



Low Volatility Net Asset Value Money Market Funds

Potential price volatility analysis

Jonathan Curry, Global Chief Investment Officer, Liquidity
Olivier Gayno, Chief Investment Officer, Wealth & EMEA Liquidity

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Executive Summary

One of the key considerations for investors in Constant Net Asset Value ('CNAV') Prime MMFs today is whether the new LVNAV MMFs that will be available will be an appropriate alternative to today's CNAV Prime MMFs. For those investors that value the simplicity and efficiency of a CNAV Prime MMF coupled with a low probability of a move in the price of the fund, an LVNAV MMF appears to be a credible replacement. With the day-to-day operation of an LVNAV MMF expected to closely mirror that of a CNAV Prime MMF from an investor's perspective, a key input for an investor to determine the applicability of an LVNAV MMF is an analysis of the probability of moving out of the 0.20% collar which would lead to a change in the price (considering that today's CNAV funds have a 0.50% collar).

For that reason, we have undertaken back-testing, the results of which, suggest **the probability of moving outside the 0.20% collar, leading to a change in price, is very low**, with only 3 occasions that the collar would have been breached across all four funds over a 16 year period. This conclusion is supported by the results of the live mark-to-market data we have for the period in which they overlap. The live data is available through the weekly mark-to-market of each fund that is performed as part of the current operation of the funds. Of course the probability is not zero. We believe this analysis will further support investors in CNAV Prime MMFs in determining which type of MMF is most appropriate for them.

In addition the two data sets will be useful analysis to present to auditors and accountants that will need to determine whether an LVNAV MMF can be considered 'cash and cash equivalent' under accounting regulation.

Results of the back test January 2002 to December 2017

(please see parameters and assumptions used in the back test in the main body of this paper)

| | Occasions 0.20% collar breached | Lowest price on downside | Highest price on upside | Number of days for price to return to 1.00 | % of sample within 0.10% collar | % sample within 0.05% collar |
|-----------|---------------------------------------|-----------------------------|----------------------------|---|--|---------------------------------------|
| USD LVNAV | 1 | 99.65 | 100.15 | 9 days | 96% | 86% |
| GBP LVNAV | 2 | 99.81 | 100.22* | 12 days / 1 day | 93% | 86% |
| EUR LVNAV | 0 | 99.84 | 100.19 | N/A | 96% | 85% |
| CAD LVNAV | 0 | 99.85 | 100.12 | N/A | 97% | 93% |

*The GBP LVNAV broke out of the 0.20% collar twice on the upside. Both occasions occurred in January 2009.

Background and features of an LVNAV MMF

The creation of the LVNAV MMF is a key part of the European MMF regulation and, in our opinion, is an effort by European regulators to ensure that a MMF which invests primarily in non-government debt is in a form that many investors will find attractive while addressing regulators key concerns surrounding MMFs. This “hybrid” solution is a primary difference between the evolution of regulators plans in Europe versus the US (where no such compromise exists in between CNAV Government and VNAV Prime funds).

We believe that LVNAV MMFs will attract a significant proportion of the cash invested in today's Prime Constant NAV ('CNAV') MMFs, in part, as we believe investors will value those features similar to existing CNAV prime funds that many use today.

An LVNAV MMF has some similarities and some important differences to today's Prime CNAV MMFs. An LVNAV MMF is intended to invest primarily in credit (bank, agency and corporate), follow many of the same key investment constraints and price to two decimal places as today's Prime CNAV MMFs do.

The fact a LVNAV MMF will be able to price to two decimal places is an important one. CNAV MMFs today use two decimal place pricing meaning that a CNAV MMF would “break the buck” i.e. the price would move, if its ‘shadow’ NAV (the weekly mark-to-market of the assets) is at or below 0.9950 or is at or above 1.0050 i.e. if the ‘shadow’ price moves by + or – 0.50%.

The most important difference with an LVNAV is that the MMF regulation stipulates that if the daily price is + or – 0.20% then the fund must switch to four decimal places pricing and thus the price would move. The ‘collar’ is fixed by regulation rather than being arithmetic, and is narrower.



Back Test assumptions and results

Back test data and live data on LVNAV price volatility

Current investors in CNAV MMFs who are considering their options post the publication of the final regulation have understandably shown a keen interest in the potential volatility of the mark-to-market NAV of an LVNAV MMF. With the current CNAV 'collar' of +/- 0.50% narrowing to a 'collar' of +/- 0.20% for an LVNAV MMF, understanding the probability of breaking outside the narrower collar is a key consideration in determining the attractiveness of an LVNAV MMF.

To help with this determination, we have two sets of data that demonstrate the potential volatility of the mark-to-market price of an LVNAV and therefore the probability of the price of the LVNAV MMF changing. One is a back test data set we have performed and the other is a live data set using the weekly mark-to-market shadow NAV conducted on our existing CNAV Prime MMFs.

Back test parameters and assumptions

We will first look at the back test data set. With any back test it is necessary to set certain parameters and to make certain assumptions. The key ones for our LVNAV MMMF back test are set out in the table below with the rationale for each.

| | | |
|--|---|--|
| Survey period | 16 years : January 2002 – December 2017 CAD GLF back test is 10 years from February 2008 – December 2017 | Statistically significant and captures 3 distinct periods: 2002 – 2007 - 'normal' interest rate level 2007 – 2010 – the Global Credit Crisis 2010 – 2017 – ultra low interest rates |
| Weighted average maturity ('WAM') | A constant 40 days over life of the back test | This is against the 60-day maximum as defined by our MMF guidelines. |
| Weighted average life ('WAL') | A constant 75 days over life of the back test | This is against the 90-day maximum as defined by our MMF guidelines.. |
| Liquidity | 10% overnight, 30% one week | In line with minimums as defined by the new MMF regulation |
| Fund size | Constant fund size | No assumptions about daily subscriptions and redemptions. This has been done to remove subjectivity if assumptions were made. |
| Pricing source | LIBOR (Bankers' Acceptance rate for CAD) | This is the one constant pricing source available |

Back test results

With the parameters and assumptions above set we have been able to perform a back test to quantify the potential volatility in the mark-to-market NAV of an LVNAV MMF.

Any back test will have certain limitations. In this case these are outlined below.

- There are no simulations of liquidity stress as there are no subscription / redemption simulations in the back test. If the market is not liquidity stressed, then the assumption is that all redemptions can be met by selling assets at the LIBOR rates used, which is the mark to market valuation.
- By using LIBOR rates (Bankers' Acceptance rates in the case of CAD) to mark to market the fund there are no assumptions on idiosyncratic credit risk i.e. the back test assumes there was no default event. It must be highlighted that, in case of a significant risk such as a default occurring, then the LVNAV fund would have to convert to VNAV, as is the case for CNAV Prime MMFs.

Back Test assumptions and results

The back test results are summarized in the table below showing results for an LVNAV MMF in each of the currencies we offer today in our Global Liquidity Fund range. The full back test results for each currency are graphically displayed in Appendix 1.

| | Occasions 0.20% collar breached | Lowest price on downside | Highest price on upside | Number of days for price to return to 1.00 | % of sample within 0.10% collar | % sample within 0.05% collar |
|------------------|--|-------------------------------------|------------------------------------|---|--|---|
| USD LVNAV | 1 | 99.65 | 100.15 | 9 days | 96% | 86% |
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Source: HSBC Global Asset Management

The results of the back test allow us to make a number of high level statements:

1. The probability of the mark-to-market price moving outside the 0.20% collar is de minimus
2. On the three occasions across the four MMFs where the mark-to-market price has moved outside the collar the magnitude of deviation has ranged from 0.02% to 0.15%
3. On the three occasions across the four MMFs where the mark-to-market price has moved outside collar, the time for the price to revert to 1.00 ranges from 1 – 12 business days
4. The mark-to-market price remains within a 0.10% collar between 93-97% of the data sample

The data for all four funds demonstrates that the greatest volatility on the downside occurred in Q3 2008 during the height of the Credit Crisis and on the upside as the markets began to recover from the extremes of the Credit Crisis. Outside of this period where market volatility was at its historic highs, the four funds mark-to-market NAVs traded within a 0.10% range.

In our opinion the back test provides further evidence that the new LVNAV MMFs will be the MMF of choice for a significant majority of investors in Prime CNAV MMFs today.

Back-tested past results do not represent actual returns and should not be seen as an indication of future returns.

Live mark-to-market price data results

As well as the back test data we have weekly mark-to-market prices on each of our Global Liquidity Funds calculated by Bank of New York Security Services who are the custodian, fund accountant and administrator of the funds. These prices are based on the live funds and carry none of the assumptions and parameters required by a back test.

The data period starts in June 2010 and goes up to December 2017 as this is the date from which we have data available from Bank of New York. The period also represents a timeframe where we have been managing the MMFs to a consistent set of investment guidelines created after the Credit Crisis of 2007-2009. Prior to this period we were managing the funds to a different set of investment guidelines which allowed the MMFs to be run at a greater risk profile than that allowed post the Credit Crisis. It is therefore a representative live mark-to-market data set.

The live mark-to-market data set results show less volatility than the longer back test data. The live data period represents a period of very low volatility in short term interest rates in the four currencies in the GLF range and in the credit spread (the yield premium that issuers trade at relative to the yield of the respective government of the currency of the MMF) of the high quality investment grade issuers that we invest in for these funds. Except for 4 occasions in the USD GLF fund, all mark-to-market fund prices across the four GLF MMFs were within a $\pm 0.05\%$ collar around a stable price of 1.00. These live mark-to-market results are consistent with the findings from the back test over the same data period.



Conclusion

The results of this back testing, supported by the results of the live mark-to-market data for the period in which they overlap, suggest the probability of moving outside the 0.20% leading to a change in price is very low. We believe this analysis will further support investors in CNAV Prime in determining which type of MMF is most appropriate for them.

In addition the two data sets will be useful analysis to present to auditors and accountants that will need to determine whether an LVNAV MMF can be considered 'cash and cash equivalent' under accounting standards.

At HSBC our project to meet the requirements of the new rules includes a planned conversion of our existing CNAV Prime Global Liquidity Funds to the new LVNAV structure as we believe it is a credible alternative to today's offering. The results of this back test further support the view that price volatility is expected to be very low for the new LVNAV environment.

Authors



Jonathan Curry

Global CIO Liquidity
CIO HSBC Global Asset
Management (USA) Inc.

Jonathan Curry is Chief Investment Officer of HSBC Global Asset Management (USA) Inc, and also Global Chief Investment Officer – Liquidity of HSBC Global Asset Management. Mr. Curry joined HSBC in August 2010 and has over 20 years of experience in fixed income asset management. Prior to joining HSBC, he served as Head of European Cash Management at Barclays Global Investors and for Citigroup Global Asset Management, London, where he spent five years from 1994 as a Fixed Income trader and money market and short duration portfolio manager. Mr. Curry began his financial career in August 1989 joining Citicorp performing a number of roles for the bank culminating in a junior role in the bank's first proprietary trading desk outside the USA. Mr. Curry holds the CFA UK Investment Management Certificate (a certificate at the time managed by the UK regulator). Mr. Curry has been a Board Director of the Institutional Money Market Fund Association since 2006 and was Chair between 2012 -2015. He has also been a member of the Bank of England's Money Market Liaison Group and the European Banking Federation's STEP and STEP+ committees



Olivier Gayno

CIO Wealth & EMEA Liquidity
CIO HSBC Global Asset
Management (France) Ltd

Olivier Gayno is Chief Investment Officer Wealth & EMEA Liquidity in HSBC Global Asset Management (France) and has been working in the industry since 1991. Mr. Gayno joined HSBC in 1989 and held a number of different positions in the asset management business of the group since 1991 including CEO & CIO of HSBC Asset Management Japan. Mr. Gayno also worked as Deputy Chief Investment Officer at T&D Taiyo Daido Asset Management and as Chief Investment Officer at Taiyo Life Gamma Asset Management. He graduated from the engineering school Ecole Nationale des Ponts et Chaussées (France).

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- The value of investments and any income from them can go down as well as up and investors may not get back the amount originally invested.
- Credit risk. Issuers of debt securities may fail to meet their regular interest and/or capital repayment obligations. All credit instruments therefore have potential for default. Higher yielding securities are more likely to default.
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- Asset backed securities (ABS) risk. ABS are typically constructed from pools of assets (e.g. mortgages) that individually have an option for early settlement or extension, and have potential for default. Cash flow terms of the ABS may change and significantly impact both the value and liquidity of the contract.
- Operational risk. The main risks are related to systems and process failures. Investment processes are overseen by independent risk functions which are subject to independent audit and supervised by regulators.
- MoneyMarket Fund risk. The fund aims to maintain a stable share price through investment in low risk, short-term securities. The market value of the securities held by the fund will fluctuate. During adverse market conditions there is no guarantee that a stable net asset value will be maintained.

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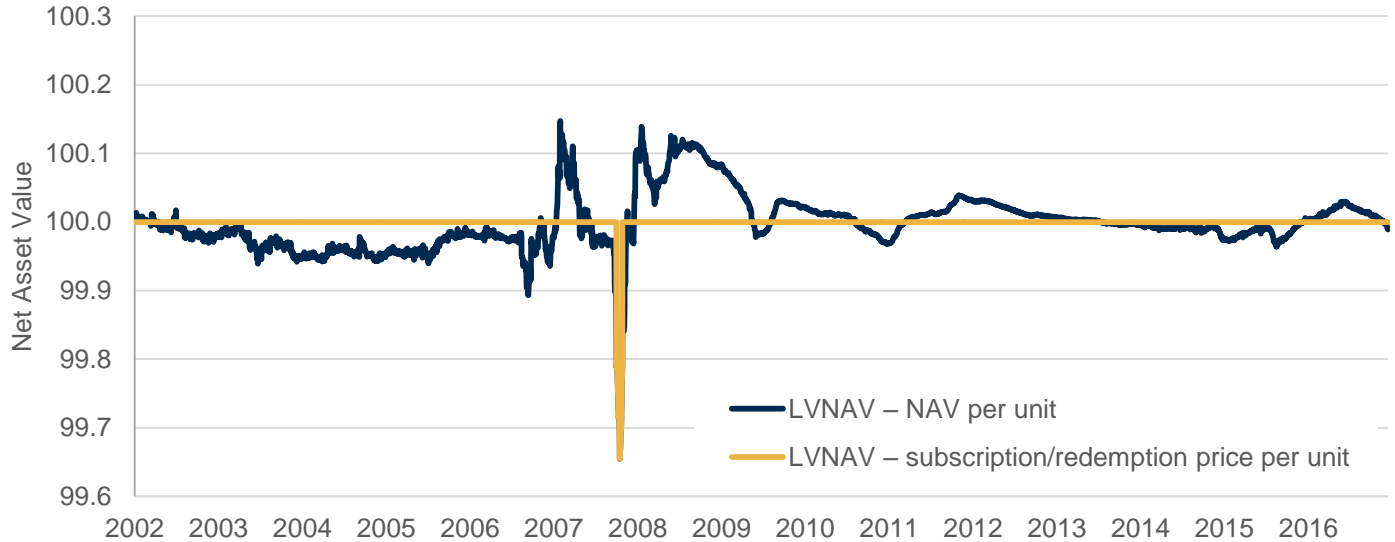
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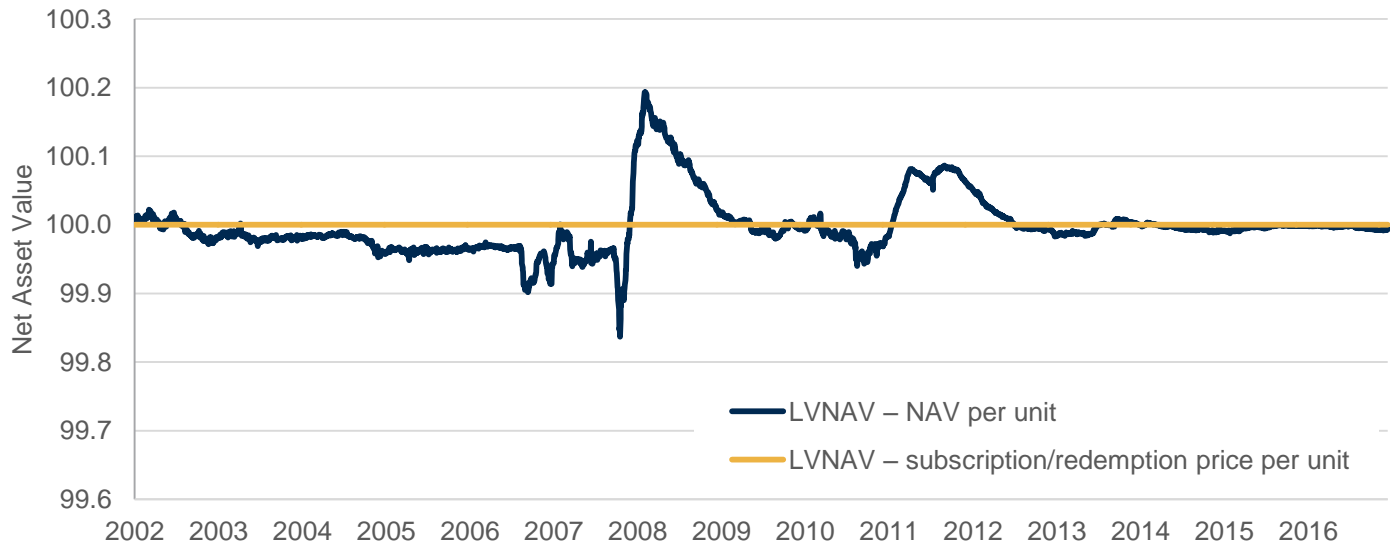
Appendix

Graphical representation of the back test data

US Dollar Global Liquidity Fund



Euro Global Liquidity Fund

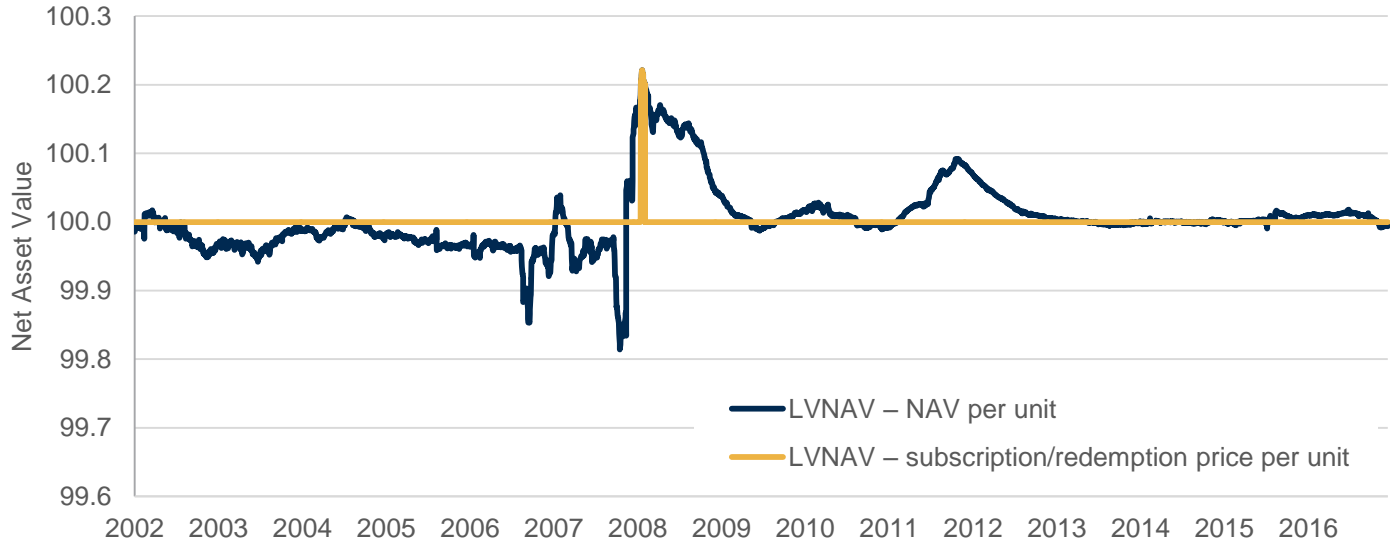


Source: HSBC Global asset Management as of December 8, 2017. Back tested results have inherent limitations, some of which are described below. Back tested returns do not represent the performance results of actual trading or portfolio asset allocations for any client assets or portfolios. Back tested returns are calculated through the retroactive application of the proposed asset allocation to its relevant benchmark and are produced with the benefit of hindsight. Therefore, the performance results are not indicative of the skill of HSBC Global Asset Management or of future results. Since back tested performance results do not represent actual trading or portfolio asset allocations they may not reflect the impact that material economic and market factors might have had on decisions made in actual trading or portfolio asset allocations. No representation is being made that any portfolio will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently significant material differences between back tested performance and performance results subsequently achieved by following a particular strategy.

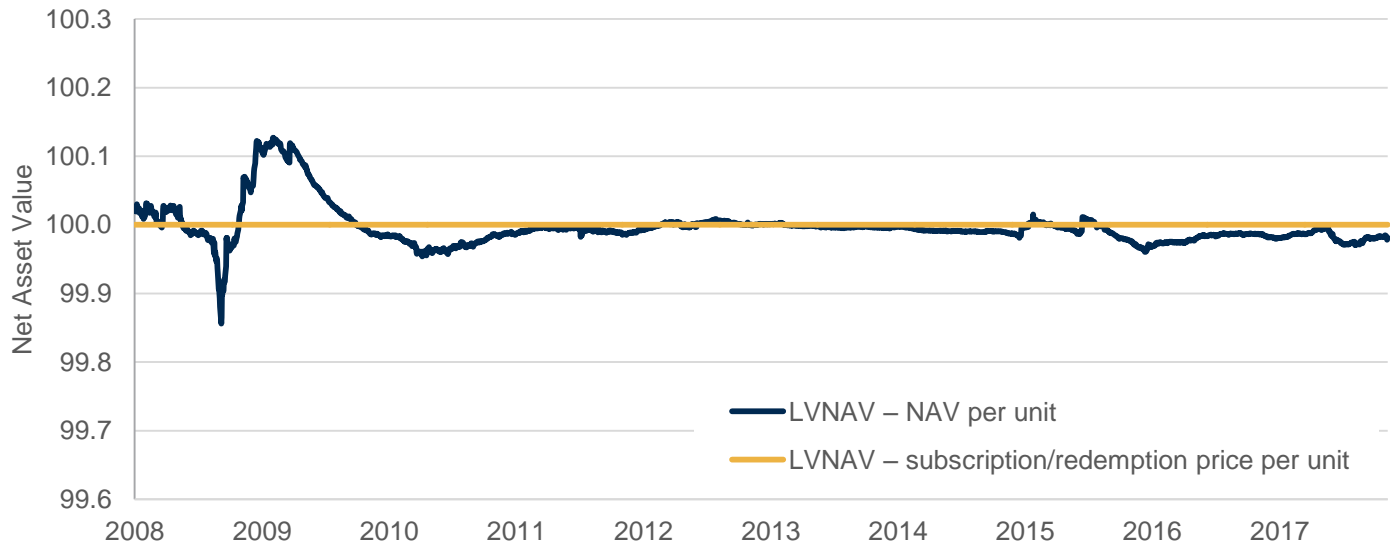
Appendix

Graphical representation of the back test data

Sterling Global Liquidity Fund



Canadian Dollar Global Liquidity Fund



Source: HSBC Global asset Management as of December 8, 2017. Back tested results have inherent limitations, some of which are described below. Back tested returns do not represent the performance results of actual trading or portfolio asset allocations for any client assets or portfolios. Back tested returns are calculated through the retroactive application of the proposed asset allocation to its relevant benchmark and are produced with the benefit of hindsight. Therefore, the performance results are not indicative of the skill of HSBC Global Asset Management or of future results. Since back tested performance results do not represent actual trading or portfolio asset allocations they may not reflect the impact that material economic and market factors might have had on decisions made in actual trading or portfolio asset allocations. No representation is being made that any portfolio will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently significant material differences between back tested performance and performance results subsequently achieved by following a particular strategy.

