Algo-Trading

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Algorithm building
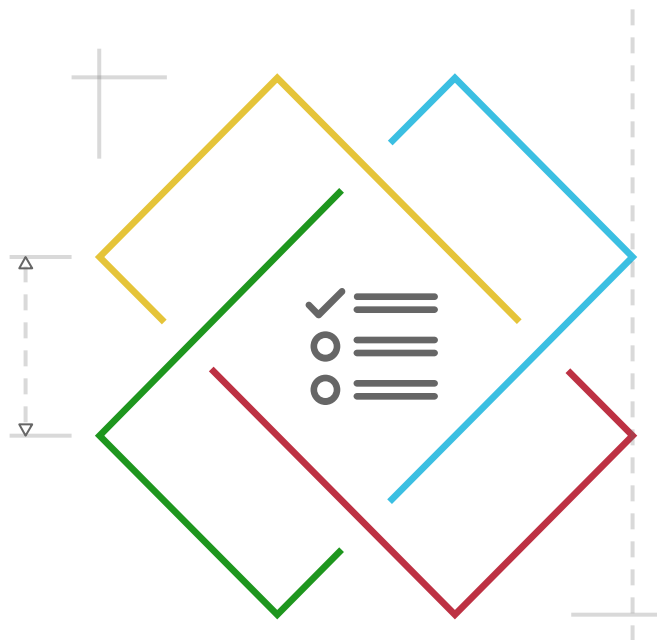
Identify

Decide

Rebalance

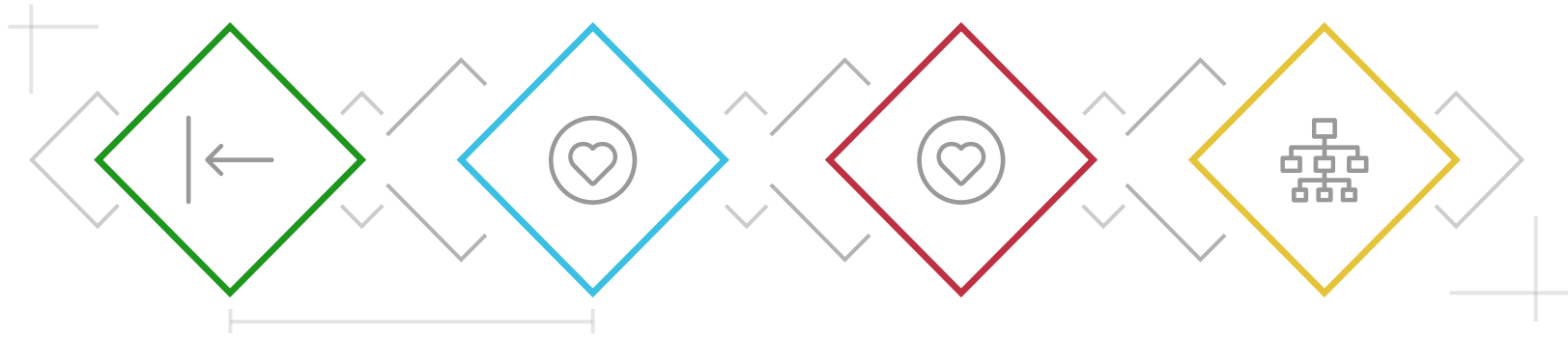Manage

1

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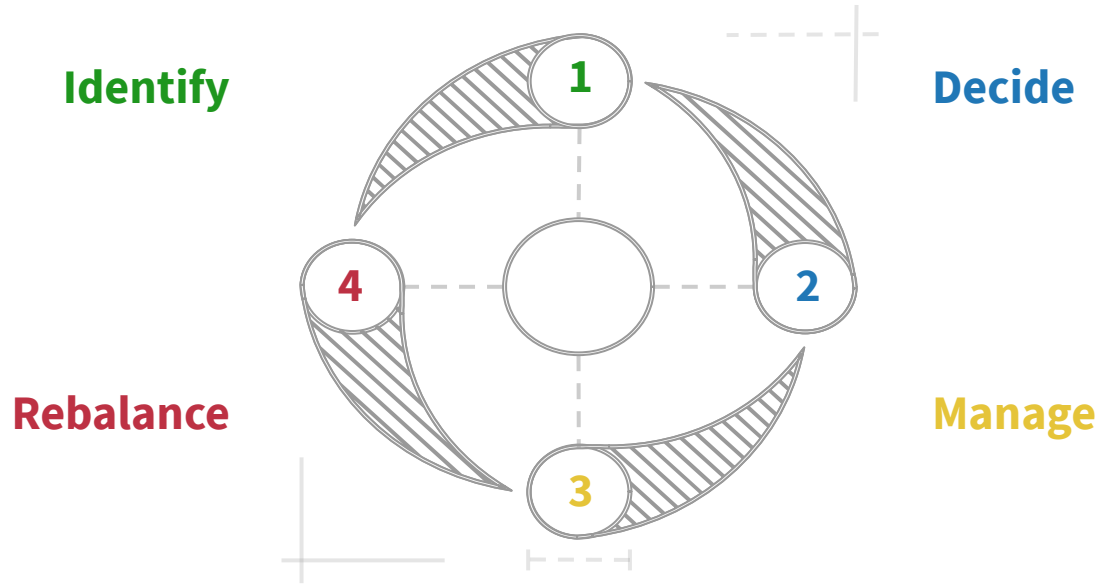
Identify

Market: Equities

Instruments: travel, pharma, e-commerce, consumer goods

Profile:

- Medium risk tolerance
- Following opportunities arising from the Covid-19 situation
- Familiar with the tech and digital space

Opportunities

Travel

Hotel bookings in China increased 40% the first week in March, while peak daily flights rose 230% from Feb

Pharmaceutical

Some pharmaceutical companies have regained their losses and are setting new record highs

Ecommerce

The ecommerce market has experienced strong gains five months due to the spread of the coronavirus

Consumer Goods

Groceries are now seen as essential goods, and the purchase of health-related products such as sanitizers have skyrocketed

Algorithm building
Identify

Name	Ticker	TCOM	BKNG	GILD	INO	MRNA	BABA	SE	JNJ	PG	Annualized Return	Daily SD	Monthly SD	Annualized SD
Trip.com	TCOM	-	0.5	0.17	-0.01	-0.02	0.59	0.29	0.26	0.14	3.28%	2.91%	12.44%	43.09%
Booking Holdings Inc.	BKNG	0.5	-	0.21	-0.09	-0.02	0.5	0.38	0.45	0.45	1.08%	2.48%	9.06%	31.38%
Gilead Sciences, Inc.	GILD	0.17	0.21	-	0.17	0.29	0.23	0.18	0.43	0.42	0.23%	2.03%	6.93%	24.00%
Inovio Pharmaceuticals, Inc.	INO	-0.01	-0.09	0.17	-	0.17	0	0	-0.02	-0.07	40.94%	8.43%	34.57%	119.75%
Moderna Inc	MRNA	-0.02	-0.02	0.29	0.17	-	0.06	0.03	0.13	0.13	82.14%	5.27%	20.41%	70.70%
Alibaba Group Holding Limited	BABA	0.59	0.5	0.23	0	0.06	-	0.42	0.4	0.3	40.33%	2.15%	9.81%	33.98%
Sea Ltd	SE	0.29	0.38	0.18	0	0.03	0.42	-	0.35	0.31	307.46%	3.93%	17.30%	59.94%
Johnson & Johnson	JNJ	0.26	0.45	0.43	-0.02	0.13	0.4	0.35	-	0.67	3.86%	1.67%	5.97%	20.68%
Procter & Gamble Company	PG	0.14	0.45	0.42	-0.07	0.13	0.3	0.31	0.67	-	28.33%	1.73%	4.61%	15.97%

Algorithm building
Identify

Largely medium correlation between stocks in the same industry groups (0.3-0.0.5)

A few exceptions → e.g. Travel and Ecommerce groups

Name	Ticker	TCOM	BKNG	GILD	INO	MRNA	BABA	SE	JNJ	PG	Annualized Return	Daily SD	Monthly SD	Annualized SD
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Algorithm building

Identify

Generally low correlations between stocks in different industry groups (<0.3)
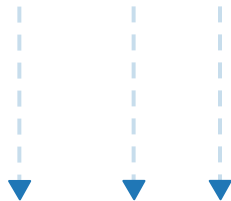
Exceptions → Travel and Ecommerce groups

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Algorithm building
Identify

Negative correlation between pharmaceuticals and travel, ecommerce and consumer goods

→ Exception: Gilead and consumer goods

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Algorithm building
Identify

Booking.com	Gilead Sciences	Alibaba	Proctor & Gamble
• Trading at 30.6% below our estimate of its fair value • Earnings are forecast to grow 43.28% per year	• Trading at 39.8% below our estimate of its fair value • Earnings are forecast to grow 21.27% per year	• Earnings are forecast to grow 62.3% per year	• Earnings are forecast to grow 5.85% per year • Earnings grew by 250.8% over the past year • Pays a reliable dividend of 2.33%
Trip.com	**Inovio**	**Sea**	**Johnson & Johnson**
• Earnings are forecast to grow 108.04% per year	• Trading at 78.7% below our estimate of its fair value • Revenue is forecast to grow 29.36% per year	• PE ratio (27.9x) is below Online Retail industry average (28.7x) • Earnings are forecast to grow 19.83% per year • Earnings grew by 74.3% over the past year	• Trading at 11.1% below our estimate of its fair value • Earnings are forecast to grow 20.56% per year • Pays a reliable dividend of 2.74%
	Moderna		
	• Earnings are forecast to grow 48.23% per year		

Fundamentals: Rewards

Identify

Fundamentals: Risks

Booking.com
- Has a high level of debt

Gilead Sciences
- Interest payments not well covered by earnings
- Dividend of 4.24% is not well covered by earnings

Alibaba
- Shareholders have been diluted in the past year

Proctor & Gamble
- Has a high level of debt
- Significant insider selling over the past 3 months

Trip.com
- Interest payments are not well covered by earnings

Inovio
- Shareholders diluted in the past year
- Currently unprofitable, not forecasted to be
- Highly volatile share price in past 3 months
- Don't have meaningful revenue ($3M)

Sea
- Highly volatile share price over past 3 months
- Shareholders have been diluted in the past year

Johnson & Johnson
- Has a high level of debt
- Significant insider selling over the past 3 months

Moderna
- Highly volatile share price over past 3 months
- Shareholders have been diluted in the past year

Algorithm building
Identify

Travel
Booking.com
Trip.com

Pharmaceutical
Gilead Sciences
Inovio
Moderna

Ecommerce
Alibaba
Sea

Consumer Goods
Proctor & Gamble
Johnson & Johnson

Algorithm Building
Decide + Manage

Moving Average Convergence Divergence

Understand whether the bullish or bearish movement in the price is strengthening or weakening

Bollinger Band

Determines overbought and oversold market conditions based on price and volatility > Concept of mean reversion

Relative Strength Index

Measures how well a stock is performing against itself by comparing the strength of the up days versus the down days

Algorithm building

Decide

MACD

= If MACD line is above the Signal line, buy

RSI

= If previous RSI > 30 and current RSI < 30, buy
= If current RSI < 30, enter short position

Bollinger Band

= If current value < lower band, buy

Manage Risk

MACD

= If MACD line is below the Signal line, sell

RSI

= If current RSI < 30, and position is short, sell
= If current RSI > 70 and position is long, sell

Bollinger Band

= If current value > upper band, sell

```python
def Initialize(self):
    ''' Initialize the data and resolution you require for your strategy '''

    self.SetStartDate(2016, 1, 1)
    self.SetEndDate(2020, 9, 7)

    self.CashAmount = 100000.0 #CHANGE HERE

    self.SetCash(self.CashAmount)

    self.equityDict = dict()
    self.bolDict = dict()
    self.macdDict = dict()

    self.equities = ["TCOM", "BKNG", "GILD" , "INO", "MRNA", "SE", "BABA", "PG", "JNJ"]

    for symbol in self.equities:
        self.equityDict[symbol] = self.AddEquity(symbol, Resolution.Daily)
        self.bolDict[symbol] = self.BB(symbol, 20, 2, MovingAverageType.Simple, Resolution.Daily)
        self.macdDict[symbol] = self.MACD(symbol, 12, 26, 9, MovingAverageType.Simple, Resolution.Daily)

    self.buyAmount = 1.0/len(self.equities)
    self.sellAmount = -self.buyAmount

    # Set WarmUp period
    self.SetWarmUp(20)
```

Algorithm Building
Decide + Manage

```python
def checkBB(_symbol):
    #Reference: https://www.quantconnect.com/tutorials/strategy-library/the-dynamic-breakout-ii-strategy

    # Return if no data or if indicator is not ready
    if not (data.ContainsKey(_symbol) or self.bolDict[_symbol].IsReady): return

    # Retrieve current price
    price = self.Securities[_symbol].Close

    # Sell if price is higher than upper band
    if not self.Portfolio.Invested and price > self.bolDict[_symbol].UpperBand.Current.Value:
        return "sell"

    # Liquidate if price is lower than middle band
    if self.Portfolio.Invested and price < self.bolDict[_symbol].LowerBand.Current.Value:
        return "buy"
```

Algorithm Building
Decide + Manage

```python
def checkMACD(_symbol):
    #Reference: https://www.quantconnect.com/forum/discussion/6299/trading-spx500-in-margin-account/p1

    # wait for our macd to fully initialize
    if not self.macdDict[_symbol].IsReady: return

    # only once per day
    if self.__previous.date() == self.Time.date(): return

    # define a small tolerance on our checks to avoid bouncing
    tolerance = 0.0025

    holdings = self.Portfolio[_symbol].Quantity

    signalDeltaPercent = (self.macdDict[_symbol].Current.Value - self.macdDict[_symbol].Signal.Current.Value)/self.macdDict[_symbol].Fast.Current.Value

    # if our macd is greater than our signal, then let's go long
    if holdings <= 0 and signalDeltaPercent > tolerance:   # 0.01%
        # longterm says buy as well
        return "buy"

    # of our macd is less than our signal, then let's go short
    elif holdings >= 0 and signalDeltaPercent < -tolerance:
        return "sell"
```

Algorithm Building
Decide + Manage

```python
for symbol in self.equities:

    #stop loss at -20% of portfolion) aka rebalance
    if self.Portfolio.Cash < 0.8 * self.CashAmount:
        self.stop = True
        self.Liquidate()

    elif checkMACD(symbol) is "sell" and checkBB(symbol) is "sell":
        self.SetHoldings(symbol, self.sellAmount)

    elif checkMACD(symbol) is "buy" and checkBB(symbol) is "buy":
        self.SetHoldings(symbol, self.buyAmount)
```

Algorithm Building
Decide + Manage

```python
#We add our RSI 14 period indicator
for i in self.equities:
    self.rsi = self.RSI(i, 14)
#pointer to keep track of last bar's RSI Value
self.lastrsi = None
```

Decide + Manage

```python
#if RSI signals overbought
if self.lastrsi > 70 and self.rsi.Current.Value < 70:

    if not self.Portfolio[i].Invested:
        #enter short position
        return "sell"


#if RSI is overbought while we are long
elif self.rsi.Current.Value > 70 and self.Portfolio[i].IsLong:
    #if we already in a long trade we liquidate
    return "sell"


#store current RSI value to use later
self.lastrsi = self.rsi.Current.Value
```

Algorithm Building
Decide + Manage

```python
for equity in self.equities:


    #RSI: https://www.quantconnect.com/forum/discussion/7055/rsi-cross-overbought-oversold-levels-from-t
    if not self.rsi.IsReady:
        return

    #Make sure there is a past RSI value to compare to
    if self.lastrsi is None:
        self.lastrsi = self.rsi.Current.Value
        return

    #If we cross oversold threshold from below
    if self.lastrsi < 30 and self.rsi.Current.Value > 30:

        #if we are not currently in a trade
        if not self.Portfolio[i].Invested:
            #we place a long market order
            return "buy"
```

Rebalance

> Stop all trades after -20% returns
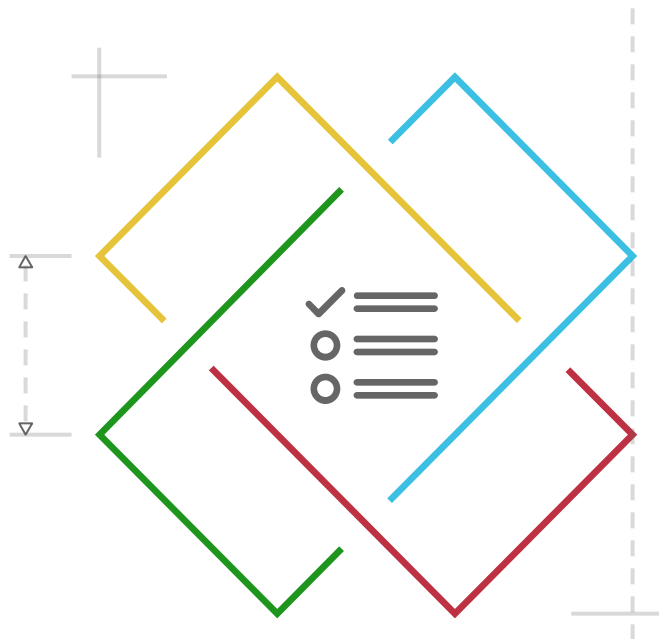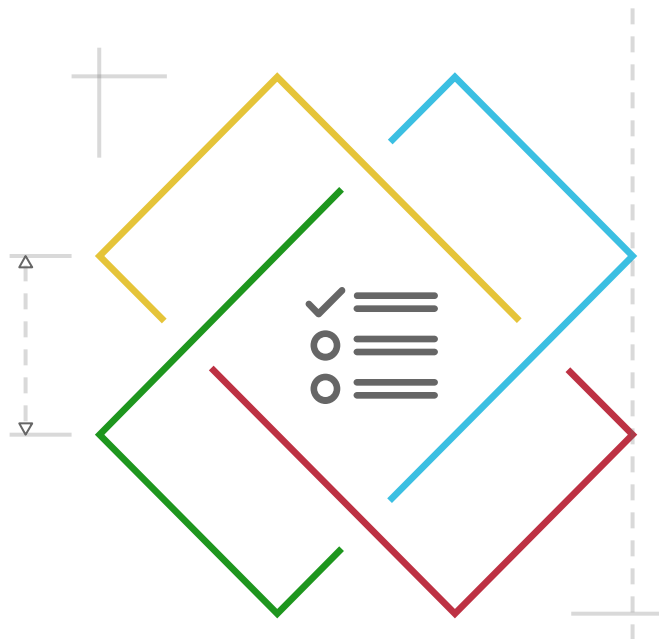
Algorithm Building
Rebalance

```python
#stop loss at -20% of portfolion) aka rebalance
if self.Portfolio.Cash < 0.8 * 100000:
    self.stop = True
    self.Liquidate()
```

Backtest Parameters

> Backtest from 1 Jan 2016 to 7 Sep 2020

> Tested on stocks 9 placed in a single portfolio

> TCOM, BKNG, GILD , INO, MRNA, SE, BABA, PG, JNJ

Algorithm Building
Portfolio Results

51.198%	**$2,709.45**	**−$98.41**	**$35,250.00**	**37.86 %**	**$137,862.04**	**$12,540.00**	**$604,392.66**
PSR	Unrealized	Fees	Net Profit	Return	Equity	Holdings	Volume

Strategy Equity

1m 3m 1y All ✖

Equity   Daily Performance

Equity

120k

100k

80k

0

−10

Daily Performance

Jan '16   Jul '16   Jan '17   Jul '17   Jan '18   Jul '18   Jan '19   Jul '19   Jan '20   Jul '20   Jan '21
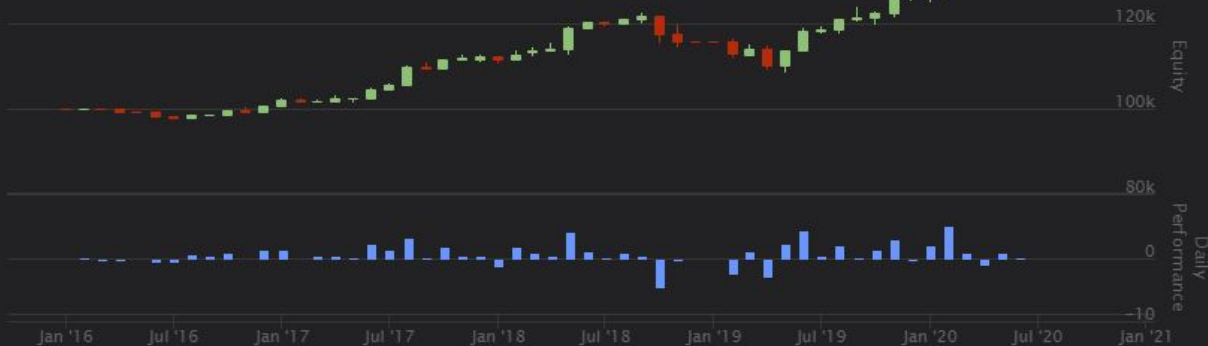
Alpha Ranking ✖

51.2%
SR > 1.0   Submit

✖ Active Strategy

✔ Not Overfitting

✖ Significant Length

✔ Positive Return

Algorithm Building
Portfolio Results

Overview	Report	Orders	Insights	Logs	Code	Share

Overview

Overall Statistics

Total Trades	42	Average Win	2.47%
Average Loss	-1.13%	Compounding Annual Return	7.098%
Drawdown	11.300%	Expectancy	1.218
Net Profit	37.862%	Sharpe Ratio	1.042
PSR	51.198%	Loss Rate	30%
Win Rate	70%	Profit-Loss Ratio	2.19
Alpha	0.06	Beta	-0.003
Annual Standard Deviation	0.057	Annual Variance	0.003
Information Ratio	-0.381	Tracking Error	0.184
Treynor Ratio	-22.868	Total Fees	$98.41

Rolling Statistics

Challenges
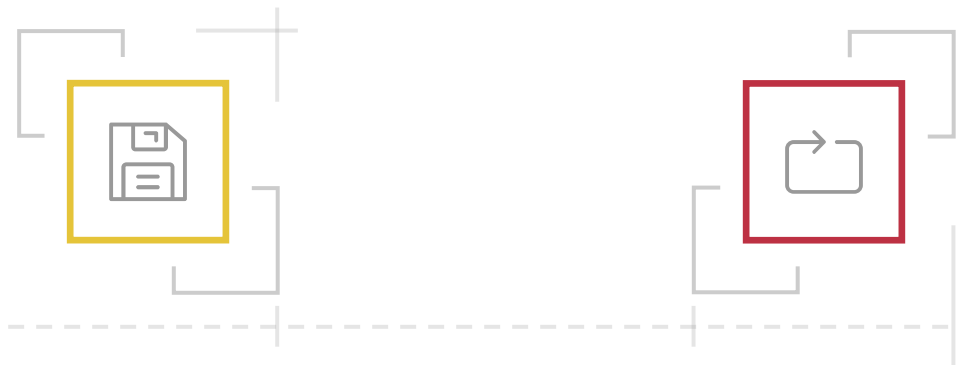
Entry and Exit Points

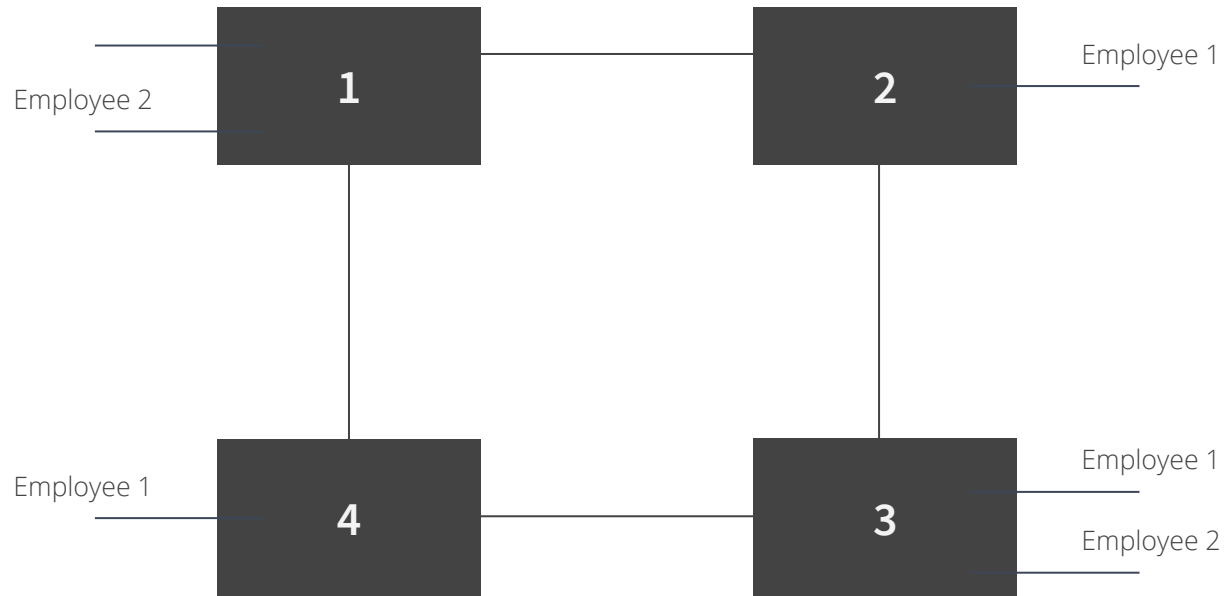Finding an alternative strategy that combines Bollinger Bands and MACD

A Diversified Portfolio

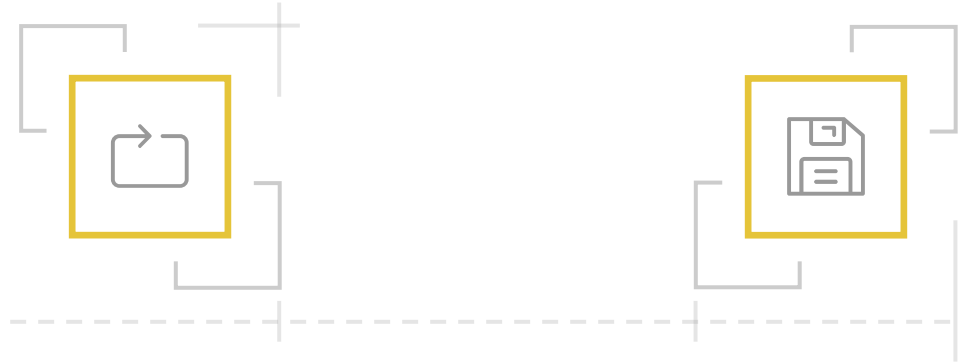Performing fundamental analysis to identify suitable equities

Thank you!

Appendix

Challenges

Algorithm building
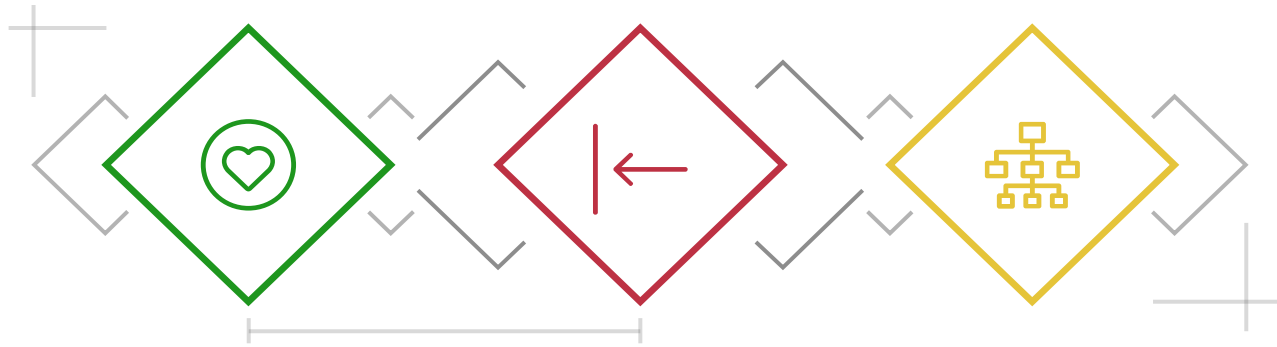
Manage

All their equipment are alive.

A peep at some distant orb has power to raise and purify our thoughts like a strain of sacred music.

Diversification

Apparently we had reached a great height in the atmosphere, for the sky was a dead black.

Algorithm building
Identify

All their equipment are alive.

A red flair silhouetted the jagged.

It was going to be a lonely trip back.