The Source Code

V133: It Is a Bear Market Again

The software market has been under considerable pressure since the high in November, and now as we have crossed into bear market territory we thought it would be good to update the "Navigating Software Market Corrections" analysis we did in 2019. We also provide a couple of shopping lists for investors to consider as things settle out. Key takeaways are focus on large-cap profitable names with better margins during the pullback and names with good revenue upside potential after the correction is done.

- **Software universe is down 21.7% peak to trough:** The software universe is trading down 21.7% from the recent peak in mid November as fears of lockdowns emerge on the back of the global spike in COVID-19 cases amid rising interest rates and inflation. We saw a similar trend in the first half of 2021 when the software market came down 19% from its peak in February 2021. We note that the software universe returned ~30% since the last trough in May 2021 to the recent peak in November 2021.

- **Revenue multiples see sharp decline:** Forward sales multiples are down over 2x multiple turns to 9.9x from the recent high of 12.5x in January 2021, and a similar trend can be seen in the SaaS sub-segment where revenue multiples have come down significantly to 10.2x from 17.3x in January 2021. However, on an EV/FCFF basis the multiples trended up and have reached an all-time high of 26.7x as of 1/7/2022 for the software universe, while there is a downtick for the SaaS sub-segment. We note that there are far fewer observations for FCF than revenue given the number of companies that are still burning cash.

- **Small-cap, money-losing, premium-valued stocks are the hardest hit during corrections.** Our analysis indicates that the worst-performing group in software during market corrections of 15% or more tends to be small-cap companies with negative operating margins and valuations on either revenue or cash flow above that of the software industry average. These companies have high revenue growth rates and tend to have high average analyst ratings.

- **Large-cap, more profitable companies perform better in corrections.** During the market corrections the companies that perform the best tended to be large-cap companies with higher operating margins that traded at valuations below the software industry average at the market peak heading into the correction. These companies tended to be safer places as investors were attracted to more attainable growth targets, better profitability, and cash flow dynamics.

- **The 12 months following a correction focus on companies with best revenue upside potential.** Once the software market bottoms, in the next 12 months performance tends to focus on smaller capitalization companies that are beating revenue. All the other indicators ranging from valuation to margin profile are less descriptive determinants of performance.

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Executive Summary: Where Do We Go from Here?

On December 14, 2021, we published our 2022 outlook where we downgraded a number of high-multiple names and pointed out the possibility that valuation had jumped the shark. Our concern is that impending Fed interest rate increases could potentially lead to compressing multiples in software where a number of stocks are being valued on 10-year outlooks that require significant top-line growth and low interest rates to support the valuations at that time. Since then we have seen the concerns around rising interest rates lead to a bear market in software with the items we identified playing out faster than we anticipated. So the question really is how much more is left to go and what should investors do. We see two primary scenarios playing out, but in each of them we believe the biggest portion of the pullback has already occurred.

Scenario #1: December earnings remind investors that software has good fundamentals

Even though we have seen significant pressure on software stocks, our primary research indicates that demand for solutions from these companies remains robust. We expect a very good earnings report season for the December quarter, and that could be the catalysts to stabilize the software sector, especially if valuations fall below 10x on revenue multiples for both the overall software sector and SaaS.

Scenario #2: Fed rate increases lead to another leg down post-December earnings

Even with the very good fundamental results expected for the December quarter there is a possibility that when the Fed actually begins its first interest-rate increases it could lead to another phase of multiple compression. We could see a little bit of a pop or respite from December earnings then a sell-the-news type of reaction when we finally get rate increases. But even in this scenario we think the pressure would play out in the first half of 2022 and not linger.

Shift back to focus on fundamentals should occur

Looking back over our 25-year career, there are times when macro/market factors outweigh company fundamentals, but inevitably the focus shifts back to those company-specific fundamentals. We do expect that shift back to focus on fundamentals to occur before 2H22.

Shopping Lists to Consider

In the analysis below you will see that during the actual pullback larger companies with operating margins greater than 20% with reasonable valuations perform the best. Then after the pullback is complete companies that offer the greatest beat-and-raise results perform the best in the 12 months following the completion of the correction. In the table below we pulled a subset of our coverages into four categories regardless of rating. The compounders represent large-cap, very profitable names, with varying degrees of valuation, to consider as the pullback continues. We prefer Intuit and Synopsys in particular. But once the pullback is done the beat-and-raise profile kicks in; here the focus would shift to the growth names. We split names into all stars, some honorable mention names, and the up-and-coming emerging disruptors for investors to consider.

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Table 1: Potential Investor Shopping Lists

The compounders	Growth All-Stars	Growth Honorable Mentions	Emerging disruptors
Adobe	DataDog	RingCentral	CS Disco
Intuit	Cloudflare	Five9	Xometry
Autodesk	Crowdstrike	Dynatrace	Procore
Veeva	Zscaler	Altair	Samsara
ServiceNow	Okta	Guidewire	Expensify
Costar	GitLab		Olo
Ansys	Zoom		Duck Creek
CDNS	Doximity		Clearwater Analytics
Synopsys			Intapp
PTC			

Source: J.P. Morgan estimates.

Market Correction Analysis

Refer to **The Source Code V91 - Navigating Software Market Corrections** for the previous version of this analysis.

In this report we are refreshing our market correction analysis report that we published in March 2019. Since our last report there are a lot of changes on the number of public companies in software. We extend the analysis to 298 stocks post 2019 to identify periods of correction. We define a correction as a fall of greater than 15% for the software group as a whole in any 12-month window from the peak and a bear market as a fall of greater than 20%. We identify a total of 13 market correction periods since 2000 out of which 10 qualify as bear markets. The most recent sell-off that began in November 2021 is ongoing, and the software market is down 21.7% as of 1/7/2022 from the peak. Table 2 below shows all the market correction periods since 2000.

Table 2: Periods of correction since 2000 when software fell more than 15%

Market Correction		Index Performances		
Start Date	Trough Date	Software Index	S&P 500	NASDAQ
10-Mar-00	14-Apr-00	-41.8%	-2.8%	-34.2%
1-Sep-00	4-Apr-01	-49.1%	-27.5%	-61.3%
20-Jan-04	12-Aug-04	-26.1%	-6.6%	-18.4%
5-May-06	21-Jul-06	-15.5%	-6.4%	-13.8%
31-Oct-07	22-Jan-08	-20.8%	-15.4%	-19.8%
7-Jul-11	3-Oct-11	-27.5%	-18.8%	-18.7%
5-Mar-14	8-May-14	-19.4%	0.1%	-7.0%
23-Jun-15	29-Sep-15	-16.5%	-11.3%	-12.5%
1-Dec-15	9-Feb-16	-25.6%	-11.9%	-17.2%
14-Sep-18	24-Dec-18	-21.1%	-19.1%	-22.7%
2-Feb-20	18-Mar-20	-36.3%	-29.2%	-28.8%
12-Feb-21	13-May-21	-19.1%	4.5%	-6.9%
12-Nov-21	Ongoing	21.7%	-0.1%	-5.8%

Source: Bloomberg Finance L.P., J.P. Morgan Research.

What is causing the market corrections recently?

We show three periods of market corrections since 2019 in Figure 1. In the recent period we see that the major factors affecting the performance in the software stocks is either the macro trend (like onset of COVID-19 in the Feb '20 – Mar '20 correction where the entire market lost ground (SPX down ~29%) due to major disruptions in the businesses) or rising interest rates, increasing inflation fears from Fed tapering, and supply chain issues (like we saw in the pullback from Feb '21 – May '21 where software market was down 19% compared to a gain of 4.5% for S&P 500). However, the most recent pullback is a combination of both the fear from the surge in COVID-19 cases globally along with looming fears of rising interest rates, increasing inflation, and supply chain disruptions.

Recently, the market has come back to software after corrections. This trend is clear from Figure 1 below where we can see ~200% return from trough to peak in the 11-month period between first two corrections and ~30% returns in the six-month period between the recent two corrections.

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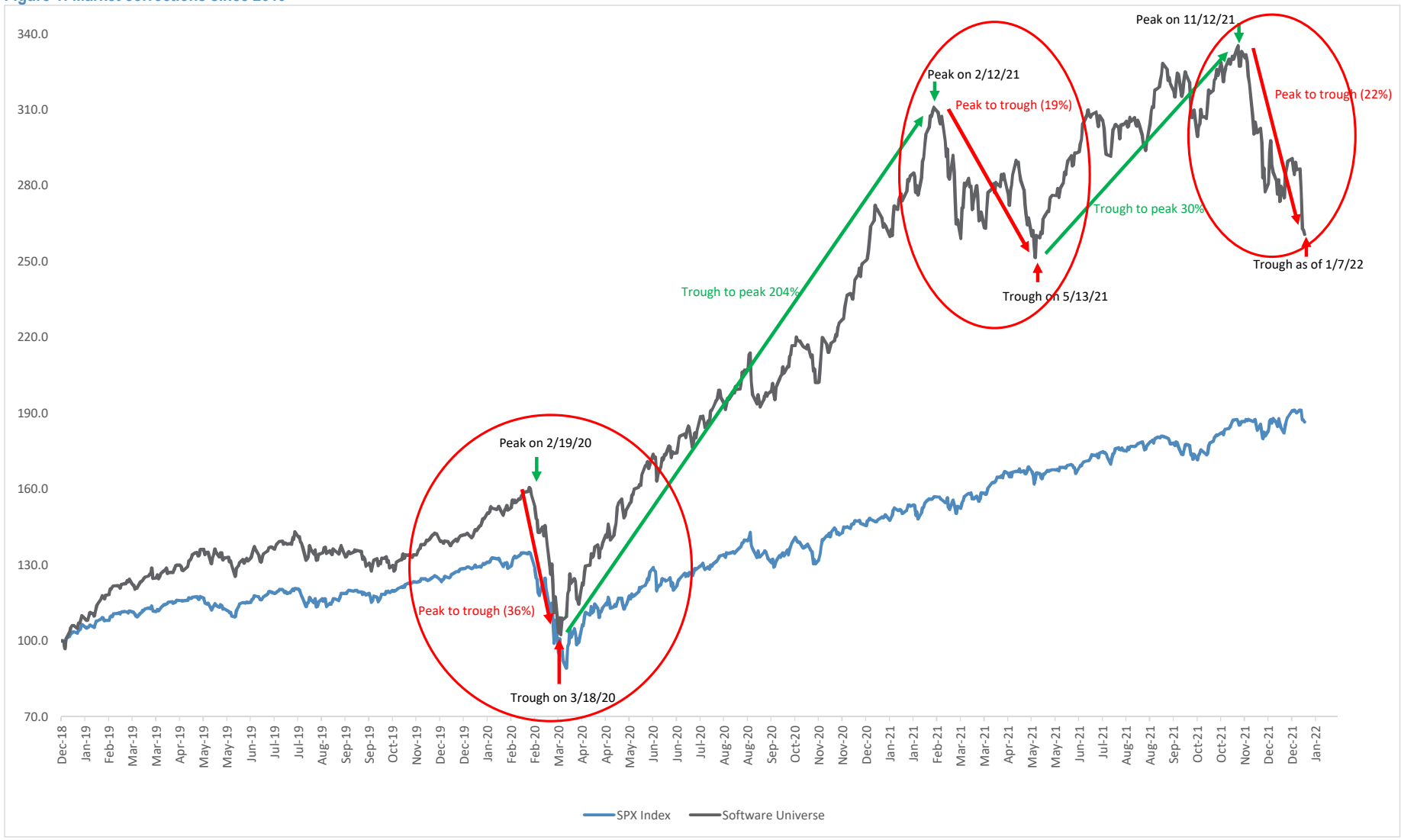
Figure 1: Market corrections since 2019



Source: Bloomberg Finance L.P. and J.P. Morgan. Note: In our previous note (The Source Code V124) our calculation for the Feb-May 2021 pullback may differ from the one in this report due to addition of newly public companies into the tracker.

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Sharp Valuation Corrections Despite Higher Growth Outlooks

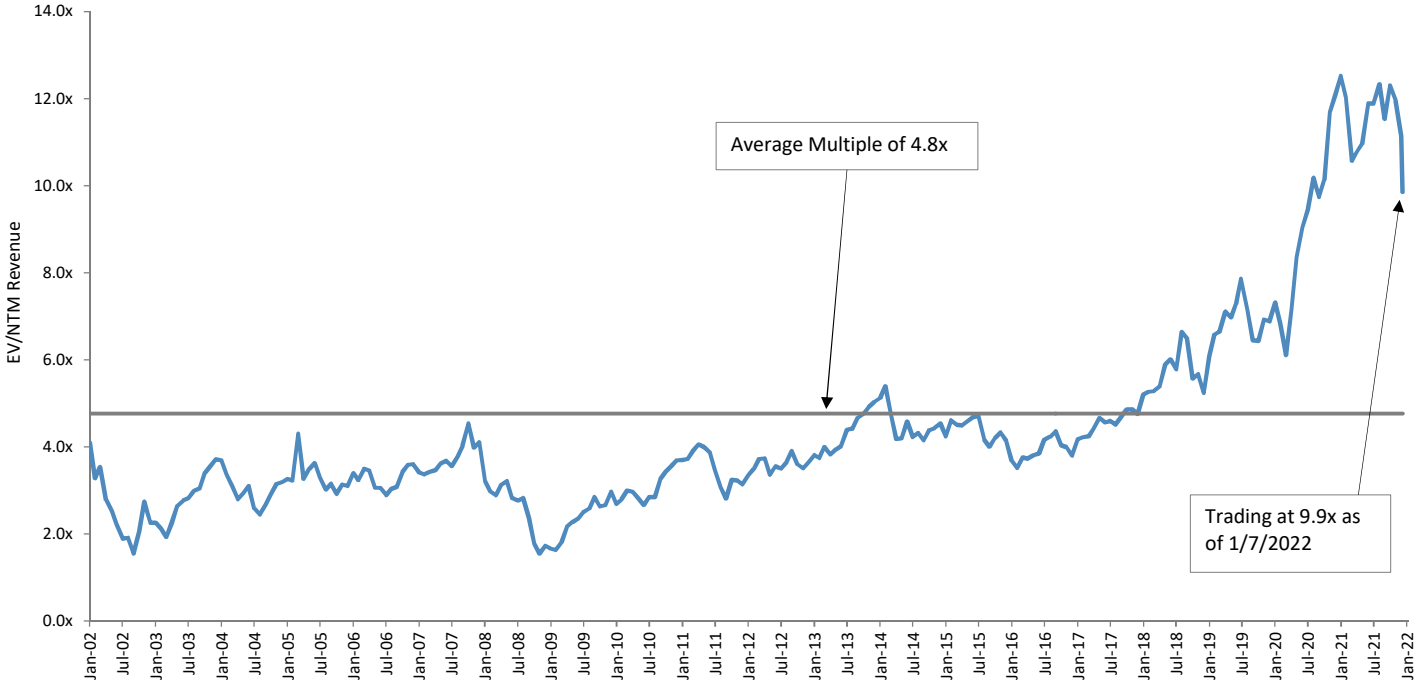
Forward revenue multiples for the software sector have come down sharply in the past few months, showing strong correlation to sector performance. The NTM sales multiple for the overall software sector has come down to 9.9x from the peak value of 12.5x in January 2021, moving parallel to the price performance trend. The pure SaaS-sub-segment is no different with an even sharper contraction in revenue multiples to 10.2x from peak 17.3x in January 2021. The interesting trend to note is that even though the software sector was performing poorly, NTM revenue growth estimates jumped significantly, pointing to continued strong fundamentals (Figure 2). This shows that right now there is a disconnect between software stock behavior and fundamentals.

Figure 2: Software performance index vs NTM revenue growth estimates

Source: Bloomberg Finance L.P. and J.P. Morgan. Note: Green and red dashed lines indicate performance peak and trough, respectively.

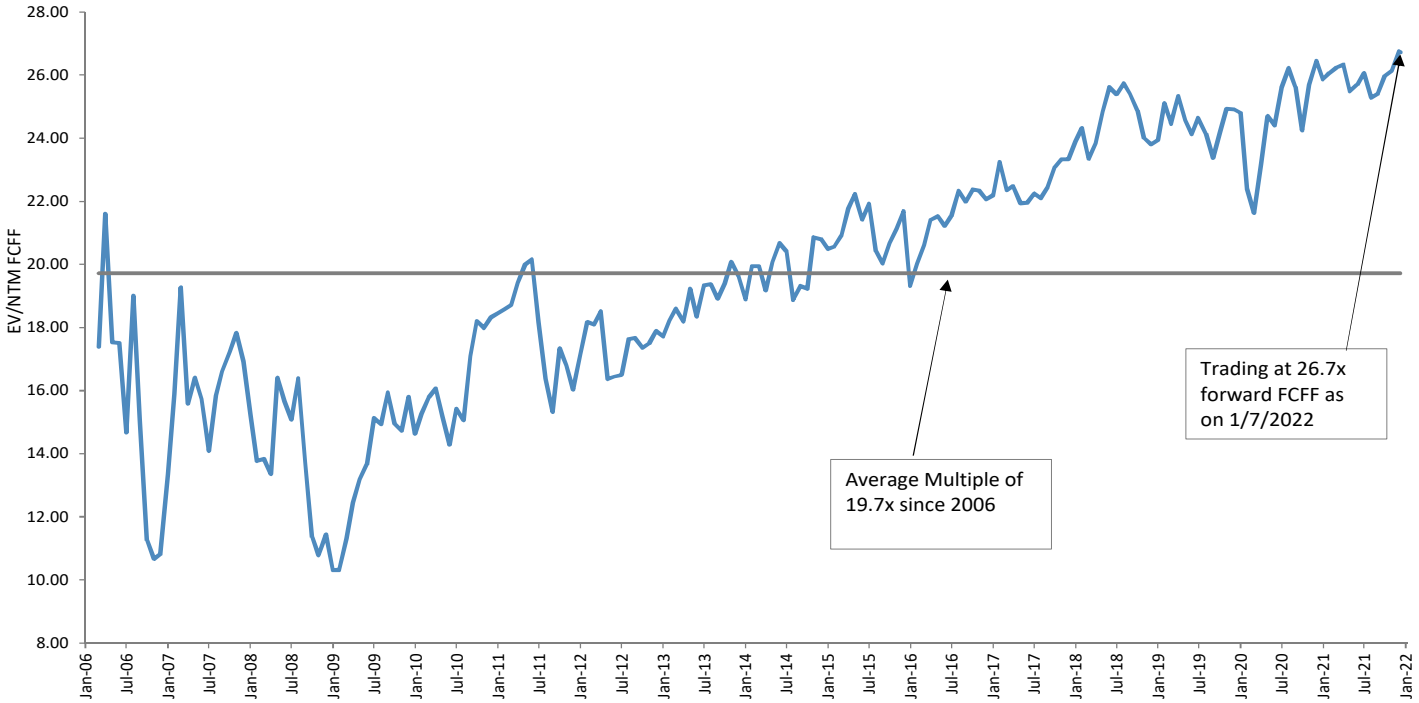
However, forward FCFF multiples tell a different tale altogether as software EV/NTM FCFF multiples touch the all-time high of 26.7x, suggesting next 12-month cash flow estimates are going down. SaaS cash flow multiples also followed the same trend; however, the recent contraction took multiple down to 28.2x. Part of this is once again incorporating increased T&E from improved business travel and higher levels of hiring into the cost base of companies to support the growth outlooks.

Figure 3: EV/sales multiples have gone down significantly to 9.9x



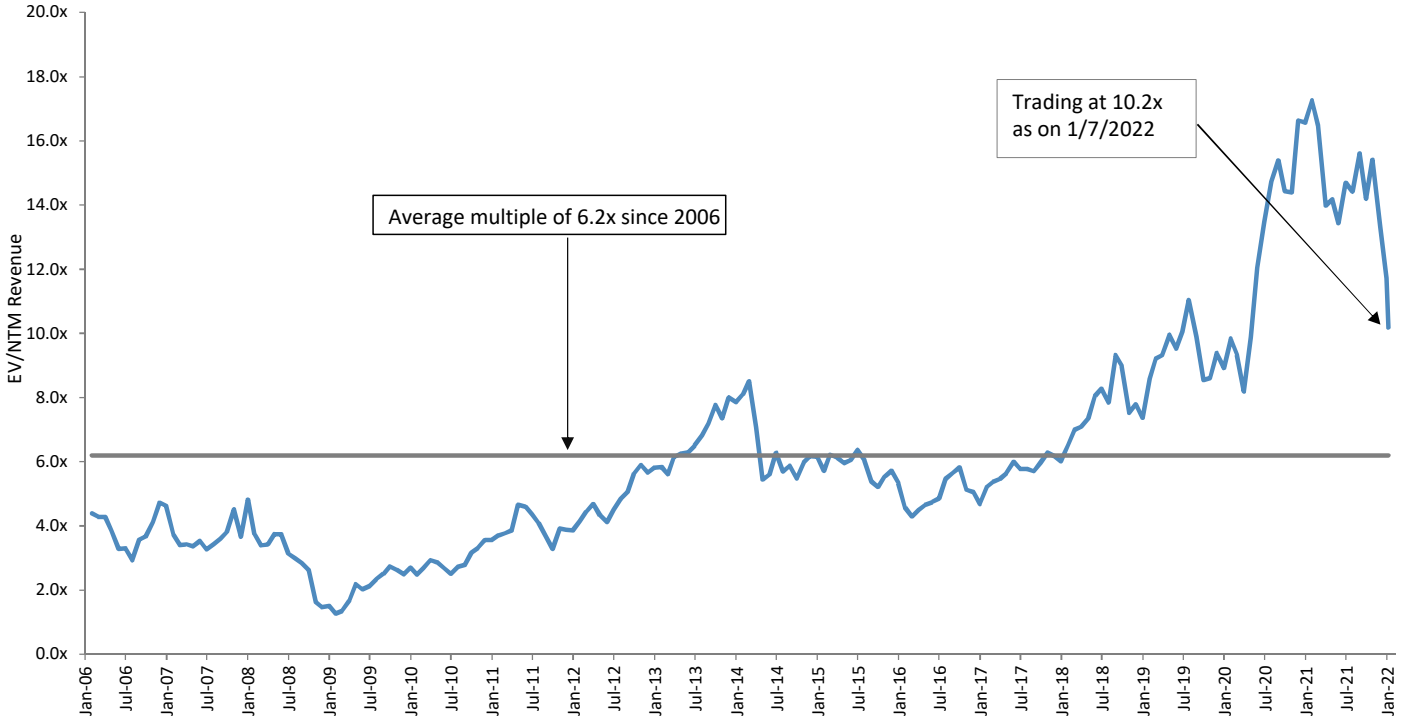
Source: Bloomberg Finance L.P. and J.P. Morgan.

Figure 4: EV/FCFF multiples are at all-time high of 26.7x as of 1/7/2022



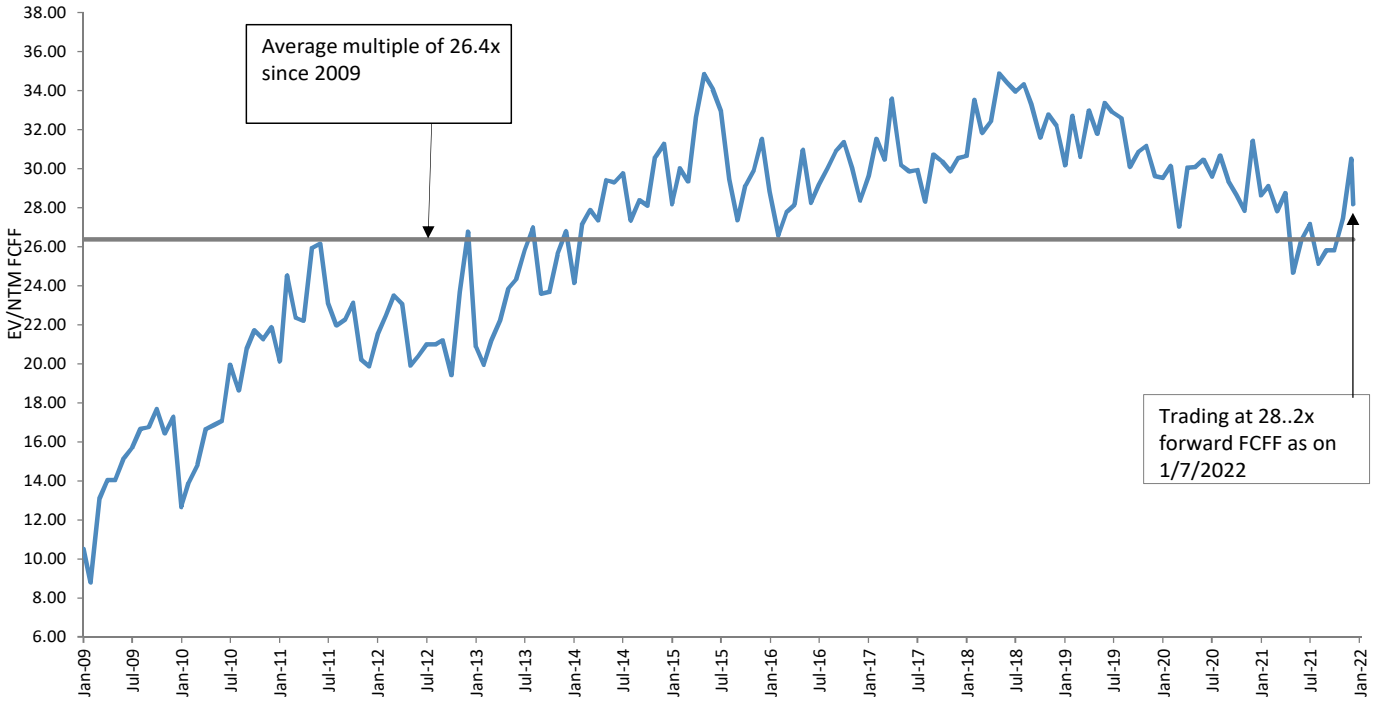
Source: Bloomberg Finance L.P. and J.P. Morgan.

Figure 5: SaaS-only EV/sales multiples have gone down significantly since all-time high of 17.3x in Jan 2021 to 10.2x



Source: Bloomberg Finance L.P. and J.P. Morgan.

Figure 6: SaaS-only EV/FCFF multiples are trading at 28.2x



Source: Bloomberg Finance L.P. and J.P. Morgan.

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Factors Affecting Stock Performance

What caused some stocks to perform better/worse than most?

To determine the source of performance we analyzed a variety of factors for stocks with the biggest swings in each period in order to identify similarities in their characteristics. This helps provide a framework for dealing with such corrections in the future. For most of the metrics, we analyzed the performance for the four quarters leading up to the market peak and then during the actual correction. The 12-month post correction looks at the performance for the four quarters reported after the trough of the correction. Please note that we removed the stocks with very small market caps—less than $500M post 2016, less than $400M in 2011, 2014, and 2015, less than $300M in 2004 and 2006, less than $200M in 2000 and 2001.

Table 3: Factors that we looked at to identify winners and losers

Metric	Explanation
Revenue: Reported vs Estimates	Comparison of the reported revenue vs consensus
EPS: Reported vs Estimates	Comparison of the reported EPS vs consensus
Revenue Growth Trend	Looking for revenue growth acceleration/deceleration
Operating Margin Trend	Looking at operating margin for expansion/compression
Valuation	Comparison of EV/sales and EV/FCFF multiples vs the software industry average to determine premium/discount
Magnitudes of Beat/Miss	Measured the percentage beat/miss to find any trends in thresholds
Percentage Change in Estimates	Measured the percentage change in forward estimates during the correction or 12 months following trough to see if performance was driven by estimate revisions
Short Interest	Looked at magnitude of short interest to see if a predictor of performance
Software Sector	Categorization of stocks within the software sector to identify the worst and best performing sub sectors (i.e., cyber security, design, etc.)

Source: J.P. Morgan Research

Who performed the worst

The first step in our analysis was picking out the worst performers in each of the 13 market corrections going back to 2000. We show these in Table 4 below.

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Table 4: Worst performing stocks during market corrections in the 3 periods since 2019

19-Feb-20 to 18-Mar-20		12-Feb-21 to 13-May-21		12-Nov-21 to 7-Jan-22		14-Sep-18 to 24-Dec-18		1-Dec-15 to 9-Feb-16		23-Jun-15 to 29-Sep-15		5-Mar-14 to 8-May-14	
EB	-67.4%	WISH	-70.5%	RSKD	-62.4%	LLNW	-57.9%	HDP	-66.3%	CSLT	-60.8%	FEYE	-72.4%
EIGI	-67.4%	AI	-68.2%	ASAN	-56.8%	TLND	-56.1%	PRO	-62.9%	MOBL	-59.2%	IMPV	-71.7%
EVH	-66.0%	API	-65.2%	UPST	-55.7%	CBLK	-51.6%	TIVO	-57.5%	AVID	-57.4%	VRNS	-61.1%
DOMO	-64.0%	SKLZ	-63.0%	EVBG	-54.8%	MB	-50.5%	IMPV	-56.2%	SSTK	-53.6%	BNFT	-59.5%
BNFT	-63.9%	FSLY	-60.8%	ALHC	-51.5%	YEXT	-50.4%	QLYS	-55.8%	FEYE	-47.0%	SPLK	-56.2%
PS	-61.8%	SUMO	-59.4%	SKLZ	-51.4%	BV	-50.4%	HUBS	-53.8%	MB	-46.9%	WIX	-52.9%
BCOR	-59.4%	OPEN	-59.1%	OPEN	-50.9%	PS	-49.2%	MKTO	-52.4%	TIVO	-46.2%	VEEV	-52.7%
CSOD	-59.2%	VERX	-56.4%	PHR	-50.9%	PSTG	-48.4%	PFPT	-51.0%	TTWO	-45.2%	MDSO	-49.7%
PRO	-58.5%	ROOT	-55.8%	BASE	-50.0%	ATVI	-47.2%	SPLK	-50.8%	EIGI	-42.7%	RNG	-48.3%
TUFN	-57.3%	MDLA	-48.7%	DOMO	-49.9%	HDP	-47.1%	PAYC	-49.9%	BOX	-42.7%	MKTO	-47.9%
Software	**-36.3%**	**Software**	**-19.1%**	**Software**	**-21.7%**	**Software**	**-21.1%**	**Software**	**-25.6%**	**Software**	**-16.5%**	**Software**	**-19.4%**
S&P 500	**-29.2%**	**S&P 500**	**4.5%**	**S&P 500**	**-0.1%**	**S&P 500**	**-19.1%**	**S&P 500**	**-11.9%**	**S&P 500**	**-11.3%**	**S&P 500**	**0.1%**

7-Jul-11 to 3-Oct-11		31-Oct-07 to 22-Jan-08		5-May-06 to 21-Jul-06		20-Jan-04 to 12-Aug-04		1-Sep-00 to 4-Apr-01		10-Mar-00 to 14-Apr-00	
AVID	-64.4%	RVBD	-62.5%	SCUR	-57.7%	IPAS	-71.4%	ARBA	-97.4%	KEYN	-82.9%
APKT	-58.8%	LLNW	-57.2%	TTWO	-50.3%	SCUR	-70.3%	ARTG	-95.8%	BVEW	-81.4%
LLNW	-58.5%	VMW	-56.0%	RSAS	-46.2%	ARBA	-69.3%	TIBX	-93.9%	AKAM	-78.1%
RVBD	-53.0%	MELI	-55.4%	IPAS	-44.4%	MUSE	-62.8%	AKAM	-92.6%	SCUR	-75.8%
LAVA	-52.0%	CDNS	-54.1%	NUAN	-43.6%	SNPS	-60.8%	CWLD	-91.7%	PTC	-74.8%
VOCS	-51.2%	SNCR	-53.7%	RNOW	-39.3%	ASCNTL	-60.0%	PORTAL	-91.4%	DSGX	-73.5%
NTCT	-49.1%	RNOW	-49.5%	CRM	-38.1%	SPRT	-58.2%	SPRT	-90.9%	QSFT	-72.8%
MKTG	-45.8%	VRNT	-48.8%	SPSS	-35.3%	BEAS	-58.0%	WEBX	-89.4%	MROI	-71.7%
CAVM	-44.1%	TLEO	-46.1%	COGN	-35.1%	RHT	-57.3%	ZIXI	-87.8%	CNQR	-71.5%
WBSN	-43.8%	APKT	-45.1%	MERQ	-33.7%	SEBL	-55.8%	VRSN	-86.6%	MRBA	-71.2%
Software	**-27.5%**	**Software**	**-20.8%**	**Software**	**-15.5%**	**Software**	**-26.1%**	**Software**	**-49.1%**	**Software**	**-41.8%**
S&P 500	**-18.8%**	**S&P 500**	**-15.4%**	**S&P 500**	**-6.4%**	**S&P 500**	**-6.6%**	**S&P 500**	**-27.5%**	**S&P 500**	**-2.8%**

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: The best and worst performers do not include stocks below market cap: $500M for 2016-2022, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001.

Small-cap stocks with premium valuations and negative operating margins

The defining characteristics of stocks that performed the worst during corrections were that they were small-cap companies trading at higher multiples than the software average and had a negative operating margins in most cases. We believe that small-cap stocks are generally more volatile than the broader market since they have a higher beta and suffer more during such periods of downturn. The negative impact gets compounded even further when these stocks are expensive as investors flock to safety to preserve capital. The negative margins often were an indication of a younger company (relative to the IPO) and still investing heavy in future growth rather than optimizing profits. Interestingly, these companies had an average analyst consensus rating of 4+ at peak as well as the trough, had expanding operating margins, and delivered beats on EPS in almost all the periods under consideration. We provide a summary of the worst performer characteristics in Table 5 and Table 6 below.

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Table 5: Small-cap stocks generally perform worse than the market during periods of correction

	Market Cap	Revenue Beat/Miss	If Beat, median magnitude of beat	Full year revenue estimate change over the quarters	EPS Beat/Miss	Revenue Growth Accel/Decel	Margin Expansion/ Contraction
2022	Small Cap	Beat	6%	1%	Beat	Deceleration	Expansion
2021	Mid Cap	Beat	6%	1%	Beat	Deceleration	Contraction
2020	Small Cap	Beat	2%	-1%	Beat	Acceleration	Expansion
2018	Small Cap	Beat	3%	0%	Beat	Deceleration	Expansion
2016	Small Cap	Beat	4%	2%	Beat	Deceleration	Expansion
2015	Small Cap	Beat	4%	0%	Beat	Deceleration	Expansion
2014	Small Cap	Beat	4%	2%	Beat	Deceleration	Expansion
2011	NC	Beat	3%	0%	Beat	NC	Expansion
2007	Mid Cap	Beat	3%	2%	Beat	Deceleration	NC
2006	NC	Beat	3%	-2%	Beat	Deceleration	Expansion
2004	Large Cap	NC	4%	0%	Beat	NC	Expansion
2001	Large Cap	Beat	19%	1%	Beat	Deceleration	Contraction
2000	Large Cap	NC	5%	5%	Miss	Acceleration	Contraction
Summary	**Small Cap**	**Beat**	**4%**	**1%**	**Beat**	**Decelerating**	**Expanding**

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: Market Cap definitions: For 2004 and before – small cap < $500M, mid cap $500M-$1B, large cap $1B+, For 2005-2010 – small cap < $1B, mid cap $1B-$3B, large cap $3B+, For 2010-2015 – small cap < $3B, mid cap $3B-$6B, large cap $6B+, For 2015-2022 – small cap < $5B, mid cap $5B-$10B, large cap $10B+; NC = Not Clear.

Table 6: Expensive stocks suffer disproportionately more during correction

	EV/Sales at Peak higher/lower than industry	EV/FCFF at Peak higher/lower than industry	Average Analyst Rating: Peak	Average Analyst Rating: Trough	Average growth	Average margins
2022	Higher	Higher	4.3	4.2	44%	-32%
2021	Higher	Higher	4.2	4.2	30%	-27%
2020	Lower	Higher	4.3	4.3	20%	-9%
2018	Lower	Higher	4.2	4.2	20%	-6%
2016	Higher	Higher	4.5	4.5	40%	-16%
2015	Lower	Higher	4.2	4.2	31%	-13%
2014	Higher	Higher	4.3	4.4	44%	-14%
2011	Higher	Higher	4.0	3.9	23%	16%
2007	Higher	Higher	4.0	4.1	31%	13%
2006	NC	Higher	3.9	3.8	24%	19%
2004	Lower	NC	3.7	3.8	12%	-3%
2001	Higher	NC	4.8	4.4	62%	-15%
2000	Higher	NC	4.8	4.6	38%	-30%
Summary	**Higher**	**Higher**	**4.3**	**4.2**	**32%**	**-9%**

Source: Bloomberg Finance L.P., J.P. Morgan Research.

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Who performed the best

The second step was looking at the best performers during the 13 market corrections going back to 2000. We outline the best performers in Table 7 below.

Table 7: Best performing stocks during market corrections in the 3 periods since 2019

19-Feb-20 to 18-Mar-20		12-Feb-21 to 13-May-21		12-Nov-21 to 7-Jan-22		14-Sep-18 to 24-Dec-18		1-Dec-15 to 9-Feb-16		23-Jun-15 to 29-Sep-15		5-Mar-14 to 8-May-14	
ZM	14.2%	PFPT	26.7%	VCRA	39.0%	WEB	-0.5%	SAP	-8.9%	CSGS	-9.3%	HAS	-7.9%
EVBG	10.1%	ORCL	24.4%	EPAY	24.1%	CA	-3.6%	JKHY	-10.2%	DOX	-10.7%	CHKP	-8.9%
NET	9.4%	FTNT	20.4%	VG	21.0%	CTXS	-13.1%	FISV	-10.7%	ANSS	-11.8%	SAP	-9.2%
CTXS	7.1%	BOX	18.4%	CSGS	11.3%	DOX	-15.0%	SYMC	-12.4%	CHKP	-11.8%	JKHY	-9.5%
AKAM	-5.3%	TLND	16.9%	VRNT	10.3%	FISV	-16.2%	INFO	-12.7%	JKHY	-12.7%	DOX	-9.7%
TTWO	-6.1%	INFO	12.4%	JAMF	8.9%	CDNS	-17.2%	INTU	-12.7%	CDNS	-14.0%	MCRS	-9.8%
JKHY	-8.5%	VMW	11.7%	GDDY	8.3%	CHKP	-17.3%	MSFT	-12.9%	SNPS	-14.0%	MSFT	-10.2%
LOGM	-8.5%	SSNC	11.0%	JKHY	7.9%	ORCL	-17.6%	ANSS	-13.2%	HAS	-14.4%	ATVI	-10.3%
DBX	-9.8%	AVID	10.7%	FISV	7.9%	TDC	-17.7%	CSGS	-13.9%	AKAM	-14.4%	CPUWR	-10.5%
ATVI	-13.6%	MIME	10.4%	CTXS	7.2%	BCOV	-17.9%	CA	-13.9%	NUAN	-14.5%	FISV	-10.8%
Software	**-36.3%**	**Software**	**-19.1%**	**Software**	**-21.7%**	**Software**	**-21.1%**	**Software**	**-25.6%**	**Software**	**-16.5%**	**Software**	**-19.4%**
S&P 500	**-29.2%**	**S&P 500**	**4.5%**	**S&P 500**	**-0.1%**	**S&P 500**	**-19.1%**	**S&P 500**	**-11.9%**	**S&P 500**	**-11.3%**	**S&P 500**	**0.1%**
7-Jul-11 to 3-Oct-11		**31-Oct-07 to 22-Jan-08**		**5-May-06 to 21-Jul-06**		**20-Jan-04 to 12-Aug-04**		**1-Sep-00 to 4-Apr-01**		**10-Mar-00 to 14-Apr-00**			
BBBB	-10.8%	INTU	-13.1%	FISV	-11.1%	MSFT	-16.7%	FISV	-30.0%	STRLNG	-13.2%		
MSFT	-15.5%	FISV	-14.1%	CSGS	-11.8%	JKHY	-17.4%	AXNT	-34.3%	UGS	-17.5%		
DOX	-18.3%	SY	-14.5%	MAT	-12.0%	MCRS	-17.5%	HAS	-35.1%	HAS	-19.3%		
MAT	-18.8%	PRGS	-14.5%	SY	-12.4%	MAT	-18.1%	EA	-39.0%	SNPS	-25.2%		
ANSS	-19.0%	PRGS	-14.5%	ORCL	-13.0%	EA	-20.3%	JKHY	-40.0%	JKHY	-26.3%		
SNPS	-20.2%	BLKB	-15.6%	DOX	-14.0%	FISV	-20.6%	UGS	-40.7%	MAT	-26.8%		
CHKP	-20.3%	ORCL	-16.2%	MCRS	-15.2%	SAP	-21.6%	MSFT	-42.7%	PRGS	-28.0%		
CA	-20.5%	COGN	-17.0%	BMC	-16.0%	COGN	-21.7%	SYMC	-43.4%	COGN	-28.3%		
VRSN	-20.5%	BMC	-18.2%	SYMC	-16.4%	CSGP	-22.4%	CSGS	-45.8%	CA	-30.7%		
ULTI	-20.9%	AVID	-18.4%	HAS	-16.8%	CA	-22.5%	DOX	-47.1%	BMC	-31.6%		
Software	**-27.5%**	**Software**	**-20.8%**	**Software**	**-15.5%**	**Software**	**-26.1%**	**Software**	**-49.1%**	**Software**	**-41.8%**		
S&P 500	**-18.8%**	**S&P 500**	**-15.4%**	**S&P 500**	**-6.4%**	**S&P 500**	**-6.6%**	**S&P 500**	**-27.5%**	**S&P 500**	**-2.8%**		

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: The best and worst performers do not include stocks below market cap: $500M for 2016-2022, $400M for 2011-2015, $300M for 2004-2007 and $200M for 2000-2001.

Stocks that suffered the least in corrections were large-cap value stocks

This is in line with our expectations as large-cap companies are generally more mature with stable cash flows and earnings. These stocks were also on average cheaper than the software universe with their EV/sales trading at a discount and even EV/FCFF in some cases. Another factor in stark contrast to the worst stocks is their operating margin. The best stocks had an average of 19% operating margin implying that investors look for profitable companies with a more stable/sustainable business model when the downturn begins. Table 8 and Table 9 below summarize the metrics of the best performing stocks.

Table 8: Large-cap stocks suffer less during periods of correction

	Market Cap	Revenue Beat/Miss	If Beat, median magnitude of beat	Full year revenue estimate change over the quarters	EPS Beat/Miss	Revenue Growth Accel/Decel	Margin Expansion/ Contraction
2022	Large Cap	Beat	3%	1%	Beat	Deceleration	Expansion
2021	Large Cap	Beat	2%	1%	Beat	Deceleration	Expansion
2020	Large Cap	Beat	2%	1%	Beat	Deceleration	Expansion
2018	Large Cap	Beat	2%	0%	Beat	Deceleration	Expansion
2016	Large Cap	Miss	1%	-1%	Beat	Acceleration	Expansion
2015	NC	Beat	1%	0%	Beat	Deceleration	Expansion
2014	Large Cap	Beat	1%	0%	Beat	Acceleration	Expansion
2011	NC	Beat	2%	1%	Beat	NC	Expansion
2007	Large Cap	Beat	2%	0%	Beat	NC	Expansion
2006	Large Cap	Beat	5%	0%	Beat	NC	Expansion
2004	Large Cap	Beat	3%	0%	Beat	Acceleration	Expansion
2001	Large Cap	Beat	1%	-3%	Beat	Deceleration	NC
2000	Large Cap	NC		-1%	Beat	Deceleration	Expansion
Summary	**Large**	**Beat**	**2%**	**0%**	**Beat**	**Deceleration**	**Expansion**

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: Market Cap definitions: For 2004 and before – small cap < $500M, mid cap $500M-$1B, large cap $1B+, For 2005-2010 – small cap < $1B, mid cap $1B-$3B, large cap $3B+, For 2010-2015 – small cap < $3B, mid cap $3B-$6B, large cap $6B+, For 2015-2022 – small cap < $5B, mid cap $5B-$10B, large cap $10B+; NC = Not Clear.

Table 9: Relatively inexpensive stocks with high operating margins perform well during pullbacks

	EV/Sales at Peak higher/lower than industry	EV/FCFF at Peak higher/lower than industry	Average Analyst Rating: Peak	Average Analyst Rating: Trough	Average growth	Average margins
2022	Lower	Higher	4.3	4.1	14%	13%
2021	Lower	Higher	4.1	4.1	11%	17%
2020	Lower	Lower	3.8	3.9	20%	10%
2018	Lower	Lower	3.8	3.9	8%	22%
2016	Lower	Lower	3.7	3.7	4%	24%
2015	Lower	NC	4.0	4.1	13%	20%
2014	Lower	Lower	3.8	3.8	4%	25%
2011	Lower	Lower	4.0	4.2	10%	22%
2007	Lower	Lower	4.1	4.1	15%	21%
2006	Lower	Lower	3.7	3.7	14%	20%
2004	Lower	NC	3.9	4.2	9%	14%
2001	Lower	NC	4.3	4.4	17%	17%
2000	Lower	NC	4.7	4.6	22%	20%
Summary	**Lower**	**Lower**	**4.0**	**4.1**	**12%**	**19%**

Source: Bloomberg Finance L.P., J.P. Morgan Research

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What Happens in the 12 Months after a Correction?

After looking at the correction periods, we wanted to determine the type of stocks that investors can buy at the troughs to maximize their returns in the period that follows and what to avoid. We are still not through the most recent correction, so looked at the performance in the 12 months following the other two corrections. Apart from the factors that we looked at for analyzing the correction periods, here we looked at three additional parameters—the percentage of revenue and EPS beats in the four quarters that follow the correction and the magnitude of these beats.

Who performed the worst?

We started with what names to avoid post correction. Table 10 below outlines the worst performers following the market correction.

Table 10: Stocks that performed the worst in the 12-month period following a market correction

9-Feb-16 to 9-Feb-17		29-Sep-15 to 7-Jan-22		29-Sep-15 to 7-Jan-22		9-Feb-16 to 9-Feb-17		29-Sep-15 to 29-Sep-16		8-May-14 to 8-May-15	
ARCE	-21.8%	WISH	-66.0%	BNFT	-49.7%	INOV	-29.2%	HDP	-59.5%	MAT	-30.9%
JKHY	-5.4%	DSP	-64.3%	VCRA	-42.6%	MAT	-17.1%	FEYE	-53.6%	PRO	-29.8%
AKAM	1.1%	API	-61.0%	WIFI	-37.5%	FEYE	-6.3%	INOV	-29.7%	WEB	-28.4%
CTXS	1.8%	ONEM	-53.1%	EB	-26.3%	PSTG	-5.7%	EIGI	-29.6%	CSLT	-26.0%
CSGS	10.1%	OSH	-52.4%	EIGI	-24.2%	ATHN	-1.6%	AKAM	-22.4%	TIVO	-21.4%
EVBG	11.2%	ONTF	-51.2%	ZUO	-12.3%	TYPE	-0.3%	NTCT	-17.0%	CSOD	-16.3%
VRSN	15.0%	ALHC	-49.0%	DBX	-10.0%	EPAY	2.2%	IMPV	-16.7%	CVLT	-11.6%
PFPT	24.1%	EVER	-48.8%	PS	-9.7%	NUAN	3.7%	WEB	-15.8%	VRNS	-11.2%
CHKP	26.1%	EVBG	-47.5%	ALRM	-8.1%	EIGI	6.0%	NUAN	-10.3%	EPAY	-9.5%
GWRE	26.7%	BTRS	-43.6%	NEWR	-7.6%	CSGS	6.1%	VRNT	-10.0%	SSTK	-5.6%
Software	**164.4%**	**Software**	**3.7%**	**Software**	**52.6%**	**Software**	**69.0%**	**Software**	**33.1%**	**Software**	**31.0%**
S&P 500	**63.3%**	**S&P 500**	**13.7%**	**S&P 500**	**37.1%**	**S&P 500**	**24.6%**	**S&P 500**	**14.2%**	**S&P 500**	**12.8%**

3-Oct-11 to 3-Oct-12		22-Jan-08 to 22-Jan-09		21-Jul-06 to 21-Jul-07		12-Aug-04 to 12-Aug-05		4-Apr-01 to 4-Apr-02		14-Apr-00 to 14-Apr-01	
TIVO	-64.8%	LAVA	-90.9%	RHT	-5.1%	LAVA	-46.4%	PRTL	-70.9%	CNQR	-93.8%
APKT	-54.4%	CDNS	-75.2%	DOX	3.5%	SPRT	-42.4%	MUSE	-65.7%	ARBA	-90.0%
EA	-35.0%	N	-74.2%	CSGP	6.8%	ARBA	-21.6%	RSAS	-60.2%	EPAY	-87.1%
LOGM	-26.9%	MELI	-73.7%	RNOW	8.3%	RSAS	-20.7%	ARTG	-59.2%	AKAM	-86.0%
CHKP	-10.2%	VMW	-73.6%	AVID	9.8%	TIVO	-13.8%	DSGX	-57.9%	ARTG	-86.0%
PEGA	-6.3%	PRO	-71.9%	TYL	11.9%	SNPS	-13.4%	CHKP	-48.2%	MRBA	-84.4%
ATVI	-6.0%	OMTR	-69.2%	EA	15.4%	TYL	-9.5%	DOX	-44.6%	PRTL	-81.0%
WBSN	-4.4%	EA	-66.7%	IPAS	15.7%	VRTY	-7.9%	OPSW	-43.0%	MSLV	-76.7%
BBBB	0.8%	LLNW	-62.8%	CTXS	20.6%	MANH	-6.9%	MSLV	-40.9%	TIBX	-76.9%
MKTG	2.8%	TYPE	-61.7%	WBSN	24.0%	AVID	-5.0%	PRGNQ	-40.1%	RHT	-76.2%
Software	**59.6%**	**Software**	**-30.5%**	**Software**	**64.9%**	**Software**	**38.9%**	**Software**	**54.8%**	**Software**	**-4.9%**
S&P 500	**32.0%**	**S&P 500**	**-36.9%**	**S&P 500**	**23.7%**	**S&P 500**	**15.7%**	**S&P 500**	**2.1%**	**S&P 500**	**-12.8%**

Source: Bloomberg Finance L.P., J.P. Morgan Research.
Note: (1) Note: The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007 and $200M for 2000-2001 (2) For next 12 month period for trough on 5/13/21 we have used data till 1/7/22.

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Small-cap stocks that have not been over-delivering consistently lag

Small-cap names have a lower magnitude of revenue beat in the prior four quarters compared to the best performers. Also, the number of revenue beats following the trough is 30 percentage points lower than the best performers on average. Revenue and FCFF multiples at the time of the trough, premium or discount, do not give a clear indication of future performance. In addition, growth and margin profiles of the companies does not provide a clear picture either on how the stocks would recover. Below, Table 11 and Table 12 provide a summary of our analysis of the NTM period post correction.

Table 11: Small-cap stocks with lower probability and magnitude of beats tend to perform the worst during recovery

	Market Cap	Revenue Beat/Miss	If Beat, median magnitude of beat	% Revenue Beat/Miss in 12 m following trough	% of beats in the 12m following trough	Full year revenue estimate change over the quarters	EPS Beat/Miss
2021	Small Cap	Beat	5%	5%	74%	1%	Beat
2020	Large Cap	Miss	2%	2%	75%	0%	Beat
2018	Small Cap	Beat	3%	2%	66%	0%	Beat
2016	Small Cap	Miss	1%	1%	51%	-1%	Beat
2015	Small Cap	Beat	2%	2%	54%	1%	Beat
2014	Small Cap	Beat	2%	-1%	47%	-1%	Beat
2011	Small Cap	Beat	3%	0%	37%	3%	Beat
2007	Small Cap	Beat	2%	0%	56%	-2%	Beat
2006	Small Cap	Beat	2%	1%	59%	0%	Beat
2004	Large Cap	Beat	4%			7%	Beat
2001	Large Cap	Beat	7%			-6%	Beat
2000	Large Cap	NC				4%	Beat
Summary	**Small Cap**	**Beat**	**2.4%**	**1%**	**58%**	**1%**	**Beat**

Source: Bloomberg Finance L.P., J.P. Morgan Research. Note: For next 12-month period for trough on 5/13/21 we have used data till 1/7/22.

Table 12: Most other parameters do not provide a clear indication on where the stocks are headed post correction

	Revenue Growth Accel/Decel	Margin Expansion/ Contraction	EV/Sales at Trough higher/lower than industry	EV/FCFF at Trough higher/lower than industry	Average Analyst Rating	Average growth	Average margins
2021	Decelerating	NC	Higher	Higher	4.3	37%	-15%
2020	Decelerating	Expansion	Higher	Higher	4.1	12%	16%
2018	Decelerating	Expansion	NC	Higher	4.1	19%	-9%
2016	NC	Expansion	Lower	Higher	3.9	14%	15%
2015	Decelerating	Expansion	Lower	Lower	4.3	31%	6%
2014	Decelerating	Expansion	Higher	Higher	4.1	20%	-3%
2011	Decelerating	Expansion	Lower	Lower	4.2	19%	20%
2007	Decelerating	Expansion	Lower	Higher	4.1	33%	10%
2006	NC	Expansion	Higher	NC	3.9	18%	14%
2004	NC	Expansion	Lower	NC	4.2	24%	11%
2001	Decelerating	Expansion	Lower	NC	4.6	57%	6%
2000	Decelerating	Contraction	NC	NC	4.6	45%	-12%
Summary	**Decelerating**	**Expanding**	**Lower**	**Higher**	**4.2**	**27%**	**5%**

Source: Bloomberg Finance L.P., J.P. Morgan Research. Note: For next 12-month period for trough on 5/13/21 we have used data till 1/7/22.

Who performed the best?

The important question is after a market correction what stocks do the best in the next 12 months. Table 13 below shows the names that outperformed in each of the three corrections that we have data for in the post-correction period.

Table 13: Stocks that performed the best in the 12-month period following a market correction

18-Mar-20 to 18-Mar-21		13-May-21 to 7-Jan-22		13-May-21 to 7-Jan-22		9-Feb-16 to 9-Feb-17		29-Sep-15 to 29-Sep-16		8-May-14 to 8-May-15	
UPWK	723.0%	VCRA	142.1%	SHOP	235.3%	WIX	242.9%	WIX	154.5%	IMPV	189.3%
BILL	394.1%	ASAN	117.5%	COUP	170.1%	MIME	146.1%	SSTK	113.0%	PANW	153.5%
CRWD	392.4%	DDOG	85.8%	AVLR	159.2%	DWRE	143.7%	MELI	111.9%	ELLI	152.6%
FSLY	389.1%	NEWR	80.0%	PAYC	137.3%	LOGM	139.2%	ININ	108.5%	PAYC	135.2%
TWLO	375.2%	MDB	75.5%	MELI	130.9%	PAYC	128.1%	TIVO	97.8%	PFPT	98.8%
SPT	357.7%	PSTG	73.6%	LPSN	125.9%	MKTO	124.5%	VEEV	81.4%	QLYS	87.0%
HUBS	311.9%	MIME	66.3%	SPNS	124.3%	MELI	123.4%	DLB	69.7%	EA	80.5%
WK	267.0%	VG	64.0%	ARCE	123.0%	ININ	122.9%	ADSK	58.2%	MANH	78.4%
WIX	266.3%	ZS	62.5%	OKTA	121.4%	PFPT	121.3%	BSFT	57.8%	MELI	76.1%
NET	257.5%	PANW	62.2%	PCTY	120.5%	VEEV	109.4%	ZEN	54.6%	EIGI	71.0%
Software	**164.4%**	**Software**	**3.7%**	**Software**	**52.6%**	**Software**	**69.0%**	**Software**	**33.1%**	**Software**	**31.0%**
S&P 500	**63.3%**	**S&P 500**	**13.7%**	**S&P 500**	**37.1%**	**S&P 500**	**24.6%**	**S&P 500**	**14.2%**	**S&P 500**	**12.8%**

3-Oct-11 to 3-Oct-12		22-Jan-08 to 22-Jan-09		21-Jul-06 to 21-Jul-07		12-Aug-04 to 12-Aug-05		4-Apr-01 to 4-Apr-02		14-Apr-00 to 14-Apr-01	
CSOD	156.5%	NTCT	46.5%	OMTR	212.7%	CRM	135.5%	MFE	281.0%	EA	103.9%
N	140.8%	PEGA	38.2%	NUAN	105.6%	ATVI	105.3%	MANH	197.1%	PPLSFT	95.6%
NTCT	127.9%	TKLC	15.9%	TTWO	94.1%	ADSK	101.4%	ATVI	88.0%	NTGRTY	95.9%
ULTI	124.0%	HAS	8.9%	HAS	86.2%	MCRMD	99.5%	SYMC	82.7%	JKHY	48.5%
AKAM	109.3%	CSGS	8.2%	CNQR	80.2%	MCRS	89.4%	UGS	81.3%	MAT	51.6%
CNQR	106.9%	CMPWRE	6.1%	SPSS	79.9%	CMPWRE	80.4%	WEBX	80.0%	FISV	41.1%
TLEO	89.2%	BEAS	3.5%	DLB	66.8%	ANSS	72.7%	HYSL	78.3%	CDNS	43.0%
SSNC	87.8%	CNQR	2.5%	AKAM	66.6%	FILE	68.8%	TTWO	77.5%	SCUR	32.5%
QSFT	85.6%	COGN	1.0%	MANH	60.8%	MFE	65.8%	SCUR	73.9%	SNPS	35.0%
FIRE	84.5%	CHKP	0.7%	MFE	57.5%	ASCNTL	65.4%	COGN	67.6%	CHKP	27.3%
Software	**59.6%**	**Software**	**-30.5%**	**Software**	**64.9%**	**Software**	**38.9%**	**Software**	**54.8%**	**Software**	**-4.9%**
S&P 500	**32.0%**	**S&P 500**	**-36.9%**	**S&P 500**	**23.7%**	**S&P 500**	**15.7%**	**S&P 500**	**2.1%**	**S&P 500**	**-12.8%**

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: (1) Note: The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001. (2) For next 12-month period for trough on 5/13/21 we have used data to 1/7/22.

Focus on small-cap revenue to find outperformance

The defining characteristics of the companies that performed the best post corrections were that they were small-cap companies with a very high probability of beating their revenue estimates in the four quarters following the troughs. On average, these companies beat their consensus revenue estimates 80% of the times. The magnitude of the beat was high at 5%. These companies also performed well in the four prior quarters, with a median magnitude of 3.3% beat (calculated only when there was a beat). Similar to the worst-performing stocks, the other characteristics were not very conclusive for the periods following the troughs. Below, Table 14 and Table 15 provide a summary of our analysis on the NTM period post correction.

Table 14: Stocks with high beat ratio performed the best after the pullbacks

	Market Cap	Revenue Beat/Miss	If Beat, median magnitude of beat	% Revenue Beat/Miss in the following 12m	% of beats in the 12m following trough	Average change in full year revenue estimate over the quarters	EPS Beat/Miss
2021	Large Cap	Beat	5%	6%	75%	3%	Beat
2020	Small Cap	Beat	3%	6%	87%	2%	Beat
2018	Small Cap	Beat	3%	6%	90%	2%	Beat
2016	Small Cap	Beat	2%	2%	84%	1%	Beat
2015	Small Cap	Beat	4%	6%	71%	1%	Beat
2014	Small Cap	Beat	2%	5%	82%	1%	Beat
2011	Small Cap	Beat	2%	3%	74%	2%	Beat
2007	Large Cap	Beat	3%	5%	78%	1%	Beat
2006	NC	Beat	6%	5%	80%	2%	Beat
2004	Large Cap	Beat	3%			1%	Beat
2001	NC	Beat	6%			-2%	Beat
2000	Large Cap	NC				3%	Beat
Summary	**Small Cap**	**Beat**	**3.3%**	**5%**	**80%**	**1%**	**Beat**

Source: Bloomberg Finance L.P., J.P. Morgan Research. Note: For next 12-month period for trough on 5/13/21 we have used data to 1/7/22.

Table 15: Most other factors were inconclusive for identifying stocks after correction

	Revenue Growth Accel/Decel	Margin Expansion/ Contraction	EV/Sales at Trough higher/lower than industry	EV/FCFF at Trough higher/lower than industry	Average Analyst Rating	Average growth	Average margins
2021	Decelerating	Expanding	Higher	Higher	4.3	32%	-9%
2020	Decelerating	NC	Higher	Higher	4.3	29%	-15%
2018	Decelerating	Expanding	Higher	Higher	4.1	26%	-3%
2016	Decelerating	Expanding	NC	Lower	4.3	26%	-3%
2015	Decelerating	Expanding	Higher	NC	4.3	22%	4%
2014	Decelerating	Expanding	Lower	Lower	4.2	24%	8%
2011	Decelerating	Expanding	Lower	Lower	4.1	22%	11%
2007	Decelerating	Expanding	Lower	Lower	3.7	15%	16%
2006	Decelerating	Expanding	Lower	NC	3.7	16%	19%
2004	Decelerating	Expanding	Lower	NC	3.9	13%	12%
2001	Decelerating	Expanding	Higher	NC	4.2	31%	-6%
2000	Decelerating	Expanding	Higher	NC	4.5	27%	6%
Summary	**Decelerating**	**Expanding**	**Lower**	**NC**	**4.1**	**23%**	**3%**

Source: Bloomberg Finance L.P., J.P. Morgan Research. Note: For next 12-month period for trough on 5/13/21 we have used data to 1/7/22.

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Appendix 1: Market Correction Periods data

Time Period	19-Feb-20	to	18-Mar-20		Indices	
Best Performers		Worst Performers		Software Index	S&P 500	NASDAQ
ZM	14.2%	EB	-67.4%	-36.3%	-29.2%	-28.8%
EVBG	10.1%	EIGI	-67.4%			
NET	9.4%	EVH	-66.0%			
CTXS	7.1%	DOMO	-64.0%			
AKAM	-5.3%	BNFT	-63.9%			
TTWO	-6.1%	PS	-61.8%			
JKHY	-8.5%	BCOR	-59.4%			
LOGM	-8.5%	CSOD	-59.2%			
DBX	-9.8%	PRO	-58.5%			
ATVI	-13.6%	TUFN	-57.3%			
Time Period	**12-Feb-21**	**to**	**13-May-21**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
PFPT	26.7%	WISH	-70.5%	-19.1%	4.5%	-6.9%
ORCL	24.4%	AI	-68.2%			
FTNT	20.4%	API	-65.2%			
BOX	18.4%	SKLZ	-63.0%			
TLND	16.9%	FSLY	-60.8%			
INFO	12.4%	SUMO	-59.4%			
VMW	11.7%	OPEN	-59.1%			
SSNC	11.0%	VERX	-56.4%			
AVID	10.7%	ROOT	-55.8%			
MIME	10.4%	MDLA	-48.7%			
Time Period	**12-Nov-21**	**to**	**7-Jan-22**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
VCRA	39.0%	RSKD	-62.4%	-21.7%	-0.1%	-5.8%
EPAY	24.1%	ASAN	-56.8%			
VG	21.0%	UPST	-55.7%			
CSGS	11.3%	EVBG	-54.8%			
VRNT	10.3%	ALHC	-51.5%			
JAMF	8.9%	SKLZ	-51.4%			
GDDY	8.3%	OPEN	-50.9%			
JKHY	7.9%	PHR	-50.9%			
FISV	7.9%	BASE	-50.0%			
CTXS	7.2%	DOMO	-49.9%			
Time Period	**14-Sep-18**	**to**	**24-Dec-18**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
WEB	-0.5%	LLNW	-57.9%	-21.1%	-19.1%	-22.7%
CA	-3.6%	TLND	-56.1%			
CTXS	-13.1%	CBLK	-51.6%			
DOX	-15.0%	MB	-50.5%			
FISV	-16.2%	YEXT	-50.4%			
CDNS	-17.2%	BV	-50.4%			
CHKP	-17.3%	PS	-49.2%			
ORCL	-17.6%	PSTG	-48.4%			
TDC	-17.7%	ATVI	-47.2%			
BCOV	-17.9%	HDP	-47.1%			
Time Period	**1-Dec-15**	**to**	**9-Feb-16**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
SAP	-8.9%	HDP	-66.3%	-25.6%	-11.9%	-17.2%
JKHY	-10.2%	PRO	-62.9%			
FISV	-10.7%	TIVO	-57.5%			
SYMC	-12.4%	IMPV	-56.2%			
INFO	-12.7%	QLYS	-55.8%			
INTU	-12.7%	HUBS	-53.8%			
MSFT	-12.9%	MKTO	-52.4%			
ANSS	-13.2%	PFPT	-51.0%			
CSGS	-13.9%	SPLK	-50.8%			
CA	-13.9%	PAYC	-49.9%			

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001.

Appendix 1: Market Correction Periods data (continued)

Time Period	23-Jun-15	to	29-Sep-15	Indices		
Best Performers		Worst Performers		Software Index	S&P 500	NASDAQ
CSGS	-9.3%	CSLT	-60.8%	-16.5%	-11.3%	-12.5%
DOX	-10.7%	MOBL	-59.2%			
ANSS	-11.8%	AVID	-57.4%			
CHKP	-11.8%	SSTK	-53.6%			
JKHY	-12.7%	FEYE	-47.0%			
CDNS	-14.0%	MB	-46.9%			
SNPS	-14.0%	TIVO	-46.2%			
HAS	-14.4%	TTWO	-45.2%			
AKAM	-14.4%	EIGI	-42.7%			
NUAN	-14.5%	BOX	-42.7%			
Time Period	**5-Mar-14**	**to**	**8-May-14**	**Indices**		
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
HAS	-7.9%	FEYE	-72.4%	-19.4%	0.1%	-7.0%
CHKP	-8.9%	IMPV	-71.7%			
SAP	-9.2%	VRNS	-61.1%			
JKHY	-9.5%	BNFT	-59.5%			
DOX	-9.7%	SPLK	-56.2%			
MCRS	-9.8%	WIX	-52.9%			
MSFT	-10.2%	VEEV	-52.7%			
ATVI	-10.3%	MDSO	-49.7%			
1519128D	-10.5%	RNG	-48.3%			
FISV	-10.8%	MKTO	-47.9%			
Time Period	**7-Jul-11**	**to**	**3-Oct-11**	**Indices**		
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
BBBB	-10.8%	AVID	-64.4%	-27.5%	-18.8%	-18.7%
MSFT	-15.5%	APKT	-58.8%			
DOX	-18.3%	LLNW	-58.5%			
MAT	-18.8%	RVBD	-53.0%			
ANSS	-19.0%	LAVA	-52.0%			
SNPS	-20.2%	VOCS	-51.2%			
CHKP	-20.3%	NTCT	-49.1%			
CA	-20.5%	MKTG	-45.8%			
VRSN	-20.5%	CAVM	-44.1%			
ULTI	-20.9%	WBSN	-43.8%			
Time Period	**31-Oct-07**	**to**	**22-Jan-08**	**Indices**		
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
INTU	-13.1%	RVBD	-62.5%	-20.8%	-15.4%	-19.8%
FISV	-14.1%	LLNW	-57.2%			
SY	-14.5%	VMW	-56.0%			
PRGS	-14.5%	MELI	-55.4%			
PRGS	-14.5%	CDNS	-54.1%			
BLKB	-15.6%	SNCR	-53.7%			
ORCL	-16.2%	RNOW	-49.5%			
COGN	-17.0%	VRNT	-48.8%			
BMC	-18.2%	TLEO	-46.1%			
AVID	-18.4%	APKT	-45.1%			
Time Period	**5-May-06**	**to**	**21-Jul-06**	**Indices**		
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
FISV	-11.1%	SCUR	-57.7%	-15.5%	-6.4%	-13.8%
CSGS	-11.8%	TTWO	-50.3%			
MAT	-12.0%	RSAS	-46.2%			
SY	-12.4%	IPAS	-44.4%			
ORCL	-13.0%	NUAN	-43.6%			
DOX	-14.0%	RNOW	-39.3%			
MCRS	-15.2%	CRM	-38.1%			
BMC	-16.0%	SPSS	-35.3%			
SYMC	-16.4%	COGN	-35.1%			
HAS	-16.8%	MERQ	-33.7%			

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001

Appendix 1: Market Correction Periods data (continued)

Time Period	20-Jan-04	to	12-Aug-04	Indices		
Best Performers		Worst Performers		Software Index	S&P 500	NASDAQ
MSFT	-16.7%	IPAS	-71.4%	-26.1%	-6.6%	-18.4%
JKHY	-17.4%	SCUR	-70.3%			
MCRS	-17.5%	ARBA	-69.3%			
MAT	-18.1%	MUSE	-62.8%			
EA	-20.3%	SNPS	-60.8%			
FISV	-20.6%	1436225D	-60.0%			
SAP	-21.6%	SPRT	-58.2%			
COGN	-21.7%	BEAS	-58.0%			
CSGP	-22.4%	RHT	-57.3%			
CA	-22.5%	SEBL	-55.8%			
Time Period	**1-Sep-00**	**to**	**4-Apr-01**	**Indices**		
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
FISV	-30.0%	ARBA	-97.4%	-49.1%	-27.5%	-61.3%
AXNT	-34.3%	ARTG	-95.8%			
HAS	-35.1%	TIBX	-93.9%			
EA	-39.0%	AKAM	-92.6%			
JKHY	-40.0%	CWLD	-91.7%			
UGS	-40.7%	2482718Q	-91.4%			
MSFT	-42.7%	SPRT	-90.9%			
SYMC	-43.4%	WEBX	-89.4%			
CSGS	-45.8%	ZIXI	-87.8%			
DOX	-47.1%	VRSN	-86.6%			
Time Period	**10-Mar-00**	**to**	**14-Apr-00**	**Indices**		
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
597946Q	-13.2%	KEYN	-82.9%	-41.8%	-2.8%	-34.2%
UGS	-17.5%	BVEW	-81.4%			
HAS	-19.3%	AKAM	-78.1%			
SNPS	-25.2%	SCUR	-75.8%			
JKHY	-26.3%	PTC	-74.8%			
MAT	-26.8%	DSGX	-73.5%			
PRGS	-28.0%	QSFT	-72.8%			
COGN	-28.3%	MROI	-71.7%			
CA	-30.7%	CNQR	-71.5%			
BMC	-31.6%	MRBA	-71.2%			

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001.

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Appendix 2: Best and worst performers in the 12 months following correction

Time Period	18-Mar-20	to	18-Mar-21		Indices	
Best Performers		Worst Performers		Software Index	S&P 500	NASDAQ
UPWK	723.0%	ARCE	-21.8%	164.4%	63.3%	87.6%
BILL	394.1%	JKHY	-5.4%			
CRWD	392.4%	AKAM	1.1%			
FSLY	389.1%	CTXS	1.8%			
TWLO	375.2%	CSGS	10.1%			
SPT	357.7%	EVBG	11.2%			
HUBS	311.9%	VRSN	15.0%			
WK	267.0%	PFPT	24.1%			
WIX	266.3%	CHKP	26.1%			
NET	257.5%	GWRE	26.7%			
Time Period	**13-May-21**	**to**	**7-Jan-22**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
VCRA	142.1%	WISH	-66.0%	3.7%	13.7%	13.8%
ASAN	117.5%	DSP	-64.3%			
DDOG	85.8%	API	-61.0%			
NEWR	80.0%	ONEM	-53.1%			
MDB	75.5%	OSH	-52.4%			
PSTG	73.6%	ONTF	-51.2%			
MIME	66.3%	ALHC	-49.0%			
VG	64.0%	EVER	-48.8%			
ZS	62.5%	EVBG	-47.5%			
PANW	62.2%	BTRS	-43.6%			
Time Period	**24-Dec-18**	**to**	**24-Dec-19**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
SHOP	235.3%	BNFT	-49.7%	52.6%	37.1%	44.6%
COUP	170.1%	VCRA	-42.6%			
AVLR	159.2%	WIFI	-37.5%			
PAYC	137.3%	EB	-26.3%			
MELI	130.9%	EIGI	-24.2%			
LPSN	125.9%	ZUO	-12.3%			
SPNS	124.3%	DBX	-10.0%			
ARCE	123.0%	PS	-9.7%			
OKTA	121.4%	ALRM	-8.1%			
PCTY	120.5%	NEWR	-7.6%			
Time Period	**9-Feb-16**	**to**	**9-Feb-17**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
WIX	242.9%	INOV	-29.2%	69.0%	24.6%	33.9%
MIME	146.1%	MAT	-17.1%			
DWRE	143.7%	FEYE	-6.3%			
LOGM	139.2%	PSTG	-5.7%			
PAYC	128.1%	ATHN	-1.6%			
MKTO	124.5%	TYPE	-0.3%			
MELI	123.4%	EPAY	2.2%			
ININ	122.9%	NUAN	3.7%			
PFPT	121.3%	EIGI	6.0%			
VEEV	109.4%	CSGS	6.1%			
Time Period	**29-Sep-15**	**to**	**29-Sep-16**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
WIX	154.5%	HDP	-59.5%	33.1%	14.2%	16.6%
SSTK	113.0%	FEYE	-53.6%			
MELI	111.9%	INOV	-29.7%			
ININ	108.5%	EIGI	-29.6%			
TIVO	97.8%	AKAM	-22.4%			
VEEV	81.4%	NTCT	-17.0%			
DLB	69.7%	IMPV	-16.7%			
ADSK	58.2%	WEB	-15.8%			
BSFT	57.8%	NUAN	-10.3%			
ZEN	54.6%	VRNT	-10.0%			

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: (1) The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001 (2) For next 12-month period for trough on 5/13/21 we have used data to 1/7/22.

Appendix 2: Best and worst performers in the 12 months following correction (continued)

Time Period	8-May-14	to	8-May-15		Indices	
Best Performers		Worst Performers		Software Index	S&P 500	NASDAQ
IMPV	189.3%	MAT	-30.9%	31.0%	12.8%	23.5%
PANW	153.5%	PRO	-29.8%			
ELLI	152.6%	WEB	-28.4%			
PAYC	135.2%	CSLT	-26.0%			
PFPT	98.8%	TIVO	-21.4%			
QLYS	87.0%	CSOD	-16.3%			
EA	80.5%	CVLT	-11.6%			
MANH	78.4%	VRNS	-11.2%			
MELI	76.1%	EPAY	-9.5%			
EIGI	71.0%	SSTK	-5.6%			
Time Period	**3-Oct-11**	**to**	**3-Oct-12**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
CSOD	156.5%	TIVO	-64.8%	59.6%	32.0%	34.2%
N	140.8%	APKT	-54.4%			
NTCT	127.9%	EA	-35.0%			
ULTI	124.0%	LOGM	-26.9%			
AKAM	109.3%	CHKP	-10.2%			
CNQR	106.9%	PEGA	-6.3%			
TLEO	89.2%	ATVI	-6.0%			
SSNC	87.8%	WBSN	-4.4%			
QSFT	85.6%	BBBB	0.8%			
FIRE	84.5%	MKTG	2.8%			
Time Period	**22-Jan-08**	**to**	**22-Jan-09**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
NTCT	46.5%	LAVA	-90.9%	-30.5%	-36.9%	-36.1%
PEGA	38.2%	CDNS	-75.2%			
TKLC	15.9%	N	-74.2%			
HAS	8.9%	MELI	-73.7%			
CSGS	8.2%	VMW	-73.6%			
1519128D	6.1%	PRO	-71.9%			
BEAS	3.5%	OMTR	-69.2%			
CNQR	2.5%	EA	-66.7%			
COGN	1.0%	LLNW	-62.8%			
CHKP	0.7%	TYPE	-61.7%			
Time Period	**21-Jul-06**	**to**	**21-Jul-07**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
OMTR	212.7%	RHT	-5.1%	64.9%	23.7%	33.0%
NUAN	105.6%	DOX	3.5%			
TTWO	94.1%	CSGP	6.8%			
HAS	86.2%	RNOW	8.3%			
CNQR	80.2%	AVID	9.8%			
SPSS	79.9%	TYL	11.9%			
DLB	66.8%	EA	15.4%			
AKAM	66.6%	IPAS	15.7%			
MANH	60.8%	CTXS	20.6%			
MFE	57.5%	WBSN	24.0%			
Time Period	**12-Aug-04**	**to**	**12-Aug-05**		**Indices**	
Best Performers		**Worst Performers**		Software Index	S&P 500	NASDAQ
CRM	135.5%	LAVA	-46.4%	38.9%	15.7%	23.1%
ATVI	105.3%	SPRT	-42.4%			
ADSK	101.4%	ARBA	-21.6%			
0941825D	99.5%	RSAS	-20.7%			
MCRS	89.4%	TIVO	-13.8%			
1519128D	80.4%	SNPS	-13.4%			
ANSS	72.7%	TYL	-9.5%			
FILE	68.8%	0772374D	-7.9%			
MFE	65.8%	MANH	-6.9%			
1436225D	65.4%	AVID	-5.0%			

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: (1) The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001 (2) For next 12-month period for trough on 5/13/21 we have used data to 1/7/22.

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Appendix 2: Best and worst performers in the 12 months following correction (continued)

Time Period	4-Apr-01	to	4-Apr-02	Indices		
Best Performers		Worst Performers		Software Index	S&P 500	NASDAQ
MFE	281.0%	2482718Q	-70.9%	54.8%	2.1%	9.2%
MANH	197.1%	MUSE	-65.7%			
ATVI	88.0%	RSAS	-60.2%			
SYMC	82.7%	ARTG	-59.2%			
UGS	81.3%	DSGX	-57.9%			
WEBX	80.0%	CHKP	-48.2%			
HYSL	78.3%	DOX	-44.6%			
TTWO	77.5%	OPSW	-43.0%			
SCUR	73.9%	MSLV	-40.9%			
COGN	67.6%	PRGNQ	-40.1%			

Time Period	14-Apr-00	to	14-Apr-01	Indices		
Best Performers		Worst Performers		Software Index	S&P 500	NASDAQ
EA	103.9%	CNQR	-93.8%	-4.9%	-12.8%	-40.9%
3029830Q	95.6%	ARBA	-90.0%			
4623601Q	95.9%	EPAY	-87.1%			
JKHY	48.5%	AKAM	-86.0%			
MAT	51.6%	ARTG	-86.0%			
FISV	41.1%	MRBA	-84.4%			
CDNS	43.0%	2482718Q	-81.0%			
SCUR	32.5%	MSLV	-76.7%			
SNPS	35.0%	TIBX	-76.9%			
CHKP	27.3%	RHT	-76.2%			

Source: Bloomberg Finance L.P., J.P. Morgan Research.

Note: (1) The best and worst performers do not include stocks below market cap: $500M post 2016, $400M for 2011-2015, $300M for 2004-2007, and $200M for 2000-2001 (2) For next 12-month period for trough on 5/13/21 we have used data to 1/7/22.

Companies Discussed in This Report (all prices in this report as of market close on 10 January 2022)
Intuit(INTU/$570.19/OW), Synopsys Inc(SNPS/$329.63/OW)

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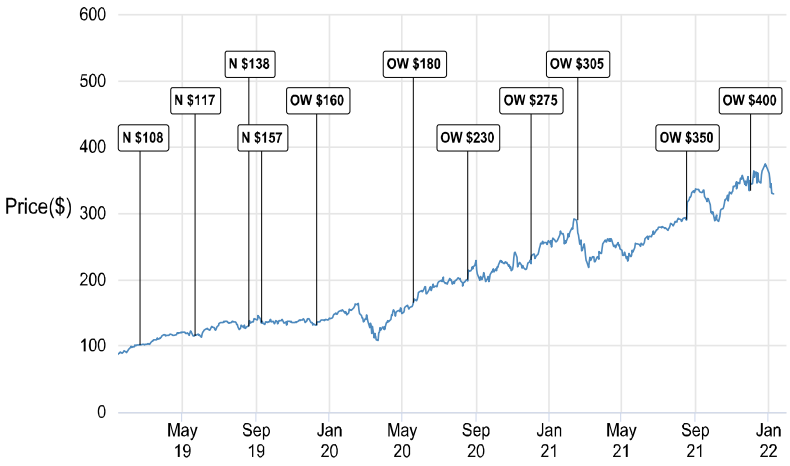
Intuit (INTU, INTU US) Price Chart

Date	Rating	Price ($)	Price Target ($)
21-Feb-19	UW	235.97	202
23-May-19	UW	247.53	211
22-Aug-19	UW	276.24	256
25-Feb-20	UW	286.43	268
25-Mar-20	UW	233.82	249
25-Aug-20	UW	333.12	295
19-Nov-20	UW	354.74	300
09-Dec-20	OW	372.59	450
25-May-21	OW	440.41	530
24-Aug-21	OW	552.49	630
18-Nov-21	OW	635.06	750

Source: Bloomberg Finance L.P. and J.P. Morgan; price data adjusted for stock splits and dividends.
Initiated coverage Nov 12, 2001. All share prices are as of market close on the previous business day.

Synopsys Inc (SNPS, SNPS US) Price Chart



Date	Rating	Price ($)	Price Target ($)
20-Feb-19	N	101.86	108
23-May-19	N	115.09	117
21-Aug-19	N	129.96	138
11-Sep-19	N	135.25	157
12-Dec-19	OW	132.08	160
21-May-20	OW	165.47	180
19-Aug-20	OW	200.09	230
02-Dec-20	OW	230.02	275
17-Feb-21	OW	290.67	305
18-Aug-21	OW	291.62	350
02-Dec-21	OW	334.75	400

Source: Bloomberg Finance L.P. and J.P. Morgan; price data adjusted for stock splits and dividends.
Initiated coverage Nov 25, 2005. All share prices are as of market close on the previous business day.

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