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Extreme daily returns and the cross-section of expected returns: Evidence from Brazil

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ABSTRACT

This paper examines whether extreme (positive) daily returns predict the cross-section of monthly stock returns in Brazil. We find a negative effect of the maximum (MAX) daily return on future performance which is in line with the findings from recent studies in the U.S. and Europe. High MAX stocks appear to cater to some investors who are looking for lottery-like stocks, as extreme positive return stocks offer the possibility of substantial gains with a low probability. Increased demand leads to overpricing of and ensuing lower returns to lottery-like stocks. Other proxies for extreme returns, such as idiosyncratic volatility and skewness, play a much weaker role (if any) as cross-sectional determinants of stock performance. We document that the MAX effect is significant only during economic contractions, thus suggesting that the gambling behavior in the stock market exacerbates during economic downturns.

1. Introduction

Bali, Cakici, and Whitelaw (2011) show that portfolios that include U.S. stocks with the most extreme positive (or maximum (MAX)) daily returns in any given month, underperform those portfolios consisting of stocks with less extreme positive returns (or the lowest of the maximum daily returns within a month). The effect of MAX on performance suggests that some investors end up paying more for lottery-type stocks that underperform later on. Investing in high MAX stocks resembles buying lottery tickets since high MAX stocks offer the potential of a huge reward from a small initial investment (on average, high MAX stocks trade at lower prices than low MAX stocks). Additionally, high MAX stocks tend to be illiquid stocks that come from small cap and high idiosyncratic volatility (IVOL) firms. Kumar (2009) finds that individual investors (in contrast to institutional investors) in the U.S. are inclined to purchase stocks that provide a slim probability of a very high return. Hence, some retail investors tend to overweight stocks with lottery-type features (i.e., low price, high IVOL, and high idiosyncratic skewness stocks). Furthermore, investing in lottery-like stocks is likely to have a detrimental effect on performance (in risk-adjusted terms, a portfolio of lottery-type stocks attained a negative alpha, and the spread of a hedge portfolio long on lottery-type stocks, and short on other stocks was also negative and statistically significant). By and large, Kumar's (2009) finding of a substandard performance of stocks that share lottery-like characteristics is similar to that of Bali et al. (2011), although he does not use MAX as a proxy for extreme (and low likelihood) returns. Hsu, Yang, and Sung (2016) also find a detrimental effect on performance of stocks that exhibit lottery-like characteristics in the seasoned equity offerings market. Furthermore, Conrad, Kapadia, and Xing (2014) document that stocks with a substantial ex ante probability of "jackpot" returns (i.e., returns above 100% over the next year) earn subpar average returns. "Jackpot" shares are usually stocks with high volatility, high skewness, and a high probability of default. In all, Conrad, Kapadia, and Xing's (2014) evidence is consistent with the idea that some investors display a preference for lottery-type payoffs that lead to overpriced stocks and subsequent lower returns. Fong and Toh (2014) update Bali, Cakici, and Whitelaw's (2011) study and document a pervasive negative MAX effect on stock performance. It is interesting to note that the deteriorating effect of MAX on performance is shown to be significant only in periods during which the propensity to speculate in the stock market is more acute. In general, the findings of the aforementioned empirical studies are consonant with the theoretical implications of the models by Brunnermeier, Gollier, and Parker (2007), and Barberis and Huang (2008). In Brunnermeier's et al. (2007) model investors are inclined to upwardly bias the probabilities of good states of the world since, in those states, investors get paid handsomely. This optimism leads investors to under-diversify in order to attain skewed returns. Furthermore, the optimism on the likelihood of good states also

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drives prices of skewed return stocks to overshoot, and, consequently, to reduce their expected returns.

Two recent papers uncover evidence of the MAX effect in the main European stock markets. Walkshäusl (2014) finds that the MAX effect holds even after controlling for common determinants of cross-sectional returns such as IVOL, size, beta, skewness, book-to-market, momentum, short-term (return) reversal, and illiquidity. In Europe, the MAX effect is stronger among firms with high cash-flow volatility. Moreover, Annaert, De Ceuster, and Verstegen (2013) find that stocks with extreme positive returns show lower excess returns in the coming month (although the MAX effect in Europe is somewhat weaker to that reported in the U.S. by Bali et al. (2011)). Furthermore, the negative MAX effect is robust to controlling by IVOL (after correcting multicollinearity problems given the strong positive association between idiosyncratic volatility and the maximum daily return).

In this paper we extend the evidence of a MAX effect on stock performance to a large emerging market since we focus on the Brazilian stock market. According to the World Federation of Exchanges (WFE), Brazil (in particular, the Bovespa Exchange) is the third largest stock market in terms of capitalization (with close to 1.2 trillion USD in market value as of August 2014) in the Americas (trailing the U.S. and Canada). Our out-of-sample analysis helps dispel the notion that previous findings of a MAX effect in developed markets are sample-specific or a mere by-product of statistical manipulations (Lo & MacKinlay, 1990). Our study examines the existence of a MAX effect using univariate and bivariate sorts. We find a negative and statistically significant MAX effect that is stronger for risk-adjusted or abnormal returns (rather than for raw returns) and for equally-weighted portfolios. We also look at the impact of IVOL and total skewness (TSKW) on stock returns. Like Ang, Hodrick, Xing, and Zheng (2006), we find a puzzling negative effect of IVOL on performance as high IVOL stocks command lower risk-adjusted returns. With regards to TSKW, we document a positive but insignificant effect of skewness on returns. Although IVOL and MAX are highly correlated with each other and might be capturing the same effect, a regression analysis shows that a negative MAX effect subsumes any IVOL effect in the sample (after orthogonalizing IVOL to allay multicollinearity concerns).

Our evidence that the real predictor of performance is MAX (and not IVOL) coincides with the findings of Bali et al. (2011) for the U.S., and Annaert et al. (2013) and Walkshäusl (2014) for Europe. As reported in these studies for developed markets, when we include MAX in monthly cross-sectional regressions, the negative coefficient on IVOL reverses its sign and becomes statistically insignificant.

We also contribute to the literature by examining the role of economic conditions (i.e., whether the overall economy is contracting or expanding) in the overpricing of high MAX stocks. In other words, we study whether high MAX stocks underperform low MAX stocks after periods of economic strength or weakness. Previous literature provides mixed evidence on whether the demand for speculative stocks is stronger throughout economic recessions or booms. We document a significant negative MAX effect only in periods following weak economic activity. Our evidence agrees with that of Kumar (2009) in the U.S. and Walkshäusl (2014) in Europe, and with recent survey evidence on Brazil which suggests that speculative behavior exacerbates during periods of economic contraction.

This paper is organized as follows: Section 2 provides an overview of the sample and the construction of the main variables used in this study. In Section 3 we examine the extent and significance of the negative effect of the maximum daily return on stock performance using univariate and bivariate sorts as well as regression analysis. We also discuss the interaction among MAX, IVOL, and TSKW to determine which variable best captures lottery-like behavior that attracts investor demand. Section 4 discusses the results of several robustness checks, including, among others, the impact of overall economic activity on the significance of the MAX effect. Lastly, Section 5 concludes the paper with a summary of our findings.

2. Data

2.1. Sample

From Bloomberg we gather information of prices, number of outstanding and traded shares, as well as the book-to-market value of equity ratio of common stocks listed in Sao Paulo's BM & F Bovespa stock exchange. We also extract information on the same variables for delisted (common) stocks to avoid survivorship bias. All figures are shown in U.S. dollars (USD). The estimation period spans from July 2001 to August 2014. To enter the sample, we require a stock to show at least two months (42 days) of trading. All together our sample includes 278 common stocks. Following Fu (2009), we delete observations with monthly returns over 300% and winsorize the monthly data at the 0.5 and 99.5 percentiles to mitigate the impact of outliers. We corrected the number of outstanding shares for a few stocks in which the figure was inflated by a factor of 1000.[1]

The yield on U.S. Treasury notes (with a one-month maturity) proxies for the risk-free rate,[2] and returns from Ibovespa index account for market returns. We construct (value-weighted) risk factors following Fama and French (1993) and Carhart (1997). In the process we exclude financial firms and utilities. At the end of June, we allocate stocks to two different size portfolios: a small (S) portfolio containing stocks with below median market capitalization, and a big (B) portfolio including the remaining large stocks. We also split stocks into three sets according to the book-to-market value of equity of each stock. The first set (or growth (G) portfolio) includes stocks at the bottom 30% of the book-to-market value of equity distribution, the second set (neutral (N) portfolio) contains stocks in the middle of the distribution (from the 30% to the 70% percentile), and the last set (value (V) portfolio) is comprised of the remaining stocks.

In all, we end up with six size and book-to-market value of equity value-weighted portfolios (SG, SN, SV, BG, BN, and BV) coming from the (independent) intersections of the two size and three book-to-market portfolios. Portfolio holding returns for the next year (ended in June) are then tabulated for the six portfolios. This sorting and evaluation procedure is replicated in the coming year and until the end of the sample allowing us to construct six stacked time-series of monthly portfolio returns.

A size factor (smb, “small minus big”) is estimated as the average return of three long-short portfolios (SV-BV, SN-BN, and SG-BG). A distress factor (hml, “high minus low”) is the mean return of two long-short portfolios related to the book-to-market value of equity of their constituent stocks (SV-SG, and BV-BG). To estimate a momentum factor, we employ a similar approach. We now use information on two size portfolios and three momentum portfolios with stocks with low (L), medium (M), and high (H) $t-12$ to $t-2$ returns. The cutoffs to define low, medium, and high momentum stocks are the same we used to define book-to-market portfolios. Instead of annual formation and holding period we use monthly periods. As before, we end up with six portfolios coming from the independent intersections of two size and three momentum portfolios. The momentum factor is then the value-weighted mean of two spread portfolios that take a long position in high momentum stocks and a short position in low momentum stocks (SH-SL and BH-BL).

[1] We contacted Bloomberg's help desk to rule out possible database errors (e.g., in stocks with tickers LUPA3 BZ Equity and OSXB3 BZ Equity). The answers provided by Bloomberg suggested that amending the database was not necessary.

[2] As a proxy for the risk-free rate we also used the yield (in USD) on Brazil sovereign bonds (with constant maturity of three months) and obtained qualitatively similar conclusions as those reported in Sections 3 and 4 below. Furthermore, the availability of the one-month Treasury note yield starting from late July 2001 determined the initial date of our sample.