

How much should I invest and when?

August 2020

Executive Summary

This study investigates the performance of an investor deploying capital in installments on a fixed schedule (aka dollar-cost averaging), lump-sum once per annum, and attempting to time the market lows.

Key takeaways

- Irrespective of the annual amount, setting a habit of investing say monthly, generally outperforms.
- Delaying capital deployment and therefore staying out of the market generally leads to subpar performance in the long run.
- More importantly, an investor attempting to time market declines underperforms in long run.

Introduction

One question most financial advisors get asked often by their clients is: I have earmarked X amount for cash for investment this year; when should I invest it? Should I wait for a market dip?

While investors can benefit from lower price per share by aligning capital deployment with days of market dips, such approach is naturally very difficult. In fact, market timing is generally accepted as a fool's errand even for most skilled investors.

Dollar-cost averaging (DCA) is another approach used by investors to deploy investment capital. For example, consider an investor looking to invest \$24,000 per year. Unlike lump-sum investing where the full amount is invested at the beginning or end of the year, an investor employing DCA spreads the investments into tranches, say \$2,000 monthly or \$6,000 quarterly.

In a bull market, the DCA investor pays a lower price on average than lump-sum investor that waited till end of the year for lows that never came (but is worse off than a lump-sum investor that invested at the beginning of the year). Conversely, if the market decreased over that time i.e. a bear market, the DCA investor is arguably better off than a lumpsum investor that invested at the start of the year. Either approach clearly has its benefits or drawback depending on market movement. In this study, we evaluate the annualized returns of such strategies.

Configuration

Naturally, we employ this backtest study using our proprietary portfolio optimization strategy on a pre-defined investment universe that matches our own (as of 08/2020). We run the simulation for a period of more than two decade from Jan 2000 through June 2020, capturing multiple market cycles.

The allocations for each position are computed every 30-days at which time the portfolios are rebalanced. Fractional share ownership is not allowed but re-investments of dividend income is. Our proprietary dynamic allocator solves an optimization problem in which it asymmetrical weighs downside risk for a pre-specified portfolio return which depends on macroeconomic conditions.¹ The simulation results are net of an assumed one-percent management fee and returns are computed using time-weighted rate of returns which adjusts (i.e. ignores) effects of the cash flows. The S&P 500 is chosen as the benchmark index.

We assume a long-only strategy with a starting capital of \$2,000. The additional capital earmarked annually for investments is varied from \$2,400 to \$24,000. For DCA configuration, the deposit cadence is either (a) bi-weekly on the 1st and 15th day of each month or nearest trading day, (b) monthly at first trading day or (c) quarterly at first trading day. For example, the \$2,400 earmarked translated to a total of 24 deposits in \$100 installments for bi-weekly, 12 deposits in \$200

¹ There are several other features of the dynamic trading style and environment which are proprietary and cannot be disclosed.

Past performance is not a guarantee of future performance. Investment in any of the strategies described herein carries substantial risk, including the possible loss of principal.

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Backtest version used in this simulation: GIT SHA 1be32130b5cce2d61025a9ad081af068b98575fe on master branch

installments for monthly and 4 deposits in \$600 in for quarterly. For lump-sum deposit, we assume a fixed annual cadence, once at the start of the year (or first trading day) for the full \$2,400 amount. To evaluate the effect of market timing, we introduce an option to make the annual deposit when the market decreases (as reflected by drawdown) or increases above a predefined threshold e.g. 10%.

Limitations

There are a few limitations to the analysis that are worth mentioning, as they affect the results herein.

First, the rebalance schedule is fixed to monthly. Therefore, although deposits are made per prescribed intervals, the capital may not be invested until a rebalance occurs. This delay can affect the average execution price of the assets and quantity of shares bought especially as fractional shares is not allowed.

Secondly, for the market timing configuration, the deposit date per annum are determined *a priori*. In the event the market as represented by benchmark index does not increase or decrease in desired direction, it sets the lump-sum deposit to the the

start of the year. Realistically, this look-ahead bias is not possible in real-world as such information would not have been known at the time.

Lastly, for simplicity, practical intraday price movements, execution efficiencies and liquidity effects are ignored. All orders in the simulation execute at end-of-day prices.

Results

The results highlight the benefit of dollar-cost averaging and creating a plan to invest when able as your financial situation allows. A monthly deposit schedule generally outperformed likely due to alignment with the rebalance frequency.

Additionally, the amount of capital earmarked for investment can lead to different investment outcome and results depends on your investment plan.

Delaying capital deployment and therefore staying out of the market generally leads to subpar performance in the long run. This is even more so for an investor attempting to time market declines.

Annualized returns over Jan 2000 - June 2020						
Total amount per annum / Deposit schedule		\$2,400	\$3,600	\$6,000	\$12,000	\$24,000
DCA	Bi-weekly	18.6%	19.4%	18.7%	18.6%	-
	Monthly	19.2%	19.3%	19.0%	18.9%	19.1%
	Quarterly	18.6%	18.1%	18.3%	18.4%	18.9%
Lump-sum	Annually	18.6%	17.9%	18.7%	18.9%	19.1%
	Annually or on over 10% decline in market	17.4%	17.6%	17.8%	17.5%	18.1%
S&P 500 Index Total returns		5.7%				