

Lending in the context of investing: another step toward Total Wealth advice

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Loans against portfolios of financial assets can be a very cost-effective source of funds for investors. The proceeds of the loan can either be re-invested in a portfolio or used for external purposes. The presence of a loan can impact the portfolio risk/return characteristics significantly, however. Therefore it is important to discuss the rationale for taking the loan, the changes to expected investment returns and risk, and identify both the optimal portfolios from a lending perspective and the optimal amount of leverage from an investment perspective. We use our set of Strategic Asset Allocations (SAAs), including the Systematic Allocation Portfolio (S.A.P.) and the Global Credit Opportunities (GCO), as the basis for our analysis. We also address the importance of rebalancing the loan amount and discuss the current market environment and the CIO's investment outlook.

Introduction

Investment portfolios represent not only a source of returns but also a source of funding. In other words, when considering whether to allocate capital to a particular portfolio of bonds, equities, etc., clients should always ask themselves two questions:

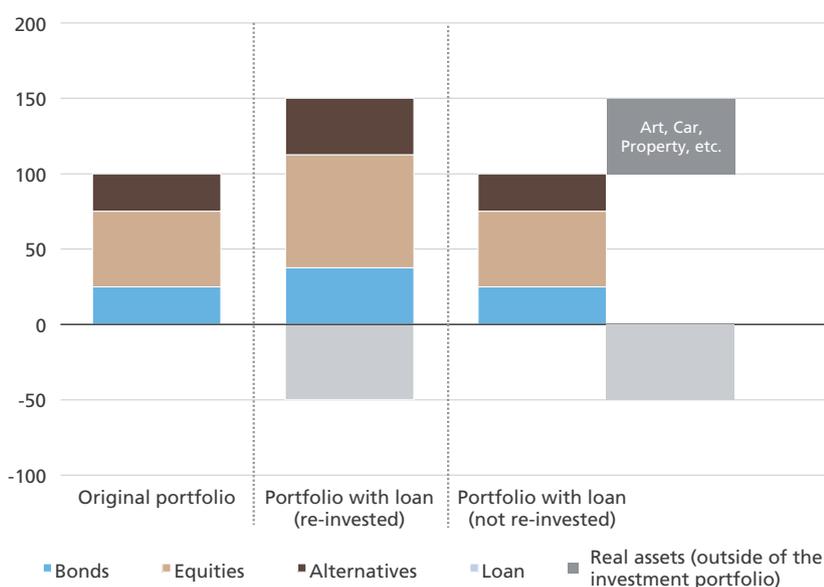
- 1) Is this the right portfolio to achieve my return objectives, while respecting my risk constraints?
- 2) Can or should I leverage this portfolio, i.e. use it as a source of liquidity, diversification or return enhancement, in order to optimize my Total Wealth?

These two questions cannot be answered in full unless we take a holistic view of both assets and liabilities. In this publication we will address the impact of leverage, specifically Lombard loans, on the risk/return characteristics of a portfolio, and give examples of how Lombard lending can be used in the context of investing. There are other types of leverage one can and should consider as well, such as a loan against real estate.

Lombard loan – What is it?

A Lombard loan, as referred to in this publication, is a loan secured by a portfolio of financial assets. Investors can take out such a loan – using their portfolio as collateral – to obtain relatively cheap financing. The loan can be used to fund further acquisitions of securities in a portfolio (see Fig. 1) or alternatively the purchase of real assets, goods or services.

Figure 1: Illustration of a leveraged investment portfolio



Source: UBS CIO GAA

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Given that the collateral for Lombard loans consists of securities (which are generally readily marketable assets), the financing institution can offer more attractive interest rates compared to most other forms of credit. The largest possible size of the loan depends on the value of the assets that are being used as collateral. The “safer” these assets, the higher their lending value. Assets with low volatility and/or high liquidity are considered safer than more volatile and illiquid asset classes. Hence, a diversified portfolio of stocks has a higher lending value compared to a single stock, while an investment grade bond portfolio has typically a higher lending value than an equity portfolio. The tenor of the loan can vary from just a few weeks to several years, whereas the interest rate depends on the prevailing market interest rate for the respective tenor and the additional margin charged by the financing institution.

As long as the return of the investment portfolio is above the cost of the loan, the leverage strategy will increase the investor’s total return. Put differently, a Lombard loan can be used to adjust a portfolio’s risk/return profile without having to sell existing assets or add more capital.

When do clients consider taking a loan?

There are three general purposes for taking a Lombard loan:

1. Return enhancement: clients take a loan against an existing portfolio and re-invest the proceeds to increase the portfolio's expected returns (and risk).
2. Diversification: clients take a loan against a concentrated portfolio (e.g. small number of securities) and use the proceeds to invest in a diversified portfolio, thereby increasing the overall diversification of the investment portfolio.
3. Liquidity: clients take a loan against a portfolio of securities and use the proceeds externally.

Additionally, real estate holdings can be used as a source of funding, and clients can choose to take a loan secured by property instead of secured by a portfolio of securities.

How does Lombard lending affect your investments?

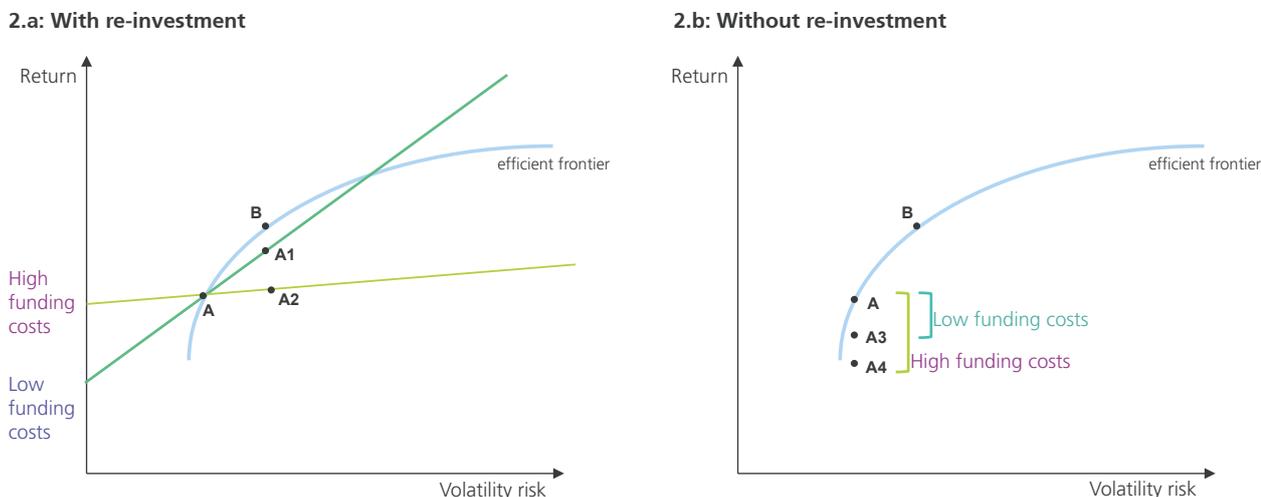
A Lombard loan allows an investor to get access to relatively cheap and flexible funding by pledging his existing portfolio as collateral. It often proves beneficial to take out such a loan to fund the purchase of assets, goods or services outside the investment portfolio, rather than selling a portion thereof. It also allows investors to put additional money (above their initial capital) to work in financial markets. Such a leveraged investment strategy can enhance the return potential of the portfolio, in particular when funding costs are low.

The principle of a leveraged investment strategy is illustrated in Fig. 2. The investor is initially invested in portfolio A, which has a relatively low risk profile. By taking out a loan at a low interest rate and investing the proceeds into the same portfolio, the investor is able to shift his asset allocation to A1, which has a significantly higher expected return, while also increasing the expected risk (note that in this illustrative example, the investor would be better off moving along the efficient frontier to portfolio B, increasing risk and return by allocating more to equities, for example). Fig. 2a also highlights that Lombard lending is particularly attractive when funding costs are low (i.e. A1 instead of A2). If the loan is not re-invested into the portfolio, the expected return is simply reduced proportionally to the costs of the loan (A3 or A4 respectively) as illustrated in Fig. 2b. In this case we treat the loan simply as a cost to the portfolio.

An additional benefit in certain jurisdictions is the tax deductibility of interest payments on the loan. This highly depends on the investor's individual situation and will not be taken into account in this report. The ability to deduct the tax on interest payments lowers the "effective" funding cost for the loan.

However, a leveraged strategy is no free lunch. As can also be seen in Fig. 2, leverage does not only increase the expected return, but also the expected risk of the portfolio.

Figure 2: How leverage changes a portfolio's risk-return characteristics



Source: UBS CIO GAA

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What are the risks?

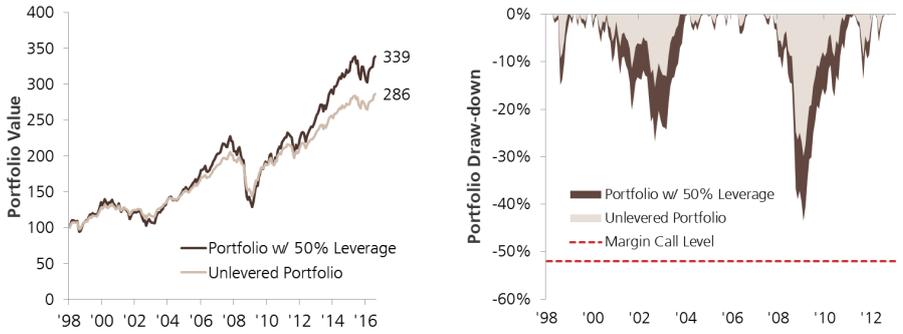
For a leveraged investment strategy to perform, total returns of the underlying portfolio have to exceed the total loan costs. Hence, poor portfolio returns and high or rising interest rates pose fundamental risks to the use of leverage in investing. In addition, if at any time the market value of the collateral falls below a certain pre-defined threshold, the financial institution will require the investor to bring additional capital (margin call). If the investor fails to comply with the margin call, then the institution is entitled to sell his collateral to the extent required in order to reduce the risk of loan non-repayment (credit risk). Thus, in extreme cases, a leveraged investment strategy can cause the investor a large financial loss. In fig.3 we show examples of historical drawdowns of the SAA Balanced portfolio and S.A.P. Medium, with and without leverage, in relation to the respective margin call level – we assume that the portfolio would enter a draw-down phase with the full leveraged amount. The right level of leverage depends on your individual circumstances. What the figures clearly illustrate is that:

- The quantitative risk management features of the S.A.P. helped limit the historical drawdowns.
- Investors should be careful when increasing the leverage ratio to high levels. For example for 100% leverage ratio in the case of the SAA Balanced, an investor would have hit the margin call levels (fig.3c).

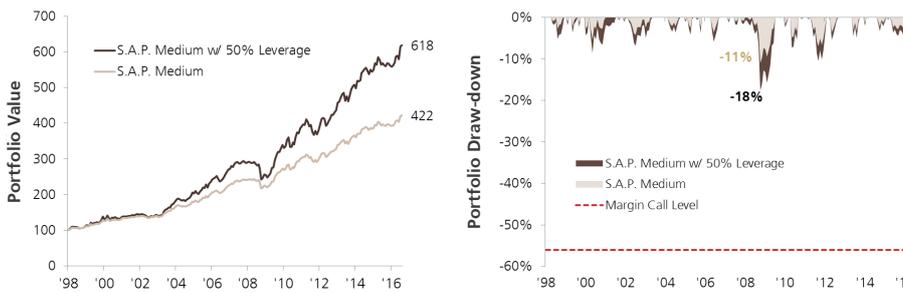
We define portfolio leverage as the ratio between the loan and client investment amount. In other words, if a client allocates to a portfolio of e.g. USD 1m, funded by a client investment of USD 600,000 and a loan of USD 400,000, then the portfolio leverage is $400/600 = 66\%$. An alternative way to describe lending in a portfolio context is the loan to assets ratio. In the example above the loan to asset ratio is $400/1000$ i.e. 40%. In our analysis we will use portfolio leverage.

Figure 3: Leverage enhances returns but can expose the portfolio to margin calls during adverse financial market periods

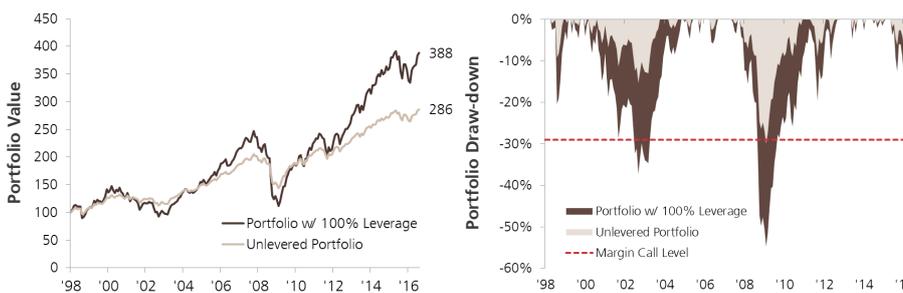
3.a: SAA Balanced (50% Leverage)



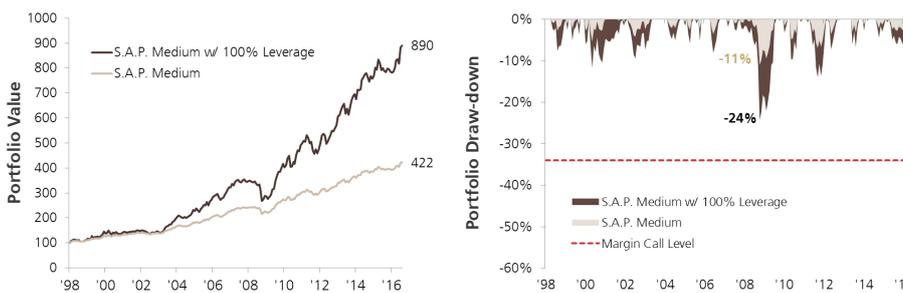
3.b: S.A.P. Medium (50% Leverage)



3.c: SAA Balanced (100% Leverage)



3.d: S.A.P. Medium (100% Leverage)



Source: UBS CIO GAA

For illustrative purposes only.

However, there are a few simple steps an investor can take to mitigate such risks:

1. Using a well-diversified portfolio as collateral and investing the loan proceeds into a well-diversified solution reduces financial market risk.
2. Using a “risk-controlled” investment solution (e.g. management of draw-downs) can further reduce portfolio volatility and the risk of financial losses. An example of such a solution is the S.A.P.².
3. Clients should typically not make use of maximum lending value available unless they are willing and able to transfer additional liquid assets to cover potential margin calls.
4. Choosing a loan tenor that is in line with the investor’s interest rate expectations and risk profile helps to keep funding cost risks under control (more details on this point will follow below).
5. Borrowing against a portfolio of assets with little or positive correlation to interest rate increases. For example, adding floating-rate asset classes (such as senior loans) to the portfolio can further mitigate the funding cost risk, as rising interest rates would increase both funding costs and expected investment returns at the same time.

² Mads N. S. Pedersen, Carolina Moura-Alves, Oliver Malitius, Hannes Huett, *Systematic Asset Allocation (S.A.P.)*, UBS CIO WM Global Investment Office

Analysis

We performed analysis of different leverage ratios on our portfolios (all six risk levels of traditional SAA, the Global Credit Opportunities (GCO) and the Systematic Allocation Portfolio (S.A.P.)). For this analysis, the forward-looking cost of borrowing is assumed to be 3.05% (a combination of 3m USD LIBOR, as per our 5yr forward-looking estimation, and the loan margin). Fig. 4 illustrates how leverage affects the risk and return expectations of our portfolios. Using leverage only makes sense when the additional return derived from higher leverage is at least equal to the associated financing costs. In this case, it can be noticed that the expected returns of the SAA Fixed Income are reduced because borrowing costs exceed expected returns. Also, as leverage (% loan amount) increases, the expected risk-adjusted return as measured by the Sharpe ratio declines.

Figure 4: USD SAAs forward-looking estimations of risk and return

	SAA Fixed Income	SAA Income	SAA Yield	SAA Balanced	SAA Growth	SAA Equity	GCO	S.A.P. Defensive
Unlevered								
Volatility	3.4%	4.1%	6.0%	8.1%	10.7%	13.5%	5.8%	5.1%
Return	2.6%	3.7%	4.7%	5.7%	6.7%	7.6%	4.7%	4.2%
Sharpe Ratio	0.15	0.39	0.44	0.45	0.43	0.41	0.44	0.42
Max Draw-down	7.7%	12.1%	20.5%	30.0%	39.1%	47.2%	21.7%	9.2%
10% Leverage								
Volatility	3.8%	4.5%	6.6%	8.9%	11.7%	14.8%	6.4%	5.6%
Return	2.5%	3.7%	4.8%	5.9%	7.0%	8.1%	4.8%	4.3%
Sharpe Ratio	0.12	0.36	0.43	0.44	0.42	0.41	0.43	0.40
Max Draw-down	8.7%	13.5%	22.9%	33.1%	42.8%	51.2%	24.3%	10.4%
Loss Triggering a Margin Call	89.3%	88.3%	87.5%	87.0%	86.6%	87.0%	86.0%	88.6%
20% Leverage								
Volatility	4.1%	5.0%	7.1%	9.7%	12.8%	16.2%	7.0%	6.1%
Return	2.5%	3.8%	5.0%	6.2%	7.4%	8.6%	5.0%	4.4%
Sharpe Ratio	0.10	0.35	0.41	0.43	0.42	0.40	0.42	0.38
Max Draw-down	9.7%	14.9%	25.3%	36.1%	46.3%	55.0%	26.8%	11.6%
Loss Triggering a Margin Call	80.4%	78.6%	77.2%	76.2%	75.5%	76.2%	74.4%	79.2%
50% Leverage								
Volatility	5.1%	6.2%	8.9%	12.1%	16.0%	20.2%	8.8%	7.7%
Return	2.3%	3.9%	5.5%	7.0%	8.5%	9.9%	5.5%	4.7%
Sharpe Ratio	0.05	0.31	0.38	0.41	0.40	0.39	0.39	0.35
Max Draw-down	12.7%	19.1%	32.1%	44.6%	56.0%	65.4%	38.1%	15.1%
Loss Triggering a Margin Call	60.8%	57.3%	54.3%	52.4%	51.0%	52.4%	48.7%	58.3%
Borrowing Cost	3.1%							
Illustrative Lending Value	85%	78%	73%	70%	68%	70%	65%	80%

The expected return, volatility, and Sharpe ratio for the S.A.P. Defensive are derived from the static Medium allocation of the S.A.P. The maximum draw-downs are obtained using historical data, and simulating the S.A.P. performance over the period from Jan. 1998 – Sep. 2016.

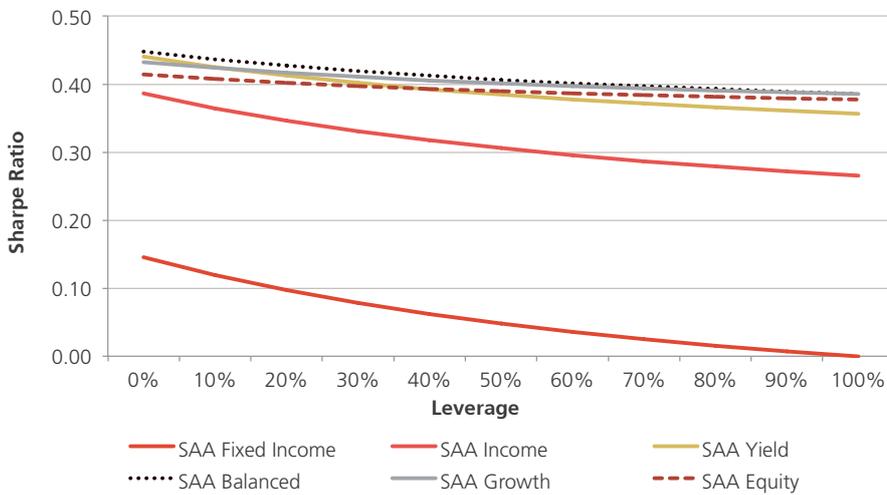
Source: UBS CIO GAA

For illustrative purposes only.

If an investor could borrow at the risk-free rate, then the Sharpe ratio would remain unchanged regardless of the leverage amount. However, because the investor needs to pay a borrowing spread above the risk-free rate, the Sharpe ratio will decrease as leverage (% loan amount) on the portfolio increases.

In Fig. 5, we illustrate the impact of leverage on the Sharpe ratio using our 5yr forward-looking estimates of risk and return. The rate of decrease in the Sharpe ratio resulting from higher leverage is dependent on the excess return (above loan funding costs) of the unlevered portfolio. In other words, the decrease in efficiency of a portfolio (as measured by the Sharpe ratio) will be relatively smaller for an equity portfolio with a high excess return compared to a fixed income portfolio with a low excess return. It should be noted that as we move along the efficient frontier (without leverage), towards portfolios with a higher risk profile, we would in any case observe a decline in Sharpe Ratio.

Figure 5: Impact of leverage on Sharpe ratio – assuming 3.1% borrowing costs

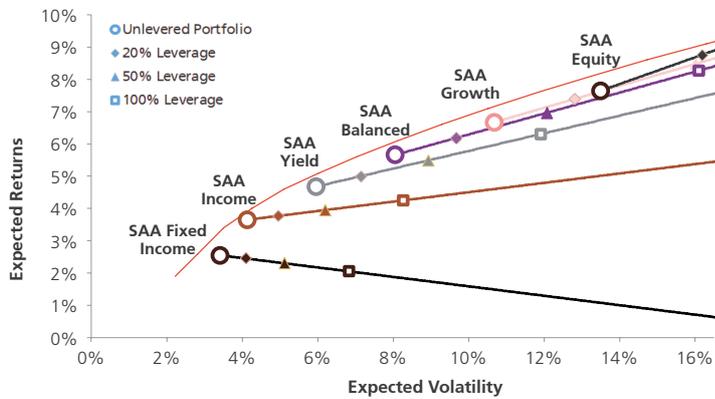


Source: UBS CIO GAA

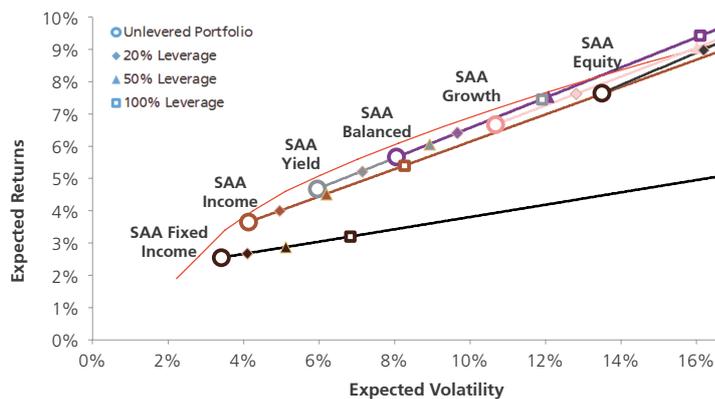
For illustrative purposes only.

Figure 6: Impact of leverage on the efficient frontier

6.a: Assuming borrowing costs are 3.1%



6.b: Assuming borrowing costs current 3m LIBOR plus margin



Source: UBS CIO GAA

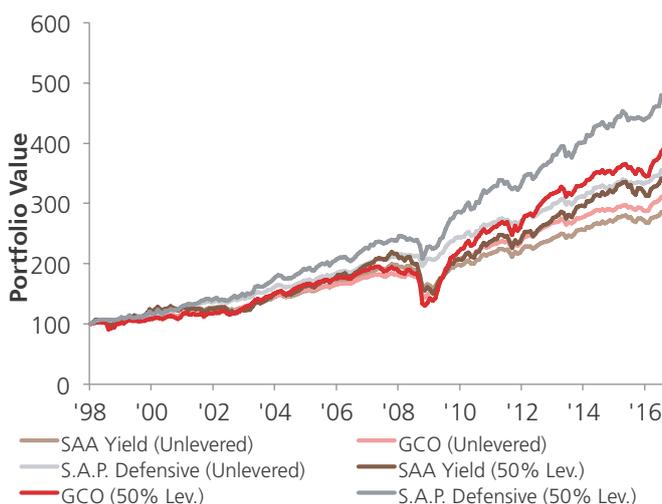
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Fig. 6 illustrates the range of forward-looking expected returns and volatilities that can be obtained by leveraging the SAAs. The lines drawn for each of the portfolios show which risk/return combinations could result from the use of leverage. Again, one can observe how the total return of the fixed income SAA is actually lower than the corresponding borrowing cost assuming our expected 3m LIBOR rate. Hence, leveraging such a portfolio will result in lower expected returns. For all other portfolios, leverage increases the returns. However, above a certain level of leverage, the investor would be better off with the following SAA along the risk spectrum. Our analysis shows that, for SAA Income and above, a 20%–25% leverage ratio represents a good trade-off between increasing expected returns and preserving the original portfolio’s risk profile.

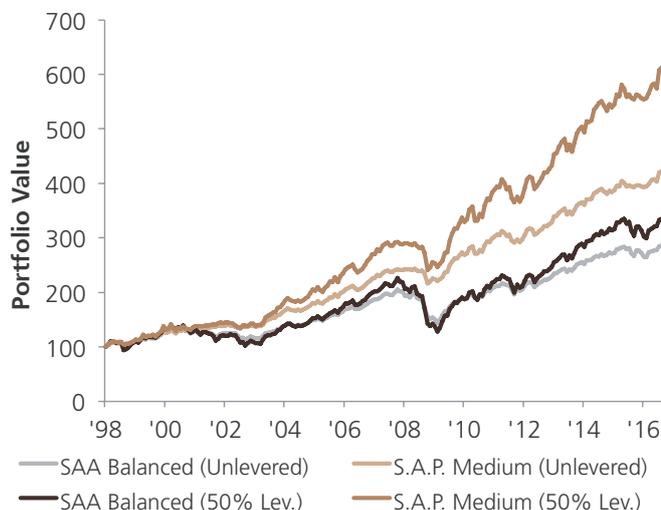
We also analyzed the historical performance of SAA Yield and Balanced, GCO and S.A.P. Defensive and Medium without and with 50% leverage:

Figure 7: Historical performance of CIO SAAs

7.a: SAA Yield, GCO and S.A.P. Defensive with and without leverage



7.b: SAA Balanced and S.A.P. Medium with and without leverage

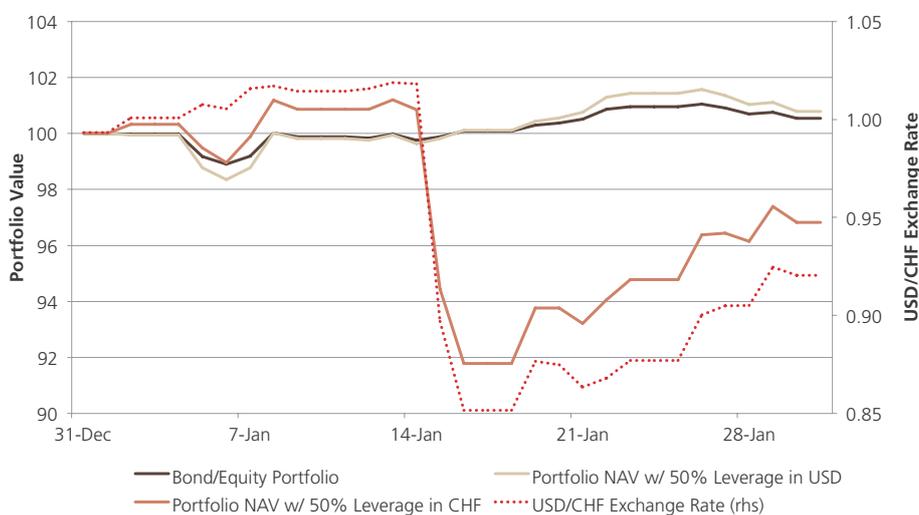


Source: UBS CIO GAA

For illustrative purposes only.

In some cases, it could prove advantageous if the investor borrowed in a currency offering the benefit of lower borrowing costs. However, the investor would be assuming additional currency risk due to the mismatch between the portfolio's and the loan's respective currency. For example, Fig. 8 illustrates the impact of currency fluctuations on portfolio leverage. The chart shows the performance during the month of January 2015 of a portfolio invested 50% in MSCI World and 50% in the Citigroup US 5–7yr AA+ bond index. One portfolio is levered 50% by borrowing in USD, while another is levered by borrowing in CHF. We see that the portfolio borrowing in CHF had a very large draw-down over a short period after the SNB's decision to remove the cap on the CHF/EUR.

Figure 8: Changes to portfolio value due to currency fluctuations



Source: UBS CIO GAA

For illustrative purposes only.

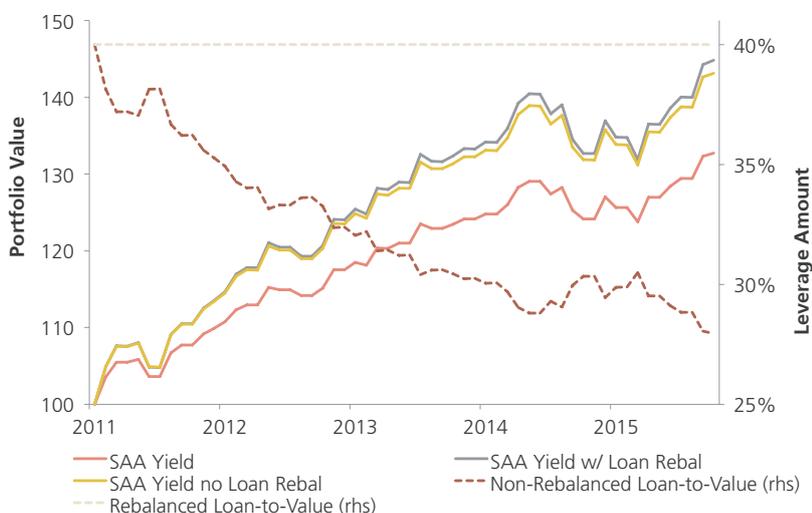
Rebalancing

It is also important, in the context of leveraging portfolios, to consider whether the leverage ratio changes or remains constant over time. There is a clear need for regular rebalancing of the Lombard loan to ensure that as portfolio value changes, the leverage ratio remains unchanged. If the portfolio value increases without rebalancing, then the leverage ratio will decrease (and vice versa), which can have unintended consequences on the risk-return profile of the investment strategy.

Fig. 9 illustrates the importance of regularly rebalancing the Lombard loan as the portfolio value increases. The example looks at using 40% leverage in an SAA Balanced portfolio for the period starting December 2011 and ending August 2016. In the first portfolio, the investor rebalances the Lombard loan on a monthly basis to maintain a constant 40% leverage. It should be noted that if the portfolio decreases in value, rebalancing to a constant leverage could result in missing an opportunity of recovery due to insufficient leverage. Therefore, unless there is margin call, a client would be advised not to rebalance. In the second portfolio, the investor initially takes out a loan equivalent to 40% of

portfolio value, but maintains an equal loan amount throughout the period. The dotted line in Fig. 9 shows that the leverage for this investor decreases to about 25% by the end of the period. While both portfolios substantially outperformed the unlevered portfolio, the portfolio that maintained a 40% leverage ratio outperformed the portfolio with a constant loan amount by about 1.5% during the period. Furthermore, rebalancing the Lombard loan with different frequencies (e.g. 1m, 3m or 12m) would have led to different deviations from the 40% target leverage ratio (Fig. 9).

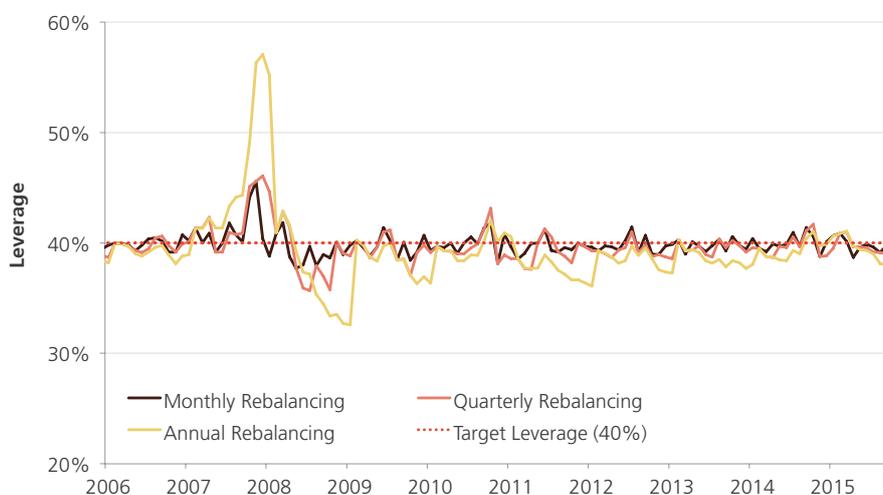
Figure 9: Rebalancing the Lombard loan during the lifetime of the portfolio



Source: UBS CIO GAA

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Figure 10: Loan-to-book value for different tenors (SAA Yield)

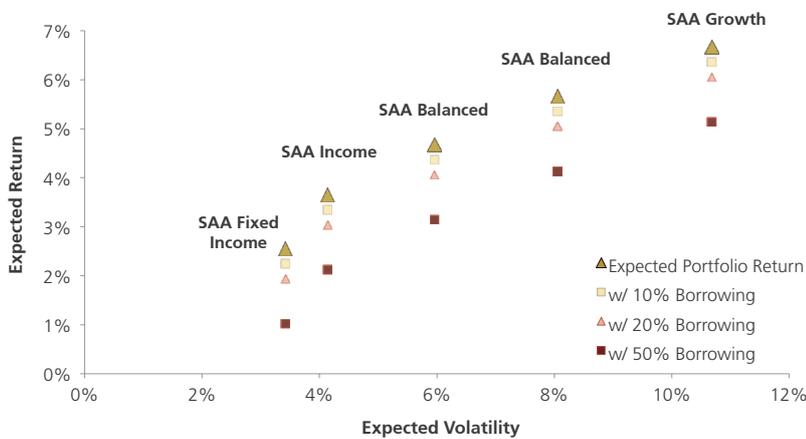


Source: UBS CIO GAA

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Taking a Lombard loan against a portfolio, rather than liquidating part thereof and using the proceeds externally (e.g., buying a real asset, bridging a temporary liquidity need, etc.), can be very efficient from a Total Wealth perspective, since the interest rate on the loan will typically be competitive vs. alternative sources of capital. Nevertheless, it is important to understand the impact of a loan on the portfolio's risk/return characteristics. As illustrated in Fig.11, the expected return decreases proportionally to the expected loan costs and, with volatility unchanged, the risk of a loss increases by virtue of the risk of receiving a margin call triggered against the assets (i.e. liquidation of the portfolio when it is most disadvantageous). In this case we treat the loan simply as a cost to the portfolio.

Figure 11: Effect of borrowing without reinvesting



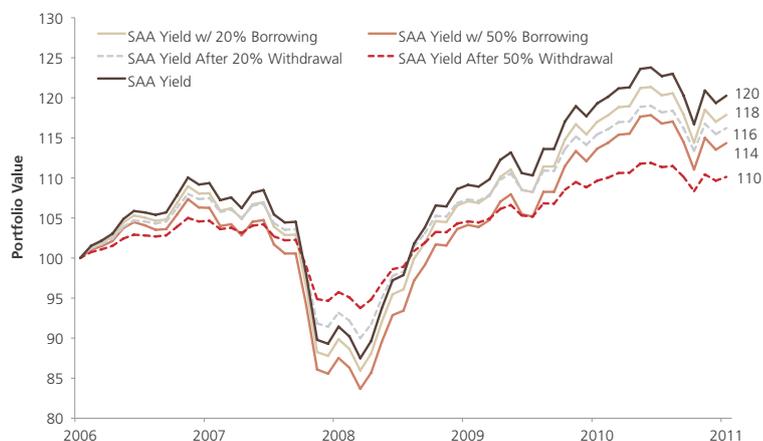
The above figure shows how the risk/return profiles of some of the SAA portfolios would be changed if a client were to borrow against the portfolio, but does not invest the proceeds into the portfolio.

Source: UBS CIO GAA

For illustrative purposes only.

However, we should not forget that in this situation the client is in fact faced with two possible alternatives: either taking a Lombard loan or liquidating a portion of the portfolio and foregoing potential investment returns on the liquidated amount. Fig.12 shows the impact from a holistic perspective of foregoing returns vs. paying the loan costs, by looking at the historical performance of the SAA Yield. In this analysis we assume that the amount liquidated has a zero return and we show the total asset value of both the levered portfolio and the unlevered portfolio plus cash holding.

Figure 12: Historical analysis of the effect of borrowing without reinvesting

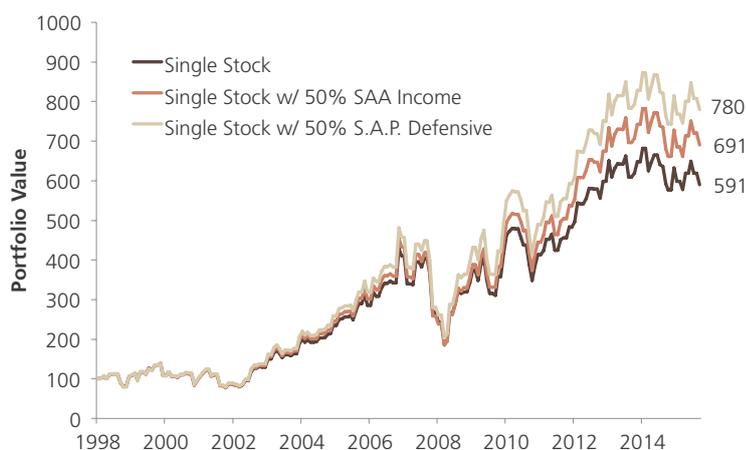


Source: UBS CIO GAA

For illustrative purposes only.

Taking a Lombard loan against a concentrated portfolio and using the proceeds to invest in a portfolio which is diversified improves the risk/return characteristics of the overall portfolio (Fig. 13). This approach makes particular sense when the client cannot or does not wish to sell the concentrated portfolio holdings. Below we illustrate this historical performance with a single USD stock (chosen to be representative of the US single stock universe) on a standalone basis, and when combined with a diversified portfolio funded out of a Lombard loan against the stock. The benefits of diversification are very clear both at the return and risk level.

Figure 13: Borrowing to Diversify a Single Stock Position



	Single Stock	Single Stock w/ 50% SAA Income	Single Stock w/ 50% S.A.P. Defensive
Ann. Return	10.5%	11.5%	12.3%
Volatility	28.3%	29.3%	29.3%
Sharpe Ratio	0.29	0.32	0.34
Max. Draw-down	-56%	-59%	-58%
Correlation to Single Stock	100%	44%	37%

Source: UBS CIO GAA

For illustrative purposes only.

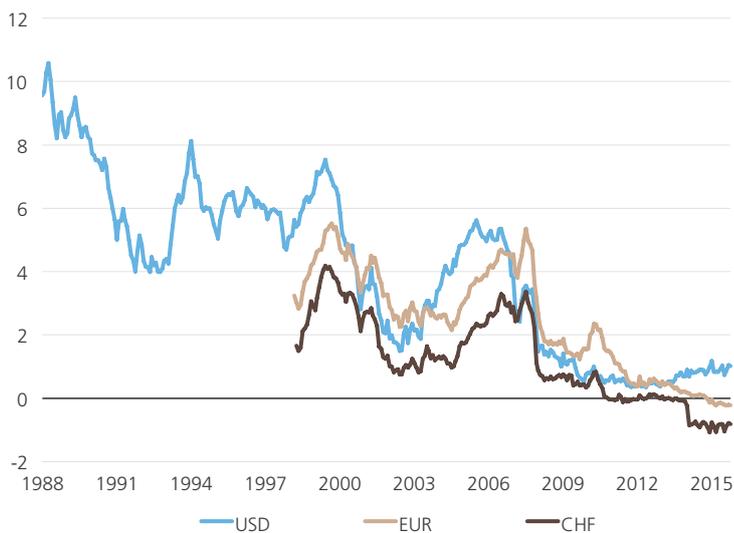
Lombard loans in the current market environment

Loan funding costs are an important determinant of the success of leveraged investing. Obviously, the lower the funding costs, the more attractive it is to apply leverage. Funding costs are determined by two major components: market interest rates and the additional margin charged by the financing institution.

Is the current interest rate environment attractive?

To estimate current market interest rates, we use short-term swap rates. Fig. 14 illustrates the development of two-year swap rates over time. Compared to the past, current market rates are undoubtedly low in all aforementioned currencies, and we can conclude that the current environment provides an attractive opportunity for clients to take out loans.

Fig. 14: Interest rates are historically low (2-year swap rates in %)

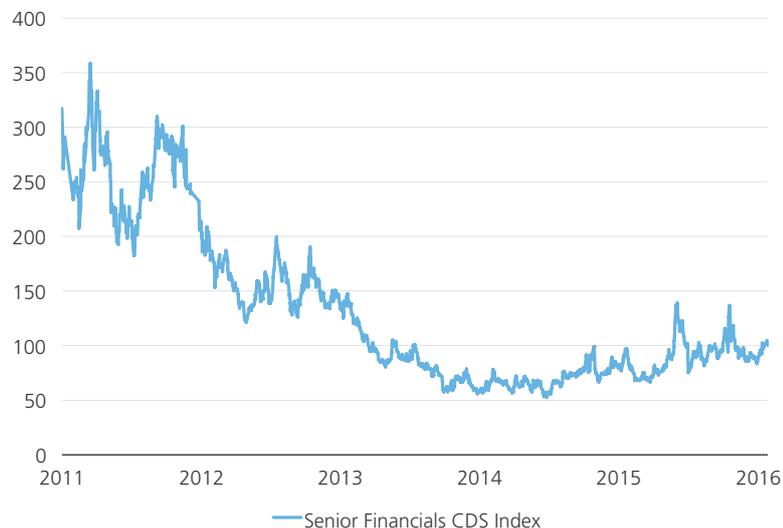


Source: UBS CIO GAA

For illustrative purposes only.

The additional interest margin charged by the financing institution depends on a multitude of factors including i) regulatory capital requirements, ii) business strategy, iii) tenor of the loan and iv) funding situation of the lending institution. To get a rough estimate of how the margin changes over time, we look at senior financials' credit default swaps (CDS) as an indication of financial companies' own funding costs. Fig. 15 makes evident that currently the CDS level is low compared to recent history, speaking for a relatively attractive funding environment with low funding costs. However, financial stress, as was experienced in 2011 and 2012, could lead to a sharp deterioration in funding conditions and consequentially higher lending margins for investors.

Figure 15: Low funding costs mean low margins



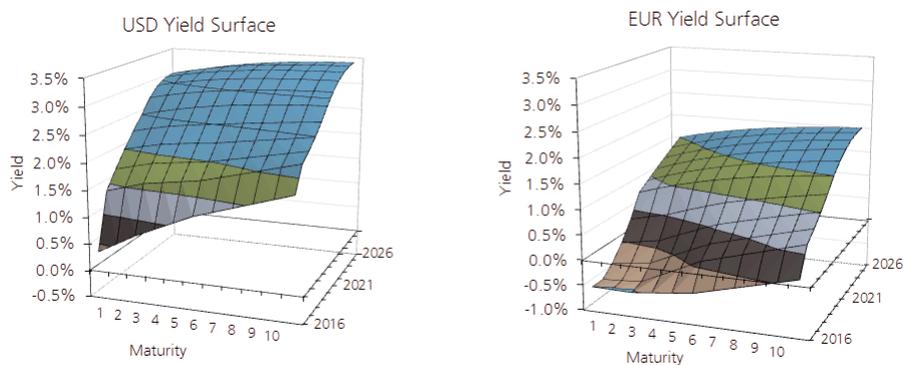
Source: UBS CIO GAA

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What is the outlook?

Current funding costs are low and thus conducive to leveraged investment strategies. But what do we expect for the coming years? Based on our capital market assumptions, we project interest rate curves for the next 10 years. Fig. 16 illustrates an excerpt of these yield surfaces. While we do foresee a gradual increase in interest rates across all three currencies, such a move will likely be moderate over the coming years. Central banks will retreat only cautiously from their ultra-loose monetary policy stance employed over the past years, led by the US Federal Reserve. This will likely compel interest rates in USD, EUR and CHF to remain low compared to their historic levels, and hence to keep funding costs attractive for investors for some time to come.

Figure 16: Long-term yield forecasts for USD and EUR



Source: UBS CIO GAA

For illustrative purposes only.

What is the right tenor?

Deciding for a loan tenor involves a trade-off between security and (potential) financial gains. By choosing a relatively long tenor of multiple years, investors accept paying higher interest rates compared to what they would pay for shorter tenors. At the same time, interest costs are locked in for the full tenor of the loan, thus providing stable foresight on funding costs until maturity. Loans with shorter tenors (which can be rolled over at maturity) increase the risk associated with a rise in interest rates, but they reward the investor with lower interest costs at the beginning of the period.

Currently, interest rate curves are relatively flat, limiting the benefit of short-term loans and favoring medium to long tenors. Ultimately, the decision depends on an investor's individual situation and preferences. It may also be worth considering a mix of different tenors.

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