Venture Capital Exits and Investments:

The Influences of Market Run-up, Market Timing, and Media Attention

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In this paper, with particular attention to biotech, we address the question of whether venture capital (VC) firms are able to add value through exit and investment timing. We consider several aspects of this broad question. First, are VCs able to time IPOs to follow market run-ups? Second, are they able to time IPOs to precede market declines? Third, does media attention influence VC exit timing? Fourth, do public market conditions influence the Investment stage focus of new VC private-equity investments in a sector? Considering all venture-backed exits, we find that VCs are able to time IPOs to occur after market run-ups. However, we find no evidence that VCs can time IPOs to precede low or negative market returns. Focusing on the biotech sector, we do find evidence of successful market timing in that IPO activity is highest following market run-ups and before periods of low market returns. Controlling for leading and lagging market returns, we find little evidence that media attention influences IPO exit timing. As to new VC investments in biotech, we find that when market returns are low (high), VCs focus their investments in the sector on earlier (later) investment rounds with longer (shorter) times to anticipated harvesting.

1. Motivation and Literature Review

In 1963, the Securities and Exchange Commission (SEC), following the marketwide Flash Crash of 1962, called attention to what it described as the "troublesome and sometimes dangerous phenomenon of 'hot' issues." Supporting its position and policy recommendations, the SEC pointed to IPO evidence from the 1959-1961 hot issue market and subsequent market performance in 1962. Looking specifically at IPOs during the 1961 market peak, the SEC found that as of September 30, 1962, 77.2% were trading below their 1961 offer prices. The SEC ascribed the decline to over-optimism and speculation at the time of the IPOs. It is noteworthy that over the same period, the overall market also declined, implying that perhaps IPO investors are not so different from other market participants.

Since that time, and following an SEC hearing on hot issue markets in 1972, considerable academic attention has focused on the question of whether issuers are able to anticipate market declines and undertake IPOs at market peaks. Ibbotson and Jaffe (1975) claim to be the first to provide an academically rigorous study of hot issues. They find no evidence of negative market-adjusted returns after periods of high IPO activity.

The SEC and Ibbotson and Jaffe approaches to assessing market timing are fundamentally different from each other. Whereas the SEC's focus is on raw returns, Ibbotson and Jaffe study market-adjusted returns. In subsequent research, scholars have distinguished between aggregate market timing (the SEC approach) and firm-specific or idiosyncratic market timing (the Ibbotson and Jaffe approach).

Firm-specific market timing

Firm-specific market timing can arise if issuers know more than investors about the expected future performance of the firm and elect to issue at times when they believe investors are overly optimistic about the firm. Ritter (1991), Keloharju (1993), Jain and Kini (1994), Mikkelson and Shah

(1994), Lee, Taylor, and Walter (1996), Pagano, Panetta, and Zingales (1998) and Arosio, Paeleari, and Guidici (2001) all find evidence that operating or market-adjusted performance declines after IPOs.

The motivations for IPOs may be different for venture-backed firms than for others. Brav and Gompers (1997) compare the long-run aftermarket performance of IPOs by firms that are venture-backed versus non-venture-backed. Using an equal-weighted market index to adjust returns, they find that venture-backed firms outperform non-venture-backed. Further, they find that most underperformance is concentrated among small, low book-to-market firms such that when returns are adjusted by a value-weighted index, venture-backed and non-venture-backed IPO firms perform similarly to each other and similarly to non-IPO public firms of matched size and book-to-market ratio. They suggest that venture-backing, including information sharing, may reduce information asymmetry between insiders and investors, that venture-backed firms may attract a more sophisticated long-run investor clientele than non-venture-backed, or that, as long-term players in the IPO market, VCs may have lower incentives to exploit investor over-optimism.

Schultz (2003) challenges the evidence of firm-specific market timing, proposing that under-performance is an artifact of the lack of independence of firms' IPO timing decisions. He notes that as market prices are rising, private firms are increasingly likely to go public so that more firms go public following market run-ups than after stable or declining markets. Measuring excess returns on a firm-by-firm basis, it can appear that issuers are able to predict market declines, when, in fact, they are simply deciding not to issue unless market values continue to increase. Schultz refers to the phenomenon as "pseudo market timing." He argues that a correct test of market timing should be based on calendar time estimates rather than event time. Using calendar time regressions of market-adjusted returns, he finds no significant evidence of successful IPO market timing. While the pseudo market timing reasoning seems to apply both to firm-specific and aggregate market timing, Schultz does not test aggregate market timing, which is the focus of our study.

Gompers and Lerner (2003) study post-IPO performance for firms that went public between 1935 and 1972. In calendar-time regressions they find no significant evidence of firm-specific market timing. Ang, Gu, and Hochberg (2007) accept the Gompers and Lerner finding for the pre-NASDAQ period but challenge their suggestion that underperformance after IPOs in a post-1970 sample may be a statistical fluke associated with basing inferences on a small sample where occurrences of large positive long-run aftermarket performance are rare. They find that underperformance is present in both even-time and calendar-time estimates and contend that the magnitude of underperformance is too large to be a result of small-sample bias.

Aggregate market timing

Recognizing that the pseudo market timing argument applies also to aggregate market timing, Baker and Wurgler (2000) study the relationship between the share of capital raised via new issues of equity compared to new long-term debt. They measure equity share annually over the period from 1927 through 1996. So, effectively, their approach is based on calendar time but does not consider the number of offerings and is not limited to IPOs. They find evidence of aggregate market timing in that the dollar-valued equity share in one year significantly predicts CRSP equal-weighted and value-weighted returns in the subsequent year and that, in some years, equity share predicts negative returns when realized returns are negative making it inconsistent with market efficiency.

While the evidence in Baker and Wurgler supports aggregate market timing, the conclusions are heavily dependent on results from a two-year period (1929 and 1930) surrounding the Great Depression where it seems clear that over-optimism, including uncontrolled margin trading, substantially inflated the market. Butler, Grullon, and Weston (2005) call attention to the potential for look-ahead bias arising from in-sample estimation methods. This is a particular concern in the sample used by Baker and Wurgler where the sample period begins in 1927, the most significant negative predictions of returns are for two and three years later (1929 and 1930) and the predictions of negative returns are based on data through 1996, most of which would not have been observable in 1929. Using a bootstrap approach to control for look-ahead bias, Butler, Grullon, and Weston find no evidence of successful market timing. Baker, Taliaferro, and Wurgler (2006) dispute the conclusion reached by Butler, Grullon, and Weston. Using a simulation approach, they estimate that the pseudo-market-timing associated with small samples is much too small to account for the observed magnitudes of their estimated market timing effects.

Other studies of aggregate market timing all focus on venture-backed firms. Lerner (1994) appears to be the first to study aggregate market timing. Lerner uses a sample of venture-backed biotech firms from 1978 through 1992 to study the choice between IPO and private financing. He finds evidence of market timing in that firms are able to issue after market run-ups and before market declines. He argues that because biotech ventures take years to develop and typically involve several funding rounds, the sector is particularly well-suited to testing market timing. He finds that the return on an index of publicly traded biotech firms is 9.9% over the 60 market days before the IPO and declines by 4.6% over the 60 market days after.

In a more recent paper, Ball, Chiu, and Smith (2011) use a large sample of venture-backed firms over three decades (1978 through 2009) to study the exit choices of VCs between IPO and M&A. Clustering by calendar quarter, they find that market returns before VC exit are significantly higher for IPOs than for M&As but are not significantly different from M&A returns in up to four quarters after the exit. For the eight sectors that are the main focus of VC investing, pre-exit returns are consistently higher for IPOs than for M&A exits. Differences in post-IPO returns are generally not statistically significant. The biotech sector is an important exception, where the differences are significantly positive before the IPO and significantly negative after, with average quarterly returns near zero or negative after IPOs. Dividing the sample into the same period that is covered by Lerner (1994) and the period after, they find that for the Lerner period, mean post-IPO returns are negative after the IPO, whereas in the period subsequent to that covered by Lerner they are positive but generally lower than the returns after M&A exits. These results suggest that the Lerner sample period may be aberrational. Finally, in probit models with calendar-time clustering, they find that IPO probability is positively and significantly related to equal-weighted market returns over the four quarters before the exit and negatively related to market returns in the four quarters after. In summary, with the exception of biotech, the evidence provided by Ball, Chiu and Smith supports aggregate pseudo market timing – venture-backed firms go public following market run-ups and high IPO activity does not predict aggregate market declines.

Media attention

Media attention to biotech has been studied since the early 1980s. Goodell (1980), Altimore (1982), Pfund and Hofstadter (1981), Gaskell, Bauer Durant, and Allum (1999), and Nisbet and Lewenstein (2002) all examine media attention to biotech as a dependent variable but do not examine

the effects of media attention on venture financing or exit choices. Nisbet and Lewenstein, for example, conduct a content analysis of biotech coverage in the *New York Times* and *Newsweek* from 1970 through 1999 as opinion-shaping outlets. They do not address the impact of attention on market performance. Rather, the emphasis is on how biotech events affect media coverage.

Rajan and Servaes (1997) study the related topic of how stock market analysis attention, measured by analyst coverage, is related to IPO performance. They find that analyst earnings forecasts tend to be overoptimistic relative to realized performance. Consistent with analysts influencing investors, they find that analyst optimism spills over and is negatively related to post-IPO adjusted returns. Tetlock (2007) uses the *Wall Street Journal* "Abreast of the Market" column to study the effects of media attention. He finds that media pessimism induces temporary pressure on market prices and that the price impact for small stocks is large slow to reverse. Bhattacharya, Galpin, Ray, and Yu (2009) examine the impact of media coverage during the dot-com bubble in the late 1990s. They find that net positive media coverage is positively related to same-day abnormal returns, though the direction of causality is not clear. Que and Zhang (2021) study how investor attention to industry affects valuations of private venture-backed firms between 2006 and 2017. They find that increased attention leads to higher valuations for both first and later-round financing. However, the higher attention-related valuations are reversed in later financing rounds and to lower probability of successful exit. In general, studies of media attention find that the effects of attention are transitory and that they influence investor optimism, leading to temporary overvaluation relative to long-run value.

Investment timing and focus

If exit timing of venture-backed firms is affected by stock market performance, it is also plausible that the investment focus of VCs may be affected. VCs and other investors may change sector focus and/or investment stage focus in response to market conditions. For example, within a sector, when public market valuations are high or have been increasing VCs may concentrate new investments on ventures that have the potential to quickly be ready for harvesting. Conversely, when public market values have been declining or are low, VCs may focus more on earlier investment rounds where expected time to harvest is long. Gompers, Kovner, Lerner, and Scharfstein (2008) study the impact of public markets on VC investment cycles. They find that experienced VCs increase their investments the most when public market signals become favorable. Related to VC investment timing and focus, Kaplan and Schoar (2005) find that capital raised by VC firms is positively related to market index return in the prior year. Nanda, Samila, and Sorenson (2020) study the persistence effects of initial VC investment success. They find that initial success stems from fortuitous selection of sector, location and stage, and not from ability to spot sectors, locations, or investment stages with high potential.

2. Data

Given the mixed evidence on market timing in the biotech sector, we focus on VC harvesting and investment rounds in that sector. The focus on biotech with limited attention to the full range of VC involvement is appropriate because VC has invested in biotech for several decades, through a number of market cycles, whereas VC attention to other sectors is more recent or has generally been sporadic.

From Pitchbook, we obtain the quarterly numbers of IPO and M&A exits and investment rounds over the 41 years from 1980 through 2020. These exits are the main dependent variables used in the study. We collect data on both all VC exits and investment rounds (which we examine briefly) and on

those within the biotech sector as identified by Pitchbook (which we examine more fully). Panel A of Table 1 shows quarterly averages of VC harvesting activity by IPO and M&A. The averages are computed over 10-year periods (11 years in the final period). Whereas the total numbers of venture-backed IPOs increased through the end of the dot-com bubble in early 2000 and has subsequently declined, the total numbers of VC-backed M&A exits have risen over the entire study period so that the percentage of IPO exits by VC-backed firms had declined. Biotech is somewhat of a contrast. The quarterly numbers of VC-backed biotech IPOs have continued to increase after early 2000, as have the quarterly numbers of M&A exits. In the biotech sector, the percentage of IPOs has declined but at a slower rate than for all VC-backed sectors.

In the empirical analysis to follow, we control for the secular growth of exit activity using three linear and non-linear trend variables: a quarterly counter, the natural log of the counter, and the square of the counter. De-trending is intended to control for the long-term trends in activity so that deviations from the de-trended numbers can be used to test the effects of shorter-run changes in stock market returns and fluctuations in media attention.

In addition to testing hypothesis related to the determinants of VC-harvesting choices by IPO or M&A, we also test for the possible influences of market returns and media attention on the on the investment stage focus of the VC. Our conjecture is that when market performance is good, VCs may focus attention on later-stage investments that are close to being ready for harvest and that when market conditions are bad, they may focus on earlier-stage projects with longer anticipated holding periods. As an indication of investment stage, we use the self-reported series information from Pitchbook. Panel B of Table 1 shows quarterly averages of funding rounds by investment series, with Series A being the first VC round. Our focus with this analysis is on biotech Series A investments as a percentage of all biotech VC series investments. Considering all VC-backed funding rounds, the 10-year quarterly averages suggest that VCs have moved increasingly into earlier investment stages. The pattern is less clear for biotech funding, where the quarterly average percentage of Series A funding rounds declined in early years but then was similar to the percentages for all VC-backed funding rounds.

Panels C and D provide quarterly averages of the independent variables used in the analysis. We consider two alternative measures of quarterly market returns. The NASDAQ index is used when we examine all exits. We use either the NASDAQ index or an index constructed of all publicly held biotech firms when the focus of analysis is on the biotech sector. Using both measures of market returns enables us to assess whether our findings are sensitive to the choice of index, which could be important since the biotech index is not available until 1994. Our analysis of media attention is limited to biotech. For this, we use the numbers of articles per quarter that mention biotech or a variant of biotech such as biotechnology in either the headline or the lead paragraph. We obtain article counts from Nexis Uni. As can be seen from Panel D, the quarterly average numbers of biotech articles in the *New York Times* (*NYT*) and the *Wall Street Journal* (*WSJ*) vary considerably even when the numbers reported in the table are decade-long averages of quarterly total.

3. Empirical Analysis

We examine the effects of quarterly leading and lagging stock returns and quarterly measures of media attention on the IPO and M&A choices of venture-backed firms and on VC investment stage focus. Our basic approach is the same in all parts of the analysis – the dependent variable is the quarterly number of the event type under study and the independent variables are leads and lags of

market returns and leads of media attention, as well as the trend controls. Because we are agnostic as to how quickly or over how long a period stock returns and media attention will affect the dependent variable, our analytical focus is on Wald tests of summed coefficients aggregated over multiple quarters.

All Venture-backed IPOs on Market Returns

To begin, we test how aggregate venture-backed IPO activity is related to leading and lagging market returns. We do not include media attention in this part of the analysis. Table 2 includes two sets of results, one where market returns are measured by the Nasdaq Index and one where they are measured by the Biotech Index. Our primary focus in this table is on the Nasdaq results. The biotech results are included to help assess whether results are sensitive to the shorter time period for which biotech returns are available. The NASDAQ results indicate that IPO activity is higher after market run-ups over the two preceding quarters (nasd+1 and nasd+2) with no significant evidence of ability to time IPOs before market declines (nasd-1 and nasd-2).

Because IPOs occur throughout the calendar quarter, we have no expectation as to the sign on the contemporaneous market return coefficient (Nasdaq). In the Wald tests we report results for alternative aggregations of leading and lagging coefficients. We find that IPO activity increases after all combinations of leading market returns and is not significantly related to any combination of lagging returns. The result is inconsistent with successful market timing – venture-backed firms go public after market run-ups but do not anticipate low or negative market returns. Replacing Nasdaq returns with Biotech Index returns, results are similar, indicating that the findings are not sensitive to the shorter time period covered by the Biotech Index or to using biotech to measure market returns.

Biotech IPOs on Market Returns and Media Attention

In Table 3, we report the results of regressing quarterly IPO numbers on quarterly leading and lagging market returns and on leading quarterly media attention. Results using Nasdaq as the measure of market returns are reported first, followed by results using the Biotech Index. Market timing results are similar between the two, in that the quarterly number of IPOs is positively related to market returns before the IPO quarter and negatively related to market returns after the IPO quarter. Wald test results are strong for returns both before and after quarters with high IPO numbers.

There is little evidence in Table 3 to suggest that IPO activity is affected by media attention. Individual quarterly coefficients on *WSJ* activity are not statistically significant and Wald test results are mixed. Results (unreported) are similar when *WSJ* attention is replaced with *NYT* attention.

While the negative coefficients on lagging market return are indicative of aggregate market timing, they could just reflect pseudo market timing. We assess this in two ways. First, we use the coefficients on the time trend variables and the constant to estimate the but-for level of IPO activity in each quarter, leaving aside the effects of leads and lags of market returns and media attention and any omitted factors. We then calculate standardized residuals relative to predicted IPO numbers based on just the time trend controls and constant. The residuals are the levels of IPO activity that are not explained by the time trend controls or the constant. We then select quarters with residuals at least 0.5 standard deviations above or below zero and consider those to be high and low IPO activity quarters. For those two subsets, we compute average quarterly Nasdaq returns over periods from four quarters before to two quarters after the IPO quarter. Figure 1 is a plot of the average standardized residuals for the two

subsets over the quarters surrounding the IPO quarter. For the high IPO activity subset, the figure shows high average Nasdaq returns over the four quarters before (market run-up), and low but positive returns over the two quarters after. Against the average quarterly Nasdaq return of 3.2 percent over the 1980-2020 sample period, the post-IPO quarter returns are below average, and Q+2 returns, in particular, are even below average short-term treasury rates over the study period, suggesting effective market timing of venture-backed biotech IPOs. Differences between the high returns and moderate returns are negative and significant at the 0.10 level in both of the lagged quarters.

It is possible that the results could be driven by some sort of look-ahead bias or that the periods of high or low IPO activity are actually just a few extended episodes due partly to inadequate time-trend controls. To examine this, Figure 2 is a time-series plot of the standardized residuals. As can be seen, there are many short episodes of residuals above 0.5, spread over the entire sample period, and a number of episodes of standardized residuals below -0.5, mostly occurring during the latter half of the sample period. The evidence in Figure 2 does not indicate a material concern about look-ahead bias or incorrect inference based on a few extended periods of high or low IPO activity.

As shown in Figure 3, results are similar when market returns around IPOs are measured by the biotech Index, where returns are only available for 104 quarters. The average quarterly biotech return over all available quarters is 4.2 percent. For the high-IPO quarters, post-IPO returns on the index are less that 2 percent in each of the two quarters, which is well below the index average by above the average risk-free rate over since 1994. Numbers of observations are lower and differences relative to the moderate returns groups are not statistically significant at conventional levels.

Biotech M&As on Market Returns and Media Attention

The IPO evidence could be driven either by firms focusing on IPOs in lieu of M&A exits or by a broader increase in exits surrounding market run-ups or market peaks. In Table 4, we examine the relations between Biotech M&A exits and our measures of market returns and media attention. Using the Nasdaq Index as a measure of market returns, post-exit results are similar to those for IPOs in that M&A exits occur before lower market returns. In contrast to the IPO results, market returns before M&A exits are negatively related to M&A activity. The results suggest that venture-backed biotech firms substitute away from IPOs when market returns have been low or declining. M&A results using the Biotech Index are similar to those using Nasdaq but are weaker and not statistically significant.

With either index of market returns, media attention as measured by *WSJ* articles is consistently positive and is statistically significant over most windows covered by Wald tests. While media attention could influence M&A activity, it is also possible that attention to the biotech sector prior to high levels of M&A exits could indicate media speculation over biotech M&As or that press articles about actual biotech mergers simply increase as the numbers of mergers increase.

When media attention is measured by *New York Times* articles, the (unreported) results related to pre- and post-exit market return are similar to those in Table 4, however those related to attention are much weaker, with mixed signs, and with Wald tests that generally are not statistically significant.

Biotech IPO Percentage on Market Returns and Media Attention

To further examine the choice between IPO and M&A exits, in Table 5, we use the IPO percentage of total IPO and M&A exits in a quarter (IPO Percent). In the model with Nasdaq, returns after the IPO

Percent quarter are not significantly related to returns in the subsequent two quarters. Leading quarter returns remain significantly positive, which is consistent with the earlier evidence that leading returns are significantly positively related to the number of IPOs and significantly negatively related to the number of M&A exits. Results using the Biotech Index are similar except that post exit returns remain significantly negatively related to IPO Percent. We present both approached but focus discussion on the Nasdaq results unless there is a difference of note.

We find little significant evidence that IPO Percent is related to *WSJ* attention before the exit. The only statistically significant results are when the Biotech Index is used and then only for Wald tests that include media attention four quarters before the exit quarter.

Series A Percentage of All Series on Market Returns and Media Attention

Here, we address the question of whether, in addition to exit timing and choice, market returns and media attention also influence the focus of new VC investments. Specifically, we ask whether, within the biotech sector, does market performance or media attention influence the choices of VCs to invest at early stages of portfolio firm development or at later stages? Our conjecture is that if market returns to the sector have been low, investing at later stages may be viewed as throwing bad money after good, whereas investing at an early stage may be viewed as taking a longer term approach of the sector. To assess this, we measure Series A Percent as the number of investments at the early stage (Series A) as a percentage of investments at all stages (Series A through the latest series reported). Table 6 shows the results.

In this portion of the analysis, changes in investment focus within a sector could be influenced by market performance overall (as indicated by Nasdaq) or by sector-specific market performance (as indicated by the Biotech Index). The Nasdaq results in Table 6 are weak, with few statistically significant returns quarters. The Biotech Index results are in sharp contrast. Biotech Index returns are negatively related to Series A Percent in all quarters and are statistically significant in all of the contemporaneous or leading quarters. In the Biotech Index model, none of the quarters of *WSJ* biotech article count is significantly related to Series A Percent nor is any of the related Wald tests. To our knowledge, this is the first statistical evidence of the influence of public market conditions on VC choice of investment stage focus.

Conclusions

We find strong and consistent evidence that biotech IPO activity increases following market run-ups and that market returns after IPOs are negatively related to IPO activity. With the exception of biotech, we find no significant evidence that venture-backed firms can successfully time IPO exits around market peaks or to precede periods of low returns. Our biotech evidence is in contrast, where we do find evidence of successful market timing in that periods of high IPO activity precede quarters with market returns below market norms and even below short-term risk-free returns. Our evidence further indicates that during periods of low market returns, venture-backed biotech firms substitute away from IPOs and into M&A exits. Some of these results are consistent with the findings of Ball, Chiu, and Smith (2011) and extend the period of study by another decade and with a different source of exit data and different measures of market returns. Our results on how market conditions affect investment focus unique.

We find little evidence that IPO activity is related to media attention measured by biotech articles in the Wall Street Journal. In contrast, high levels of M&A exits are preceded by high levels of media attention to biotech~~nolog~~y in the *NYT* or *WSJ*.

Finally, we find evidence that investment focus (early vs. late stage) is related to ~~the expected horizon of investment is related to sector-specific~~ media attention to biotech. Specifically during periods when biotech returns have been low, VCs have focused their biotech investments on early investment stages with long expected holding periods until anticipated harvest.

It is puzzling that issuers of venture-backed biotech IPOs seem to be able to time the market but that evidence of successful market timing is not more general. ~~seems to be limited to biotechnology.~~ A possible explanation is that the ability to time markets is narrowly focused. Biotech is a well-defined sector with a concentrated set of firms and investors and potentially with fairly concentrated knowledge of the potentials for ~~different~~ innovations within the sector. Biotech also has a relatively long investment and harvesting history ~~r~~compared ~~elative~~ to some sectors that have attracted VC attention, such as? . If market timing success occurs mainly within narrowly defined sectors, aggregating over a number of sectors could mask ~~hide~~ evidence of successful market timing. We leave this conjecture to future study.

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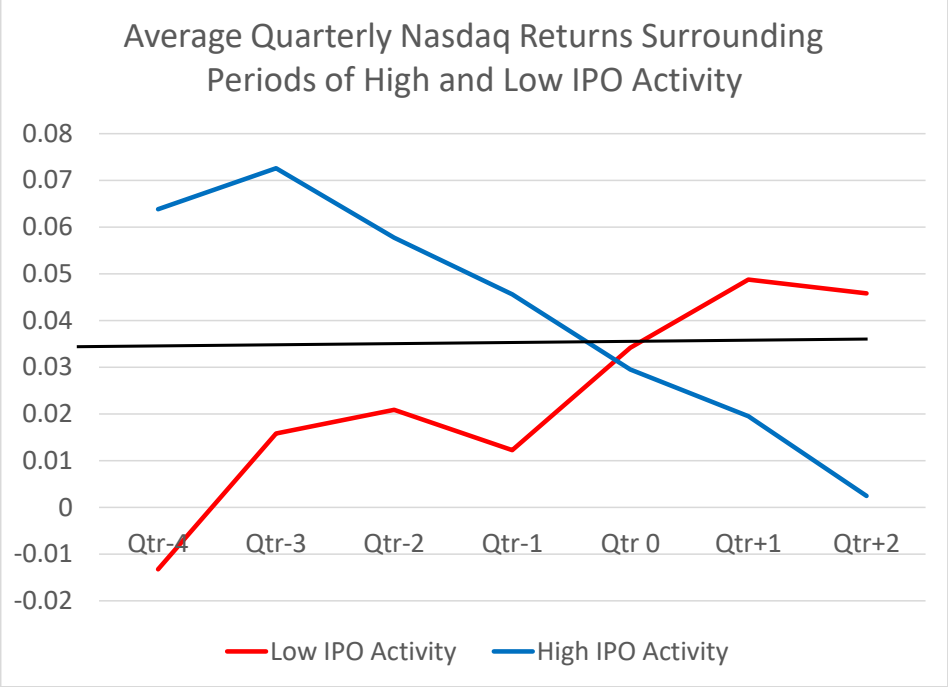

Figure 1. The figure shows average Nasdaq Index Returns by quarter for seven quarters surrounding periods of high and low IPO activity. High and low activity quarters are those with standardized residuals greater than 0.5 or less than -0.5 where predicted returns are based on trend variables and a constant so that residuals reflect the effects of other included and omitted variables.

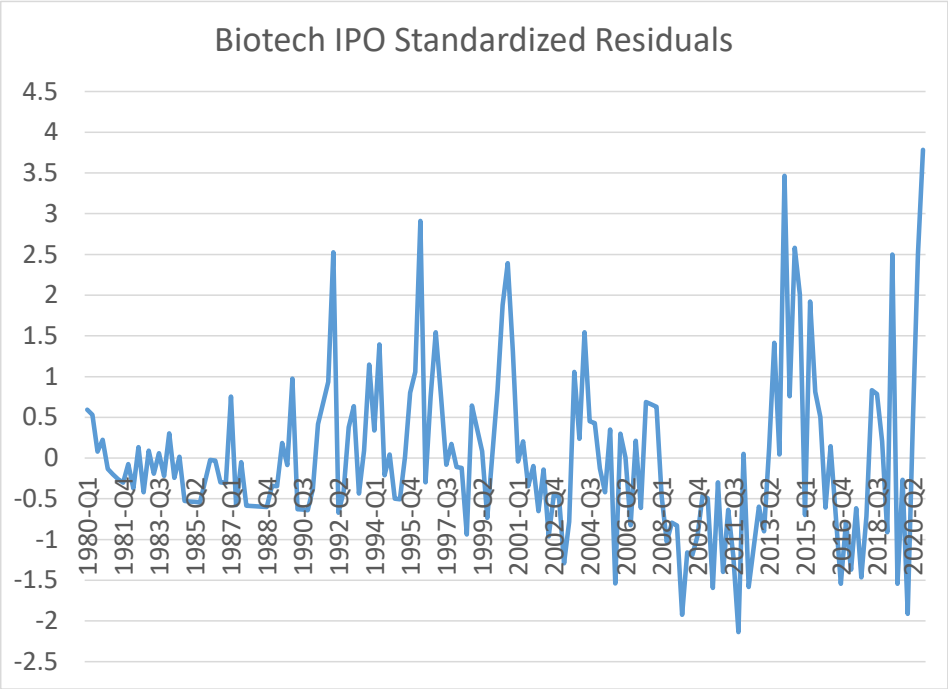

Figure 2. The figure shows the time series of standardized residuals of the quarterly number of venture-backed biotech IPOs where predicted returns are based on trend variables and a constant so that residuals reflect the effects of other included and omitted variables.

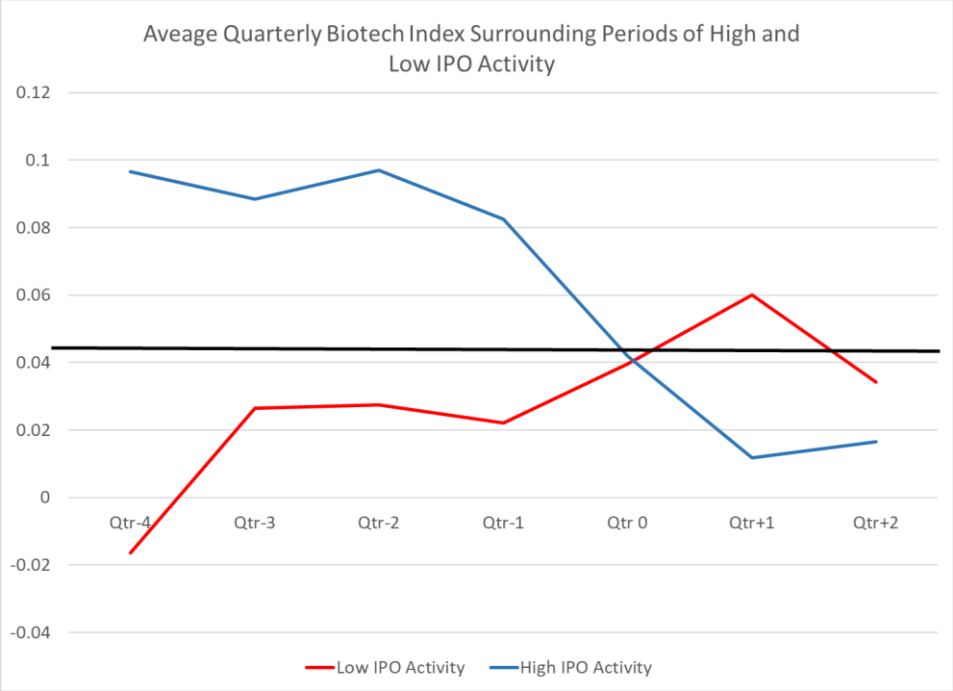

Figure 3. The figure shows average Biotech Index Returns by quarter for seven quarters surrounding periods of high and low IPO activity. High and low activity quarters are those with standardized residuals greater than 0.5 or less than -0.5 where predicted returns are based on trend variables and a constant so that residuals reflect the effects of other included and omitted variables.

Table 1

Descriptive Data over Time

Table 1. The table shows 10 or 11 year averages of the quarterly numbers of the indicated events for the decade length intervals included in the 1980-2020 sample period. Panels A and B are related to dependent variables in the analysis. Panels C and D are related to independent variables.

		1980-89	1990-99	2000-09	2010-20
Panel A	**VC Harvesting**				
	All IPOs	26.83	104.53	94.75	92.45
	All M&As	24.95	113.13	915.18	1950.45
	All IPOs/IPOs+M&As	0.62	0.53	0.10	0.05
	Biotech IPO	0.95	4.00	5.18	10.95
	Biotech MandA	0.25	1.73	14.63	31.02
	Biotech IPO/Biotech IPOs + M&As	0.84	0.70	0.26	0.25
Panel B	**VC Investment Series**				
	All Series A	0.38	26.08	215.00	475.16
	All All Series	0.93	69.33	512.13	916.05
	All Series A/All All Series	0.35	0.38	0.41	0.52
	Biotech Series A	0.03	1.58	15.53	47.30
	Biotech All Series	0.05	4.80	36.43	92.91
	Biotech Series A/Biotech All Series	0.50	0.37	0.42	0.51
Panel C	**Market Returns**				
	Nasdaq	2.81%	6.47%	-0.81%	4.39%
	BioRet		8.40%	0.25%	4.57%
Panel D	**Media Attention**				
	All NYT Articles	26305.28	30999.83	23793.73	15508.02
	NYT Biotech Articles	16.15	25.35	26.35	13.61
	WSJ Biotech Articles	3.425	7.275	9.4	10.5

Table 2

All IPO Number: Alternative Market Indexes

The table shows results of regressing the quarterly number of venture-backed IPOs on leads (indicated by + signs) and lags (indicated by - signs) of quarterly market returns. Market returns are measured as either the NASDAQ Index or a Biotech Index. T-statistics and p-values are reported and are bolded for p-values of 10 percent or lower. Controls include a quarterly counter, the log of the quarterly counter, and the square of the quarterly counter. A constant is also included. Wald test are tests of significance of combinations of summed coefficients.

All IPOs on NASDAQ Index Returns

N Obs		164
R^2		0.3761

IPO Number	Coef.	t-stat	P>t
nasd-2	-45.1524	-1.340	0.182
nasd-1	-10.0681	-0.370	0.709
nasdaq	10.4350	0.380	0.706
nasd+1	120.8241	2.990	**0.003**
nasd+2	94.9148	3.210	**0.002**
Controls	Yes		

Wald Tests	Sum	p-value
nasd + nasd-2 + nasd-1	-44.7856	0.357
nasd-1 + nasd-2	-55.2205	0.174
nasdaq + nasd+1	215.7389	**0.009**
nasd+ nasd+1 + nasd+2	226.1738	**0.000**
nasd+1 + nasd+2	215.7389	**0.000**

All IPOs on Biotech Index Returns

N Obs		108
R^2		0.2960

IPO Number	Coef.	t-stat	P>t
bioret-2	-1.8919	-0.0800	0.939
bioretl-1	6.6176	0.3400	0.734
bioret	15.9884	0.5500	0.586
bioret+1	120.6248	2.8900	**0.005**
bioret+2	96.7591	3.7700	**0.000**
Controls	Yes		

Wald Tests	Sum	p-value
bioret + bioret-1 + bioret-2	20.7141	0.629
bioret-1 + bioret-2	4.7257	0.886
bioret + bioret+1	217.3839	**0.006**
bioret + bioret+1 + bioret+2	233.3723	**0.000**
bioret+1 + bioret+2	217.3839	**0.000**

Table 3

IPO Number: Alternative Market Indexes with Wall Street Article Count

The table shows results of regressing the quarterly number of venture-backed biotech IPOs on leads (indicated by + signs) and lags (indicated by - signs) of quarterly market returns and leads of the quarterly numbers of biotech articles in the Wall Street Journal (WSJ). Market returns are measured as either the NASDAQ Index or a Biotech Index. T-statistics and p-values are reported and are bolded for p-values of 10 percent or lower. Controls include a quarterly counter, the log of the quarterly counter, and the square of the quarterly counter. A constant is also included. Wald test are tests of significance of combinations of summed coefficients.

Biotech IPOs on NASDAQ Index Returns

	N Obs		162
	R^2		0.5751
IPO Number	**Coef.**	**t**	**P>t**
nasd-2	-3.7956	-1.690	**0.093**
nasd-1	-5.0073	-1.760	**0.080**
nasdaq	-2.6693	-0.950	0.344
nasd+1	6.7212	2.790	**0.006**
nasd+2	4.5201	1.860	**0.064**
biowsj	0.0930	1.250	0.214
biowsj+1	0.0157	0.170	0.865
biowsj+2	0.0415	0.440	0.661
biowsj+3	-0.1237	-1.220	0.224
biowsj+4	-0.0720	-0.890	0.375
Controls	Yes		

Wald Tests	**Sum**	**p-value**
nasd + nasd-2 + nasd-1	-11.4723	**0.016**
nasd-1 + nasd-2	-8.8029	**0.025**
nasd+ nasd+1 + nasd+2	8.5719	**0.030**
nasd+1 + nasd+2	11.2413	**0.000**
biowsj + biowsj+1	0.1087	0.283
biowsj+1 + biowsj+2	0.0571	0.524
biowsj +biowsj+1 + biowsj+2	0.1502	**0.072**
biowsj+1 + biowsj+2 + biowsj+3	-0.0665	0.557
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	-0.1385	0.172
biowsj+2 + biowsj+3	-0.0822	0.466
biowsj+2 + biowsj+3 + biowsj+4	-0.1542	0.101

Biotech IPOs on Biotech Index Returns

	N Obs		106
	R^2		0.5608
IPO Number	**Coef.**	**t**	**P>t**
bioret-2	-3.4229	-1.500	0.138
bioretl-1	-7.4471	**-3.270**	**0.002**
bioret	-4.5807	-1.390	0.168
bioret+1	6.3404	**2.600**	**0.011**
bioret+2	8.0899	**3.090**	**0.003**
biowsj	0.0861	1.010	0.317
biowsj+1	-0.0038	-0.030	0.973
biowsj+2	0.0140	0.140	0.892
biowsj+3	-0.1860	-1.560	0.122
biowsj+4	-0.1256	-1.390	0.169
Controls	Yes		

Wald Tests	**Sum**	**p-value**
bioret + bioret-1 + bioret-2	-15.4508	**0.000**
bioret-1 + bioret-2	-10.8701	**0.003**
bioret + bioretlag1 + bioretlag2	9.8496	**0.011**
bioret+1 + bioret+2	14.4303	**0.000**
biowsj + biowsj+1	0.0823	0.431
biowsj+1 + biowsj+2	0.0103	0.915
biowsj +biowsj+1 + biowsj+2	0.0963	0.301
biowsj+1 + biowsj+2 + biowsj+3	-0.1758	0.242
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	-0.3013	**0.021**
biowsj+2 + biowsj+3	-0.1720	0.211
biowsj+2 + biowsj+3 + biowsj+4	-0.2975	**0.011**

Table 4

M&A Number: Alternative Market Indexes with Wall Street Article Count

The table shows results of regressing the quarterly number of venture-backed biotech M&A exits on leads (indicated by + signs) and lags (indicated by - signs) of quarterly market returns and leads of the quarterly numbers of biotech articles in the Wall Street Journal (WSJ). Market returns are measured as either the NASDAQ Index or a Biotech Index. T-statistics and p-values are reported and are bolded for p-values of 10 percent or lower. Controls include a quarterly counter, the log of the quarterly counter, and the square of the quarterly counter. A constant is also included. Wald test are tests of significance of combinations of summed coefficients.

Biotech M&As on NASDAQ Index Returns

	N Obs		162
	R^2		0.9412
M&A Number	**Coef.**	**t**	**P>t**
nasd-2	-6.4038	-2.700	**0.008**
nasd-1	-0.9070	-0.400	0.687
nasdaq	-4.0075	-1.910	**0.058**
nasd+1	0.8362	0.370	0.713
nasd+2	-4.0907	-1.700	**0.091**
biowsj	0.1229	1.340	0.183
biowsj+1	0.0866	0.840	0.403
biowsj+2	0.1031	0.850	0.399
biowsj+3	0.0005	0.000	0.996
biowsj+4	0.0570	0.640	0.521
Controls	Yes		

Wald Tests	**Sum**	**p-value**
nasd + nasd-2 + nasd-1	-11.3183	**0.001**
nasd-1 + nasd-2	-7.3108	**0.013**
nasdaq + nasd+1	-3.1713	0.254
nasd+ nasd+1 + nasd+2	-7.2620	**0.025**
nasd+1 + nasd+2	-3.2545	0.301
biowsj + biowsj+1	0.2094	**0.041**
biowsj+1 + biowsj+2	0.1896	**0.091**
biowsj +biowsj+1 + biowsj+2	0.3125	**0.005**
biowsj+1 + biowsj+2 + biowsj+3	0.1901	**0.078**
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	0.2472	**0.036**
biowsj+2 + biowsj+3	0.1036	0.333
biowsj+2 + biowsj+3 + biowsj+4	0.1606	0.197

Biotech M&As on Biotech Index Returns

	N Obs		106
	R^2		0.9115
M&A Number	**Coef.**	**t**	**P>t**
bioret-2	-4.4382	-1.620	0.109
bioretl-1	-0.9532	-0.340	0.737
bioret	-1.0597	-0.460	0.648
bioret+1	-2.1979	-0.820	0.417
bioret+2	-0.6031	-0.220	0.824
biowsj	0.1691	1.500	0.138
biowsj+1	0.1498	1.150	0.253
biowsj+2	0.1400	0.990	0.326
biowsj+3	0.0545	0.450	0.656
biowsj+4	0.0461	0.420	0.673
Controls	Yes		

Wald Tests	**Sum**	**p-value**
bioret + bioret-1 + bioret-2	-6.4512	0.165
bioret-1 + bioret-2	-5.3914	0.184
bioret + bioretlag1	-3.2576	0.382
bioret + bioretlag1 + bioretlag2	-3.8606	0.370
bioret+1 + bioret+2	-2.8009	0.443
biowsj + biowsj+1	0.3189	**0.015**
biowsj+1 + biowsj+2	0.2898	**0.039**
biowsj +biowsj+1 + biowsj+2	0.4588	**0.002**
biowsj+1 + biowsj+2 + biowsj+3	0.3443	**0.023**
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	0.3903	**0.022**
biowsj+2 + biowsj+3	0.1945	0.114
biowsj+2 + biowsj+3 + biowsj+4	0.2405	0.125

Table 5

IPO Percentage: Alternative Market Indexes with Wall Street Article Count

The table shows results of regressing the quarterly percentage of venture-backed IPOs to IPOs + M&As on leads (indicated by + signs) and lags (indicated by - signs) of quarterly market returns and leads of the quarterly numbers of biotech articles in the Wall Street Journal (WSJ). Market returns are measured as either the NASDAQ Index or a Biotech Index. T-statistics and p-values are reported and are bolded for p-values of 10 percent or lower. Controls include a quarterly counter, the log of the quarterly counter, and the square of the quarterly counter. A constant is also included. Wald test are tests of significance of combinations of summed coefficients.

IPO Percentage on NASDAQ Index Returns

		N Obs	143
		R^2	0.6542
Series A Percent	**Coef.**	**t**	**P>t**
nasd-2	-0.0309	-0.220	0.829
nasd-1	-0.2191	-1.250	0.215
nasdaq	0.1188	0.850	0.399
nasd+1	0.0989	0.680	0.500
nasd+2	0.4109	1.990	**0.049**
biowsj	-0.0019	-0.410	0.681
biowsj+1	0.0000	0.010	0.993
biowsj+2	-0.0030	-0.830	0.406
biowsj+3	0.0041	0.910	0.366
biowsj+4	-0.0028	-0.830	0.405
Controls	Yes		

Wald Tests	**Sum**	**p-value**
nasd + nasd-2 + nasd-1	-0.1312	0.598
nasd-1 + nasd-2	-0.2500	0.267
nasdaq + nasd+1	0.2178	0.276
nasd+ nasd+1 + nasd+2	0.6286	**0.007**
nasd+1 + nasd+2	0.5098	**0.023**
biowsj + biowsj+1	-0.0019	0.713
biowsj+1 + biowsj+2	-0.0030	0.500
biowsj +biowsj+1 + biowsj+2	0.0012	0.460
biowsj+1 + biowsj+2 + biowsj+3	0.0012	0.848
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	-0.0017	0.740
biowsj+2 + biowsj+3	0.0011	0.799
biowsj+2 + biowsj+3 + biowsj+4	-0.0017	0.695

IPO Percentage on Biotech Index Returns

		N Obs	106
		R^2	0.6317
Series A Percent	**Coef.**	**t**	**P>t**
bioret-2	-0.1677	-1.680	**0.096**
bioretl-1	-0.3166	-2.320	**0.023**
bioret	-0.1297	-1.270	0.206
bioret+1	0.2218	2.330	**0.022**
bioret+2	0.2463	2.450	**0.016**
biowsj	0.0019	0.610	0.541
biowsj+1	-0.0038	-1.250	0.214
biowsj+2	0.0003	0.090	0.926
biowsj+3	-0.0043	-1.340	0.185
biowsj+4	-0.0032	-1.120	0.266
Controls	Yes		

Wald Tests	**Sum**	**p-value**
bioret + bioret-1 + bioret-2	-0.6141	**0.004**
bioret-1 + bioret-2	-0.4844	**0.005**
bioret + bioretlag1	0.0921	0.551
bioret + bioretlag1 + bioretlag2	0.3384	**0.037**
bioret+1 + bioret+2	0.4681	**0.001**
biowsj + biowsj+1	-0.0019	0.552
biowsj+1 + biowsj+2	-0.0035	0.329
biowsj +biowsj+1 + biowsj+2	-0.0079	0.685
biowsj+1 + biowsj+2 + biowsj+3	-0.0079	0.102
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	-0.0110	**0.011**
biowsj+2 + biowsj+3	-0.0040	0.323
biowsj+2 + biowsj+3 + biowsj+4	-0.0072	**0.087**

Table 6

Series A Percentage: Alternative Market Indexes with Wall Street Article Count

The table shows results of regressing the quarterly Series A percentage of all biotech funding series on leads (indicated by + signs) and lags (indicated by - signs) of quarterly market returns and leads of the quarterly numbers of biotech articles in the Wall Street Journal (WSJ). Market returns are measured as either the NASDAQ Index or a Biotech Index. T-statistics and p-values are reported and are bolded for p-values of 10 percent or lower. Controls include a quarterly counter, the log of the quarterly counter, and the square of the quarterly counter. A constant is also included. Wald test are tests of significance of combinations of summed coefficients.

Series A Percentage on NASDAQ Index Returns

		N Obs	119
		R^2	0.2803
Series A Percent	**Coef.**	**t**	**P>t**
nasd-2	-0.12591	-0.890	0.378
nasd-1	0.062758	0.470	0.639
nasdaq	-0.0468	-0.290	0.769
nasd+1	-0.28183	-1.610	0.110
nasd+2	-0.038	-0.210	0.836
biowsj	-0.00531	**-1.550**	**0.125**
biowsj+1	-0.00171	-0.540	0.588
biowsj+2	-0.00223	**-0.590**	**0.553**
biowsj+3	0.006421	1.970	0.052
biowsj+4	0.002219	**0.730**	**0.466**
Controls	Yes		

Wald Tests	**Sum**	**p-value**
nasd + nasd-2 + nasd-1	-0.1100	0.656
nasd-1 + nasd-2	-0.0632	0.742
nasdaq + nasd+1	-0.3286	**0.094**
nasd+ nasd+1 + nasd+2	-0.3666	0.150
nasd+1 + nasd+2	-0.3198	0.222
biowsj + biowsj+1	-0.0070	**0.071**
biowsj+1 + biowsj+2	-0.0039	0.297
biowsj +biowsj+1 + biowsj+2	-0.0092	**0.097**
biowsj+1 + biowsj+2 + biowsj+3	0.0025	0.592
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	0.0047	0.247
biowsj+2 + biowsj+3	0.0042	0.292
biowsj+2 + biowsj+3 + biowsj+4	0.0064	0.150

Series A Percentage on Biotech Index Returns

		N Obs	106
		R^2	0.5468
Series A Percent	**Coef.**	**t**	**P>t**
bioret-2	-0.0662	-0.940	0.350
bioretl-1	-0.1251	-1.700	**0.092**
bioret	-0.2058	-3.190	**0.002**
bioret+1	-0.1397	-2.070	**0.042**
bioret+2	-0.1121	-1.770	**0.081**
biowsj	-0.0002	-0.130	0.896
biowsj+1	-0.0027	-1.420	0.158
biowsj+2	0.0017	0.750	0.455
biowsj+3	-0.0003	-0.160	0.872
biowsj+4	0.0006	0.270	0.788
Controls	Yes		

Wald Tests	**Sum**	**p-value**
bioret + bioret-1 + bioret-2	-0.3970	**0.001**
bioret-1 + bioret-2	-0.1912	**0.067**
bioret + bioretlag1	-0.3454	**0.001**
bioret + bioretlag1 + bioretlag2	-0.4576	**0.000**
bioret+1 + bioret+2	-0.2518	**0.010**
biowsj + biowsj+1	-0.0030	0.212
biowsj+1 + biowsj+2	-0.0010	0.671
biowsj +biowsj+1 + biowsj+2	-0.0012	0.673
biowsj+1 + biowsj+2 + biowsj+3	-0.0013	0.615
biowsj+1 + biowsj+2 + biowsj+3 + biowsj+4	-0.0007	0.794
biowsj+2 + biowsj+3	0.0014	0.561
biowsj+2 + biowsj+3 + biowsj+4	0.0020	0.491