed acquisition wave, and only 2 industries where a stock repurchase wave overlaps with an IPO wave (both these industries are in the financial sector SIC codes 6000–6999, which Dittmar and Dittmar (2008) exclude from their sample). The difference arises because Dittmar and Dittmar use aggregate activity series, whereas we use industry activity series. When we use aggregate activity, in Table 3, column 1, we also find a significant overlap of several quarters between stock issuance and stock repurchase waves. However, this is because the stock issuance and the stock repurchase waves are happening simultaneously in *different* industries.

Therefore, although our results are similar to Dittmar and Dittmar (2008) at the aggregate level, the industry analysis, which they do not conduct, suggests that their inferences are misleading. It is still possible that misvaluation drives stock issuance activity, since this activity occurs in different industries compared to stock repurchase activity.[9]

VI. Factors That Explain Waves of Corporate Events

In Table 4, we report logit regressions where the likelihood of different types of waves is explained by explanatory variables that proxy for neoclassical efficiency, misvaluation, and other factors. We estimate all models by stacking observations at the industry level and include industry and year fixed effects.[10]

We use 5 sets of explanatory variables. First, we use a set of variables to test the neoclassical explanation—marketwide (real fixed capital formation, unemployment rate, and real GDP growth rate) and industry-specific (industry profit margin, asset turnover, lagged and forward capital expenditure, industry sales growth, and return on assets).

Second, we use a set of fundamental valuation variables at the industry level, namely the industry forward median market-to-book ratio (the average market-to-book ratio of the following 4 quarters), the cross-sectional standard deviation in

[9]In analysis that we do not report in tables, we also investigate whether waves in aggregate activity are driven by specific industries or whether they reflect marketwide increases in activity. Harford (2005) finds that aggregate waves are caused by simultaneous industry waves clustering. Dittmar and Dittmar (2008) suggest that waves could be driven by general macroeconomic business expansions and contractions. We investigate whether excess activity during the aggregate wave quarters can be explained by the contribution from specific industries or whether it is driven by marketwide increases in activity. Specifically, we sum all excess activity across all industries (in quarters coinciding with aggregate wave quarters) in order to determine to what extent waves in aggregate activity can be explained by concurrent waves across some industries. No individual industry accounts for a large proportion of aggregate excess activity. In addition, in quarters where there is large aggregate wave activity, the sum of individual industry excess activity shares typically accounts for around 20%–40% of total excess activity. For example, 18 out of 59 industries explain 21% of excess SEO activity during 1980–1990, and 12 industries represent 23% during 1991–2004; 19 industries explain 27% of excess aggregate IPO activity during 1980–1990, and 28 industries explain 28% during 1991–2004; 11 industries represent 26% of excess stock-financed M&A activity during the wave of the 1980s, and 13 out of 59 represent 35% of excess activity during 1991–2004; and 45 industries explain 38% of excess repurchase activity during 1980–1990, and 28 industries represent 26% of excess activity during 1991–2004.

[10]In analysis that we do not report for brevity, we obtain qualitatively similar results when we estimate least squares regressions where the dependent variable is the series of first differences in quarterly activity rather than waves.

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TABLE 4

The Relation between Waves of Corporate Events and Neoclassical, Misvaluation, and Liquidity Variables

Table 4 reports regressions of the likelihood of different types of event waves as a function of neoclassical and misvaluation variables. Panel A estimates the likelihood of separate, equity issuance, and organizational event waves. In columns 1–5, the dependent variable takes the value of 1 in a given quarter if the event in question experiences a wave in this quarter, and 0 otherwise. In columns 6, 7, and 10, the dependent variable takes the value of 1 in a given quarter if there is a wave taking place in at least 1 of the events within the category, and 0 otherwise. In the ordered logits of columns 8, 9, and 11, the dependent variable takes the values 1, 2, or 3 if there are waves taking place in 1, 2, or 3 events concurrently in a given quarter, and 0 otherwise. In Panel B, the dependent variable takes the value of 1 in a given quarter if the event described experiences a wave, and 0 otherwise. Our event samples are described in Table 1. We classify the corporate transactions in our sample into 59 industries and estimate pooled regressions, including year and industry fixed effects. We define waves for each event as in Figure 1. We follow the same approach for each of the 59 industries separately (590 simulations). We obtain macroeconomic, stock return, and accounting data for the universe of U.S. publicly listed firms from International Financial Statistics (IFS), CRSP, Compustat, and Datastream. *Neoclassical Efficiency Variables* include quarterly observations of real fixed capital formation, real GDP growth, unemployment rate, median industry profit margin (net income over sales), asset turnover (sales over total assets), return on assets (EBIT over total assets), industry sales growth, and industry capital expenditures. Lagged capital expenditures is the aggregate total of 4 preceding quarters of marketwide capital expenditures. Forward capital expenditures is the aggregate total of 4 following quarters of marketwide capital expenditures. Capital expenditures, sales, fixed capital formation, and GDP are deflated using the GDP deflator. *Fundamental Valuation Variables* include average industry 1-year stock returns, the cross-sectional standard deviation of the quarterly market-to-book ratio within each industry, forward market-to-book (the average market-to-book ratio of the following 4 quarters), and the average industry *long-run* market-to-book component. The *long-run* market-to-book ratio component is estimated according to the specification of Model 3 of Rhodes-Kropf et al. (2005). *Misvaluation Variables* include the average industry time-series *sector* error component and the *firm-specific* error component of the market-to-book ratio estimated according to the same specification. We estimate these equations annually by pooling quarterly observations at the industry level. The investor sentiment index is an adjusted version of eq. (2) of Baker and Wurgler (2006), based on the first principal component of 4 standardized sentiment proxies using data over 1962–2004 but excluding the number of IPOs and the share of equity issuance, smoothed by averaging the figures for current, 1 quarter lag, and 1 quarter forward). The proportion of publicly listed targets in M&A transactions is estimated by summing over the current and 3 preceding quarters. *Liquidity Variables* include cash holdings (the aggregate total of real cash holdings on the balance sheet averaged over the past 4 quarters), cash holdings scaled by the sum of the dollar volume of capital (all debt, common stock, and preferred stock) issuance, and the 3-month T-bill rate. Industry spreads over the T-bill rate are estimated in 3 steps. First, we estimate an average credit rating per industry each quarter based on data on 3,883 firms rated in the S&P credit rating database in the WRDS database. For each firm, we assume that ratings remain constant in between consecutive rating dates. Subsequently, we estimate an average bond yield per rating level each quarter using offering yield to maturity data on 99,258 corporate bond issues (with ratings assigned within 1 year of the offer) available in the Mergent FISD. We use percentage differences with other credit ratings in adjacent quarters to fill in a few missing quarterly observations. Finally, we match each industry's average credit rating every quarter with the average bond yield corresponding to the credit rating in the same quarter, and calculate the spread over the 3-month T-bill rate. The *Strategic Interaction Variable* is the sales-based Herfindahl index standardized on a range from 0 to 1 to account for differences in the number of firms per industry. Intercepts, year, and industry fixed effects are estimated but not reported. The adjusted R^2 incorporates the impact of fixed effects. Significance levels (*p*-values) in parentheses are based on Huber-White (Greene (2008)) (quasi-maximum likelihood) standard errors and covariances. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Likelihood of Separate, Equity Issuance, and Organizational Event Waves (Logit Models)

	Separate Events					Equity Issuance Events				Organizational Events	
	SEOs	IPOs	Stock-Financed M&A	Cash-Financed M&A	Repurchases	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined Stock-/ Cash-Financed M&A	Combined Stock-/ Cash-Financed M&A
Dependent Variable	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Ordered	Ordered	Binary	Ordered
Logit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Neoclassical Efficiency Variables											
Real fixed capital formation (marketwide)	–0.001 (0.727)	–0.002 (0.821)	–0.001 (0.728)	–0.006 (0.386)	–0.007 (0.057)*	–0.001 (0.841)	–0.003 (0.386)	0.001 (0.717)	–0.005 (0.000)***	–0.009 (0.038)**	–0.009 (0.033)**

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TABLE 4 (continued)

The Relation between Waves of Corporate Events and Neoclassical, Misvaluation, and Liquidity Variables

	Separate Events					Equity Issuance Events				Organizational Events	
	SEOs	IPOs	Stock-Financed M&A	Cash-Financed M&A	Repurchases	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined Stock-/ Cash-Financed M&A	Combined Stock-/ Cash-Financed M&A
Dependent Variable	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Ordered	Ordered	Binary	Ordered
Logit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Real GDP growth rate (marketwide)	−54.279	−15.868	29.833	−7.898	104.723	−31.66	−11.907	−24.047	−19.183	0.946	−1.285
	(0.113)	(0.683)	(0.384)	(0.858)	(0.099)*	(0.248)	(0.610)	(0.396)	(0.352)	(0.972)	(0.962)
Unemployment rate (marketwide)	−19.892	−174.949	−152.491	−120.915	−122.679	−77.325	−91.813	−81.782	−45.865	−146.246	−152.014
	(0.503)	(0.001)***	(0.040)**	(0.036)**	(0.005)***	(0.004)***	(0.000)***	(0.001)***	(0.054)*	(0.000)***	(0.000)***
Profit margin (industry)	5.536	−3.325	−3.796	7.290	−0.308	2.159	0.795	2.517	0.628	−1.959	−2.015
	(0.280)	(0.460)	(0.228)	(0.335)	(0.941)	(0.533)	(0.803)	(0.456)	(0.799)	(0.646)	(0.637)
Asset turnover (industry)	−11.517	−8.433	0.686	−6.049	−2.039	−9.054	−6.653	−9.789	−0.805	−4.151	−4.221
	(0.001)***	(0.058)*	(0.935)	(0.310)	(0.550)	(0.008)***	(0.048)**	(0.007)***	(0.428)	(0.455)	(0.446)
1-year lagged total real CAPEX × (10^5) (industry)	−0.255	−0.661	−3.470	0.575	−2.590	−0.344	−2.210	−0.317	−1.940	−1.050	−1.030
	(0.716)	(0.359)	(0.019)**	(0.691)	(0.002)***	(0.645)	(0.002)***	(0.666)	(0.001)***	(0.118)	(0.113)
1-year forward total real CAPEX × (10^5) (industry)	1.390	0.877	2.600	−1.200	2.670	1.430	2.390	1.360	2.140	0.918	0.900
	(0.040)**	(0.183)	(0.071)*	(0.373)	(0.000)***	(0.036)**	(0.000)***	(0.041)**	(0.000)***	(0.099)*	(0.093)*
Return on assets (industry)	−17.431	49.196	−26.287	−26.692	19.426	11.225	3.296	8.537	−10.475	−26.481	−26.110
	(0.642)	(0.171)	(0.401)	(0.556)	(0.494)	(0.677)	(0.884)	(0.737)	(0.503)	(0.413)	(0.423)
Lagged annual total real sales growth (industry)		0.008	−0.002	−0.120	−0.245	−0.107	−0.015	−0.104	−0.005	0.002	0.002
		(0.503)	(0.822)	(0.813)	(0.600)	(0.807)	(0.688)	(0.818)	(0.705)	(0.794)	(0.765)

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TABLE 4 (continued)

The Relation between Waves of Corporate Events and Neoclassical, Misvaluation, and Liquidity Variables

	Separate Events					Equity Issuance Events				Organizational Events	
	SEOs	IPOs	Stock-Financed M&A	Cash-Financed M&A	Repurchases	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined Stock-/ Cash-Financed M&A	Combined Stock-/ Cash-Financed M&A
Dependent Variable	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Ordered	Ordered	Binary	Ordered
Logit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Fundamental Valuation Variables											
1-year lagged value-weighted stock returns (industry)	0.011 (0.545)	0.045 (0.133)	–0.280 (0.687)	0.005 (0.837)	–2.906 (0.000)***	0.016 (0.296)	0.013 (0.392)	0.009 (0.580)	–0.036 (0.660)	–0.162 (0.721)	–0.152 (0.740)
1-year forward market-to-book (industry)	1.324 (0.059)*	0.102 (0.860)	–1.060 (0.072)*	0.392 (0.711)	–0.466 (0.178)	0.491 (0.291)	0.088 (0.783)	0.742 (0.104)	0.124 (0.618)	–0.431 (0.450)	–0.460 (0.426)
Cross-sectional standard deviation of market-to-book (industry)	0.001 (0.004)***	0.001 (0.042)**	–0.003 (0.392)	0.000 (0.757)	0.000 (0.846)	0.001 (0.043)**	0.001 (0.101)	0.001 (0.003)***	0.001 (0.006)***	0.000 (0.629)	0.000 (0.525)
Long-run market-to-book (industry)	0.314 (0.831)	1.848 (0.347)	2.582 (0.138)	–0.862 (0.062)*	–0.453 (0.353)	1.348 (0.345)	0.680 (0.415)	1.244 (0.366)	0.448 (0.397)	–0.461 (0.270)	–0.445 (0.295)
Misvaluation Variables											
Time-series *sector* error market-to-book (industry)	0.743 (0.607)	4.973 (0.000)***	4.786 (0.001)***	2.375 (0.063)*	–0.577 (0.305)	2.843 (0.010)***	2.967 (0.000)***	2.839 (0.014)**	3.023 (0.000)***	3.273 (0.000)***	3.254 (0.000)***
Firm-specific error market-to-book (industry)	8.838 (0.000)***	7.593 (0.001)***	8.715 (0.001)***	0.696 (0.697)	–10.132 (0.000)***	6.716 (0.000)***	6.117 (0.000)***	6.336 (0.000)***	4.679 (0.000)***	4.264 (0.003)***	4.348 (0.002)***
Investor sentiment index (marketwide)	–0.334 (0.274)	0.354 (0.853)	–0.376 (0.427)	–0.244 (0.728)	1.080 (0.636)	–0.098 (0.867)	–0.623 (0.080)*	0.581 (0.240)	–0.199 (0.271)	–0.656 (0.199)	–0.640 (0.202)

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TABLE 4 (continued)

The Relation between Waves of Corporate Events and Neoclassical, Misvaluation, and Liquidity Variables

	Separate Events					Equity Issuance Events				Organizational Events	
	SEOs	IPOs	Stock-Financed M&A	Cash-Financed M&A	Repurchases	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined SEOs/IPOs	Combined SEOs/IPOs/ Stock-Financed M&A	Combined Stock-/ Cash-Financed M&A	Combined Stock-/ Cash-Financed M&A
Dependent Variable	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Ordered	Ordered	Binary	Ordered
Logit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Change in investor sentiment index (marketwide)	–0.423 (0.583)	–1.291 (0.433)	0.712 (0.325)	0.237 (0.779)	–1.688 (0.178)	–0.906 (0.200)	0.073 (0.872)	–1.205 (0.117)	–0.634 (0.056)*	0.213 (0.635)	0.199 (0.656)
1-year proportion of public M&A targets (industry)	–1.499 (0.083)*	0.346 (0.693)	–0.723 (0.405)	–0.376 (0.802)	4.194 (0.000)***	–0.564 (0.384)	–0.734 (0.189)	–0.728 (0.279)	–0.947 (0.055)*	0.111 (0.880)	0.050 (0.946)
Liquidity Variables											
1-year lagged total real cash holdings × (10^5) (industry)	–1.960 (0.079)*	0.138 (0.742)	–0.234 (0.434)	–0.056 (0.845)	–0.129 (0.654)	–0.009 (0.979)	–0.036 (0.839)	–0.092 (0.776)	–0.038 (0.802)	0.047 (0.756)	0.070 (0.652)
Proportion of cash holdings in total capital raised (industry)	–1.429 (0.265)	–2.540 (0.013)**	2.583 (0.072)*	0.182 (0.909)	1.875 (0.192)	–2.744 (0.004)***	–1.923 (0.007)***	–2.609 (0.004)***	–1.429 (0.020)**	1.540 (0.106)	1.570 (0.101)
3-month T-bill rate (marketwide)	–0.232 (0.425)	–0.027 (0.949)	–0.065 (0.807)	–0.306 (0.353)	–0.956 (0.086)*	–0.162 (0.529)	–0.248 (0.186)	–0.015 (0.951)	–0.255 (0.117)	–0.201 (0.338)	–0.193 (0.355)
Spread over 3-month T-bill rate (industry)	–0.488 (0.062)*	0.027 (0.911)	–0.002 (0.995)	0.047 (0.866)	0.530 (0.052)*	–0.249 (0.143)	–0.294 (0.060)*	–0.213 (0.198)	–0.094 (0.434)	0.053 (0.770)	0.049 (0.788)
Strategic Interaction Variables											
Herfindahl index (industry)	–11.697 (0.035)**	–6.975 (0.076)*	0.111 (0.965)	–0.935 (0.777)	–2.632 (0.147)	–9.553 (0.007)***	–2.966 (0.197)	–10.735 (0.003)***	–5.805 (0.048)**	–0.065 (0.970)	–0.141 (0.935)
Pseudo R^2	0.48	0.45	0.46	0.50	0.58	0.43	0.37	0.40	0.28	0.39	0.38
Number of observations	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864

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TABLE 4 (continued)

The Relation between Waves of Corporate Events and Neoclassical, Misvaluation, and Liquidity Variables

Panel B. Likelihood of Waves of One Type of Event Preceding, Overlapping, or Following Waves of Another Type of Event (Logit Models)

	Quarter When:								
	SEO Wave Precedes IPO Wave	SEO Wave Overlaps with IPO Wave	IPO Wave Follows SEO Wave	IPO Wave Precedes Stock-Financed M&A Wave	IPO Wave Overlaps with Stock-Financed M&A Wave	Stock-Financed M&A Wave Follows IPO Wave	Stock-Financed M&A Wave Precedes Repurchase Wave	Repurchase Wave Follows Stock-Financed M&A Wave	Stock-Financed M&A Wave Overlaps with Cash-Financed M&A Wave
Dependent Variable	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary
Logit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Neoclassical Efficiency Variables									
Real fixed capital formation (marketwide)	–0.014 (0.101)	–0.017 (0.012)**	–0.002 (0.835)	0.003 (0.694)	0.053 (0.210)	–0.006 (0.199)	0.000 (0.934)	–0.003 (0.478)	–0.022 (0.080)*
Real GDP growth rate (marketwide)	–21.446 (0.813)	3.155 (0.961)	–49.104 (0.505)	–17.479 (0.796)	1334.815 (0.051)*	–125.318 (0.114)	179.706 (0.003)***	71.779 (0.312)	–406.178 (0.000)***
Unemployment rate (marketwide)	99.263 (0.105)	–193.744 (0.003)***	–303.553 (0.005)***	–218.18 (0.015)**	675.399 (0.062)*	-372.398 (0.034)**	–129.907 (0.176)	–394.265 (0.001)***	–824.641 (0.000)***
Profit margin (industry)	–26.045 (0.051)*	–3.662 (0.424)	–1.503 (0.895)	1.336 (0.740)	25.816 (0.318)	–4.347 (0.353)	5.127 (0.678)	–7.829 (0.038)**	
Asset turnover (industry)	–22.956 (0.042)**	–8.444 (0.477)	–3.524 (0.382)	5.808 (0.380)	2.790 (0.701)	–18.220 (0.480)	4.489 (0.275)	–2.215 (0.594)	–9.184 (0.200)
1-year lagged total real CAPEX × (10^5) (industry)	–17.000 (0.000)***	–1.970 (0.092)*	–6.240 (0.423)	–0.569 (0.842)	–62.800 (0.423)		–3.570 (0.038)**	–6.720 (0.000)***	–6.280 (0.013)**
1-year forward total real CAPEX × (10^5) (industry)	–0.260 (0.975)	1.490 (0.203)	–0.289 (0.829)	–0.677 (0.689)	1.830 (0.013)**	0.327 (0.797)	3.360 (0.021)**	–4.090 (0.032)**	4.860 (0.013)**
Return on assets (industry)	257.221 (0.092)*	14.962 (0.661)	103.938 (0.139)	0.195 (0.996)	–356.614 (0.275)	41.926 (0.672)	–51.799 (0.192)	21.813 (0.633)	108.079 (0.150)
Lagged annual total real sales growth (industry)	0.048 (0.168)	0.068 (0.384)	–0.596 (0.423)	–0.443 (0.649)	0.071 (0.497)	0.305 (0.077)*	0.001 (0.952)	0.085 (0.000)***	

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TABLE 4 (continued)

The Relation between Waves of Corporate Events and Neoclassical, Misvaluation, and Liquidity Variables

	Quarter When:								
	SEO Wave Precedes IPO Wave	SEO Wave Overlaps with IPO Wave	IPO Wave Follows SEO Wave	IPO Wave Precedes Stock-Financed M&A Wave	IPO Wave Overlaps with Stock-Financed M&A Wave	Stock-Financed M&A Wave Follows IPO Wave	Stock-Financed M&A Wave Precedes Repurchase Wave	Repurchase Wave Follows Stock-Financed M&A Wave	Stock-Financed M&A Wave Overlaps with Cash-Financed M&A Wave
Dependent Variable	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary
Logit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fundamental Valuation Variables									
1-year lagged value-weighted stock returns (industry)	0.243 (0.011)**	–0.006 (0.996)	–0.356 (0.797)	0.041 (0.145)	–2.466 (0.189)	0.058 (0.158)	–1.163 (0.360)	–4.503 (0.001)***	0.103 (0.029)**
1-year forward market-to-book (industry)	–1.838 (0.124)	1.774 (0.001)***	–2.368 (0.001)***	0.686 (0.503)	–1.180 (0.743)	–6.220 (0.011)**	–1.394 (0.227)	–0.940 (0.248)	–3.193 (0.165)
Cross-sectional standard deviation of market-to-book (industry)	0.001 (0.868)	0.003 (0.007)***	0.001 (0.482)	0.001 (0.125)	0.006 (0.072)*	–0.013 (0.027)**	–0.008 (0.546)	–0.003 (0.452)	0.000 (0.479)
Long-run market-to-book (industry)	2.329 (0.365)	2.894 (0.348)	6.030 (0.000)***	2.210 (0.389)	10.062 (0.324)	11.336 (0.049)**	7.417 (0.025)**	2.806 (0.001)***	6.486 (0.025)**
Misvaluation Variables									
Time-series *sector* error market-to-book (industry)	9.884 (0.014)**	5.650 (0.000)***	7.084 (0.000)***	6.174 (0.002)***	18.529 (0.020)**	9.229 (0.041)**	8.536 (0.004)***	1.962 (0.016)**	5.112 (0.090)*
Firm-specific error market-to-book (industry)	8.781 (0.042)**	4.151 (0.448)	6.668 (0.004)***	12.933 (0.001)***	–3.680 (0.658)	17.043 (0.015)**	7.413 (0.117)	–5.766 (0.002)***	16.167 (0.001)***
Investor sentiment index (marketwide)	2.010 (0.022)**	–1.008 (0.190)	4.436 (0.095)*	3.146 (0.020)**	2.472 (0.125)	–0.463 (0.509)	0.006 (0.988)	1.556 (0.010)**	1.634 (0.228)
Change in investor sentiment index (marketwide)	1.296 (0.577)	–1.188 (0.328)	–4.474 (0.109)	–1.470 (0.267)	–9.098 (0.054)*	–0.605 (0.554)	1.523 (0.199)	–1.095 (0.256)	1.267 (0.488)
1-year proportion of public M&A targets (industry)	–1.777 (0.461)	–6.480 (0.092)*	–3.819 (0.090)*	1.940 (0.164)	5.431 (0.105)	6.842 (0.013)**	–0.767 (0.640)	1.170 (0.276)	1.086 (0.677)

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TABLE 4 (continued)

The Relation between Waves of Corporate Events and Neoclassical, Misvaluation, and Liquidity Variables

	Quarter When:								
	SEO Wave Precedes IPO Wave	SEO Wave Overlaps with IPO Wave	IPO Wave Follows SEO Wave	IPO Wave Precedes Stock-Financed M&A Wave	IPO Wave Overlaps with Stock-Financed M&A Wave	Stock-Financed M&A Wave Follows IPO Wave	Stock-Financed M&A Wave Precedes Repurchase Wave	Repurchase Wave Follows Stock-Financed M&A Wave	Stock-Financed M&A Wave Overlaps with Cash-Financed M&A Wave
Dependent Variable	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary
Logit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Liquidity Variables									
1-year lagged total real cash holdings	0.672	–4.710	1.020	–1.080	0.779	0.075	–3.640	0.116	–0.014
× (10^5) (industry)	(0.293)	(0.026)**	(0.000)***	(0.243)	(0.388)	(0.762)	(0.014)**	(0.650)	(0.919)
Proportion of cash holdings in total capital raised (industry)	0.194	–2.237	–0.026	–9.735	22.071	13.546	4.864	6.411	4.294
	(0.925)	(0.395)	(0.987)	(0.007)***	(0.018)**	(0.110)	(0.195)	(0.027)**	(0.040)**
3-month T-bill rate (marketwide)	–0.761	–0.850	0.522	0.131	5.256	–2.195	–0.087	–1.111	–1.978
	(0.161)	(0.044)**	(0.578)	(0.844)	(0.127)	(0.049)**	(0.785)	(0.035)**	(0.005)***
Spread over 3-month T-bill rate (industry)	–0.267	–1.139	–0.174	0.792	5.425	–3.021	0.401	–0.174	–2.410
	(0.602)	(0.228)	(0.711)	(0.011)**	(0.055)*	(0.034)**	(0.298)	(0.715)	(0.001)***
Strategic Interaction Variables									
Herfindahl index (industry)	–17.002	–23.517	0.993	–2.741		–73.698	0.792	–3.179	–7.909
	(0.027)**	(0.151)	(0.705)	(0.754)		(0.066)*	(0.725)	(0.182)	(0.077)*
Pseudo R^2	0.67	0.59	0.55	0.59	0.74	0.66	0.56	0.66	0.53
Number of observations	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864	4,864

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the market-to-book ratio within an industry, and 1-year lagged levels of industry value-weighted stock returns. In addition, we include the average industry *long-run* market-to-book component as a proxy for growth opportunities. The long-run market-to-book ratio component is estimated according to the market-to-book decomposition methodology using Model 3 of Rhodes-Kropf et al. (2005), which expresses market value as a function of book value, positive and negative earnings, and leverage.

Third, we use 5 variables to proxy for misvaluation. As proxies for sector and firm-specific misvaluation, we include the average industry time-series *sector* error component and the *firm-specific* error component of the market-to-book ratio estimated according to the Rhodes-Kropf et al. (2005) specification above. We estimate these equations annually by pooling quarterly observations at the industry level. Consequently, within each industry, the average firm-specific misvaluation can be nonzero in some quarters each year. Fuller et al. (2002) find that acquirers are more likely to overpay for publicly listed (as opposed to private) targets. We use the proportion of publicly listed targets among stock- and cash-financed M&As (calculated over the past 4 quarters) as an additional proxy of potential misvaluation within an industry (overall, the acquirers in our sample acquire 11,504 publicly listed targets, corresponding to 27.5% of our combined M&A sample). We also include 2 proxies for marketwide misvaluation (an adjusted version of the Baker-Wurgler (2006) investor sentiment index,[11] and changes in index levels).

Fourth, we use a set of 4 variables to proxy for capital market liquidity. The liquidity variables include cash holdings (the aggregate total of real cash holdings on the balance sheet averaged over the past 4 quarters), cash holdings scaled by the sum of the dollar volume of total capital (all debt, common stock, and preferred stock) issuance, the 3-month T-bill rate, and average industry corporate bond spreads. Industry spreads over the T-bill rate are estimated in 3 steps. First, we estimate an average credit rating per industry each quarter based on data on 3,883 firms rated in the S&P credit rating database in the WRDS. For each firm, we assume that ratings remain constant between consecutive rating dates (these firms receive 26,595 ratings overall), and create a quarterly series, which is then averaged every quarter within each industry. Over our entire sample of 5,900 industry-quarters, the credit ratings range from AAA to CCC. Subsequently, we estimate an average marketwide corporate bond yield for each rating level (AAA, AA, A, BBB, BB, B, and CCC) each quarter using offering yield to maturity data on 99,258 corporate bond issues (with ratings assigned within 1 year of the offer by 1 of the 4 major credit rating agencies) available in the Mergent FISD. We use

[11] Our investor sentiment index is the updated version of eq. (2) of Baker and Wurgler (2006), based on the first principal component of 4 (standardized) sentiment proxies using data over 1962–2004 (smoothed by averaging the figures for current, 1 quarter lag and 1 quarter forward). Baker and Wurgler's index includes trading volume as measured by NYSE turnover, the dividend premium, the closed-end fund discount, the number and 1st-day returns on IPOs, and the equity share in new issues. We exclude the number of IPOs and the share of equity issues, since these variables are highly correlated with our SEO and IPO series. We reestimate the index as the first principal component of the remaining 4 variables. We thank Jeff Wurgler for providing this data on his Web site (http://pages.stern.nyu.edu/∼jwurgler/).

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percentage differences with other credit rating levels in adjacent quarters to fill in a few missing quarterly observations. Finally, we match each industry's average credit rating every quarter with the average corporate bond yield corresponding to the same credit rating in the same quarter, and calculate the spread over the 3-month T-bill rate.

Last, we use a sales-based Herfindahl index to capture strategic interaction. Massa et al. (2007) argue that waves may also occur when firms respond strategically to (mimic) other firms' actions in concentrated industries. If the waves are driven by rational managers in concentrated industries engaging in corporate event activity as a strategic response to other firms' actions, the Herfindahl index should be positively related to wave activity.

In Panel A of Table 4 in columns 1–5, we estimate logit models of the likelihood of SEO, IPO, stock-financed M&A, cash-financed M&A, and repurchase waves separately. Both neoclassical efficiency and misvaluation variables are significant in explaining the occurrence of stock issuance waves in columns 1–3. IPO and stock-financed M&A waves are associated with periods of low unemployment, suggesting economic expansions. Capital expenditures increase following SEO and stock-financed M&A waves. SEO and IPO waves occur in industries with large cross-sectional dispersions of firm valuations. They are also associated with low initial cash holdings. SEO waves occur in industries with high liquidity (low borrowing spreads). The strategic interaction variable is never positively related to the likelihood of waves, which is inconsistent with Massa et al. (2007). In addition, marketwide investor sentiment and the proportion of public M&A targets are not significant in explaining these waves.

However, other misvaluation variables are significant. SEO waves are associated with increasing valuations (as evidenced by the positive forward market-to-book ratio), while for stock-financed M&A waves, valuations appear to have reached their peak. More importantly, the long-run component of the market-to-book ratio (growth opportunities) is never significant in explaining waves, but both the time-series sector error and the firm-specific error are highly significant (suggesting that stock issuance waves occur in overvalued industries and in quarters when many firms appear overvalued as well). In contrast, cash-financed M&A waves occur in industries with low growth opportunities (column 4), and repurchase waves occur when the firm-specific error component of the market-to-book ratio is negative, suggesting that repurchase waves occur when firms are undervalued (column 5). Repurchase waves are also associated with high borrowing spreads.[12]

[12] An alternative test, which we do not report in tables for brevity, examines whether different types of waves occur at different thresholds of valuation variables. We interact the actual values of stock returns and market-to-book variables with dummy variables indicating whether the stock returns or market-to-book exceed the time-series mean and standard deviation of the industry in question. We calculate industry means and standard deviations for each industry separately, using the industry's 100 quarterly observations during our 25-year sample period. We find that the likelihoods of SEO, IPO, and cash-financed merger waves are, respectively, positively related to the market-to-book ratio when the level of market-to-book ratio exceeds the industry's time-series mean. In addition, IPO waves are associated with high levels of stock returns. In contrast, stock-financed M&A waves require higher thresholds of valuation. The likelihood of stock-financed M&A waves is positively related to market-to-book ratios that exceed the industry's mean by more than 1 standard deviation.

In Panel A of Table 4 in columns 6–9, we estimate the likelihood of equity issuance waves by grouping together all transactions that involve the issue of shares to a public market. In column 6 we group SEOs and IPOs as equity issuance waves, and in column 7 we also add stock-financed M&A waves to this category. In each case, the dependent variable takes the value of 1 if there is a wave in at least 1 of the events in a given quarter, and 0 otherwise. We make the same inferences as before. As expected, waves of stock issuance events are driven by the same factors. The neoclassical factors (unemployment, capital expenditures, cross-sectional standard deviation of the market-to-book ratio, cash holdings, low borrowing spreads) and the misvaluation factors (industry- and firm-specific overvaluation components of the market-to-book ratio) that were significant in the previous specifications are also significant here.

As noted in the previous section, although there is considerable overlap in waves of equity issuance events, the waves do not overlap completely. For example, although there are extensive periods when SEO and IPO waves overlap, there are also many quarters when they do not overlap and occur independently of each other. This suggests that there may be differences in market conditions across periods when waves overlap compared to periods when they do not. For example, more severe neoclassical industry shocks (or alternatively, periods of more severe misvaluation) may give rise to equity issuance waves in SEOs, IPOs, and stock-financed M&As all occurring at the same time, whereas smaller shocks may lead to waves in only 1 of these events.

We explore whether these differences exist in columns 8 and 9, where we report ordered logits. The dependent variable equals the number of events experiencing waves in a given quarter (therefore, the dependent variable takes the values 1, 2, or 3 if there are waves taking place in 1, 2, or 3 events concurrently in a given quarter, and 0 otherwise). Again, we obtain results that are in line with the previous specifications. What is noteworthy here is that the larger the values of the neoclassical or the misvaluation variables, the more the stock issuance events that experience waves at the same time. For example, although firm-specific misvaluation is associated with waves in each of the stock issuance events separately (columns 1–3), larger misvaluation is associated with *concurrent* waves in all 3 events that occur simultaneously. Therefore, periods when waves of events overlap are also periods when either the efficiency shock or the misvaluation is more pronounced. On the other hand, less pronounced efficiency shocks or less severe misvaluation may give rise to waves in only one, but not all, events.

Organizational waves involve a change in the number of firms in the market. In columns 10–11 of Table 4, we group cash- and stock-financed M&A waves as organizational waves. What is striking in these specifications is that, although cash-financed M&A waves on their own are not related to misvaluation (column 4), periods when they overlap with stock-financed M&A waves are driven mainly by the factors that affect the latter, and misvaluation is present.

Therefore, stock-financed M&A waves require higher thresholds of firm valuations in order to occur compared to the other waves. Overall, these results suggest that different types of stock issuance and organizational (M&A) transactions require different thresholds of industry valuations.

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An alternate test of whether efficiency shocks or misvaluation cause the overlap of waves of different events in our sample is to compare the periods when our waves overlap with the efficiency shock wave periods identified by Harford (2005). If the merger waves identified by Harford represent periods of neoclassical efficiency shocks as he suggests, these waves might explain the overlapping between waves of different events that we observe in our sample. To economize on space, we do not report these results in the table. At first sight, it appears that a significant proportion of overlap between waves of different events in our sample occurs in industries identified by Harford as experiencing neoclassical shock waves.[13] Some 29% of the overlapping quarters between SEO and IPO waves, 83% of the overlapping quarters between SEO and stock-financed M&A waves, 14% of the overlapping quarters between IPO and stock-financed M&A waves, and 33% of the overlapping quarters between cash- and stock-financed M&A waves in our sample occur in decades when Harford identifies an efficiency shock. Upon further examination, however, the results appear less consistent with the neoclassical efficiency hypothesis. Harford's "efficiency" shocks are identified ex post, that is, he first determines the waves based on simulations of activity and only afterward searches in the press for a neoclassical explanation for them. Most of the overlap between our waves and Harford's can be attributed to the business services industry (SIC codes 7300–7399, which includes computer programming, computer systems, and software), an industry that ex post has been generally identified as probably subject to misvaluation in the late 1990s. If we exclude this industry, the proportion of overlapping quarters in our sample that coincide with Harford's efficiency shock waves drops to 14%, 33%, 0%, and 0%, respectively. It is therefore likely that some overlap between waves of different types of events in our sample may be attributed to misvaluation.

The correlation analysis of the previous section also showed that when waves do not overlap, the pattern is not random. The overall pattern among equity issuance waves suggested that, when waves do not overlap, SEO waves precede IPO waves, which in turn precede stock-financed M&A waves, which in turn precede stock repurchase waves. The latter waves continue after the earlier waves have ended. Overall, therefore, periods when SEO waves precede IPO waves may exhibit different characteristics compared to periods when IPO waves follow SEO waves. The analysis of organizational waves suggests that apart from the expected overlap between cash- and stock-financed waves, waves of one type preceded or followed the other in a roughly equal number of industries, suggesting a random pattern. We investigate these issues by examining directly the likelihood that waves of one type of event precede, overlap, or follow waves of another.

In Panel B of Table 4, the dependent variable takes the value of 1 in a given quarter if the event described experiences a wave that precedes, overlaps, or follows waves of another event, and 0 otherwise. When we examine the relationship between SEO and IPO waves in columns 1–3, we observe differences in the

[13] We classify our overlapping waves as corresponding to Harford's (2005) waves even if they occur in the same decade but outside the exact 2-year period identified by Harford. Therefore, our approach is likely to overestimate the number of waves attributed to neoclassical efficiency shocks.

neoclassical variables when the SEO wave precedes the IPO wave, and when the two overlap. SEO waves begin in periods with high unemployment, but unemployment is lower when the IPO wave begins to overlap with the SEO wave, and is still lower when the IPO wave follows the end of the SEO wave. SEO waves follow periods of low capital expenditures. Although cash holdings are low during the period of the SEO wave, they are high by the time the SEO wave is over and is followed by the IPO wave. The long-run component of the market-to-book ratio is also significant following the end of the SEO wave, suggesting that the firms doing IPOs then have high growth opportunities. These results suggest that, as we move from an SEO to an IPO wave, economic expansion gets under way. We also note that, although market-to-book ratios are positively related to the occurrence of both types of waves, forward market-to-book ratios are also positively related to the overlap between the 2 waves. This suggests that by the time SEO waves finish, valuations still have not reached their peak. The misvaluation components of the market-to-book ratio appear significant both before the IPO wave and after the SEO wave.

When we examine the relationship between IPO and stock-financed M&A waves in columns 4–6, by the time the IPO waves have ended, unemployment is low, valuations appear to have peaked (negative forward market-to-book ratio), growth opportunities are high (significant long-run market-to-book component), and interest rates are low, suggesting highly liquid capital markets. On the other hand, both the sector and the firm-specific misvaluation components are significantly positive, and furthermore, the acquisitions involve a significantly larger proportion of publicly listed targets (which may suggest that a larger proportion of acquirers may be overpaying for acquisitions).

Repurchase waves in column 8, appear to be associated with the end of business cycles (low unemployment, low and declining capital expenditures, and low stock returns). Interestingly, the firm-specific error component of the market-to-book ratio is significantly negative, consistent with the hypothesis that firms buy back their shares when they are undervalued. The results during the overlap between cash- and stock-financed M&A waves in column 9 are driven mainly by stock-financed M&As, and they are similar to the results obtained in Panel A of Table 4, columns 10–11.

This analysis sheds some light on a puzzle that has plagued a significant portion of the research on the factors behind the occurrence of waves of corporate events. Most of the empirical research on waves examines 1 wave at a time and finds no consensus on whether waves are driven by neoclassical or misvaluation factors, with different researchers finding support for one or the other hypothesis explaining waves of the same event. The analysis in Table 4 suggests that waves in stock issuance events (SEOs, IPOs, stock-financed M&As) are driven by similar factors most of the time. However, there are also distinct periods when the waves are influenced by one or another set of factors, which explains why other studies find support for different hypotheses. For example, although stock issuance waves are generally associated with high firm-specific misvaluation market-to-book components and are not related to the long-run component of the market-to-book that proxies for growth opportunities, there are distinct periods when growth opportunities become significant and/or firm-specific misvaluation appears

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absent. Similarly, cash-financed M&A waves appear to be driven by different factors when they occur on their own compared to when they coincide with stock-financed M&A waves. Cash-financed M&A waves are not driven by misvaluation when they occur on their own, but periods when cash-financed M&A waves overlap with stock-financed M&A waves are associated with misvaluation.

VII. Conclusions

Corporate events of all types (mergers, initial public offerings (IPOs), seasoned equity offerings (SEOs), and stock repurchases) happen in waves. The existing literature has typically examined one type of event at a time, though a priori there is reason to believe that the waves should be related.

In this paper, we examine the timing pattern of 5 types of corporate event waves (stock issues (both IPOs and SEOs), mergers (both stock- and cash-financed) and stock repurchases) using a comprehensive data set over the 25-year period (1980–2004). We document a new and distinctive pattern, previously undocumented in the literature, whereby SEO activity picks up first, followed by IPO activity, which is then followed by stock-financed M&A activity, followed in turn by increased stock repurchase activity. We also observe similar patterns when we go down to the individual industry level. While these patterns are not observed across all industries, we document that a significant proportion of industry-level activity does follow our observed pattern, suggesting that the phenomenon we document is economically significant.

Our results suggest that focusing on one type of corporate event alone, as prior literature has done, potentially obscures a far richer picture. Our finding that the timing of stock-related corporate events (stock issues, stock-financed acquisitions, and repurchases) is related in a consistent pattern and unrelated to cash-related events (cash-financed acquisitions) allows us to draw new conclusions on why waves occur and spread. Our results seem consistent with both the neoclassical efficiency hypothesis and the misvaluation hypothesis, and there are distinct periods when one or the other appears dominant.

Several puzzles remain, however. Why do these patterns not appear across all industries? Do these patterns appear in other types of corporate events? Why are cash-financed acquisitions not related to waves of other corporate events? We leave these questions to future research.

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