



Pardo
Capital Limited

*Artificial Intelligence in
Trading -
The New Frontier*

Robert Pardo | Background



Accomplished Trader & CTA

- Trader of the Year – Futures 2008
- Creator of *Walk-Forward Analysis*

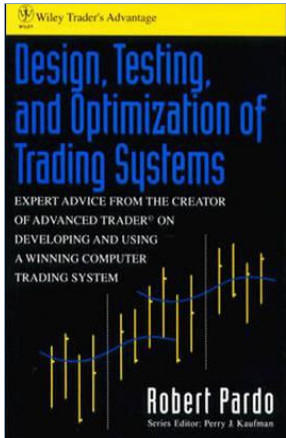
Algorithmic Trading & Technical Analysis Pioneer

- Published comprehensive technical analysis application *Advanced Chartist* in 1985 and *Advanced Trader* in 1986.
- Published the first application – *Swing Trader* – to create, test and monitor trading models

Consultant to Global Firms

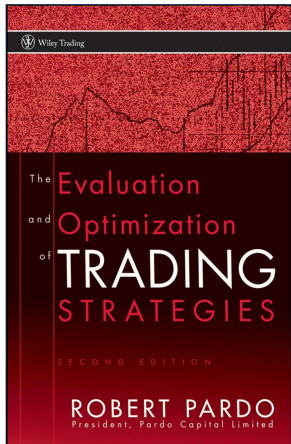
- Goldman Sachs
- Daiwa Securities America

Robert Pardo | Highly Regarded Author



Design, Testing and Optimization of Trading Systems, J. Wiley 1991

"Many consider the first edition of his book a classic."
Bill Dunn

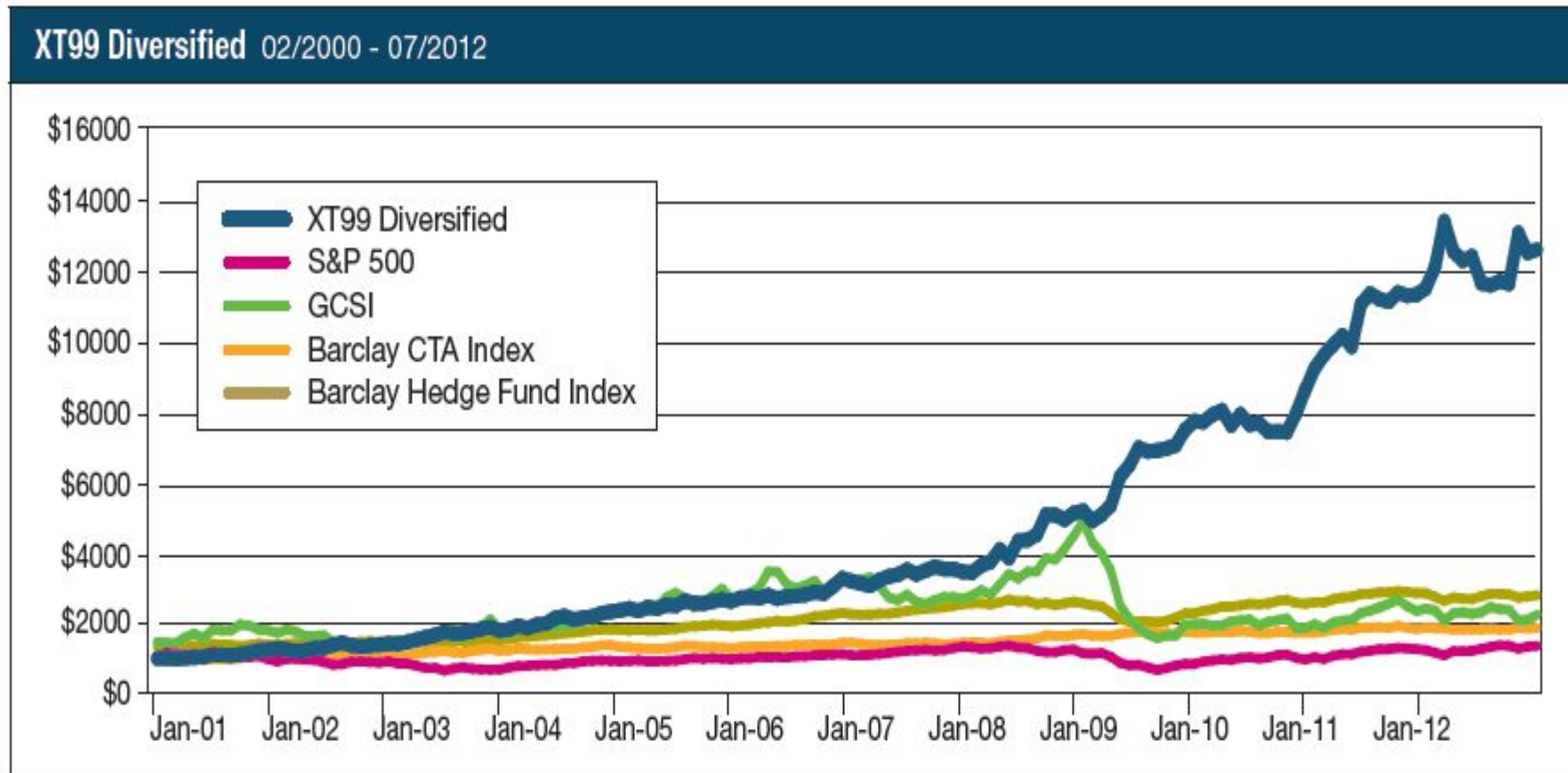


The Evaluation and Optimization of Trading Strategies, J. Wiley 2007

"Ask serious system developers for their recommended reading list and Pardo's book is likely among the first mentioned."
Art Collins



XT99 Diversified | Performance



XT99 Diversified | Essential Statistics

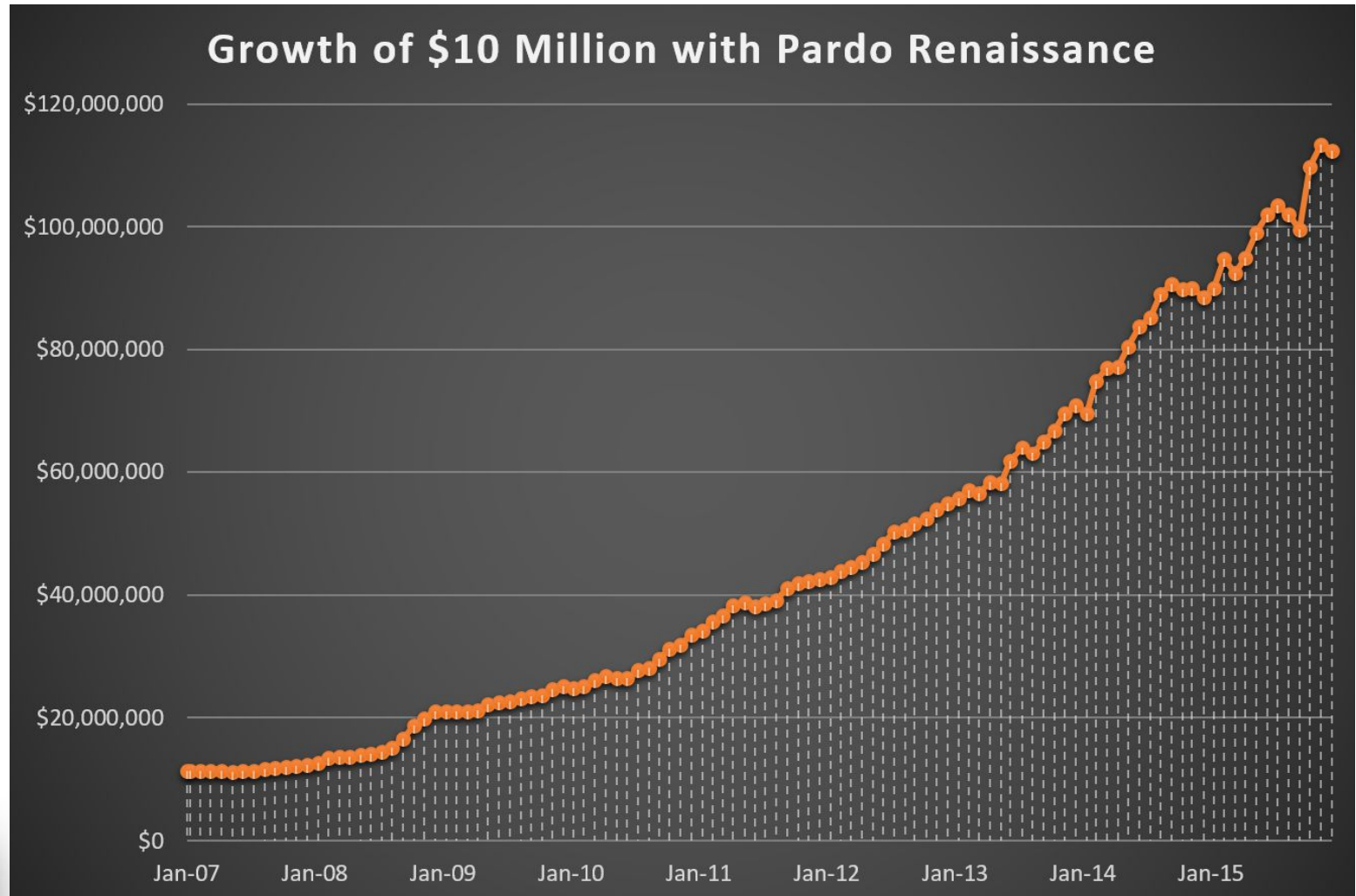
| Essential Statistics | |
|--------------------------------|---------|
| Return Analysis | |
| Compound Annual Return | 21.01% |
| Annualized Standard Deviation | 13.37% |
| Cumulative Return | 984.65% |
| Risk Analysis | |
| Largest Drawdown | 13.29% |
| Average Margin to Equity Ratio | 8.78% |
| Sharpe Ratio | 1.28 |
| Sortino Ratio | 2.82 |
| Calmar Ratio | 1.58 |
| Correlation Analysis | |
| S&P 500 | -0.252 |
| Treasury Bonds | 0.320 |
| GSCI | .012 |
| Barclay CTA Index | 0.335 |
| Barclay Hedge Fund Index | -0.176 |

Hypothetical Performance Disclaimer

Pardo Renaissance Diversified is based upon the same time-proven and established trading algorithm which produced the *original XT99 Diversified's* storied 12+ year track record and 19.75% ARR . However, it benefits from a number of new algorithms produced by years of research and development. These enhancements include model calibration, risk management and portfolio weighting and construction algorithms. However, although the XT99 trading algorithm has been successfully traded for over 12 years, *Pardo Renaissance* has never traded in real-time in these exact forms. We therefore are required by the NFA to categorize the performance of these new products as hypothetical and to provide the following disclaimer.

HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM. ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR TO ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING RESULTS.

Pardo Renaissance Diversified | Performance



Pardo Renaissance Diversified | Essential Statistics

| Essential Statistics | |
|-------------------------------|---------|
| Returns | |
| Compound Annual Return | 29.01% |
| Annualized Standard Deviation | 9.1% |
| Cumulative Return | 889.90% |
| Risk | |
| Largest Drawdown | 3.84% |
| Maximum Margin Equity Ratio | 15% |
| Sharpe Ratio | 2.55 |
| Sortino Ratio | 10.44 |
| Correlations | |
| S&P 500 | -0.08 |
| Treasury Bonds | -0.05 |
| GSCI | -0.21 |
| Barclay CTA Index | .40 |

| Compound Annual Returns | |
|-------------------------|--------|
| Portfolio | |
| 5 yr | 27.36% |
| 3 yr | 26.98% |
| 1 yr | 26.84% |
| Since Inception | |
| 889.90% | |

| Time Windows | | | |
|-----------------|--------|--------|---------|
| Length (Months) | Best | Worst | Average |
| 1 | 12.61% | -2.42% | 2.18% |
| 3 | 31.62% | -2.37% | 6.82% |
| 6 | 49.98% | -0.49% | 14.24% |
| 9 | 54.04% | 4.44% | 22.45% |
| 12 | 71.91% | 8.09% | 31.36% |
| 18 | 86.73% | 23.89% | 51.60% |

The Elements of Successful Trading

- ❖ *A Profitable and Robust Trading Strategies*
- ❖ *A Scientific, Exhaustive and Repeatable Strategy Design and Validation Process*
- ❖ *Sound Risk and Money Management*
- ❖ *Portfolio and Strategy Management*

Trading Performance Has Been Driven by Technology

- ❖ *Continuous and rapid increase in computers*
 - Processor speed
 - Memory capacity
 - Storage
 - Programming
- ❖ *Data*
 - Widely available
 - Affordable

The New Frontier

❖ *These technological advances have given rise to -*

- Wide spread high-performance algorithmic trading
- High-speed trading and market making

❖ *These rapidly growing advances make Artificial Intelligence*

- Affordable
- Usable by ever more traders
- Scalable

The Opportunity and Challenge

- ❖ *Technological advances have made algorithmic trading highly profitable and ubiquitous*
- ❖ *These continuing recent technological advances will make artificial intelligence ubiquitous in the next 5 to 10 years*
- ❖ *Artificial Intelligence and Machine Learning will produce amazingly profitable “marriages” of algorithmic and discretionary trading styles*
- ❖ *This “marriage” plus the additions of sophisticated pattern recognition, forecasting and machine learning will lead to unparalleled advances in trading performance*

What Is Artificial Intelligence?

❖ *The theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.*

Artificial Intelligence for Trading

- ❖ *Artificial Intelligence has evolved into a vast domain*
- ❖ *The main areas where I see immediate application for trading are –*
 - Expert Systems
 - Neural Nets
 - Machine Learning

❖ *Expert System*

- “A piece of software programmed using artificial intelligence techniques. Such systems use databases of expert knowledge to offer advice or make decisions in such areas as medical diagnosis and trading on the stock exchange.”

❖ *Rule-Based Logical Reasoning*

❖ Advantages

- Can be exhaustive
- Preserves established knowledge and methods
- Provides access to this domain of expertise
- Puts this expertise to work

❖ Disadvantages

- Requires an expert(s) and knowledge engineer
- Only as good as expertise
- Expensive to create

How Can an Expert System Help?

- ❖ *Make Trading Expertise Available to other Traders*
 - Can supply the full expertise of the most accomplished traders to all in firm in a very accessible manner
- ❖ *A expert knowledgebase can be used to improve*
 - The research process
 - Market conditions
 - Performance of strategy
 - Management of portfolio
- ❖ *Can be developed into a stand-alone algoithmic trading strategy and trade with great expertise*

❖ *Neural Net*

- ❖ ”A neural network is a system of hardware and/or software patterned after the operation of neurons in the human brain. Neural networks -- also called artificial neural networks -- are a variety of deep learning technologies. Commercial applications of these technologies generally focus on solving complex signal processing or pattern recognition problems.”

❖ *Intensive Computer Analysis of Data*

❖ Advantages

- No human expert required
- Can find very complex and subtle patterns
- Can identify patterns
- Can make predictions

❖ Disadvantages

- Difficult to create correctly
- Logic opaque and unknowable
- Requires a lot of computational power
- Can be the ultimate curve fitting tool
- Complications in real-time usage

How Can Neural Nets Help?

❖ Expert pattern recognition

- Chart patterns
- Complex patterns between price, volume and indicators

❖ Analyze market conditions

- Trending or congesting
- High or low volatility

❖ Make price and price swing predictions

❖ *Machine Learning*

- “Machine learning is a type of artificial intelligence that provides computers with the ability to learn without being explicitly programmed. Machine learning focuses on the development of computer programs that can teach themselves to grow and change when exposed to new data.”

❖ *Sophisticated Analysis that Grows Better Over Time*

❖ Advantages

- No human expert required
- Can incorporate neural nets and overlap
- Most important – *can learn and grow* become increasingly more effective with use

❖ Disadvantages

- Difficult to create
- Requires sophistication in design phase
- Requires a lot of computational power

How Can Machine Learning Help?

❖ *Can be “Taught” to Evaluate and Improve*

- Real-time trading strategy performance
- Portfolio re-balancing
- Strategy and market weighting

❖ *Can Be “Taught” to Trade and Improve*

In Conclusion

- ❖ *Algorithmic trading has proven itself to be highly profitable and has therefore become very widely used.*
- ❖ *Trading with various forms of artificial intelligence applications will prove itself to be even more profitable.*
- ❖ *Trading with AI is the next frontier.*

For More Information

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