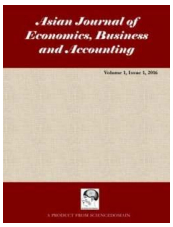

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The Leveraged Inefficiency in Trending & Choppy Markets

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

The principal target of this article is to define, initially, a new trading methodology based on the innovative term "*Leveraged Inefficiency*", and then to discuss the dimensions, functionalities, and trading returns of this inefficiency (market anomaly). In trading strategies the temporal (time-series) volatility is not well defined as far as the leverage instruments (like 3x ETFs) is concern. The proposed term could be characterized as a concept described by a 3-d array with a number of trading functionalities, because it uses (in market Entry and market Exit tactics) as its third temporal dimension the Jesse Livermore's "*Psychological Time*" and the well-known in trading "Emotional Control" and the "Money Risk Management" as the other two dimensions. After back-testing the proposed trading methodology in available 3-year data for the JDST leveraged ETF (gold miners juniors), we found that in choppy markets, overnight-position institutions profit from the proposed "*Leveraged Inefficiency*" at the expense of long-term investors, and swing traders as well. Similarly, in trending markets, day-trading speculators profit from the proposed "*Leveraged Inefficiency*" at the expense of hedge-funds. Hence, the presented research shows that the proposed "*Leveraged Inefficiency*" market anomaly accumulates profit entirely overnight in choppy markets, while in a trending market the profit occurs mainly intraday.

Keywords: Leveraged inefficiency; market anomaly; trading; market volatility; trading functionalities; gold miners; trending markets; choppy markets.

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1. INTRODUCTION

In trading methodologies and strategies the temporal (time-series) volatility is not well defined and documented as far as the leverage instruments (like 3x ETFs) is concern. This is really a big problem particularly in trending high-volatility markets. The principal target and objective of this article is to introduce a new trading methodology to shortening this gap. The proposed approach is based on an innovative concept derived by the introduced new term "*Leveraged Inefficiency*", and then to discuss the dimensions, functionalities, and trading returns of this inefficiency (market anomaly, [1,2,3]). As an application domain in our article, we choose a leveraged ETF (JDST; a Gold miners 3x ETF). The presented in Section 3 results show that the proposed methodology accumulates profit entirely overnight in choppy markets, while in trending markets the profit occurs mainly in day-trading. These article's findings reject classical theories of trading choppy/trending markets.

After back-testing our research in available 3-year data for the JDST 3x leveraged ETF (gold miners juniors reverse), we found that overnight-position institutions (well-known as "*smart money*"), in choppy markets, profit from the proposed methodology at the expense of long-term investors and swing traders [4]. On the other hand, in trending markets, day-trading speculators profit from the proposed methodology at the expense of hedge-funds [5,6].

1.1 Problem Definition

According to market anomalies literature the current prices are not dependent on past prices and are normally distributed over time because changes in price are due to current news, which obviously, are impossible to predict in advance [7,8,9].

Over the years, many studies have presented data about what academics call "market anomalies". These anomalies could be characterized as trading strategy approaches rather than as documented trading strategies [10,11].

In market anomalies literature the so-called temporal trading functionalities (e.g. "*Psychological Time*") have not been fully documented yet [1,2,3,12,13]. Also, the TTF trading has had a dominant position in markets trading [14,15,16]. In this domain, behavioral models of leveraged and inverse ETFs were examined in detail by Cheng and Madhavan [17].

Hence, understanding the 1-d trading dimensions like "*Psychological Time*", "*Emotional Control*", and "*Money Risk Management*", is critical for market trading based both on securities evaluation and trading methodologies. Also, Lefèvre [18], Ahn, Conrad, and Dittmar [19], Vayanos & Woolley [20] and Lou et al. [21] deliver remarkable new evidences about overnight-position and day-trading as temporal parameters to the proposed in this article trading methodology.

In Section 3, after applying the proposed methodology, the presented returns in Tables 1-2 are inconsistent with the classical theories about overnight-position and day-trading returns. Hence, this inconsistency could be well characterized as a new (temporal) market anomaly not belonging to literature-defined fundamental, technical or calendar-based anomalies [22].

1.2 Article's Methodology

An extensive trading-literature review indicates that, in choppy markets, "smart money" methodologies (usually applied by institutions or the "*big brothers*" traders) profit from time-series temporal momentum trading tactics at the expense of long-term or swing trading tactics. As well as, in trending markets, day-trading methodologies, profit from time-series temporal momentum trading tactics at the expense of hedge-funds.

In this trading strategies environment, for the purpose of this article, we have to investigate statistically and document logically both: (a) whether the overnight-position shareholders in a choppy market, profit from the application of the proposed "*Leveraged Inefficiency*" as a trading approach; and (b) whether the day-trading shareholders in a trending market, profit from the application of the proposed "*Leveraged Inefficiency*" as a trading approach.

Obviously, the results obtained as trading returns does depend on the trading instrument (leveraged; index-based; etc.) and hence always an personalized functionality always is involved as "volatility" / trading instrument, or "user profile" / institutions, long-term investors, swing traders, speculators, and hedge-funds.

1.3 Article's Structure

The rest of the article is organized as follows: In Section 2 ("The *Leveraged Inefficiency* Anomaly") the proposed methodology is discussed and demonstrated through the paradigm of the JDST ETF. Also, in this Section the innovative concept-term "*Leveraged Inefficiency*" is defined, analyzed by using the Livermore's "*Psychological Time*" as parameter, and its functionality is documented in "Emotional Control" and "Money Risk Management " trading dimensions. In Section 3 ("Proposed Methodology - Performance Evaluation") by back-testing available 3-year data for the JDST ETF, the performance of the proposed is demonstrated. Finally, in Section 4 ("Conclusion") article's innovations and contributions are discussed.

2. THE LEVERAGED INEFFICIENCY ANOMALY

In this Section the proposed trading methodology is discussed and demonstrated through the paradigm of the JDST 3x ETF. Also, the innovative concept-term "*Leveraged Inefficiency*" is defined, analyzed by using the Livermore's "Psychological Time" as parameter, and its functionality is documented in "Emotional Control" and "Money Risk Management " trading dimensions.

Avellaneda and Zhang [23,11,12,15,16,17,18] discuss trading methodologies. Also, in computational finance theory, leveraged (in particular if it is based on ETFs or ETNs instruments) implied volatility from market dynamics [4,13].

The proposed trading methodology could be characterized and defined as a 3-d array of trading functionalities involved in market moves and applied in overnight-position and day-trading situations for any 3x leveraged instrument. In this definition, the third (temporal) dimension is always the "*Psychological Time*" at the begging of a move, while the other dimensions are the "*Emotional Control*" and the "*Money Risk Management*".

Tables 1 and 2 in Section 3 demonstrate the trading functionality of the proposed methodology. This functionality is time-based (i.e. a temporal one) because it is hardly depended by the application timing.

At the heart of the proposed methodology is the term of "*Leverage Inefficiency*" which is defined as a temporal trading concept with three dimensions:

(i) Psychological Time;
(ii) Emotional Control; and
(iii) Money Risk Management.

Actually, the first dimension is a parameter in "*Leveraged Inefficiency*" array of trading utilities, and the other two dimensions are the main trading dimensions. These two dimensions ("Emotional Control" and "Money Risk Management") are user-depended and characterized by a high degree of "trader-dependency". In the proposed methodology, the "Leverage Inefficiency" is operated only as a short-term function parameterized by popular price action time-frames (e.g. [5-minute] or [15-minute]); and it could be documented by time- and profit-targets in trading leveraged assets as follows:

(i) Parameterize day-trading trading strategies by specific time- and profit-targets; and open/close long/short positions at a specific time- and profit-target; and
(ii) Parameterize swing trend-reversal trading strategies by consolidation price action patterns, resistance and support zones, and price action / technical indicators divergences [5,6,16].

The derived, from the proposed methodology, temporal functionalities operate as warning dynamics trading signals (w!D signals) when they are related to particular candlestick patterns (e.g. Bullish Engulfing, Dark-Cloud Cover – bearish confirmation) or price action patterns (e.g. Head-and-Shoulders/neck-line) [6,11,13,15,16].

For the proposed trading strategies, these short-term patterns operate as psychological time w!D signals awaiting the final confirmation/triggering signal (e.g. volume increase; candlestick break; Jesse Livermore's resistance pivotal-line breakout; Jesse Livermore's support pivotal-line breakdown) just before the executive order (i.e. open / close position) [24,25,4,12].

3. PROPOSED METHODOLOGY - PERFORMANCE EVALUATION

According to financial literature ([14,23]) for trading methodologies, tactics, plans and

strategies, a back-test procedure is the appropriate performance evaluation tool. Hence, in order to evaluate the proposed trading methodology (based on the innovative concept "*Leveraged Inefficiency*"), we back-test it into a 3-year data set for the 3x ETF (leveraged instrument) JDST (the domain time period: 1.7.2014 – 30.6.2017 data).

For the purpose of this article, the back-test procedure has generated 1,066 trades and the results are presented in Tables 1-2; while a comparative return analysis is discussed afterwards.

3.1 The Leveraged Inefficiency in Choppy vs. Trending Markets (Market Volatility)

The proposed trading methodology is characterized by a strong relation to overall market volatility condition. So, trading low-volatility choppy markets requires a different set of trading functionalities rather than trading a high-volatility trending market [15,23].

Also, emotional control and money risk management, as the 1-d dimensions of the proposed methodology, need more information and trading functionality in choppy markets rather than the trending ones [14]. As it is well known in traders' communities, great returns are obviously and easy in trending rather than in sideways range-bound choppy markets.

Hence, because the information asymmetry declines over a trending market, price changes (i.e. volatility) in trending markets are larger, reflecting in this way more private information and trading functionality. Hence, trending markets are less noisy before the opening bell-clock rather than after it (i.e. the big profit in trending markets occurs mainly intraday) [14,23].

3.2 The Leveraged Inefficiency in Overnight-position vs. Day-Trading (Information Asymmetry)

According to Barclay and Hendershott [26], a day-trading requires a different set of functionalities rather than an overnight-position trading. Individual trades contain more information and trading functionality in after-hours than during the daily session.

Hence, because the information asymmetry declines over the intraday trading hours, price changes overnight are larger and reflect more private information and trading functionality, and therefore they are less noisy.

3.3 An Application Case Study

Following Table 1 is referred to the introduced "*Leveraged Inefficiency*" and presents the annual return (%) after the application of a back-test procedure to the 3x ETF JDST for the time period: 1st July 2014 – 30th June 2017 (1,066 trades generated) and for Trending Markets. In our approach the expensive real-time data are not essential. So, the empirically evaluated daily and weekly data were selected by the Barron's USA stock markets data-provider and the Wall Street Journal site (WSJ.com) [27].

For statistical and documentation purposes, the returns were time-projected in two categories and they characterized as overnight-position and day-trading returns. In this frame, the JDST has an annual overnight return of -73.54% (total period return: -390.93%), while the annual daytime return is 51.02% (total period return: 217.07%).

Additionally, a quality analysis, based on the recorded standard deviation values, says that in trending markets an overnight-position return strategy is more risky than a day-trading return strategy, because of the higher annual standard deviation and the lower Sharpe Ratio values recorded in overnight-position returns [27,6,11].

This is why the statistical quality indicator Sharpe Ratio (which does not include in calculations the risk-free interest rate) for the overnight-position trading strategy is -0.77, compared to the 0.16 of the day-trading trading strategy (all the above statistics and remarks apply to trending high-volatility markets).

The Sharpe Ratio (Index, Measure) or Reward-to-Variability Ratio is an excellent way to examine, measure and evaluate the performance of a trade or investment by adjusting for its risk (e.g. high market volatility in trending markets). It is one of the financial markets evaluation standards, and it has been chosen in this article because it is related to the average return earned in excess of the risk-free rate per unit of volatility (i.e. total risk); and the leverage inefficiency concept, introduced in this article, is a volatility-based issue.

Other statistical analysis quality indicators (ratio, indexes) could be the P/E Ratio [28] and the

Structural Break (Change) [29]. But, according to Gottwald [28], the P/E Ratio is better used for valuing companies; so it is not suitable to use it for a 3x inverse ETF (JDST) to a volatile and undocumented Gold junior-Miners index (GDXJ).

Also, the Structural Break index, according to Bai & Perron [29], is an unexpected shift in a time series (like the temporal approach discussed in this article), that could lead to huge prediction mistakes and errors, resulting in trading functionalities with great unreliability. Finally, some other ratio used in financial literature, like Golden Ratio, Current Ratio, and Leverage Ratio, are regarded that offering less, than the Sharpe Ratio, functionality to the introduced "leveraged inefficiency" concept; but they could be used in future extensions of this article.

Compared the above results to existing literature regarding the 3x ETF JNUG related to the same stock-index (GDXJ) [16], we found that the proposed concept, in trending markets and for the case of a 3x inverse ETF, displays better results if it is applied in overnight-position return strategies (-73.54% vs. -84.91% and -390.93% vs. -430.22%), but worst results if it is applied in intraday return strategies (51.02% vs. 58.32% and 217.07 vs. 261.19%). In this frame, the JNUG has an annual overnight return of -84.91% (total period return: -430.22%), while the annual daytime return is 58.32% (total period return: 261.19%) [16].

Following Table 2 is referred to the introduced "*Leveraged Inefficiency*" and presents the annual return (%) after the application of a back-test procedure to the 3x ETF JDST for the time period: 1st July 2014 – 30th June 2017 (1,066 trades generated) and for Choppy Markets. In this frame, the JDST has an annual overnight return of 91.36% (total period return: 490.82%), while the annual daytime return is -78.72% (total period return: -452.29%).

Additionally, a quality analysis, based on the recorded standard deviation values, says that in choppy markets an overnight-position return strategy is less risky than a day-trading return strategy, because of the lower annual standard deviation and the higher Sharpe Ratio values recorded in overnight-position returns.

This is why the statistical quality indicator Sharpe Ratio (which does not include in calculations the risk-free interest rate) for the day-trading return strategy is -0.65, compared to the 0.61 of the over-night position return strategy (N.B. All the above statistics and remarks apply to choppy low-volatility markets).

Compared the above results to existing literature regarding the 3x ETF JNUG [16], we found that the proposed concept, in sideways and choppy markets and for the case of a 3x inverse ETF, displays a bit worst results if it is applied in overnight-position return strategies (90.08% vs. 91.36% and 471.77% vs. 490.82%), but better results if it is applied in intraday return strategies (-74.64% vs. -78.72% and -403.55 vs. -452.29%). In this frame, the JNUG has an annual overnight return of 91.36% (total period return: 490.82%), while the annual daytime return is -78.72% (total period return: -452.29%) [16].

3.4 Comparative Return Analysis

A comparative return analysis, according to above Tables 1 and 2, indicates that the particular JDST leveraged ETF has had much better annually and totally (3-year) performance as well, after the adoption of the "*Leveraged Inefficiency*" trading concept, in choppy markets (i.e. low volatility environments) within the overnight-position return strategy. This actually confirms the notes presented in Abstract and Introduction.

Tables 1 and 2 present the trade performance analysis results after applying the back-test

Table 1. Trending market - The leveraged inefficiency ETF anomaly trading-strategy approach: JDST 3x leveraged ETF: Annual returns (%) from a back-testing procedure (1,066 trades); 1st July 2014 – 30th June 2017

Net Trading Results (estimated commission cost $0.01 / traded share)

Annual return	Annual std. dev.	Sharpe ratio	Total return
Overnight-position return strategy			
-73.54%	13.28%	-0.77	-390.93%
Day-trading return strategy			
51.02%	10.02%	0.16	217.07%

Source: Survey data; Significance level: the model is significant at 5%

Table 2. Choppy market - The leveraged inefficiency ETF anomaly trading-strategy approach: JDST 3x leveraged ETF: Annual returns (%) from a back-testing procedure (1,066 trades); 1st July 2014 – 30th June 2017

Net Trading Results (estimated commission cost $0.01 / traded share)

Annual return	Annual std. dev.	Sharpe ratio	Total return
Overnight-position return strategy			
90.08%	10.44%	0.61	471.77%
Day-trading return strategy			
-74.64%	17.82%	-0.65	-403.55%

Source: Survey data; Significance level: the model is significant at 5%

procedure on JDST. For statistical back-testing purposes, during this back-test procedure, a capital of $100,000 has been invested per trade and a commission cost of $0.01 per trade share is regarded. This low commission cost results, under specific conditions, on significant (net) profit as shown in Tables 1 and 2.

It is notable that in case of double the commission cost (i.e. $0.02 per share), the total net profit of both overnight-position and day-trading return strategies would be less than zero. The things get worst, if a slippage cost is added in an overnight-position return strategy based on "*Leveraged Inefficiency*". Hopefully, thanks to nowadays internet-based low-cost brokerage, commission cost is very low (something like $0.004 per share) and the so-called "slippage cost" is not any more applicable [16,20].

4. CONCLUSION

In traditional trading strategies the temporal (time-series) volatility is not well defined as far as the leverage instruments (like 3x ETFs) is concern. The main target of this article was the proposal and discussion of an innovative trading methodology based on the introduction of a new concept ("*Leveraged Inefficiency*") involved in temporal market anomalies [1,2,3]. Also, in this article, the innovative concept-term "*Leveraged Inefficiency*" is defined, analyzed by using the Livermore's "*Psychological Time*" as parameter, and its functionality is documented in "*Emotional Control*" and "*Money Risk Management*" trading dimensions [12,18].

Typically, there are three common classifications for market inefficiencies (anomalies): Fundamental, Technical, and Calendar-based anomalies. Also, there is another class of anomalies that simply could be referred to as "*temporal*" because of the timing functionality involved. In this article we have discussed one of these "temporal" anomalies, called it "*Leveraged Inefficiency*" [30,24,25].

The introduced anomaly could be characterized as a trading-strategy approach rather than as a documented trading strategy; but if they parameterized by the time and particular by the "*Psychological Time*" during the overnight and intraday time periods, then they would respected as temporal trading strategies. That is to say, it has a temporal dimension because it uses the Jesse Livermore's "*Psychological Time*" as parameter [12].

The presented research, based on empirically tested market data, showed that the proposed temporal anomaly, if it is incorporated in a trading strategy, accumulates profit entirely overnight in a choppy market, while in a trending market the profit occurs mainly intraday. These findings, which were statistically tested for an inverse leveraged ETF instrument, reject classical theories of trending and choppy markets returns.

In Section 3, a quality analysis, based on the recorded standard deviation values, says that in trending markets an overnight-position return strategy is more risky than a day-trading return strategy, because of the higher annual standard deviation and the lower Sharpe Ratio values recorded in overnight-position returns. Also, in choppy markets an overnight-position return strategy is less risky than a day-trading return strategy, because of the lower annual standard deviation and the higher Sharpe Ratio values recorded in overnight-position returns.

Finally, a comparative return analysis -according to Section's 3 Tables 1 and 2- indicates that the particular JDST leveraged ETF has had much better annually and totally (3-year) performance as well, after the adoption of the "*Leveraged Inefficiency*" trading concept, in choppy markets (i.e. low volatility environments)

within the overnight-position return strategy [11,13].

Also, we found that in choppy markets, overnight-position institutions profit from the proposed "*Leveraged Inefficiency*" at the expense of long-term investors, and swing traders as well. Similarly, in trending markets, day-trading speculators profit from the proposed "Leveraged Inefficiency" at the expense of hedge-funds. Hence, the presented research shows that the proposed "*Leveraged Inefficiency*" market anomaly accumulates profit entirely overnight in choppy markets, while in a trending market the profit occurs mainly intraday. So, a diversified portfolio of trading strategies based on the introduced "*Leveraged Inefficiency*" anomaly, for a 3x instrument of a volatile Sector like the Gold miners one, could deliver substantial abnormal returns.

The main achievement of this paper was the introduction of a new trading methodology, armed with innovative functionalities relating to "*Psychological Time*" at the beginning of a move ([12,18]) during the day-trading and the overnight-position trading sessions.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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