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Enlightened Stock Trading

Uses and Abuses of Optimization in Systematic Trading

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Uses and Abuses of Optimization

(The Most Powerful Tool That Most Traders Use Incorrectly)

Have you ever…

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- Worried about whether your backtest results were realistic?

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- Tested trading rules that worked on past data but lost money in real trading?
- Thought backtesting doesn't work because the past is not the same as the future?
- Designed and optimized a system only to find out of sample performance is terrible?

All of these, and many more trading problems are caused by the same issue…

Incorrect Optimization

What we will cover today…

- How the industry drives you to fail in system development & optimization by asking the wrong questions
- What your evil nemisis is as a system trader and the biggest pitfalls you MUST avoid if you want a profitable trading system
- How to quickly to build unshakeable confidence that your trading approach works and keep you safe no matter what the market is doing

Principle #1: Ask The Right Questions

"How the industry drives you to fail in system development & optimization by asking the wrong questions"

When you open your trading software, what questions do you naturally ask?

When you open your trading software, what questions do you naturally ask…

- Which is the best indicator?
- What are the best input parameters for my system?
- What rules could I add to make my trading system better?
- What tweaks can I make to make my system more profitable?

The problem is all of these questions are backwards looking…

… so you focus on improving your backtest results…

… but fail to make your actual trading any better

Harry

Situation:

- Trading forex markets using automated trading systems
- Had a relatively simple system which made logical sense
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Solution:

- Change the question from “What parameter combination gives the best backtest?” to “What rules and parameters give the greatest chance of future profitability?”
- His systems started making money in real time trading because of the new focus

Focus on the right question…

"What rules and parameters will give me the greatest chance of future profitability?"

Principle #2: Avoid Optimization Traps

"Your evil trading nemisis and the biggest pitfalls you MUST avoid if you want a profitable system"

Definitions

BACKTESTING

"Applying your trading rules to historical data to see how well they performed in the past"

Definitions

OPTIMIZATION

“Varying rules and parameter values to improve the performance of a trading system”

Definitions

CURVE FITTING

"Fitting the rules and parameters of your trading system to past conditions, events, price behavior so closely that the model loses the ability to profit on future, unseen data"

Curve Fitting is the EVIL NEMESIS of system traders!

At a high level, curve fitting can be a result of:

1. **Optimization Technique**
2. **Structural Affects**
3. **Trade Inclusion / Exclusion**
4. **Market Dynamics**

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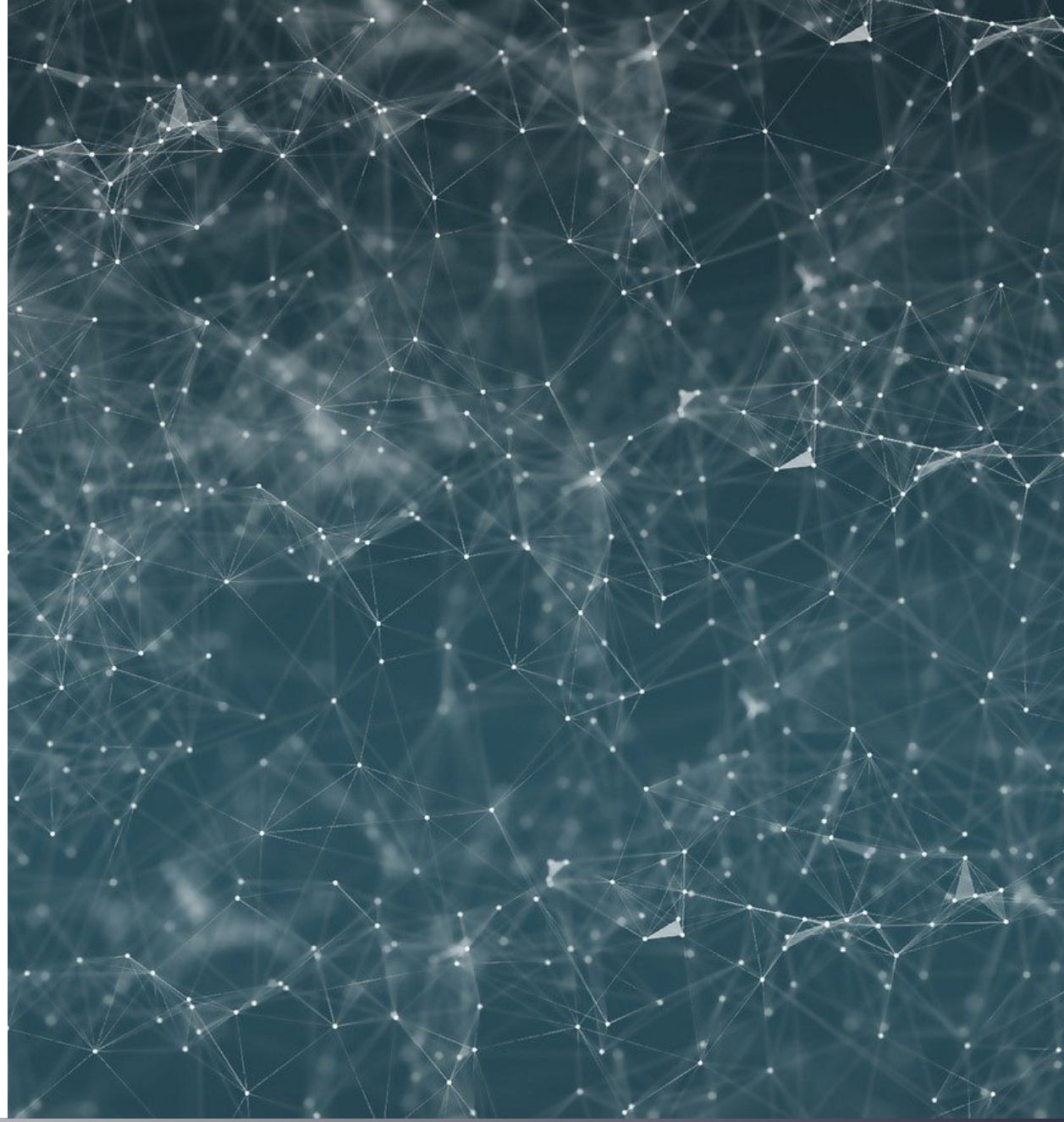
1. OPTIMIZATION TECHNIQUE

Curve fitting from when parameter values are too finely tuned to past conditions

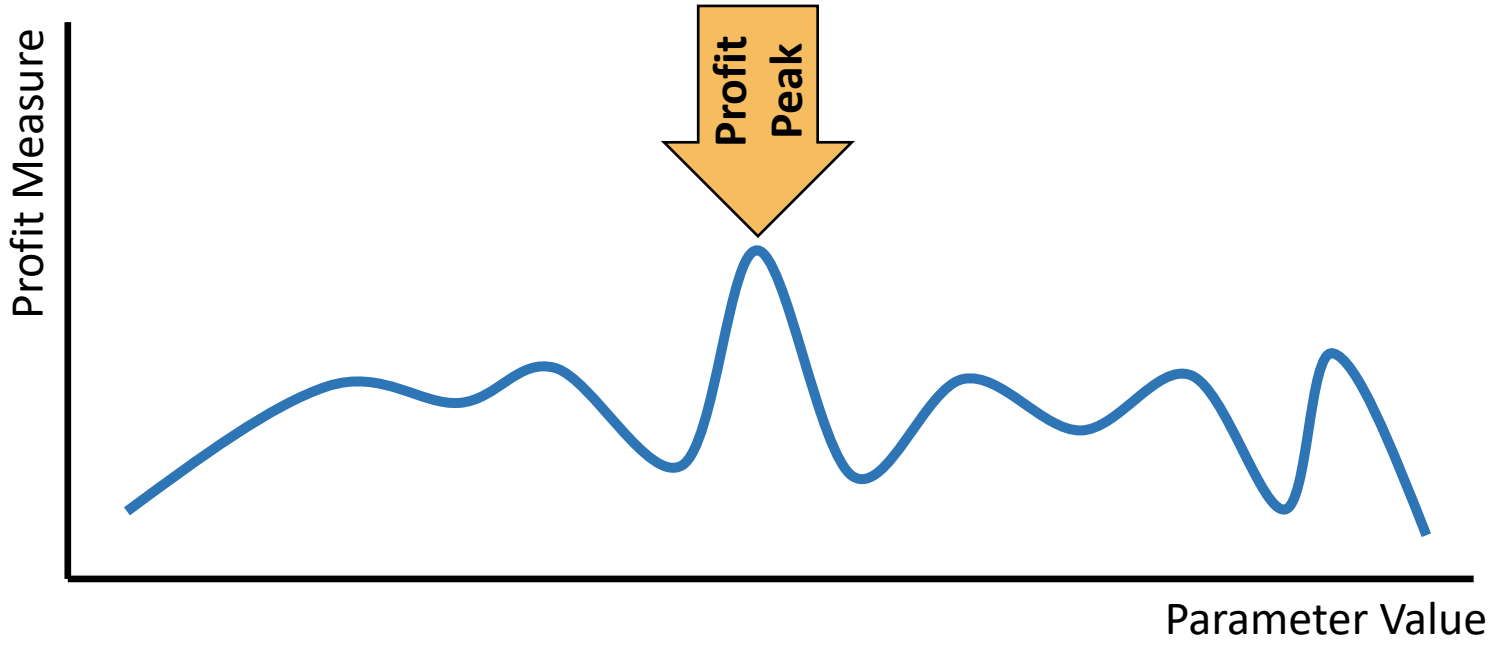
Optimization Technique

Unstable Profit Peaks



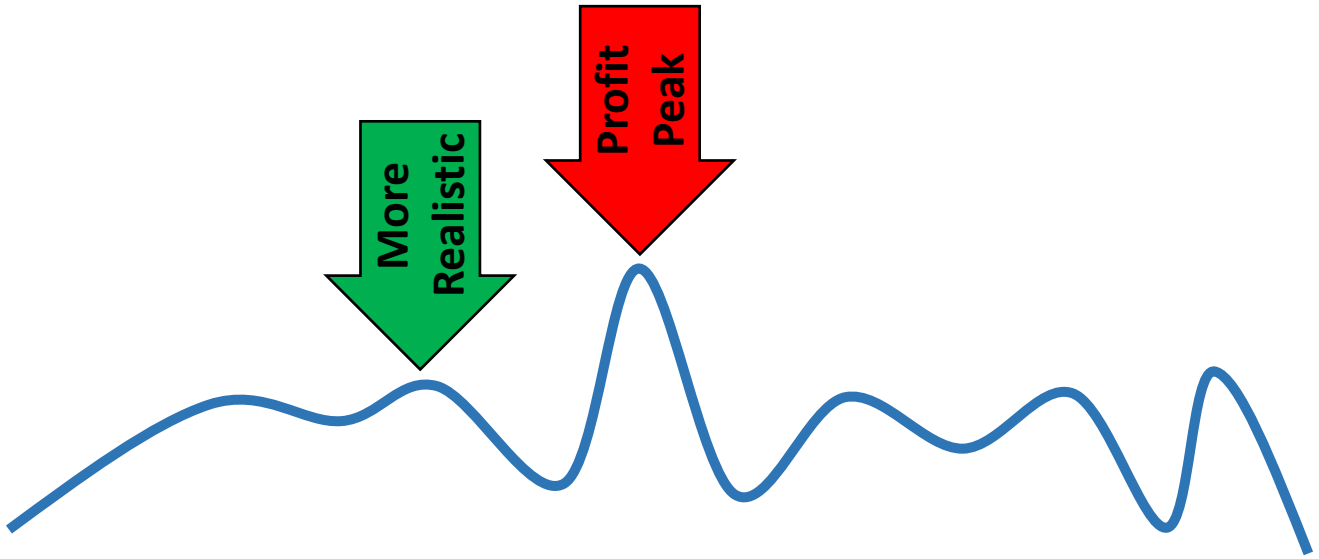
Unstable Profit Peaks

- **Situation:** Whenever we optimize a parameter we have the risk of selecting a value which is a profit peak rather than a sustainable, stable performance level

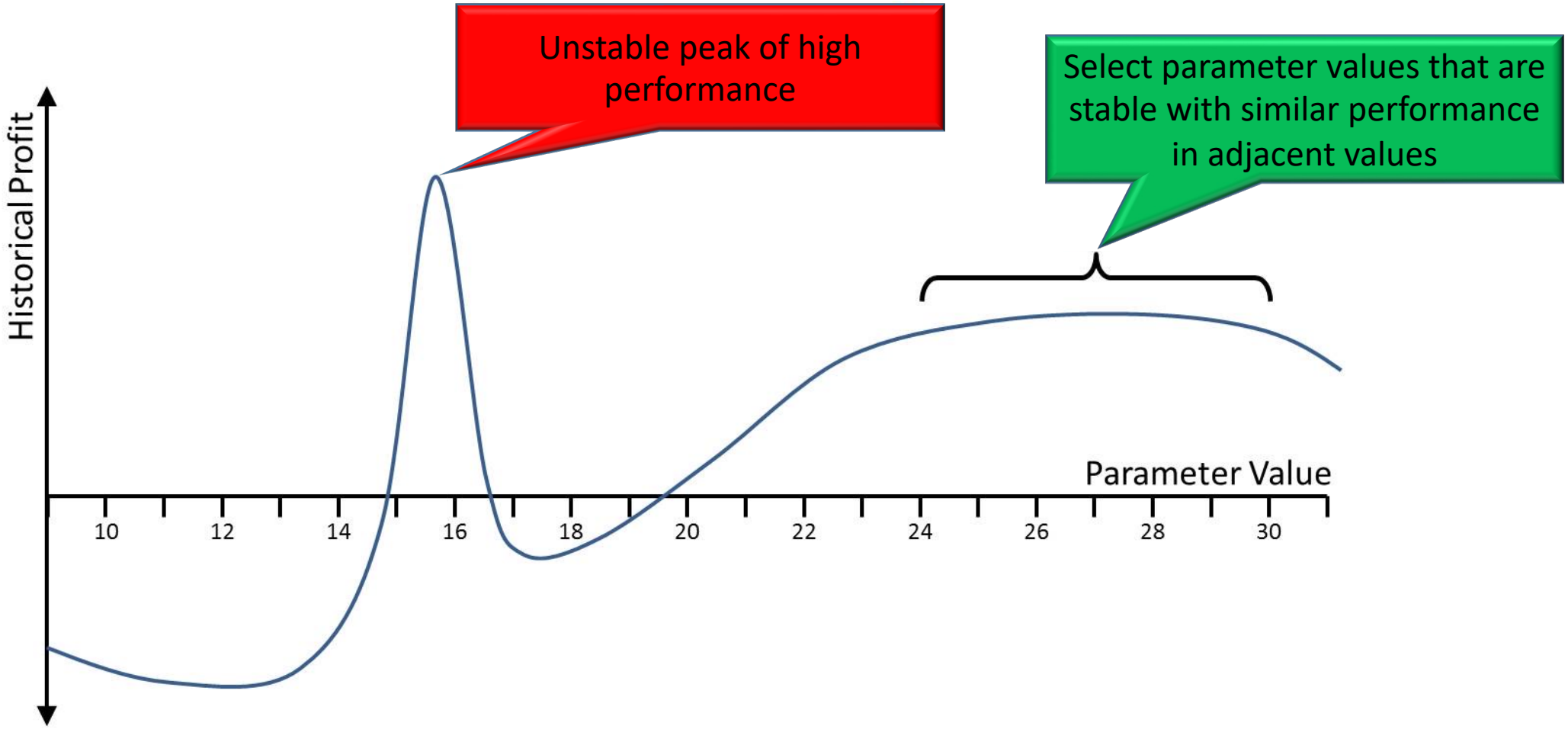


Unstable Profit Peaks

When selecting your parameter values, intentionally avoid profit peaks and choose a value which is broadly representative of the surrounding parameters

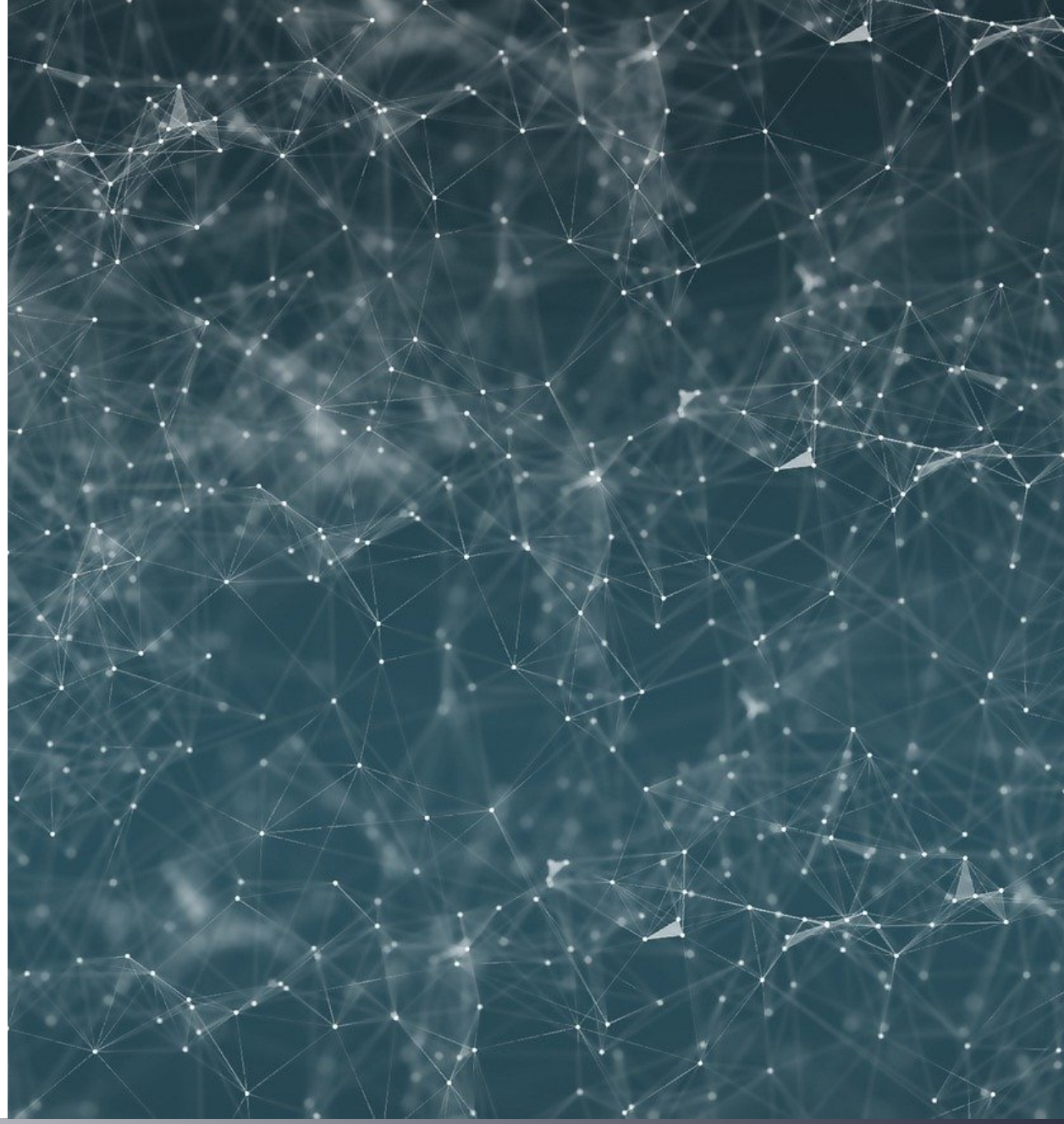


Unstable Profit Peaks

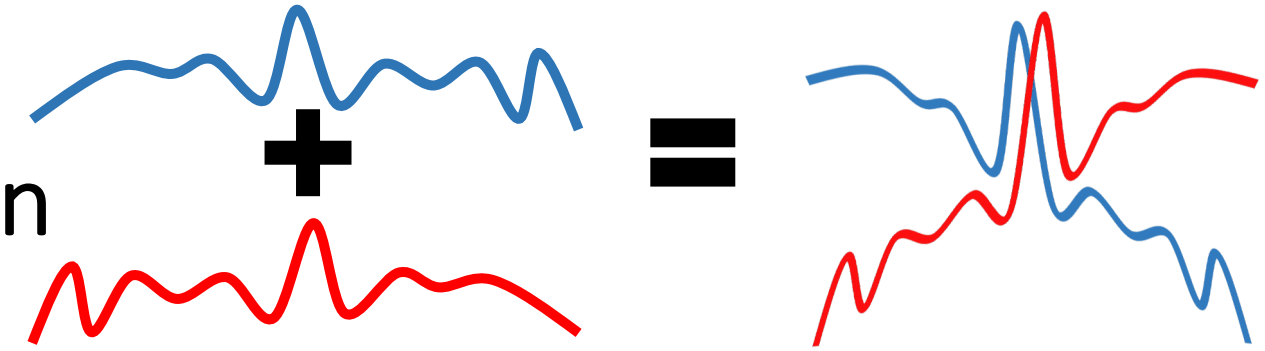


Optimization Technique

Brute Force Optimization



Brute Force Optimization



- **Situation:**
  - With each parameter we have the risk of selecting a value which is a profit peak
  - Optimizing multiple parameters simultaneously MAGNIFIES this risk
- **Problem:**
  - When multiple parameters are optimized simultaneously profit peaks compound together to give unrealistically positive backtest results
  - 10% uplift from each of 5 parameters due to an unstable profit peak drastically overstates system profitability!
- **Analogy:** Go to the most exclusive shopping centre, walk into the best jewelry store and talk to the best salesman and ask for the best diamond and you will overpay for that diamond compared to the real value of the diamond

Brute Force Optimization

Brute Force Optimization of all parameters in your system sounds clever, but unless you do a LOT of analysis on the results to find stability in your parameter space your optimization is guaranteed to be heavily curve fit

Optimizing one parameter at a time is safer

At a high level, curve fitting can be a result of:

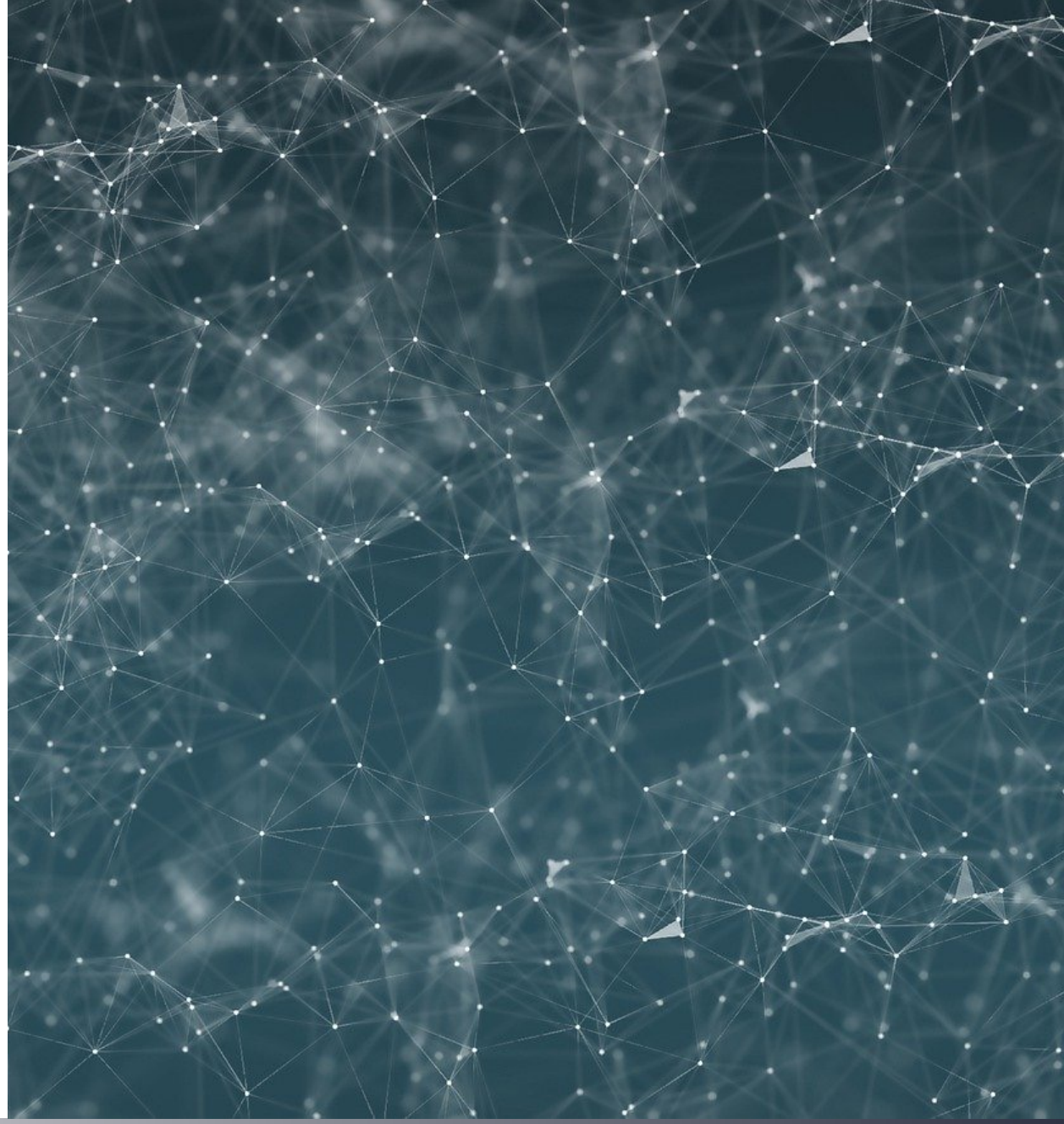
1. **Optimization Technique**
2. **Structural Affects**
3. **Trade Inclusion / Exclusion**
4. **Market Dynamics**

2. STRUCTUAL AFFECTS

Curve fitting that results from the system structure or the interaction between system components during the design process.

Structural Affects

Number Of Trades



Number of Trades

- **Situation:** There is huge variance in the trade outcomes your system gets. Optimization is extremely sensitive to which trades are included in the backtest

- **Problem:**
  - To make credible optimization decisions you therefore need a lot of data
  - Each additional rule requires exponentially more data
  - Optimizing your system with a compounding equity curve can give you limited data points because you can only fit so many trades into the portfolio.

- **Analogy:** Watching a batter hit two home runs and assuming he is a star batter … only to discover those were random flukes and he as a terrible batting average over the last 5 seasons

Number of Trades

The more complex the system, the more trades you need to give the optimization access to as many trades as possible.

To do this you can:

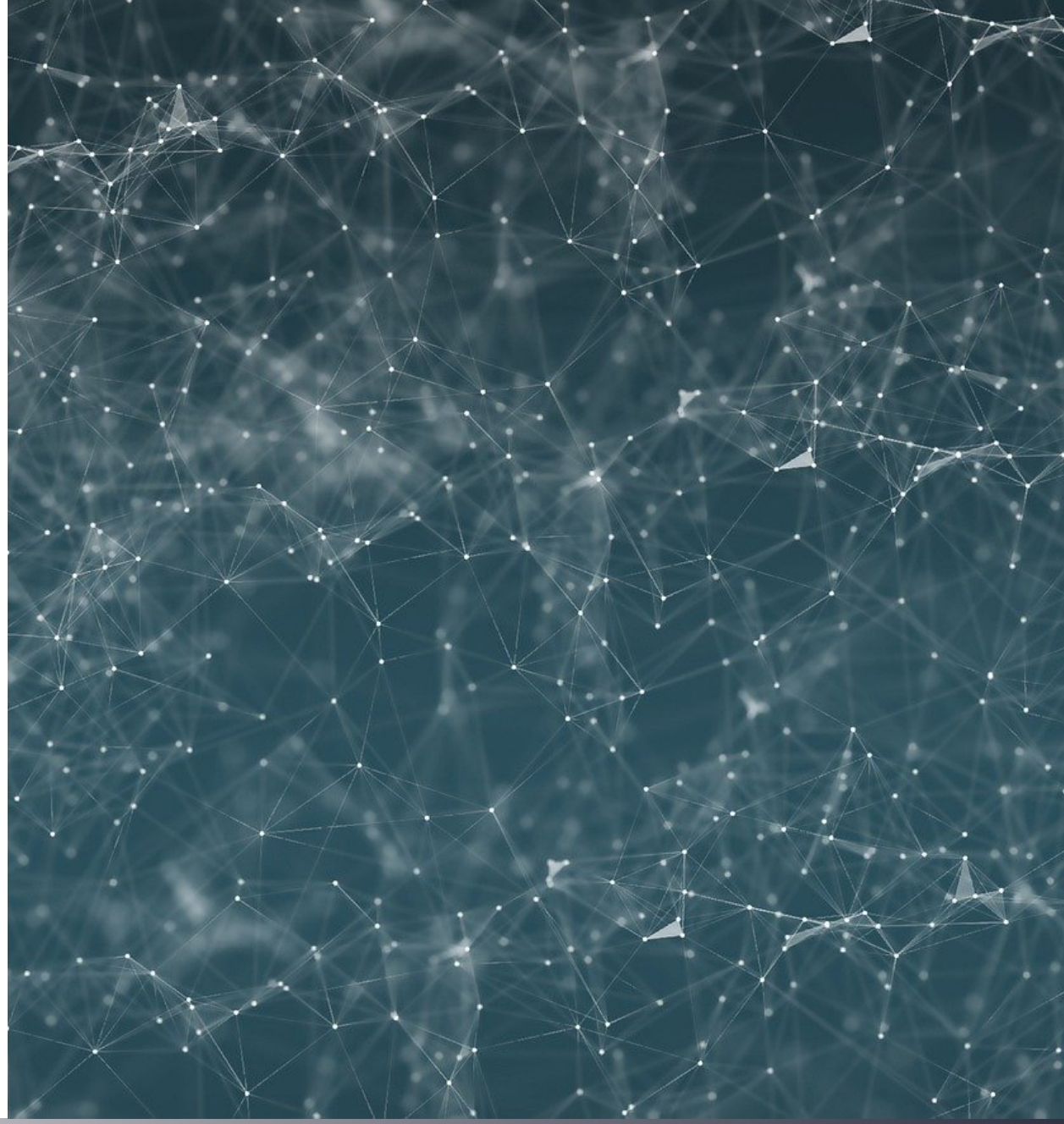
- *Loosen filters*
- *Reduce position size*
- *Use Monte Carlo optimization techniques to test over many portfolios*
- *Optimize on unconstrained capital with fixed/small position size*

Number of Trades

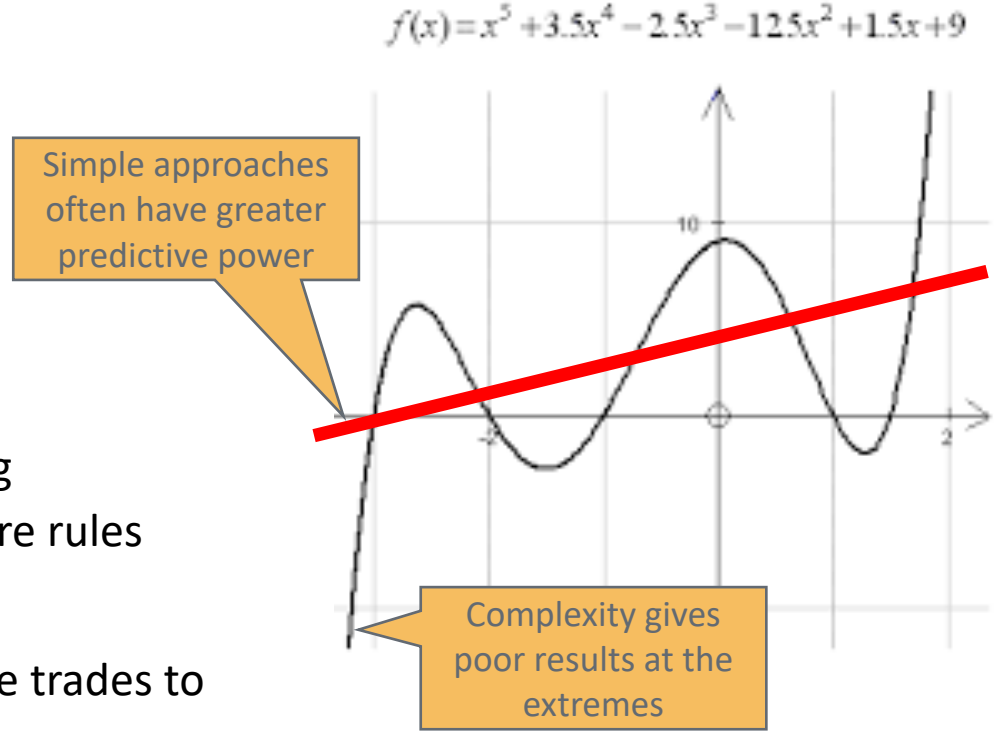
The more trades your optimization touches, the less chance of curve fitting. Even simple systems should have 500 trades for optimization… only tolerate less if the system is exceptionally stable across the whole parameter space

Structural Affects

Number Of Trading Rules



Number of Trading Rules



- **Situation:**
  - The more rules the greater the chance you have of curve fitting
  - Yet most trader's instinct to make a system better is to add more rules
- **Problem:**
  - Each additional rule in your system requires exponentially more trades to optimize with confidence
    - If you have 5 entry rules and one exit rules, the system will probably be curve fit because of the entry
    - If you have 2 entry rules and 4 exit conditions it will probably be curve fit because of the exit
    - IF you have 2 entries, 2 exits and 2 filters your system is more likely to be ok

- **Analogy:** This is like creating a complex equation to explain the data in math class. You might fit the equation to all the data points, but a simple line of best fit probably makes better predictions than your complex equation

Number of Trading Rules

Invest more time simplifying your rules than testing additional filters and rules. Seek the simplest way to capture your ideal move and use filters sparingly.

Aim for 4-6 rules whenever possible.

Use more rules only with extreme caution & scepticism.

At a high level, curve fitting can be a result of:

1. **Optimization Technique**
2. **Structural Affects**
3. **Trade Inclusion / Exclusion**
4. **Market Dynamics**

3. TRADE INCLUSION / EXCLUSION

Inclusion:

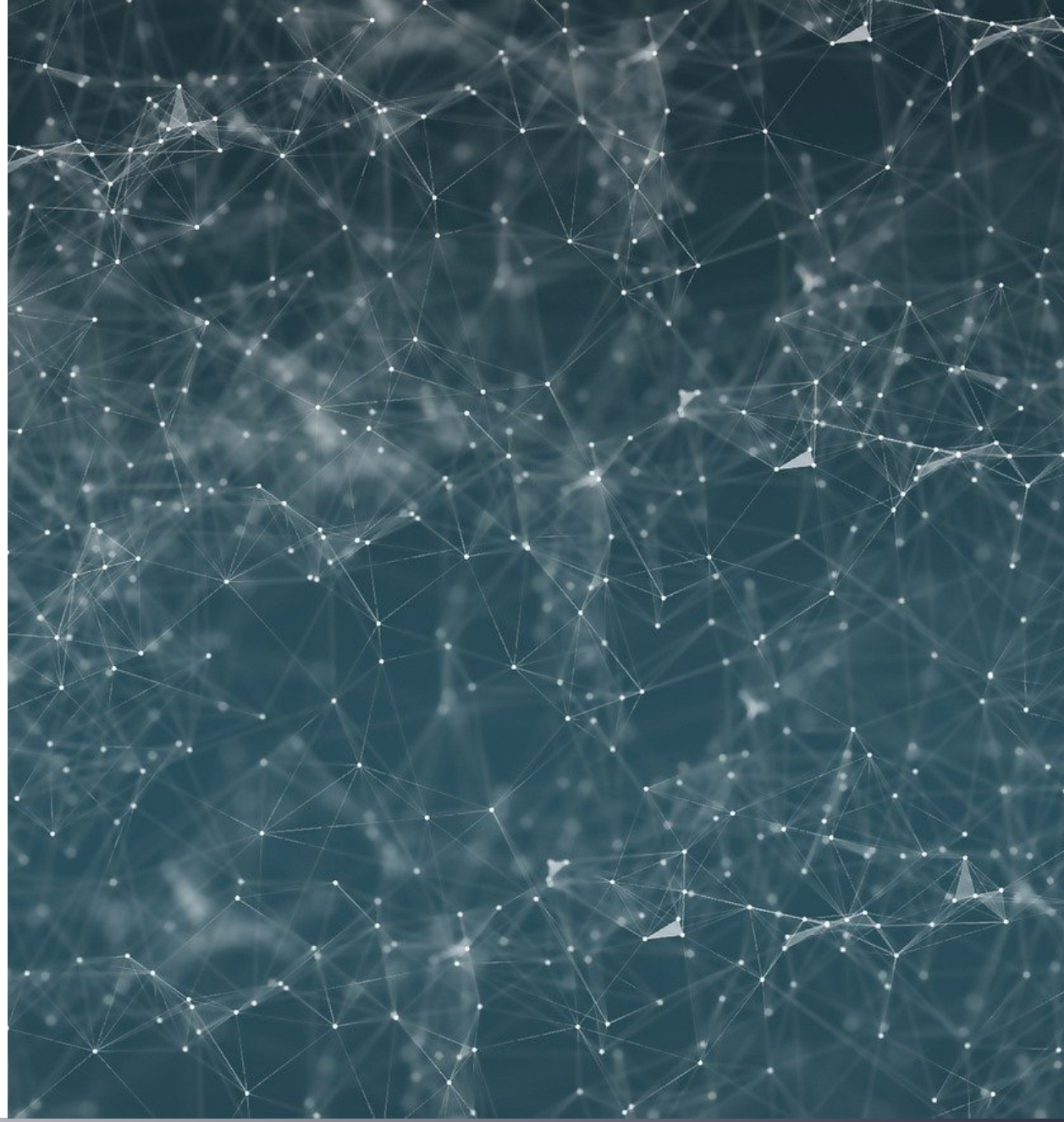
Curve fitting from when you have parameters or rules that catch or tune the system to specific trades which are not representative of the strategy's trade distribution
(ie. Luckily catch a big win)

Exclusion:

Curve fitting from when you have parameters or rules that exclude specific trades which are representative of the strategy's trade distribution. (ie. Luckily sidestep a big loss)

Trade Inclusion / Exclusion

Positive Outliers



Treatment of Positive Outliers

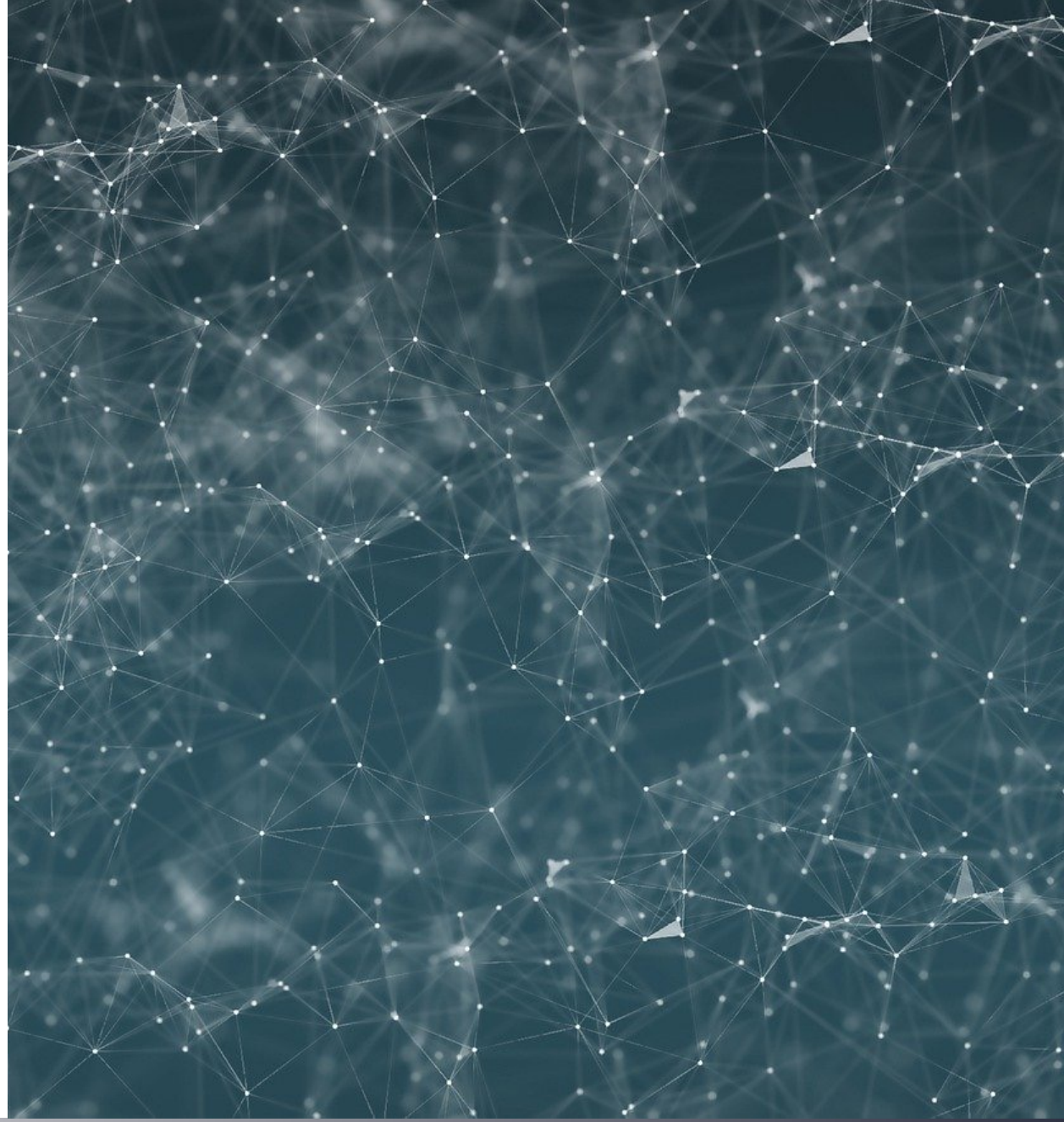
- **Problem:** If too much of the profits come from too few trades you have a high risk of curve fitting to those trades
- **Rule of thumb:** If more than 10% of total system profits come from one trade then there is a big risk you are curve fitting to that trade
- **Solution:** Remove the outlier trades and redo the optimization and compare the parameter values with the trade in and out… if they are different then you were curve fit to that trade

Treatment of Positive Outliers

When we are optimizing first remove huge positive outliers so we don't curve fit to a few large trades

Trade Inclusion / Exclusion

Avoided Negative Outliers



Avoided Negative Outliers

- **Situation:**
  - Occasionally a trading system will have some large negative outliers like when a stock collapses by 50% or more
- **Complication:**
  - Occasionally we find a rule or parameter value that improves our trading system by taking out a small number of large losing trades. This reduces drawdown and makes the equity curve look much better
  - These shock moves do happen in the market from time to time, and they may impact your portfolio
- **Solution:**
  - Be suspicious of any rule that improves your system by only removing a small number of large losing trades

Avoided Negative Outliers

BUT just because our backtest avoided these trades in the past does not mean they will be avoided in the future.

Shocks are by definition unexpected, they do not occur on a schedule or after any specific price pattern…

Avoided Negative Outliers

Any rule that removes a small number of shock adverse trades is suspicious.

Filters are ONLY valid if there is a large number of trades spread over a long period of time removed by the filter.

At a high level, curve fitting can be a result of:

1. **Optimization Technique**
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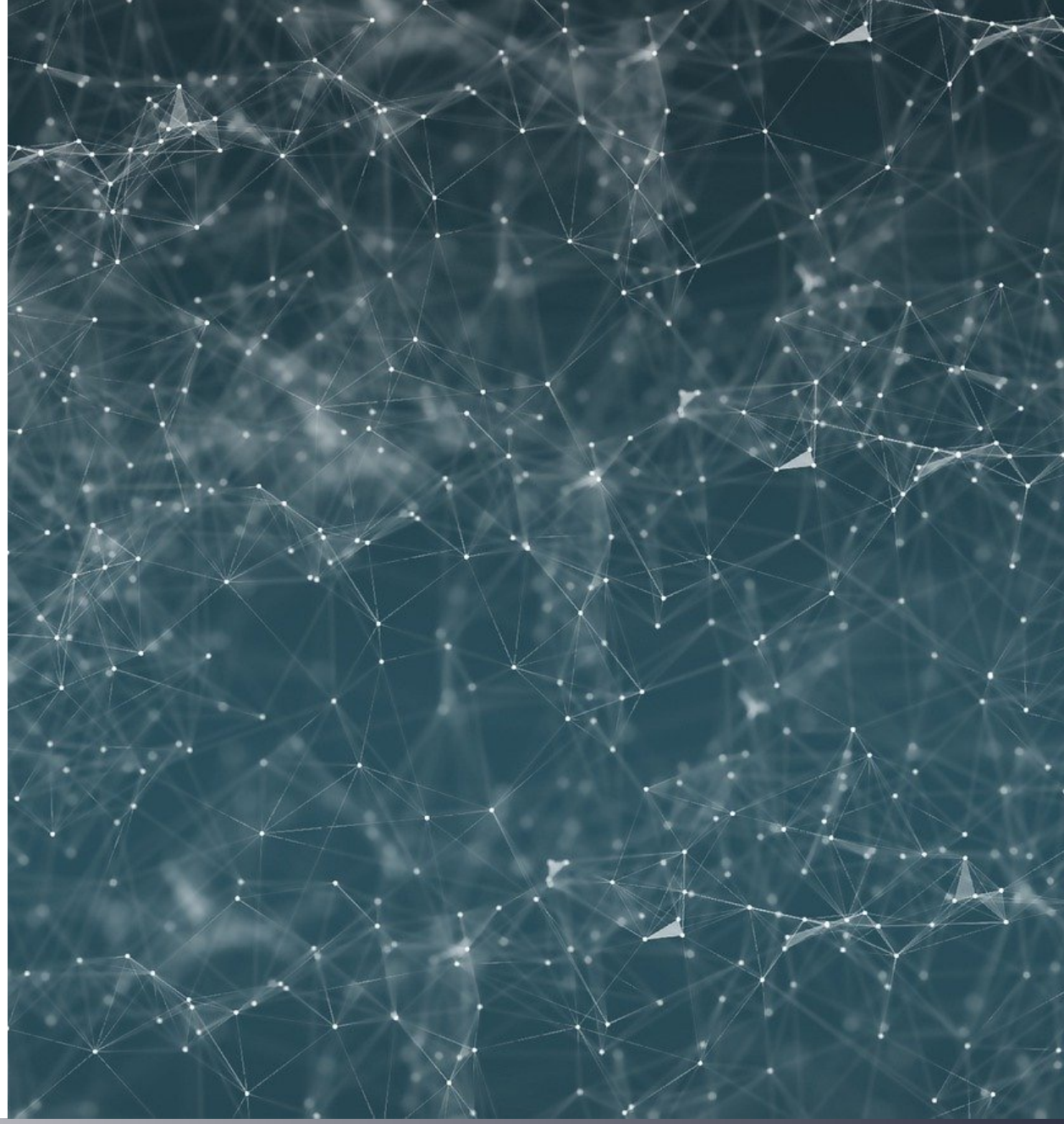
4. MARKET DYNAMICS

Curve fitting from designing a system to a particular market condition that is not readily repeatable

Market Dynamics

Unusual Market Moves



Unusual Instrument or Market Moves:

- **Situation:**
  - Occasionally an instrument or group of instruments will have an extremely large move. Some well known examples:
    - Technology stocks leading up to 2000 (and post 2000 tech bubble burst)
    - 2008 bear market in stocks
- **Problem:**
  - When developing a system it is possible that the system will look great for that one huge move, but not do much or lose money for the rest of the backtest.
  - The system that results will often be curve fit to that single move, which depending on the situation may or may not be repeatable
  - Limited frequency of these market conditions (like bear markets) causes trades to be concentrated in time leading to a high risk of curve fitting to that point in time. 2008 bear market systems are at risk of this
- **Solution:**
  - Keep system as simple as possible
  - Find similar market dynamics elsewhere to test your rules
  - Trade system cautiously

So what can we do about all of this?
How do we avoid these problems in our trading system development?

Principle #3: The Robustness Method

"How to quickly to build unshakeable confidence that your trading approach works and keep you safe no matter what the market is doing"

The Robustness Method

(Building a trading system that works)

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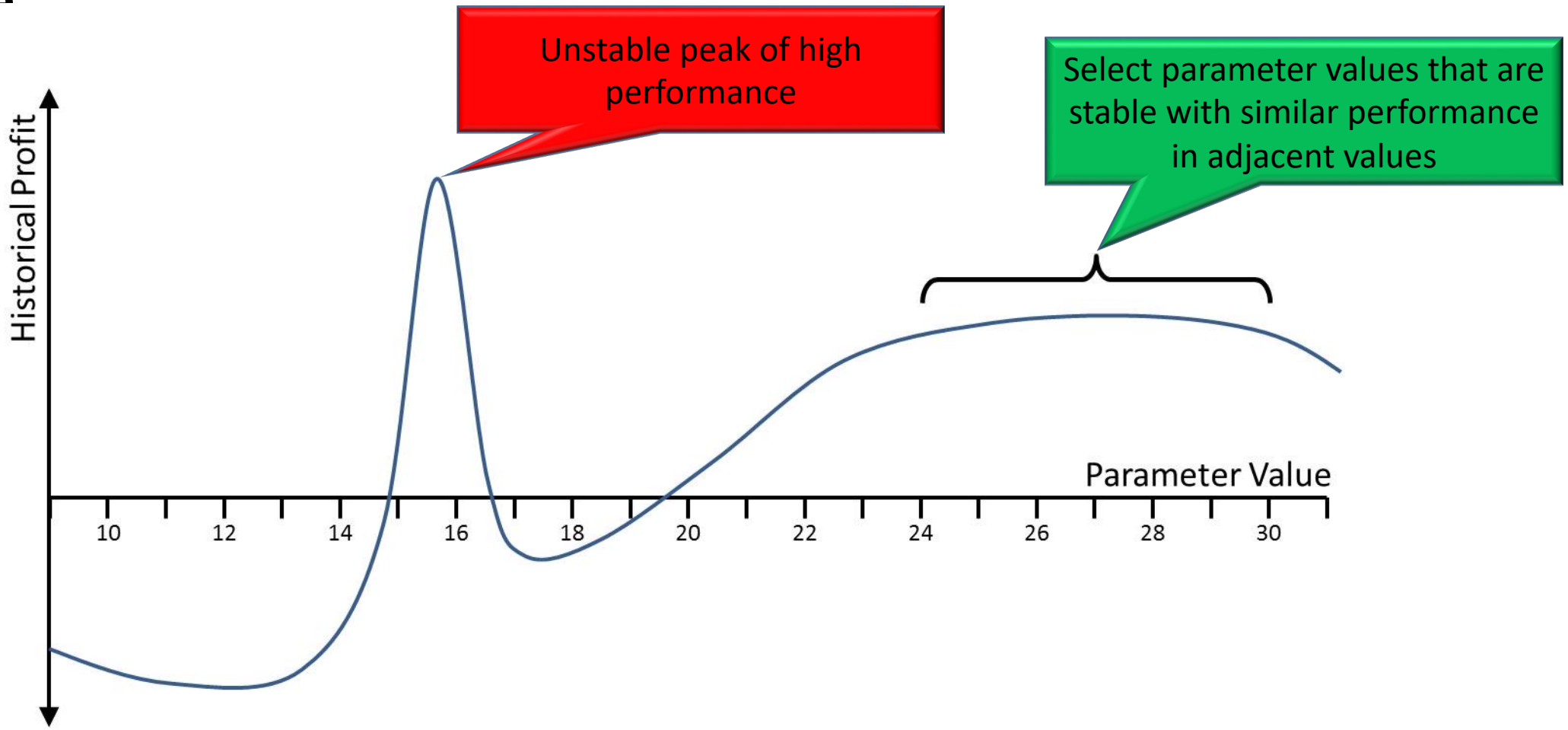
(Building a trading system that works)

- ✓ Stable parameters which perform well even if varied either side of chosen values

Parameter stability is the most critical factor for backtested systems to perform in real time

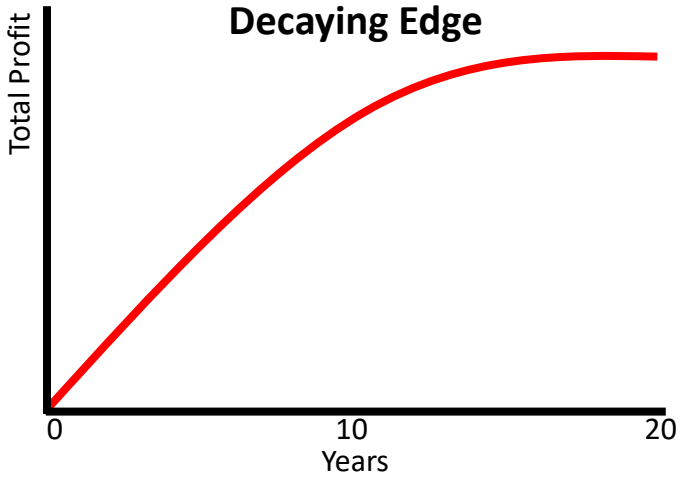


The Robustness Method
(Building a trading system that works)

- ✓ Stable parameters which perform well even if varied either side of chosen values
- ✓ Consistent market edge over 20 year backtest through all market conditions

Consistent Market Edge

Illustrative Backtest Equity Curves



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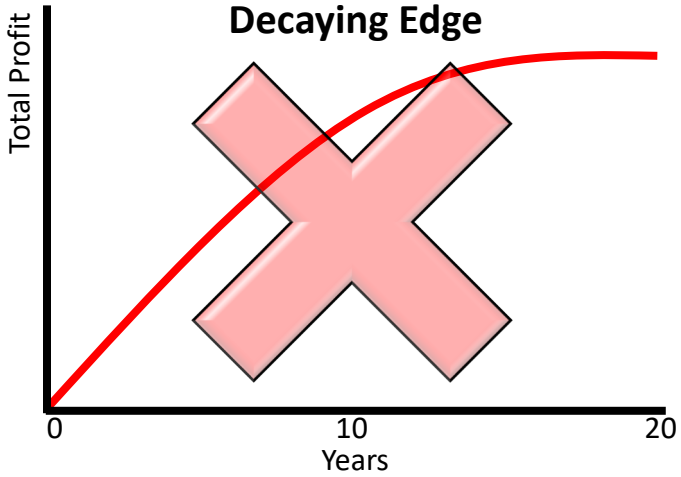

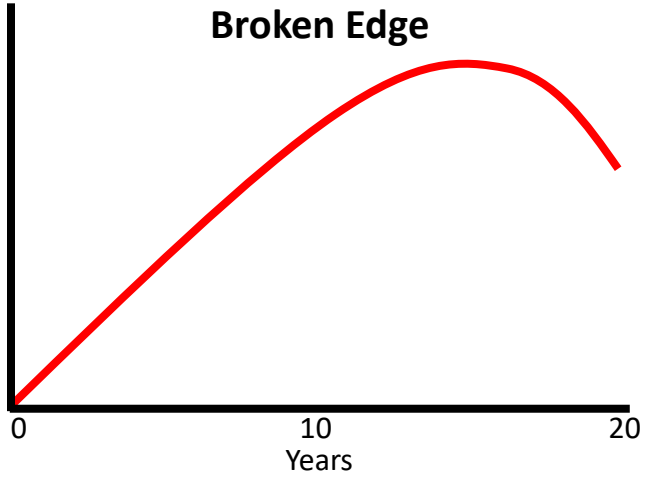

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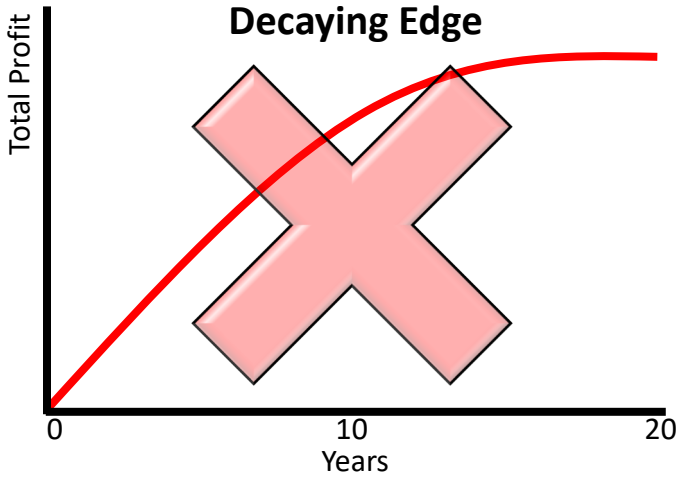

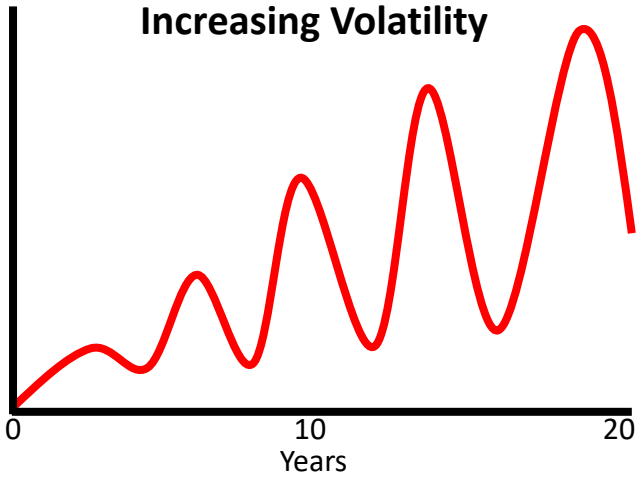

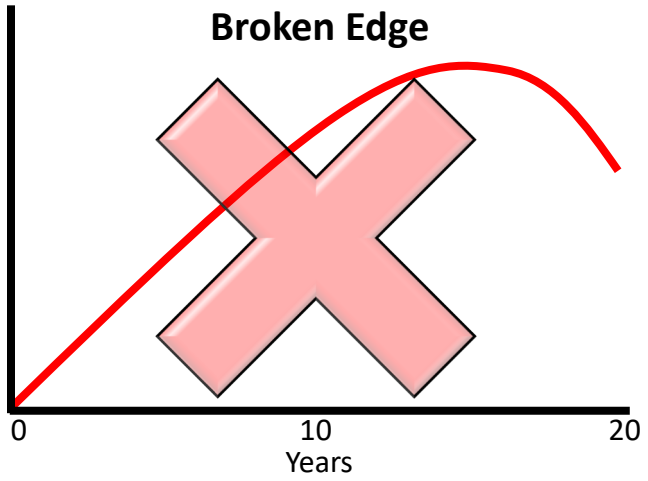

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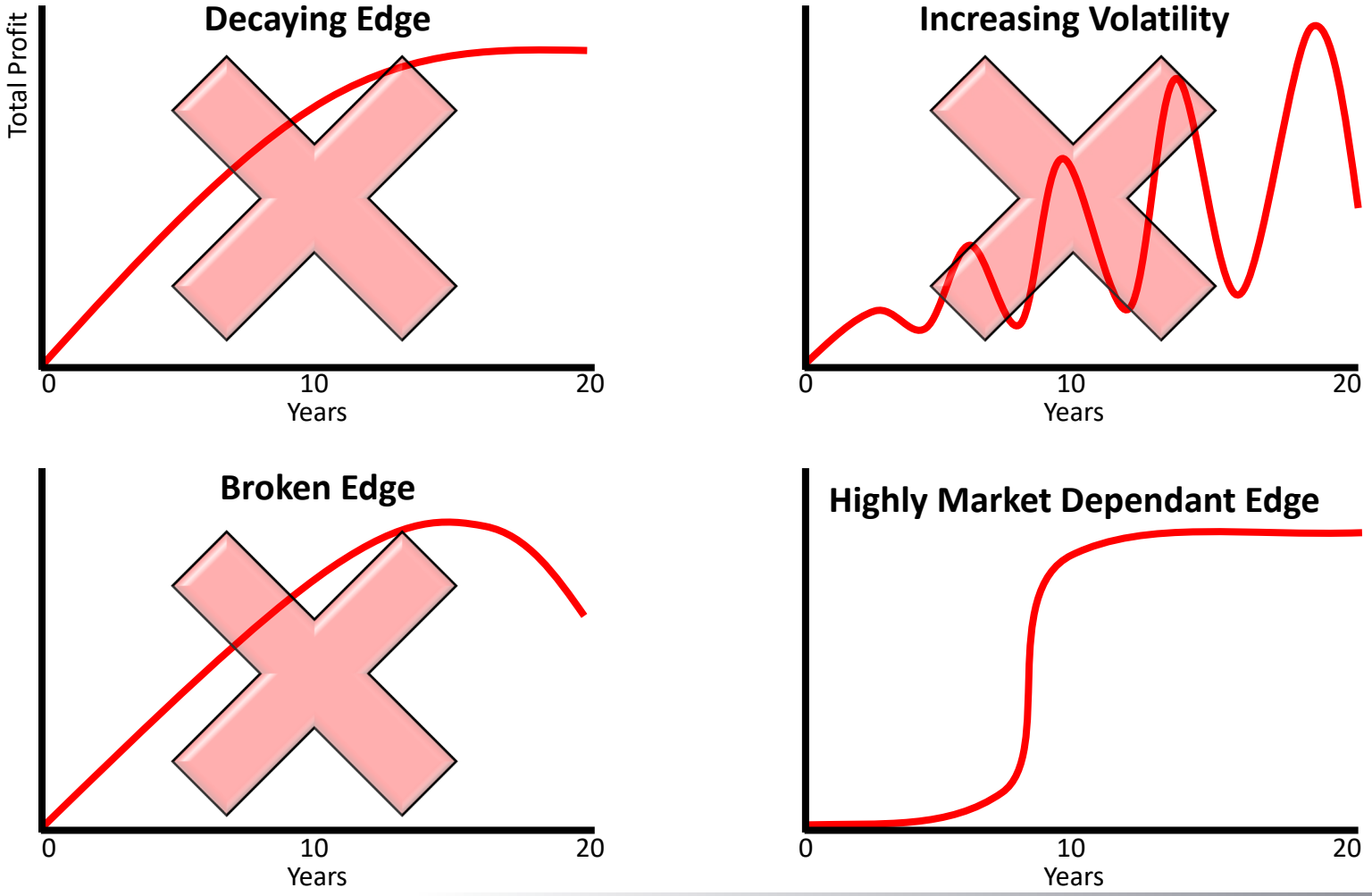

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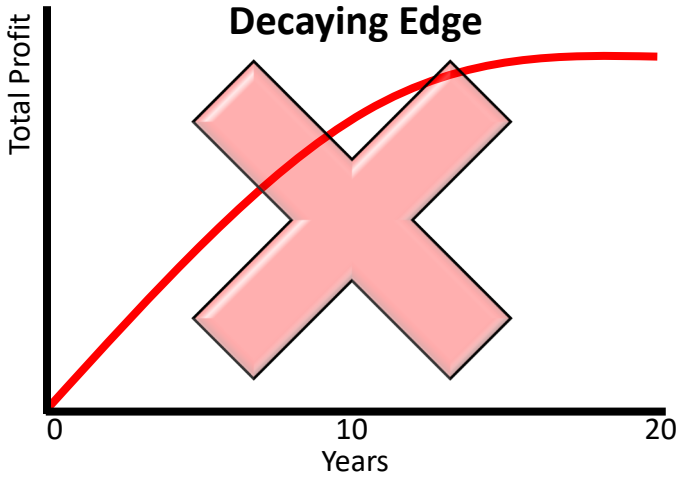
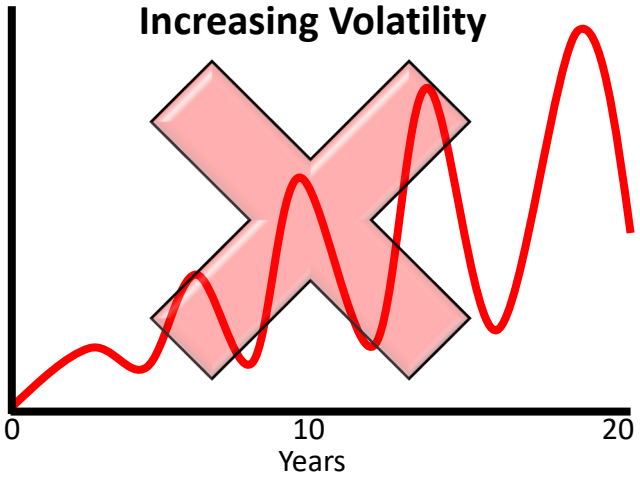
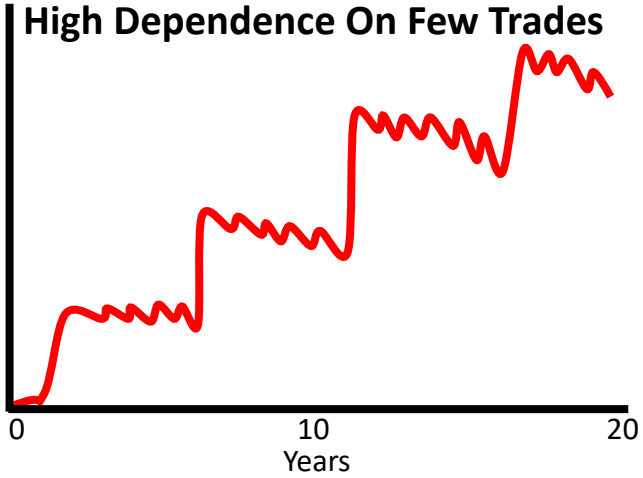
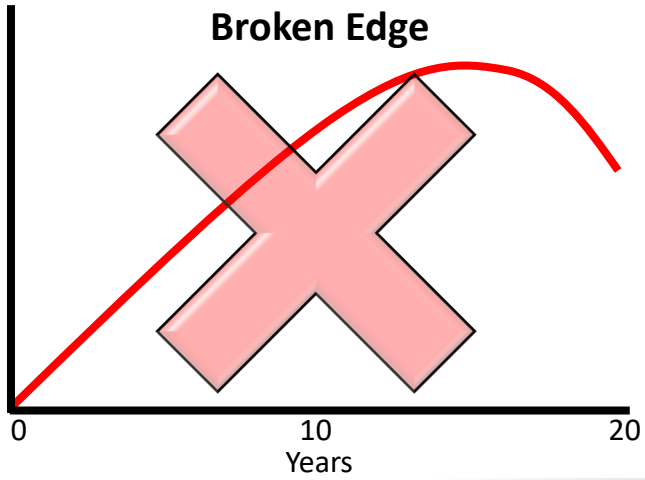
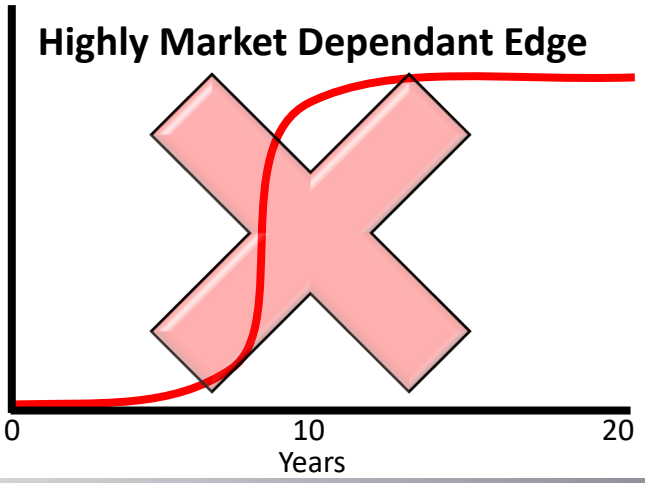




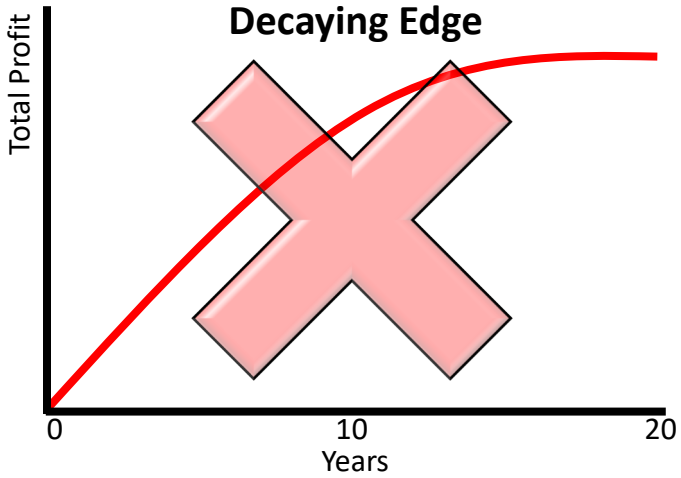


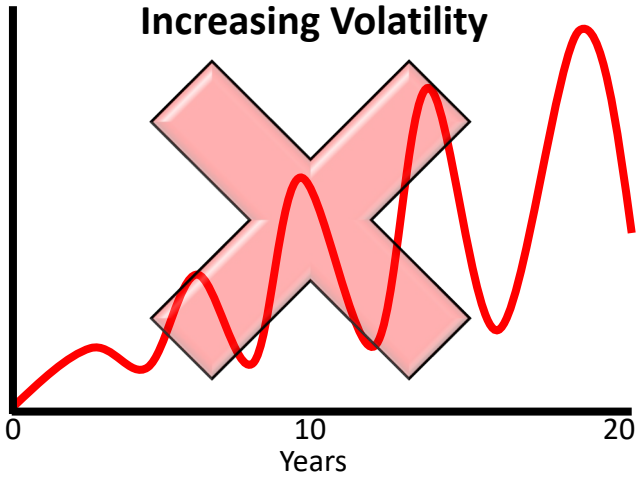


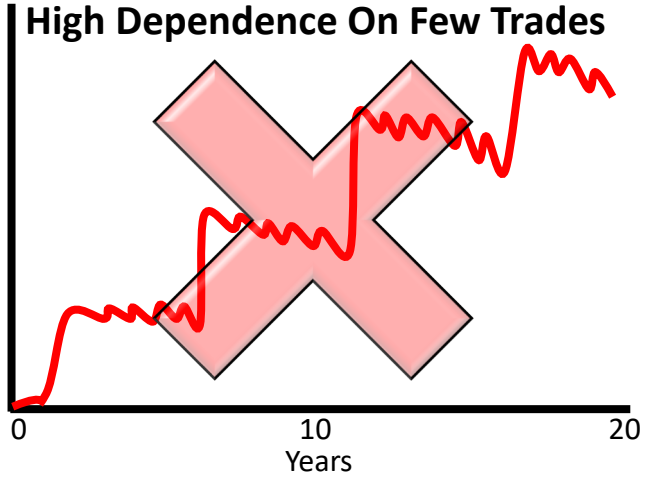


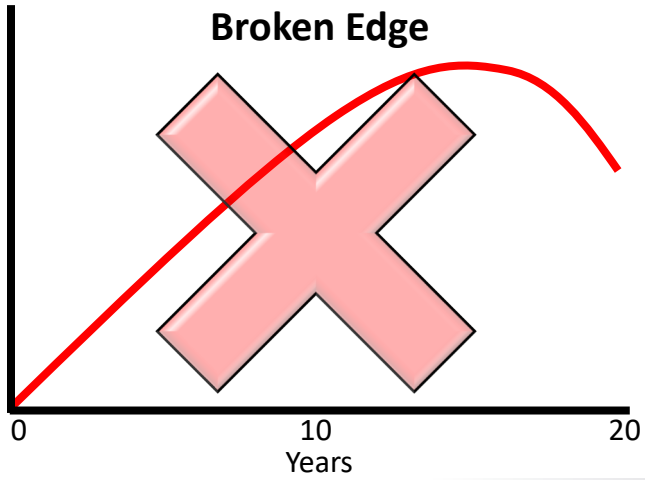
Consistent Market Edge

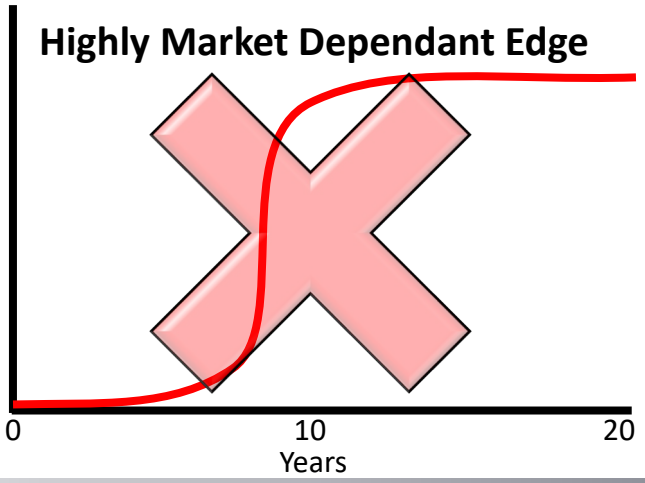
Illustrative Backtest Equity Curves

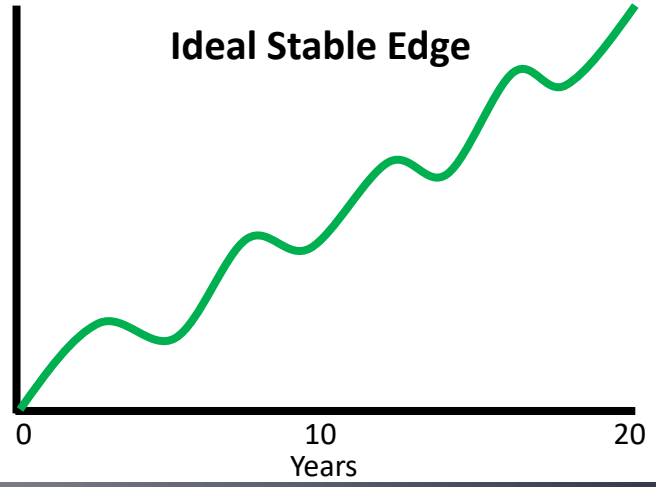












The Robustness Method

(Building a trading system that works)

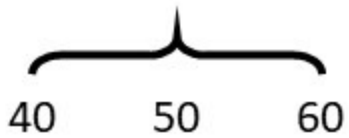
- ✓ Stable parameters which perform well even if varied either side of chosen values
- ✓ Consistent market edge over 20 year backtest through all market conditions
- ✓ System perform well over the entire surrounding parameter space

Robustness means your system is profitable over a wide range of parameter values.

For example:

- Rule 1: EMA(Close,50) > EMA(Close,200)

- Rule 2: Close = HHV(Close,50)



3x3x3 = 27 combinations should all be profitable!

The stability of your chosen parameters values relative to the surrounding values is MORE IMPORTANT than their absolute performance

We have covered…

- Principle 1: Ask The Right Questions
  How the industry drives you to fail in system development & optimization by asking the wrong questions

- Principle 2: Avoid Optimization Traps
  Your evil trading nemisis and the biggest pitfalls you MUST avoid if you want a profitable trading system

- Principle 3: The Robustness Method
  How to quickly to build unshakeable confidence that your trading approach works and keep you safe no matter what the market is doing

Let me ask you…

Let me ask you, do you…

- Want to build absolute confidence in your trading strategy?

Let me ask you, do you…

- Want to build absolute confidence in your trading strategy?
- Want a powerful step by step process to show you how?

Let me ask you, do you…

- Want to build absolute confidence in your trading strategy?
- Want a powerful step by step process to show you how?
- Want FREE training on building robust and profitable trading systems?

FREE BONUS

Trading System Confidence Cheat Sheet + Robustness Method Training

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STOCK TRADING
TRADER SUCCESS SYSTEM

QUESTIONS?

SCAN ME

bit.ly/tradingconfidence