A new metric for liquidity add-ons: easy as ADV, but better

Proposed measure allows brokers to calculate stable, stock-specific liquidity add-ons

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It's a rock and a hard place. When a firm like Archegos collapses, brokers and clearing firms are squeezed by volatile prices and vanishing liquidity.

Liquidity of single stocks is of particular concern when a client defaults; a lack of liquidity amplifies the cost of liquidating large positions – and the broker or clearer often bears the brunt.

To mitigate their losses, these firms assess an additional liquidity charge, or add-on, for positions that could result in large cost or slippage on liquidation. The go-to methodology is to compare the size of a position in a security to its average daily volume – or ADV – over a 20- or 30-day period. The broker makes an assumption based on how much ADV can be liquidated in one day and thereby calculates the number of days needed to liquidate a position. For each day, the broker levies an additional margin percentage.

On a stock with an ADV of 1 million shares, for example, the broker might assume 20% of the ADV can be liquidated without moving the market and charge a 5% margin add-on for each day it would take to exit the position. A client with a position of 600,000 shares, which would take three days to liquidate, would be charged 15% in additional margin. Some firms use minor variations on this, but the general construct remains the same – and in almost all cases, the ADV is used as the core metric for assessing liquidity.

But the ADV is only an adequate measure if the daily volume is relatively stable, without large outliers, in which case the ADV appropriately smoothes the daily volume and provides a reasonable liquidity metric – which is usually the case for mature companies with large market capitalisation and healthy liquidity.

But for lower market cap or less liquid names, daily volumes can vary dramatically, and ADV itself becomes volatile and reactionary. It is often observed that on news of stocks such as meme stocks that have huge speculative interest, the volume can often spike exponentially in a day then quickly revert to lower levels. The ADV rises, reflecting this, but it can take many days for the spike to fall out of the calculation, after which the ADV drops again.

This pathology shows a liquidity charge for a large position prior to the spike, but the liquidity charge falls off while the ADV rises and stays high for days. But this is counterintuitive from a risk perspective. The liquidity charge should remain in place because the volume spike could be temporary.

There are numerous other issues with ADV as a metric. As a means of calculating margin add-ons, it says little about slippage during liquidation, for example. The time to liquidate is not always correlated to the cost of liquidation, which can vary significantly, even for stocks that have the same ADV.

So, here, we propose a new metric: exponential liquidity per percent (ELPP), that measures the cost of liquidation for individual stocks and can be used to set margin add-ons in a way that reflects the unique liquidity characteristics of individual stocks. We also propose two alternatives to ADV that exhibit greater stability.

The first is to use the median of the last 20-day volumes – the median daily volume or MDV. The median is a statistic that ignores large outliers. If the volume spikes persist, it will quickly start incorporating them into its measure.

The second alternative is an exponential moving average, which we call EDV_t. It is defined as:

$$EDV_t = \alpha V_t + (1 - \alpha) EDV_{t-1}$$

EDV_t is the exponential weighted moving average (EWMA) of the daily volume over consecutive days (t). The α parameter is used to weight the current observation and can be set between 0 and 1. We opt for a slow-moving average, in which $\alpha = 1 - 0.5^{1/N}$, where N is the half-life of the EWMA.

The standard ADV along with our new metrics of MDV and EDV were calculated for three securities: Tailwind Acquisition Corp (TWND), a special purpose acquisition company (SPAC); AMC, a highly popular meme stock; and Upstart Holdings (UPST), which operates an artificial intelligence (AI) lending platform. All three stocks have had days with large volume spikes. The results are plotted against the actual volume (in $\log_{10}$ scale), below:

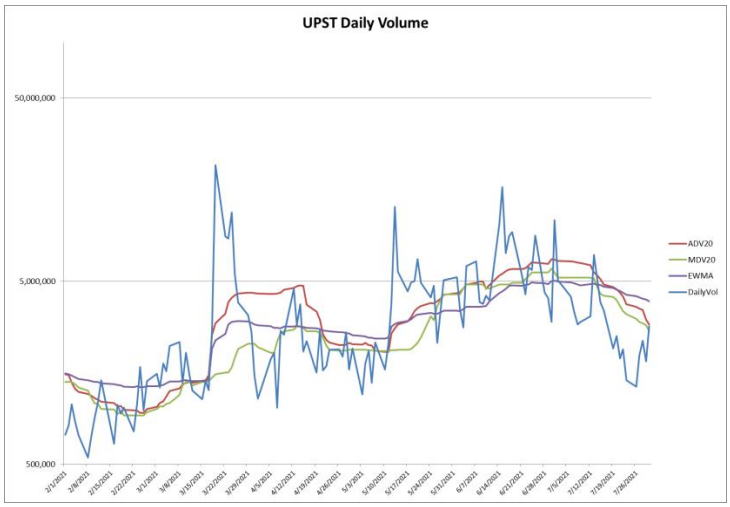

Figure 1: UPST daily volume vs the three liquidity measures

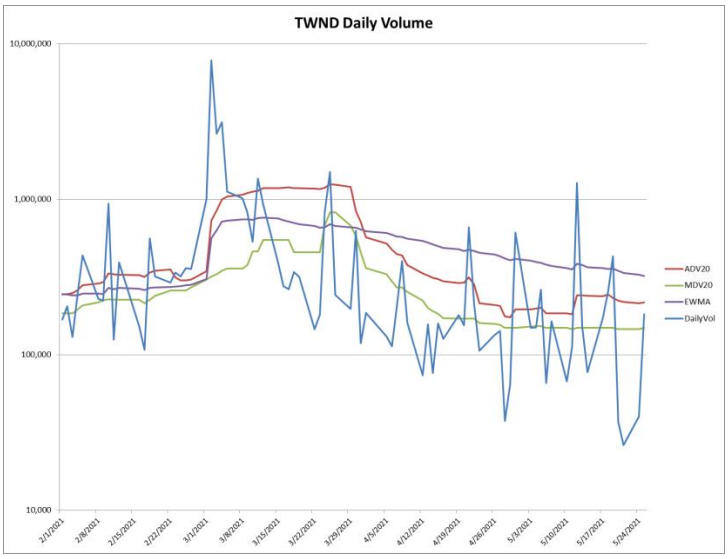

Figure 2: TWND daily volume vs the three liquidity measures

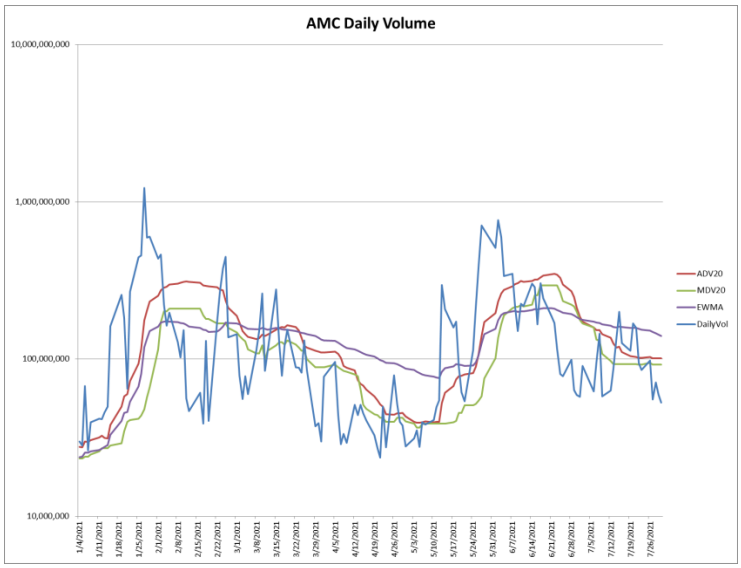

Figure 3: AMC daily volume vs the three liquidity measures

As expected, the ADV rises very quickly from the spike in volume, then falls quickly as volumes normalise. It is generally a very noisy indicator and not very stable.

The MDV is more stable in most cases, but in both TWND and AMC, the MDV comes off sharply as volumes came off, then in AMC's case, shoots back up.

The EDV provides a more stable indicator throughout in all cases.

As the liquidity add-on or charge is an inverse scaling of the liquidity measure, it will follow the same relative patterns as the three measures. Thus, using EDV will produce the most stable and consistent add-on over time for a given position.

In summary, the alternatives to ADV provide greater stability and avoid the pitfall of reducing the liquidity charge at the wrong time.

A holistic measure

So, now we have explored the improvement of the core metric used for measuring liquidity. But the goal of risk management is to estimate the cost or slippage that can occur due to lack of liquidity.

Most risk frameworks assume some fixed value as an add-on for each day to liquidate. As our initial example sets out, this could be 5%. While this is somewhat arbitrary and applied here to all stocks, the actual slippage and thus the cost of liquidation could vary significantly for different stocks.

Here we propose a new metric that results in a holistic measure of the cost of liquidation for each stock that can be directly applied as the add-on.

The concept of the metric is the amount of stock volume required to cause a certain percentage move in the underlying stock. This is akin to asking how much money it will take to move the stock a certain amount – which is essentially the inverse of the definition of the cost of liquidation.

Of course, we know such a measure will vary during the day and is an instantaneous measure, but for risk management purposes, we measure it on an intraday basis, by taking the entire day's volume and the price range over the day.

$$LPP_t = \frac{V_t * P_t}{100 * (H_t - L_t)}$$

H_t and L_t are the intraday high and low price respectively, and P_t is the day close.

The LPP thus defines the amount of volume that can be traded for a 1% move in the underlying price of the stock.

Below is a plot of LPP vs volume for UPST. We notice from the red circled area that the LPP is fairly clustered.

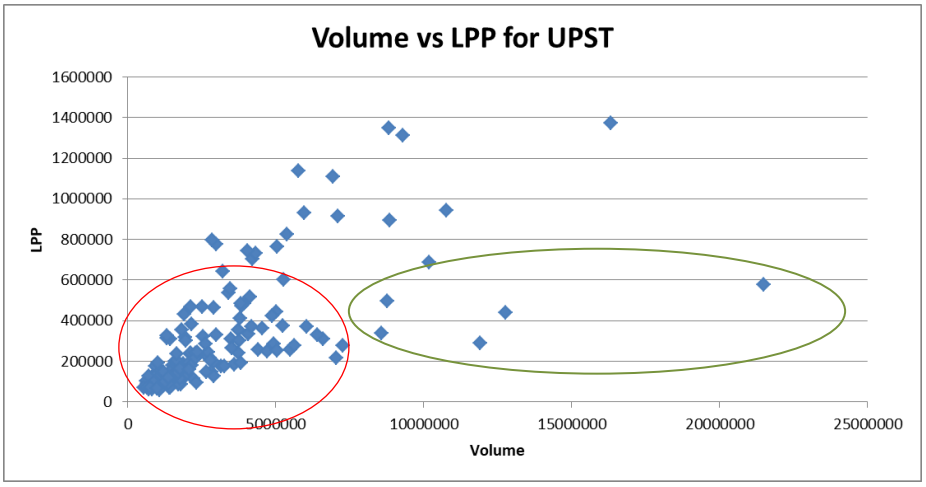

Figure 4: UPST daily volume vs LPP

It is interesting to note that on many occasions, when volume spikes, the LPP is stationary or somewhat lower, as seen in the green circled area. Thus, even with a spike in volume, the cost of liquidation remains similar and actually increases. As mentioned earlier, in the ADV-based measure, when volumes spike and ADV rises, the traditional add-ons actually reduce, which they should not.

We complete the final measure by applying a smoothing method. We prefer to use the EWMA method with a half-life of N over N=20, although others can be chosen. Our final metric is:

$$ELPP_t = \alpha LPP_t + (1-\alpha)ELPP_{t-1} \quad \text{with } \alpha = 1 - 0.5^{1/N} \quad (3)$$

A review of academic literature on this topic unearths proposals for a few similar liquidity measures.

For example, Amihud's (2002)[footnote 1] illiquidity measure, ILLIQ, is used by several regulators to measure market liquidity. It is defined as:

$$ILLIQ = \frac{1}{N}\sum_{i=1}^{N}\frac{|r_i|}{\$V_i}$$

In which r is the daily return of the stock. It is conceptually very similar to being the reciprocal of our measure, but in our opinion suffers from the use of the daily return, which does not capture the range of the market intraday.

Danyliv, Bland and Nicholass (2014) [footnote 2] propose a measure they call liquidity index, which is very similar to our measure:

$$LIX_t = log_{10}\left(\frac{V_t * P_t}{(H_t - L_t)}\right)$$

Their LIX incorporates an additional Log10 scaling for convenience. The reason we normalize to a 1% price move will become obvious.

Practical ELPP

The beauty of this measure is that it can be directly applied to the position of a stock in a portfolio and will give a stock-specific measure of the add-on or additional capital or margin required for the position. It does away with the need to calculate days-to-liquidation as well as the arbitrary value of an add-on per day to liquidate.

The liquidity add-on in % for stock x is simply = Position(x) / ELPP (x)

To put the measure in practice, we assume a position in UPST of 1,000,000 shares and compare the liquidity add-on using our initial parameters of ADV20 with amount liquidation per day of 20% and add-on for each day to liquidate of 5%. This is compared to the liquidity add-on calculated using ELPP.

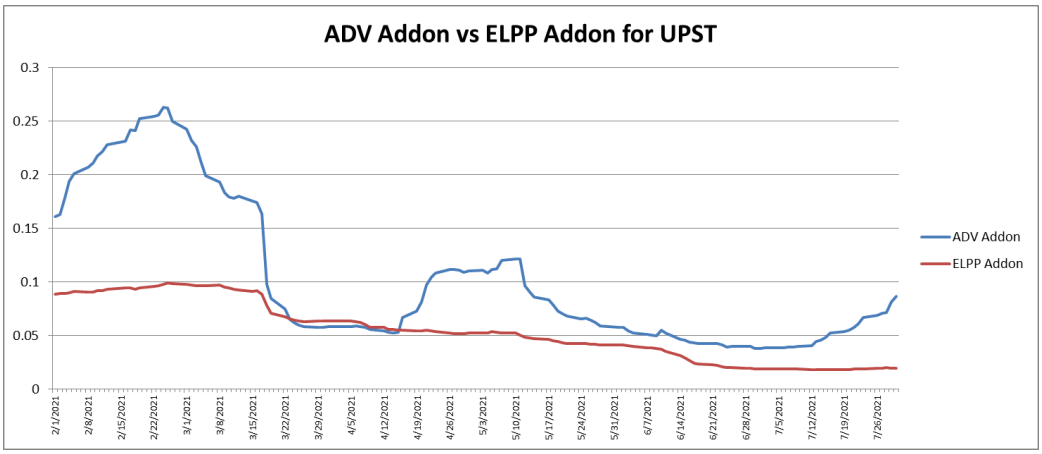

Figure 5: UPST add-on based on ADV vs ELPP

The difference is quite remarkable. The ELPP-based add-on is far more stable and consistent than the ADV-based add-on

So, what we have proposed here is a liquidity add-on methodology using a liquidity measure that holistically uses the price action of a stock along with its volume. While additional studies may be required to test the robustness of the methodology, it does seem to offer a simple, stable, consistent and stock-specific measure that is non-arbitrary and based on actual market data.

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1.Amihud, Illiquidity and stock returns: cross-section and time-series effects, Journal of Financial Markets 5 (2002) 31–56

2.Danyliv and Bland and Nicholass, Convenient Liquidity Measure for Financial Markets, ERN: Other Econometric Modeling: Capital Markets - Asset Pricing (Topic) (2014)