Exploring a Long-Short Approach

Executive Summary

This study investigates the performance of Xantos Labs' investment framework when the dynamic allocator ('Titi') can short stocks. In the benchmark configuration, Titi is constrained from choosing negative allocations. In the alternative configurations, Titi can choose negative allocations i.e., short stocks.

Key takeaways

- Enabling short sales in this investment framework underperforms the benchmark configuration in a risk-unadjusted sense.
- Titi's performance with the alternative configuration will need to be optimized by hyper-tuning several parameters.
- Additional considerations need to be made for the investable universe especially given the structural and secular tailwinds for the timeframe explored. Shorting universe of *winners* is a poor exercise as most have better than average growth prospects.
- Implementing trailing stops or developing an event-driven framework might yield better performance.

Introduction

Traditional portfolio theory involves minimizing the risk of a portfolio for a given expected portfolio return. Xantos Labs developed a proprietary allocator, Titi, which so far has excelled in achieving the right balance of risk and return. Nevertheless, there remains room for improvement.

Fundamentally, what sets Titi apart is the way in which it defines risk and returns. A key component of the optimization problem in the benchmark configuration is the presence of a short-selling constraint. Although this constraint is motivated primarily by strategic and technological constraints, disabling short-selling pushes Titi off the "efficient-frontier". In other words, there are more ideal risk/return tradeoffs which are out of reach because of the short-selling constraints. This report provides some illustrative scenarios that compare Titi's performance when short sales are enabled versus its performance in the benchmark configuration.

Primary results show that enabling short sales in the Xantos Labs investment framework underperforms the benchmark configuration in a risk-unadjusted sense. Specifically, the compound annual growth rate (CAGR) over the past twenty years for the current investable universe is higher in the *constrained* setting versus the *unconstrained* setting. These results remain for an alternative portfolio chosen to include companies that could be `Xantos-quality' in the sense that they are typically high growth, wide moat stocks.

The results should be interpreted with caution due to the limitations of the analysis. First, the portfolios chosen are not randomized and thus are subject to selection bias. A deeper dive would involve repeating the analysis for randomized portfolios over various periods, but this is not feasible due to resource constraints.

Second, the parameters that govern Titi's performance in the benchmark configuration have been hyptertuned through extensive backtesting. Given the practical issues involved in operationalizing the dynamic allocator with short sales enabled, these parameters would need to be hypertuned to give the short sale framework a fighting chance. Experiments conducted in such an environment might be more informative because the parameters are tuned in an unconstrained setting.

Third, trailing orders that limit losses due to price movements might be useful in managing risk in the

Xantos Labs trading environment. This is particularly the case when short sales are involved.

The report here presents only risk-unadjusted comparisons. The next stage of the analysis will involve adjusting the computation of risk metrics to account for leverage and the cost of financing short sales. However, these are second order concerns for now because the short sale configuration, which is inherently risky, underperforms even in a risk unadjusted sense.

Portfolio Construction

The investment universe involves only publicly traded US equities. Two portfolios are considered: 1) A standard portfolio with fifteen assets which make up the current approved investment universe for Xantos Labs[1]; 2) An alternate portfolio with sixteen assets which represent high-growth, wide-moat stocks that, along these margins, have fundamentals that might be attractive to Xantos Labs.[2] The allocations for each position are computed every 30-days at which time the portfolios are rebalanced. No cash flows are assumed in and out of the portfolio, and fractional share ownership is not allowed. Titi, the dynamic allocator, solves an optimization problem in which it asymmetrical weighs downside risk for a pre-specified portfolio return which depends on macroeconomic conditions.[3]

Optimization Constraints

The baseline configuration on which Titi currently runs includes two principal constraints: the allocations must sum to 1, and the allocations must be non-negative. The latter constraint amounts to a no short-sale constraint and as discussed earlier, pushed the resulting allocations off the efficient frontier in the Markowitz sense. For the various scenarios and portfolios explored below, the 'baseline' refers to this no short-sale optimization problem.

The main goal of this analysis is to explore the performance of the framework when the no short-sale constraint is removed. This means that Titi, based on its objective function, sometimes calls for negative positions in certain assets. A closed loop short-sell transaction involves the following steps: 1) borrow stock from broker, 2) sell stock on market, 3) proceeds from sell transaction added to account, 4) buy stock from market, 5) proceeds from buy transaction removed from account, and 6) stock returned to broker. Implementing this in the Xantos Labs environment involves several steps:

1) When a short-sell transaction is opened, a) the cash value increases because proceeds from the transaction are added to the account, b) the market value reflects the negative current value of the stock on the market, and c) the portfolio value equals the sum of the cash and market values. The higher the market value of the negative position, the lower the overall portfolio value.

2) When a short-sale transaction is closed, a) the cash value decreases as the proceeds from the transaction are removed from the account; b) the portfolio value increases or decreases by the net proceeds from closing the short-sale transaction.

3) When Titi switches from short to long on a stock, short positions are closed out first *before* taking the long position.

4) When Titi switches from long to short on a stock, long positions are closed out first *before* taking the short position.

5) When Titi shorts a dividend paying stock, the dividends paid by the stock are removed from the account and paid back to broker at the dividend payable date.

Importantly, proceeds from short-sell transactions in the account are not made available to buy other assets. Thus, the initial margin requirement is ignored. This decision is made to simplify the analysis, as margin trading incurs daily interest and includes the possibility of margin calls. An additional consideration is that the threshold at which trading control implemented to prevent

[1] These include: Amazon (AMZN), Booking (BKNG), Church & Dwight (CHD), Waters Corporation (WAT) and much more.
[2] The alternate portfolio includes ServiceNow (NOW), Facebook (FB), NVIDIA (NVDA), Tesla (TSLA) and much more.
[3] There are several other features of the dynamic trading style and environment which are proprietary and cannot be disclosed.

allocation drift is narrowed to 1%. This leads to an increase in the number of transactions relative to Xantos Labs' operational settings.

Results

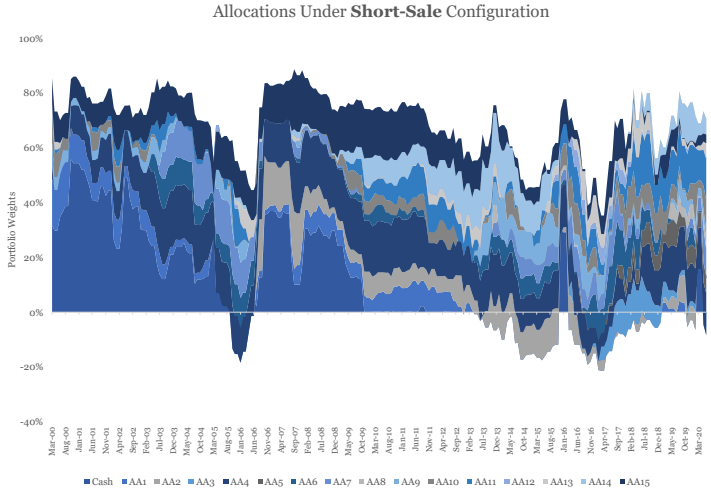
The results show the baseline configuration outperforming the short-sale enabled allocations in a risk-unadjusted sense. This obtains across the different experiments.

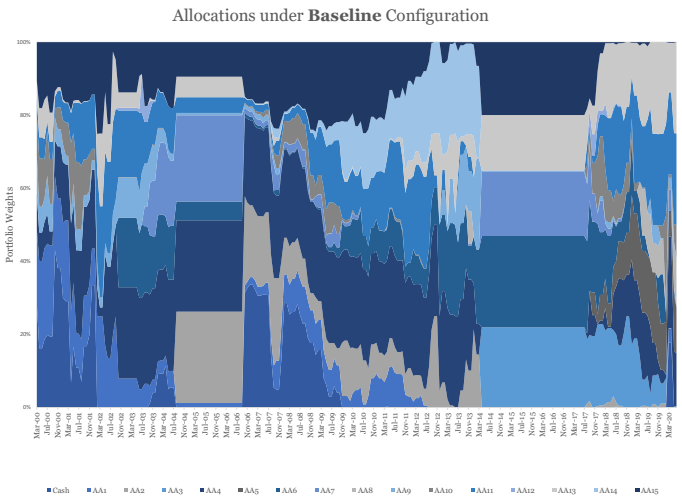
In the first exercise, the standard portfolio is constructed with and without the short sale constraints. For the short sale constraint, various lower limits are considered to allow for different levels of 'leverage'. With the standard portfolio, the baseline crushes the short sale limits as shown in Table 1 below.

TABLE 1: STANDARD PORTFOLIO

	Baseline	***Short Sale***				
Short Limit		20%	40%	60%	80%	100%
Value	**$ 573,101.56**	$ 229,541.83	$ 228,586.54	$ 229,505.49	$ 212,238.14	$ 228,968.43
CAGR	**22%**	17%	17%	17%	16%	17%
TWRR	**5631%**	2195%	2186%	2195%	2022%	2190%
Cash Balance	**$ 117.00**	$ 53,605.48	$ 55,407.81	$ 54,682.58	$ 58,179.18	$ 52,890.83

The short-sale configurations all perform worse than the baseline but lead to similar outcomes. This suggests implicitly that the short limits do not bind: Titi would not allocate large negative positions even if there were no lower bounds on negative positions. Given this finding, the rest of the analysis focuses on only the baseline and the short-sale configuration with a 100% negative lower bound (henceforth, 'short-sale enabled'). The figures below display allocations under the baseline and the short-sale enabled configurations.





The largest negative allocation (-31 percent) was given to WAT. As discussed earlier, the cash that is received from the initiation of a short-sale transaction is not available for buys. Therefore, allocations sum up to less than 100 percent. Table 3 gives a detailed breakdown of the performance of the constrained and the unconstrained configurations. As noted above, the baseline case outperforms the short sale configuration in terms of returns and (tax-adjusted) profits. The total number of trades under the short sale configuration (1387) is unsurprisingly higher than the baseline configuration (509): a short-sale transaction can involve several steps and more trades especially if a prior long position was held.

Turning to risk metrics, the short sale configuration results in less risk over the trading period. As displayed in Table 4, the short sale configuration has a lower beta and downside beta (0.51 and 0.55, respectively) than the baseline configuration (0.9 and 0.89, respectively). Also, the max drawdown under the short sale configuration is 27% compared with 35% under the baseline. And the

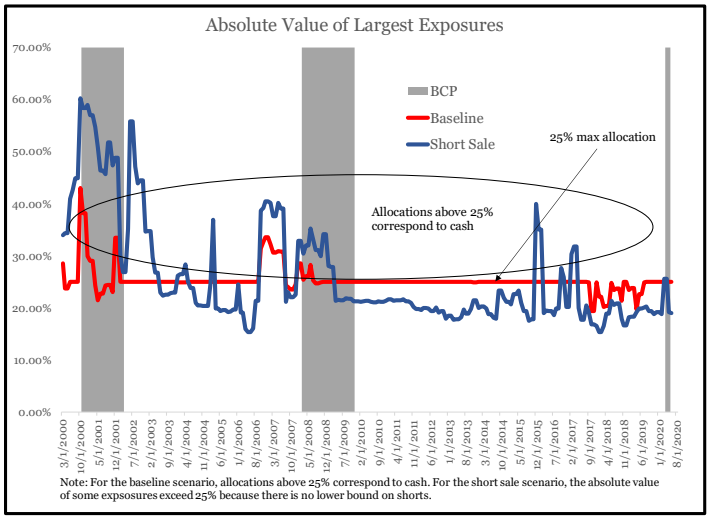
overall portfolio volatility of the short sale configuration (14%) is lower than the volatility in the baseline configuration (18.9%). One possible intuition for these results is that the baseline configuration is forced to take larger exposures (in an absolute sense) than the short-sale configuration in order to achieve the same target expected return because of the extra constraint. The figure below confirms that (absolute) exposures are smaller for the short sale configuration than in the baseline setup.

TABLE 3: STANDARD PORTFOLIO - DETAILED PERFORMANCE

	Baseline	*Short Sale*
P/L	$547,089.47	$218,958.78
P/L (%)	5470.94%	2189.68%
Real P/L	$449,565.90	$153,281.68
Real P/L (%)	4276.23%	1422.09%
Realized P/L	$410,708.98	$165,352.20
Unrealized P/L	$136,380.49	$53,606.58
Wash sales loss disallowed	($14,710.47)	($94,742.97)
Taxes Paid	$97,523.58	$65,677.10
Taxes (Short-term)	$97,523.58	$65,677.10
Taxes (Long-Term)	$0.00	$0.00
Mgmt Fees	$21,946.55	$11,082.34
Total trades	509	1387
Total Buy-side Trades	270	677
Total Sell-side Trades	239	710
Invested?	TRUE	TRUE
Holdings	15	15
Starting Market Value	$0.00	$0.00
Ending Market Value	$556,768.15	$176,077.59
Starting Value	$10,000.00	$10,000.00
Ending Value	$557,093.62	$228,968.43
Starting Cash Balance	$10,000.00	$10,000.00
Ending Cash Balance	$325.47	$52,890.83
Net Cash Flow	($9,674.53)	$42,890.83

TABLE 4: STANDARD PORTFOLIO - RISK METRICS

	Baseline	*Short Sale*
Risk free Return	1.09%	1.09%
Algo return	19.05%	14.38%
Index Return	4.11%	4.11%
Algo Volatility	18.87%	14.01%
Index Volatility	15.01%	15.01%
Beta	0.90	0.51
Alpha	0.16%	0.12%
Excess Return	3237.97%	1309.11%
Sharpe Ratio	0.97	0.96
Sortino Ratio	1.63	1.67
Max DD (Algo)	-35.38%	-27.28%
Max DD (Index)	-52.56%	-52.56%
Downside Beta	0.89	0.55
Risk Return Ratio	-95.12	-52.64
Tracking Error	4.01%	4.05%



We next consider the relative performance for an alternate growth portfolio as described above. As can be seen in the charts below. Again, the baseline configuration vastly outperforms the short-sale configuration, and both outperform the market. We explore the configuration performance under various alternative settings including, *inter alia*: (i) placing higher weights on more recent asset price returns

TABLE 2: ALTERNATE PORTFOLIO

		Baseline		*Short Sale*
Short Limit				100%
Value	$	10,835,842.29	$	4,423,238.89
CAGR		41%		35%
TWRR		108259%		44133%
Cash Balance	$	930,947.74	$	2,823,953.52

with the use of an exponential weighted moving average; (ii) a more aggressive target return; (iii) a less aggressive target return; (iv) and allowing cash from short sale proceeds to be used for buy transactions. The results remain unchanged, though the gap in performance varies across the illustrative scenarios.