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How Volatility Events Affect Private Asset Class Performance

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In an earlier study we examined the performance of public asset classes before, during and after equity market volatility events. We now expand this study to include three types of private assets (US buyout, US mezzanine, and US real estate funds).

Public equity and credit assets experienced poor performance during spike events relative to their private asset peers. However, public assets responded quickly after the event and performed better in the post-spike period than in the pre-spike period. In contrast, private assets rode out the volatility storm relatively well compared to related public assets. However, private assets "paid" for this relative performance gain during the volatility event with relatively weaker post-spike performance compared to their pre-spike performance.

Overall, our expanded findings continue to support investors who intend to "stay the course" following a volatility event (*i.e.*, do not de-risk) and possibly rebalance to increase allocation to private assets.

We expand our earlier analysis of public asset class performance before, during and after equity market volatility events to include three types of private assets (US Buyout, US Mezzanine, and US Real Estate funds).[1]

Our expanded findings continue to support investors who intend to "stay the course" following a volatility event (*i.e.*, do not de-risk) and possibly rebalance to increase allocation to risk assets.

In this research note we proceed as follows: First, we briefly describe the data sources for private asset returns. Then, we update the schematic of VIX spike events to reflect the quarterly reporting periodicity of private assets. We use the same definition of volatility

1 A. Xie, *When the Dust Flies: How Volatility Events Affect Asset Class Performance*, PGIM IAS, April 2018. A webinar discussion of this research, updated to March 2020, can be accessed via a replay: https://www.pgim.com/insights/pgim-expertise/when-the-dust-flies.

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spike months as described in our earlier paper, but we now map each volatility spike month to its corresponding calendar quarter. Finally, for both private and public assets, we compare asset class performance during the volatility spike quarter as well as during the seven quarters before and after the spike.

Returns Data

To represent the periodic total return of private assets we use the reported quarterly internal rates of return (IRRs), pooled across all vintages, available from Burgiss for buyout and mezzanine LP funds.[2] These returns are net of fees. Data for buyout funds are available back to Q1 1983 and for mezzanine funds back to Q2 1987. For real estate quarterly total return (net of fees) data we use the NFI-ODCE Open End Capitalization-Weighted Index available from ODCE. These data are available back to Q1 1978.[3]

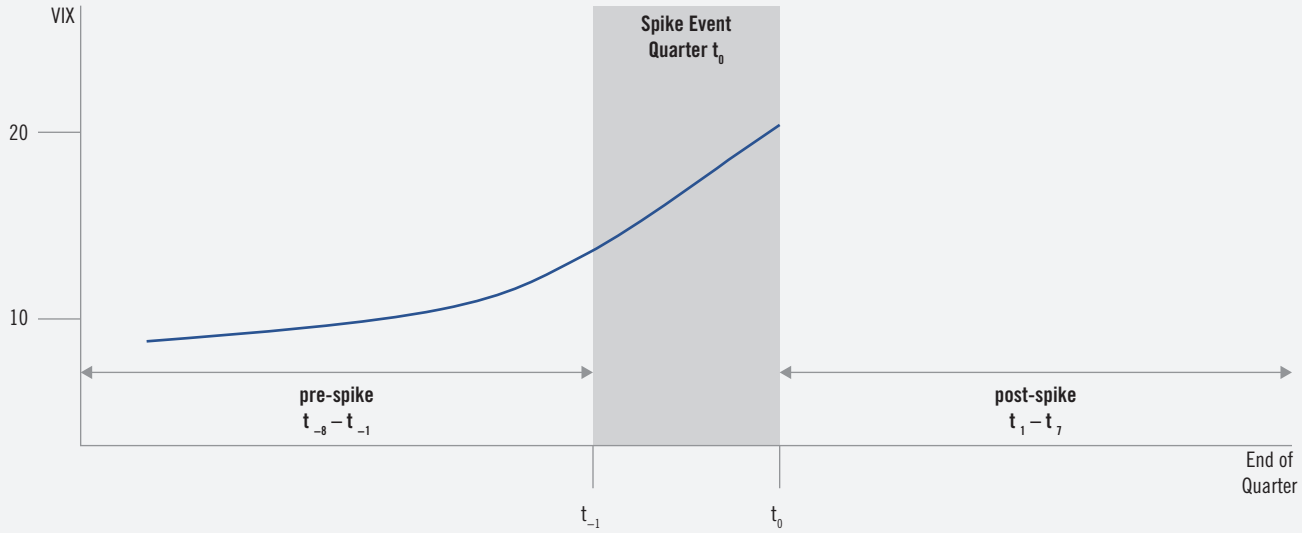
For the public equity and fixed income markets we use reported monthly index total returns (S&P 500, Dow Jones Industrials, 10y Treasury Constant Maturity Rate,[4] Bloomberg Barclays Investment Grade Corporate and Bloomberg Barclays High Yield Corporate Total Return Index). These public returns are gross of fees.

Schematic of Quarterly VIX Spike Events

We update the schematic of VIX spike events to reflect the quarterly data frequency of private asset returns. The definition of a VIX spike event is unchanged from the earlier paper: the month during which the average daily VIX index value increases significantly (by at least 50% compared to the average VIX level two months earlier) is labelled as a **spike month**. We label the calendar quarter in which the spike month resides as the corresponding **spike quarter**. For example, August 2007 (the beginning of the global financial crisis) is a VIX spike month. Correspondingly, Q3 2007 becomes the spike quarter.

Figure 1 shows the updated schematic of VIX spike events expressed in terms of calendar quarters. Quarter t_0, represented by the grey bar, is the spike quarter. We define the **pre-spike period** as the 7q period ending in calendar quarter t_{-1} (so, not including the returns for quarter t_0) and the **post-spike period** as the 7q period after quarter t_0 (beginning with the returns for quarter t_1). The 7-quarter duration of the pre- & post-spike periods is consistent with the 21m pre- & post-spike period durations defined in the earlier paper.

Figure 1: Schematic of VIX Spike Event (Quarterly Frequency)



Source: PGIM IAS. For illustrative purposes only.

2 We use the quarterly IRRs reported from Burgiss, and geometrically link these returns to generate a cumulative time-weighted total return series (TWRR).

3 We use NFI-ODCE open end diversified core real estate equity quarterly returns instead of Burgiss real estate value-added returns because ODCE quarterly returns go back to Q1 1978 whereas the Burgiss time series begins in Q2 1990. For the period after Q2 1990, ODCE quarterly returns and Burgiss returns are reasonably well-correlated (76%).

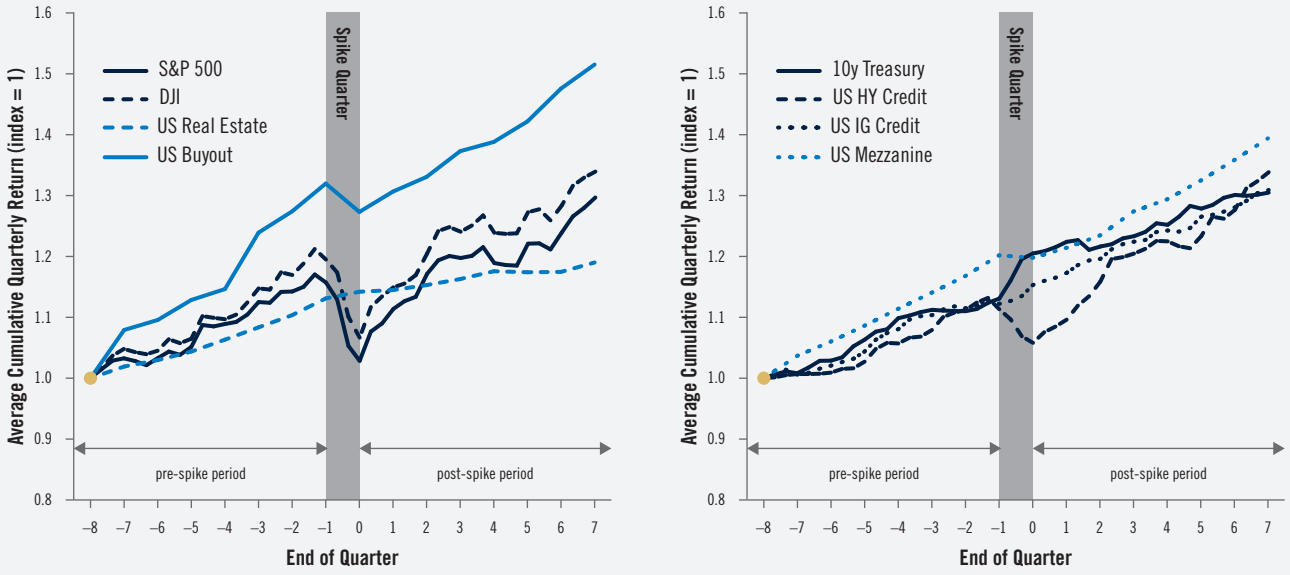
4 Our 10y Treasury total return is implied from the monthly change of the 10y Treasury Constant Maturity Rate, *i.e.*, total return = (- duration × 10y Treasury monthly yield change) + monthly coupon return. Data are from FRB St. Louis (FRED).

Performance Results

We compare the average performance of public equity, fixed income, and private assets surrounding the nine historical volatility spike events occurring after Q4 1988 and up to Q2 2017.[5] For these nine spike events we have complete pre- and post-spike quarterly returns, as well as returns for the spike quarter, for all private and public asset classes.

Figure 2 shows that during the spike quarter (grey area), the equity market had poor performance with an average 1q spike period loss of -11.9% (Figure 3). Performance of buyout funds also declined during the spike quarter, but the average quarterly loss was much smaller (-4.1%) than that for public equity.

Figure 2: Cumulative Quarterly Returns Surrounding VIX Spike Events Q4 1988 – Q2 2017; 9 VIX Spike Events



Past performance is not a reliable indicator of future performance.
Source: PGIM IAS, Burgiss, Datastream, ODCE, FRB St. Louis (FRED). For illustrative purposes only.

For the fixed income market, 10y Treasury performed well, as might be expected, during the spike quarter with an average return of 6.5% (Figure 3) reflecting a "flight to safety." Returns for US IG corporates (fixed-rate bonds) were also positive (2.8%) as losses from spread widening were more than offset by gains from the movement in their medium-duration Treasury pricing benchmark. In contrast, US high yield (fixed-rate bonds) suffered an average loss of 5.2% during the spike quarter.

In contrast to public credit assets, private mezzanine funds (generally a mix of fixed-rate and floating-rate bonds) and real estate funds were more resilient during the spike quarter with average spike quarter performance of -0.4% and 1.0%, respectively.

5 See Figure A1 in the Appendix for the specific volatility spike event quarters as well as each event's associated 7q pre- and post-spike periods.

Figure 3: Total Cumulative Returns (Pre-spike, Spike and Post-spike Periods) Q4 1988 – Q2 2017; 9 VIX Spike Events

Asset Class	Total Cumulative Returns			
	Pre-Spike (7 Quarters)	Spike Period (1 Quarter)	Post-Spike (7 Quarters)	Entire Period (15 Quarters)
S&P 500	15.7%	–11.9%	27.0%	29.7%
DJI	19.5%	–11.2%	27.1%	33.9%
10y Treasury	13.1%	6.5%	8.5%	30.5%
US HY Credit	11.3%	–5.2%	28.9%	33.8%
US IG Credit	12.2%	2.8%	13.7%	30.9%
US Buyout LPs	32.0%	–4.1%	20.7%	51.5%
US Mezzanine LPs	20.2%	–0.4%	16.3%	39.4%
US Real Estate LPs	13.1%	1.0%	5.2%	19.0%

Past performance is not a reliable indicator of future performance.
Source: PGIM IAS, Burgiss, Datastream, ODCE, FRB St. Louis (FRED). For illustrative purposes only.

Before the spike quarter we observe that the S&P 500 average pre-spike cumulative total return was 15.7% (Figure 3) which *increased* to 27.0% during the post-spike period. In contrast, buyout funds, on average, experienced *lower* post-spike performance (20.7%) compared to their cumulative pre-spike performance (32.0%).

Comparing the pre- and post-spike cumulative total return performance of credit assets, we see a similar pattern as observed in the equity market. Public IG and HY corporates did better in the post-spike period than in the pre-spike period, as was observed for public equities.

The post-spike cumulative performance for the 10y Treasury (8.5%) was, however, less than its pre-spike performance (13.1%). As the market recovered from the spike event, not only did riskier assets outperform the credit-safe asset, but they made up lost ground from their poor performance during the spike quarter.

Private mezzanine and real estate funds did not demonstrate the aggressive post-spike performance as did IG and HY (and equities). Cumulative post-spike period performance for mezzanine funds was 16.3% compared to 20.2% in the pre-spike period, and post-spike period performance for real estate was only 5.2%, compared to 13.1% during the pre-spike period.[6]

Overall, in contrast to public risky assets, we find that private assets had weaker performance after the spike compared to before the spike. Since quarterly private asset returns include a subjective NAV valuation, this pattern of weaker post-spike performance may reflect *overestimated* performance during the spike period. In other words, private assets may not have been marked down as severely as were public assets, perhaps due, in part, to a cautious valuation adjustment process. Alternatively, it might be argued that public assets were too aggressively marked down during the spike month (due to both forced-selling by a limited number of participants during illiquid public market conditions and reliance on the last observed trade price at month-end) and did not reflect accurate fundamental valuation.

Buyout LP Fund Results – by Vintage Age

For US buyout LP funds, we examine if the pattern of performance around a volatility spike event might differ conditional on fund age. Since the age-specific secondary market for buyout funds has limited volume, the results of this type of analysis would not readily lend themselves to a portfolio rebalancing strategy. However, it may help inform investor expectations as they survey across their buyout fund portfolio.

In the wake of volatility spike events we might expect differences in fund performance, conditional on fund age, due to where funds of different ages might be in their performance cycle. For example, young funds may be in a better position to take advantage of volatile markets when deploying capital. In contrast, old funds may have already made most of their distributions and have mostly struggling companies remaining in the fund whose valuations are more susceptible to volatile markets.

6 Real estate performance was particularly hurt by the 2007-08 episode. Excluding this episode, both pre- and post-spike performance for real estate would have been greater than that for the 10y Treasury.

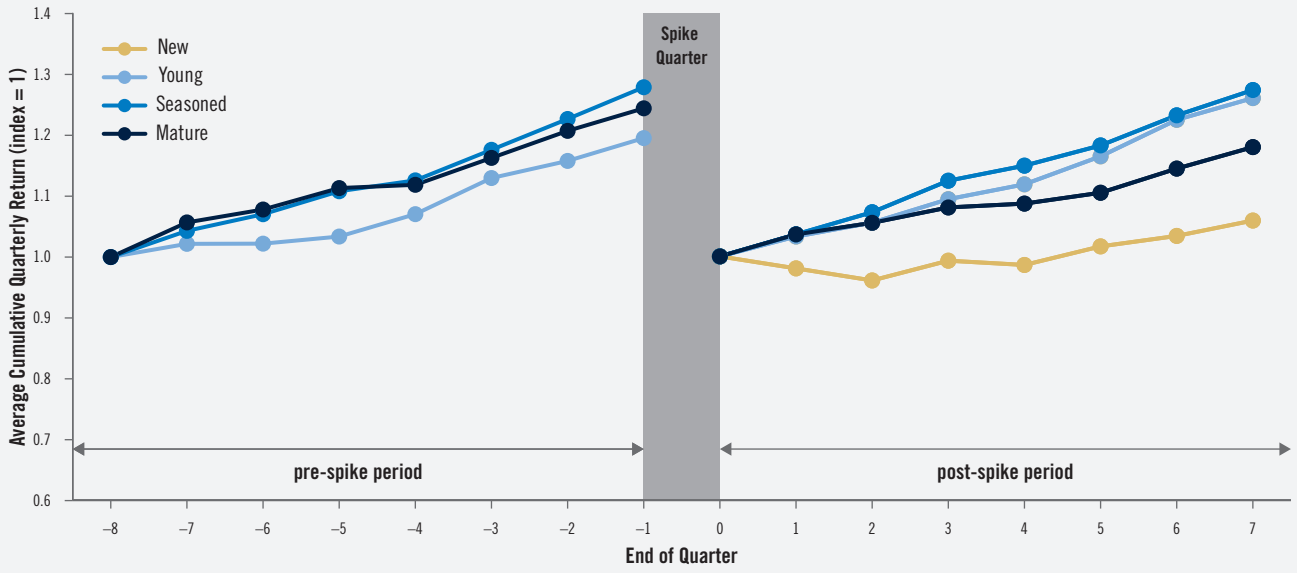
To conduct this analysis, we group buyout funds into age cohorts for each of eight VIX spike events.[7] An LP fund less than 1y old (at the time of the spike quarter) is defined as "new"; between 1-3y old, "young"; between 3-6y old, "seasoned," and older than 6y the fund is defined as "mature." For example, during spike event Q3 2007, new funds are those with vintage year 2007; funds with a vintage year between 2004 and 2006 are young funds; funds with a vintage year between 2001 to 2003 are seasoned funds; and finally, funds with vintage year before 2001 are mature funds. For each VIX spike event we construct fund-age cohorts and pool each cohort's performance to study the average performance of different age cohorts pre- & post-spike events. Note that the new fund cohort will not have pre-spike performance values.

Figure 4 shows that new funds underperform the other cohorts in the period after the volatility spike. These funds do not seem able to capitalize on any market dislocation to acquire attractive investments. Or, perhaps, these funds need more time beyond the seven quarters post spike? The poor relative performance of new funds may also be due to the "J-curve effect" – during its first couple of years after inception, an LP fund mainly experiences capital calls and operational costs and fees rather than distributions and NAV appreciation.

We also observe in Figure 4 that the mature cohort post-spike event recovery is not as strong as that for the young and seasoned cohorts – perhaps due to these funds having already made the bulk of their lifetime distributions and having limited room for further operational enhancement.

The young and seasoned cohorts both have similar strong performance in the post-spike period, with the young cohort picking up some ground as, perhaps, any residual J-curve effect vanishes.

Figure 4: US Buyout Cumulative Quarterly Returns – Pre- & Post-VIX Spike Events, by Age Cohorts
Q4 1997 – Q2 2017; 8 VIX Spike Events



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Source: PGIM IAS, Burgiss. For illustrative purposes only.

7 Only vintages with at least five buyout LP funds are included in this analysis to reduce the potential of an idiosyncratic fund-level event heavily affecting vintage-level returns. We study only eight VIX spike events, instead of the nine that occur after Q4 1988 and before Q2 2017, because for the 1990 Q3 VIX spike event there were not enough LP data for mature funds that spanned both pre- and post-spike periods.

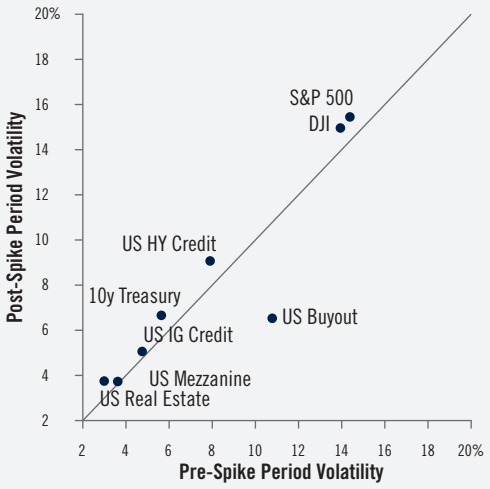
Changes in Volatility

How does return volatility change after a spike event? Figure 5 shows the change in volatility (annualized) for various assets between the pre- and post-spike event periods. Except for buyout funds, all asset classes were more volatile in their post-spike period compared to their pre-spike period (as we found in our earlier study). For example, S&P 500 index monthly total return volatility was 14.4% in the pre-spike period and rose to 15.4% in the post-spike period. We see the same pattern for the public credit markets, and to a more muted effect, for the private credit and real estate markets.

In contrast, volatility for buyout was 10.8% in the pre-spike period and *fell* to 6.5% in the post-spike period. As was shown above, relative to the public equity market, returns for buyout funds were stronger during the spike quarter. And, unlike public equities, post-spike buyout fund cumulative performance lagged its pre-spike performance. The more muted, and less volatile, post-spike cumulative performance for buyout perhaps reflects the spike period already having somewhat discounted its post-spike recovery. Since the NAV valuator is not a forced seller, perhaps the valuator makes a longer-horizon assessment of present value during the spike period?

Figure 5: Volatility (Annualized) of Asset Class Total Returns Q4 1988 – Q2 2017; 9 VIX Spike Events

Annualized Volatilities	Spike Events	
	Pre-Spike (7 Quarters)	Post-Spike (7 Quarters)
S&P 500	14.4%	15.4%
DJI	13.9%	15.0%
10y Treasury	5.6%	6.7%
US HY Credit	7.9%	9.1%
US IG Credit	4.8%	5.1%
US Buyout LPs	10.8%	6.5%
US Mezzanine LPs	3.6%	3.7%
US Real Estate LPs	3.0%	3.8%



Past performance is not a reliable indicator of future performance.
Source: PGIM IAS, Burgiss, Datastream, ODCE, FRB St. Louis (FRED). For illustrative purposes only.

A Summing Up

Public equity and credit assets experienced poor performance during spike events relative to their kindred private assets. However, for public assets that experienced relatively larger losses during spike events, they responded quickly after the event and performed better in the post-spike period than in the pre-spike period.

While private assets rode out the spike storm relatively well compared to comparable public assets, private assets "paid" for that relative performance gain with relatively weaker post-spike performance compared to their pre-spike performance.

On net, however, our analysis of private asset performance supports our earlier findings for public assets: Following a volatility event, investors might wish to consider "staying the course" (*i.e.*, do not de-risk) and possibly rebalance to increase allocation to private assets.

Acknowledgments

We wish to thank Dr. Taimur Hyat and Robin Stern for their valuable comments and suggestions.

Appendix

Figure A1: 9 VIX Spike Event Quarters; Pre- and Post-Spike Periods

Pre-Spike (7 Quarters)	Spike Period (1 Quarter)	Post-Spike (7 Quarters)
Q4 1988 – Q2 1990	**Q3 1990**	Q4 1990 – Q2 1992
Q4 1996 – Q2 1998	**Q3 1998**	Q4 1998 – Q2 2000
Q4 1999 – Q2 2001	**Q3 2001**	Q4 2001 – Q2 2003
Q4 2000 – Q2 2002	**Q3 2002**	Q4 2002 – Q2 2004
Q4 2005 – Q2 2007	**Q3 2007**	Q4 2007 – Q2 2009
Q1 2007 – Q3 2008	**Q4 2008**	Q1 2009 – Q3 2010
Q3 2008 – Q1 2010	**Q2 2010**	Q3 2010 – Q1 2012
Q4 2009 – Q2 2011	**Q3 2011**	Q4 2011 – Q2 2013
Q4 2013 – Q2 2015	**Q3 2015**	Q4 2015 – Q2 2017

Source: PGIM IAS.

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