TRZ Funds

Statistical Arbitrage

How to diversify to generate Alpha

TRZ Funds

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Executive Summary

TRZ Funds	• TRZ Funds is an alternative Assets Manager active in equities and derivatives • The investment company is based in Amsterdam • TRZ works with professionals with many years of experience in the Investment Banking world
Investment Strategy	• Diversified statistical arbitrage portfolio • Combination of Mean reversion and Earnings Momentum combined with BETA and Global Yield Curves • Risk-averse
Performance	• Return this year: 18,28% • Return annualised: 55,91% • Return to Date: 35,13% • Return to Date annualised: 52,13%

Investment Strategies

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It has been proven that long only and static asset allocation methodologies are incapable of enduring the peak-to-through decline of the markets.

Based on this assumption our strategy combines Mean Reversion and Earnings Momentum to build a diversified statistical arbitrage portfolio. These are combined with a Beta Neutral Portfolio (BNP) and Global Yield Curves (GYC) strategies:

- Mean reversion: we created a mean reversion strategy that identifies medium to long term opportunities across American and European stocks
- Earnings Momentum: we use intraday techniques to recognize temporary opportunities in a very short term period
- Beta Neutral portfolio (BNP): long low beta assets and short high beta assets to extract only Alpha from the Portfolio
- GYC: Systematic directional fundamental and non-directional relative value strategies on liquid Governments Bonds and IR Futures

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Advantages of our system

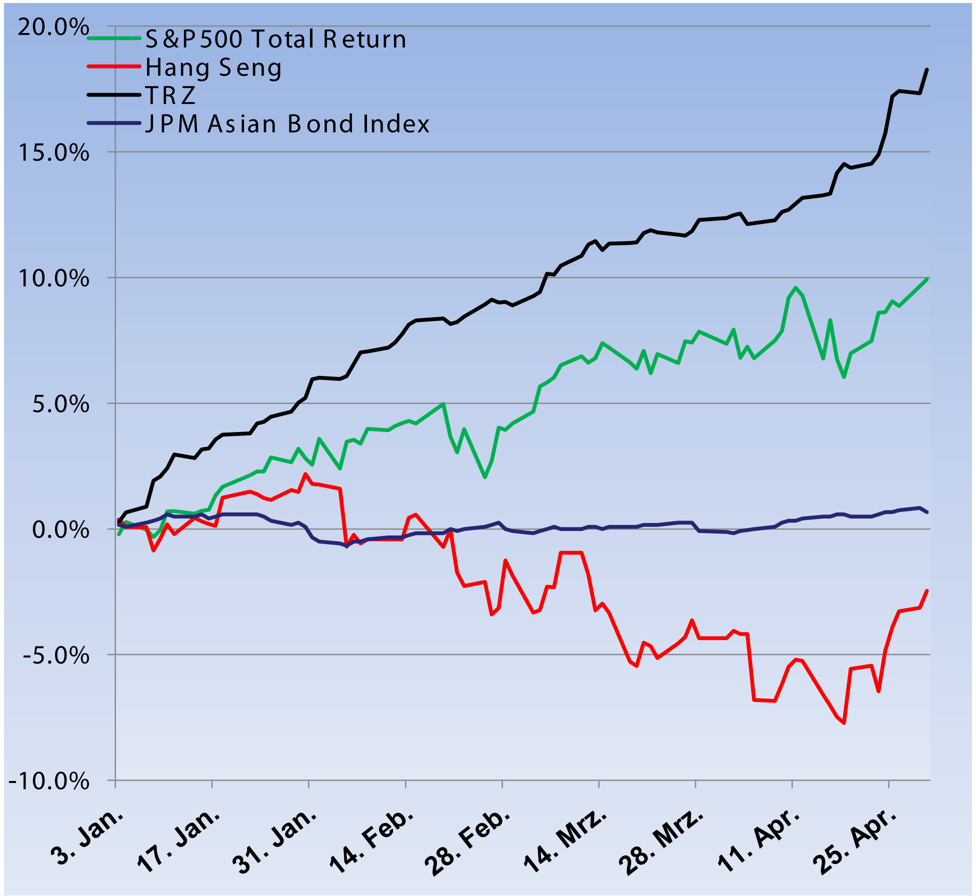
What our system is not:

- It is not an algorithmic “black box” with no human intervention
- It is not a High Frequency system that follows the ultra low-latency battle
- It is not a pure directional trading system

What our system does:

- Mean Reversion trading on highly correlated pairs (Correlation higher than 90% over 3-6-24 windows)
- Statistical Trading signals (Pairs/Spreads are measured in terms of Standard deviations from Moving Averages)
- Actual trading decisions are based on Fundamental Analysis of Balance sheets, Cash Flows, debt Levels, Business Models and the latest news. Something that a robot can not do because it requires human judgement and information filtering.
- Pattern analysis to optimize Trading execution
- Statistical take Profit, Stop Losses and Trail Losses

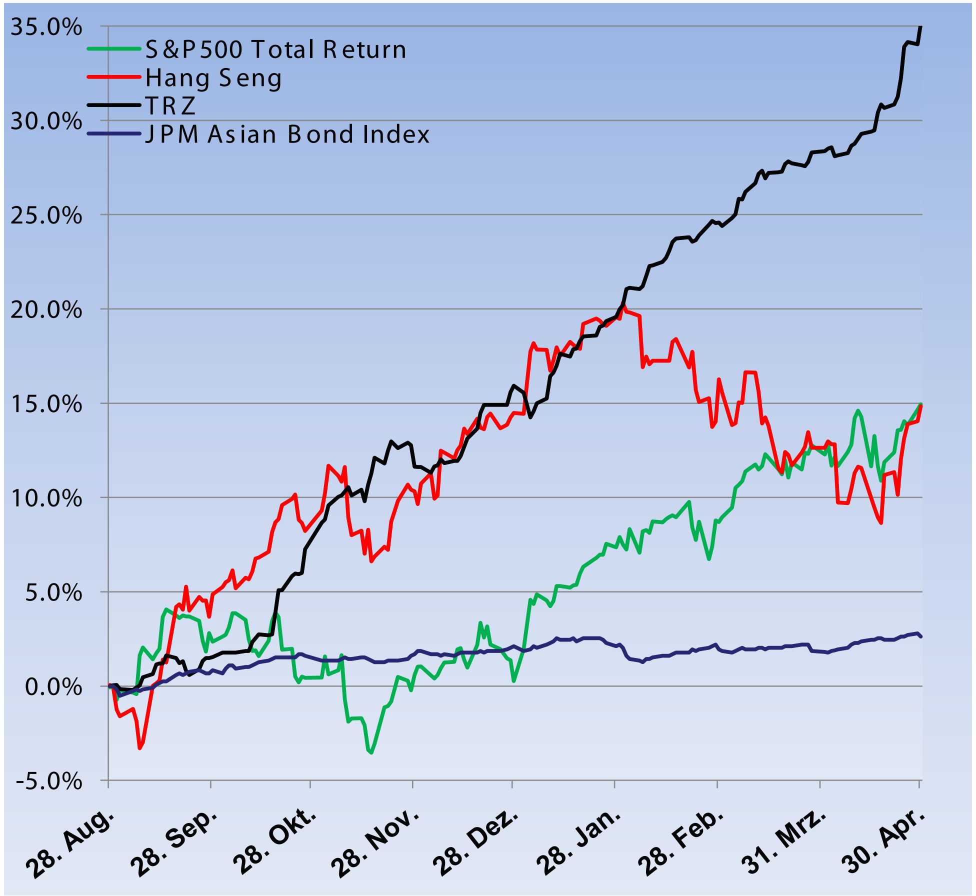
Performance - 2013



Key statistics

Return (Jan' 13 – Apr'13)	18.28%
Return (Annualised)	55.91%
Std Dev (Annualised)	17.01%
Sharpe Ratio	3.29
Sortino Ratio	8.39
Alpha (Annualised)	57.27%
Beta (vs S&P500)	-4.49%
Max Drawdown	-1.71%
VaR (Montecarlo @ 99.9%)	-5.50%
Correlations	
TRZ vs S&P500	-10.60%
TRZ vs Hang Seng	7.60%
TRZ vs JPM Asian Bond Index	-2.95%

Performance – Since inception



Key statistics

Return (Inception – Apr'13)	35.13%
Return (Annualised)	52.13%
Std Dev (Annualised)	15.67%
Sharpe Ratio	3.33
Sortino Ratio	4.52
Alpha (Annualised)	54.36%
Beta (vs S&P500)	-10.06%
Max Drawdown	-2.54%
VaR (Montecarlo @ 99.9%)	-6.40%
Correlations	
TRZ vs S&P500	-19.76%
TRZ vs Hang Seng	-0.19%
TRZ vs JPM Asian Bond Index	-11.11%

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How our trading system works

Our approach

- Hybrid approach: this enables us to take advantages of statistical tools to spot trading opportunities in the US and European Equity markets
- Analysis: Before entering a trade, we analyse all the fundamentals of both stocks involved in the pair to make sure the statistical signal is purely driven by market overreaction to random news. If we then believe there are no fundamental reasons why the pair is moving so much, we enter the trade assuming it will revert to its historical moving average.

Money Management

- Allocation: We optimize the way we build the portfolio by dynamically allocating the capital between different strategies
- Frequency: This is a day-to-day process
- Model: We use a proprietary version of Ed Thorp optimal allocation. Our model minimizes the exposure on positions at loss, to maintain the leverage at the most efficient level

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How our trading system works

Mean Reversion

- On Mean Reversion we mostly use pairs trading, a form of Arbitrage which is very simple and easy to trade. We use the concept of equilibrium of oscillation of long and short positions and apply a set of rules to spot inefficiencies and produce returns. This single equilibrium is then wrapped into the “portfolio equilibrium”, which incorporates all the positions we hold at that specific moment. We keep an eye out on the positions’ equilibrium, adjusting it based on some external events.

Earnings Momentum

- Earnings Momentum is largely related to the quarterly earnings results. This allows us to invest capital for a short timeframe. The Earnings strategy works very well with the Mean Reversion. In fact every time we see a trading signal opening on Earnings events we make an analysis of existing positions on Mean Reversion and BNP, calculating the perfect fitting of new positions with the existing ones

BNP: Beta Neutral Portfolio

The BNP strategy assumptions are fairly easy to assess. From a mathematical point of view we apply part of the propositions theorized by Frazzini and Pedersen in their last paper. The remaining part is a proprietary model.

The BNP Strategy

- The idea is that high Beta means Low Alpha and vice versa
- Starting from this point we build a specific portfolio, long low-beta and short high-Beta
- We calculate the weights of Low-Beta and high-Beta positions to create a market neutral portfolio with an overall Beta of zero
- Once we neutralise the overall Beta, the portfolio will produce only Alpha
- To make sure this is always the case, we constantly monitor our portfolio and we change the weights in our positions to guarantee beta neutrality
- Average holding period of stocks on BNP strategy is 3 months, with stocks taking 1-6 months to actually reverse on their Beta-means.

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GYC: Introducing Global Yield Curves

GYC is a mix of SYSTEMATIC directional fundamental and non-directional relative value strategies with the following features:

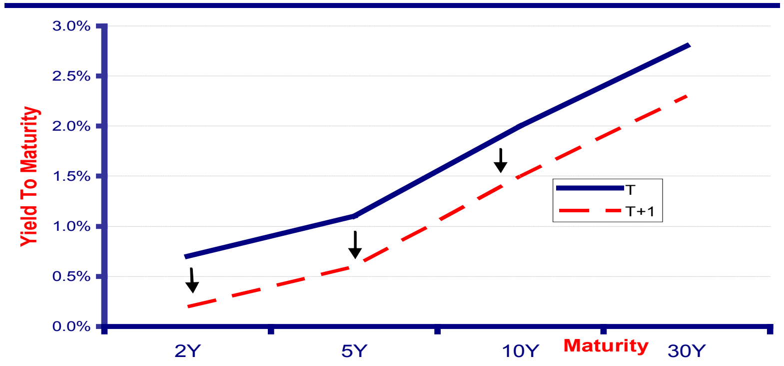
- A diversified portfolio of uncorrelated Fixed Income strategies
- Zero default Risk in the underlying assets, no Credit risk
- Liquid Government Bond and IR futures of developed and “stable” countries
- Portfolio behaves similarly to a safe asset (government bond) but delivers more alpha than a long only strategy, important feature in a period of rising inflation risks and low rates

GYC: Yield Curve strategies

GYC captures most yield curve movements

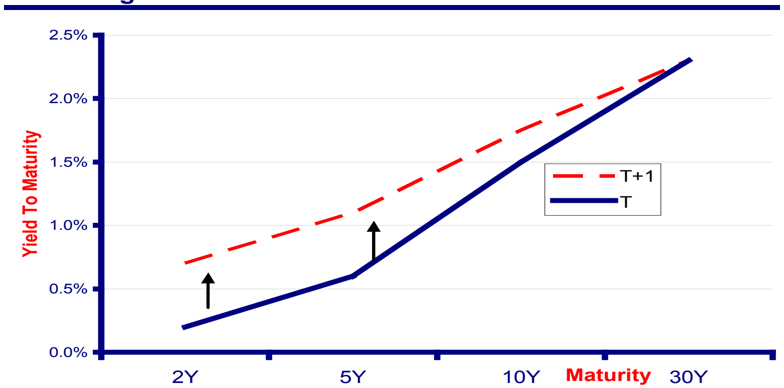
- ➢ Parallel shifts, steepening/flattening, butterfly trades
- ➢ Returns on same assets but low correlation
- ➢ Positive carry and duration neutrality
- ➢ Directional in the level, slope and convexity

Parallel shift



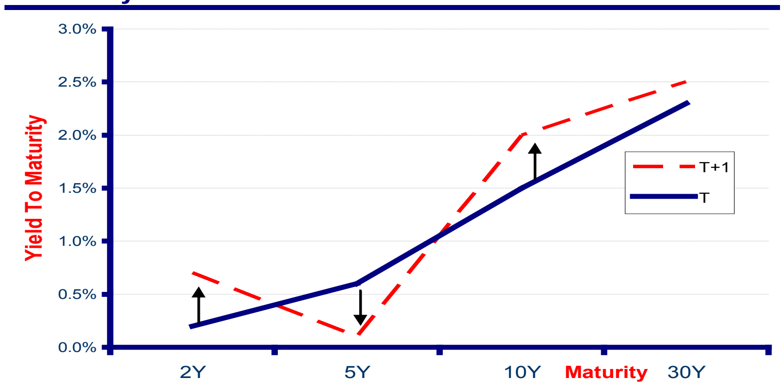
Source: Diarch Research

Flattening



Source: Diarch Research

Convexity Increase



Source: Diarch Research

GYC: Pairs Trading long term rates

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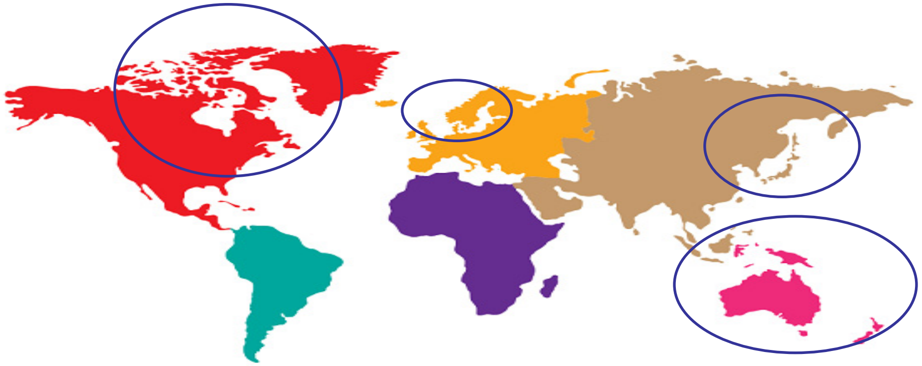
Global Yield Curves

- G10 government bonds (different countries, same maturity) are heavily related
- Mean-Reversion and marketing timing indicators to take positions on spreads
- Time zone differences of Asia Pacific, Europe and North America
- Beta neutral portfolios means that correlation is near zero with regards to underlying assets



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GYC: Risk Management

Risk Management

- Volatility targeting by forecasting model, single strategy and portfolio
- Portfolio optimisation with penalised turnover and extreme risk constraints
- Models refitting and validation
- Adaptive but ROBUST strategies, stable performance over the entire business cycle
- Performance Monitoring by single strategies and models
- Low use of capital:12% max margin/equity, easy to leverage more

Statistical analysis of fundamental factors and time series models:

- Risk aversion, macroeconomic environment, relationship between yield curve components
- Momentum and timing indicators to confirm trading decisions
- Nonlinear autoregressive techniques and time varying parameter models
- Data filtering (online filters and robust statistics)
- Volatility forecasting

Performance

Since we started diversifying among strategies our trading system has consistently produced average returns around with very low draw downs. To achieve these returns we use a leverage of around 5 times the AUM which guarantees a very good trade-off between risk and returns. If the investor can afford a higher risk appetite this can be increased.

Figures

- Average returns around 3-4% per month
- The average daily VaR (at 99% confidence level) of our positions is usually around 5% of AUM (or 1% Notional) VaR is linearly proportional to Leverage. On average 1% per leverage point.
- The reason for such a relatively low VaR is that 95% of the positions are market neutral long-short. As a consequence, our performance is not correlated with the market either

Diversification

- Diversification per se is not enough to generate Alpha
- Diversification is assessed every time a new position is open
- We use several diversification approaches;

I. Sector
II. Geographic
III. Asset Class
IV. Risk Value (proprietary measure)
V. Products (proprietary measure)
VI. Impact ion the overall portfolio (proprietary measure)

Why diversification?

Advantages of optimal diversification over traditional portfolio construction

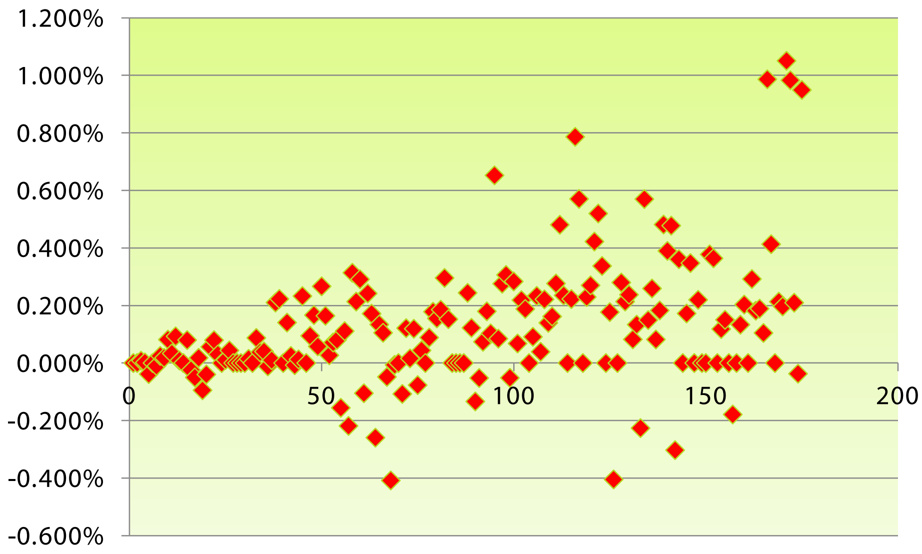
- It adds substantial positive returns to a single asset class or portfolio for a given unit of risk
- Significant decreases the overall portfolio volatility, thus further increasing the Return/Risk ratio
- Allows a dynamic shift to the asset classes that we expect to perform better in a specified period of time or market conditions

What can be achieved through diversification

- With our diversification techniques we are able to preserve capital
- We are able to reduce volatility
- We are able to generate Alpha

Alpha Generator

- 83% Positive Alpha
- 17% Negative Alpha



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Portfolio Revisions

Portfolio revisions

- The frequency mainly depends on the news flow and the assessment of existing positions. This is a continuous process.
- Minimizing the costs is also an integral part of our trading strategies. We calculate the marginal contribution to the Portfolio risk/returns coming from investing in a new stock “A”. This is measured by it’s risk-adjusted alpha, and if it satisfies our pre-conditions we finally enter the trade.
- Our portfolio revisions may lead to small changes in our risk tolerance, but always in a pre-defined frame.

Questions & Answers

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