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# A tracking error approach to leveraged ETFs: Are they really that bad?

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## ABSTRACT

Exchange traded funds or ETFs are undoubtedly one of the most successful financial innovations of the past two decades. They were largely non-controversial until the advent of leveraged exchange traded funds or LETFs which were introduced in 2006. LETFs have been criticized by many in the popular press, but also in a number of scholarly journals, as routinely underperforming their stated return objectives. They have also become the subject of many lawsuits. Noticeably few scholarly papers have defended them. We take a tracking error approach, using both simulation analysis and past historical data, to examine how these funds would have behaved under various return/volatility scenarios. We conclude that LETFs of the  $2\times$ ,  $3\times$ ,  $-2\times$ , and  $-3\times$  varieties have been wrongly maligned and we believe they should be considered for inclusion in aggressive portfolios.

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## 1. Introduction

One of the most successful equity market innovations of the past two decades is exchange traded funds or ETFs. These products first appeared in 1993 in the form of Standard & Poor's Depository Receipts, commonly known as "spiders." While often cited as revolutionary, they were in fact the result of an evolutionary process.<sup>1</sup> Spiders replicate the behavior of the S&P 500 index in the form of a single security that trades like a stock. Since ETFs are often organized as unit trusts, we will refer to the shares of ETFs as "units."

By 2000, index-replicating ETFs, or simply index-ETFs, had become popular and various sponsors had introduced similar products on a variety of other stock market indexes including the Dow Jones Industrial

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<sup>1</sup> See Gastineau and Marshall (2011) for a discussion of the evolution of ETFs.

Average, the Russell 2000, and the Nasdaq 100. In time, similar products were introduced on sector-specific indexes that made it easier for investors to engage in sector asset allocation strategies. Eventually, similarly-structured products were introduced on underlyings other than stock indexes such as bonds and commodities.

The earliest of the ETFs were passively managed. That is, they simply replicated the holdings of a well-defined index and, therefore, little active management was required and management fees were very low. But, later, actively managed ETFs appeared with higher management fees. Actively managed ETFs are not intended to be index-replicating.

By year-end 2006, there were already 347 U.S.-listed ETFs holding \$410 billion in assets.<sup>2</sup> Until that year, ETFs were largely noncontroversial. They clearly provided an efficient and cost effective way to trade a market view or a sector view and could be used to hedge an existing equity portfolio against an anticipated market downturn without having to liquidate the portfolio. Further, index-ETFs could be used by investors to execute sophisticated investment strategies that had theretofore been largely limited to hedge funds — such as isolating beta risk in order to earn alpha-only returns. But in 2006 a new breed of ETFs was introduced that have since become very controversial. These are the leveraged ETFs. They include both Bullish and Bearish varieties. Unlike index-ETFs which always employ a leverage multiple of 1, leveraged ETFs employ a leverage multiple other than 1. For the Bullish variety, the leverage multiple is usually  $2\times$  or  $3\times$ . For the Bearish variety it is usually  $-1\times$ ,  $-2\times$ , or  $-3\times$ . The latter are often called “inverse ETFs.” Most of the time, we will refer to both varieties, collectively, as LETFs.

The first of the LETFs were launched by ProFund Advisors LLC in the summer of 2006 in three leverage multiples. These included  $2\times$ ,  $-1\times$ , and  $-2\times$  and they were introduced on several major indexes including the S&P 500. Other multiples, such as  $3\times$  and  $-3\times$ , came later. Despite disclosures in the prospectuses for LETFs, numerous warnings in the investment trade literature, and a number of scholarly research papers, it appears that the idiosyncratic risks associated with LETFs still remain obscure to most investors. This has resulted in a number of class action lawsuits over these products.<sup>3</sup>

The problem, essentially, is that LETFs seek to generate a stated multiple of the target index return over a one-day holding period only. To maintain the stated leverage multiple, LETF management must rebalance the fund daily. This is called dynamic rebalancing. Over longer holding periods, the actual return multiple can and almost always does differ from the target return multiple. The difference between the actual return for the holding period and the investor-perceived target return for the holding period can be thought of as tracking error.

Some have argued that the dynamic rebalancing necessary to maintain a constant leverage multiple is almost always detrimental to long-term investors and they should therefore shun these products. Others have argued that LETFs may just as likely outperform as underperform and therefore long-term investors should consider LETFs for inclusion in their portfolios. In this paper, we explore the manager-independent factors that influence holding period return (HPR) shortfalls and overages, which are manifestations of the tracking error, for longer-term investors in LETFs. Our focus is on investors with a one-year investment horizon. We provide results of a series of simulations that tie tracking error to the causative variables, we compare the results of the simulations to results from approximation formulae developed by others, and we examine how LETFs tied to the S&P 500 would have performed over the last 50 years had they existed.

It is well-understood from prior literature that a number of factors influence the size of tracking error. These include (1) the quality of index replication, (2) the frequency of rebalancing, (3) a dividend effect, (4) costs associated with fund management, (5) a trending effect, (6) a volatility effect, and (7) a compounding effect. To a greater or lesser degree, these tracking error contributory factors are intertwined, which complicates any attempt to evaluate the performance of LETFs. Our principal concern in this paper is with the latter three effects since they are the drivers that distinguish LETFs from index-ETFs and are, therefore, the principal culprits in the creation of what has come to be known as the “constant leverage trap.”

The plan for this paper is as follows: The next section provides a brief literature review. The following section lays out the mechanics of a stylized LETF both with and without daily rebalancing in order to see and how trend, volatility and compounding conspire to cause longer-period tracking error. As part of this section, we conduct simulations to demonstrate the intuition behind the model as well as some results that

<sup>2</sup> *Wall Street Journal Market Watch*, December 26, 2006. “For ETFs, Party Just Getting Started.”

<sup>3</sup> See Shum and Kang (2013).

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