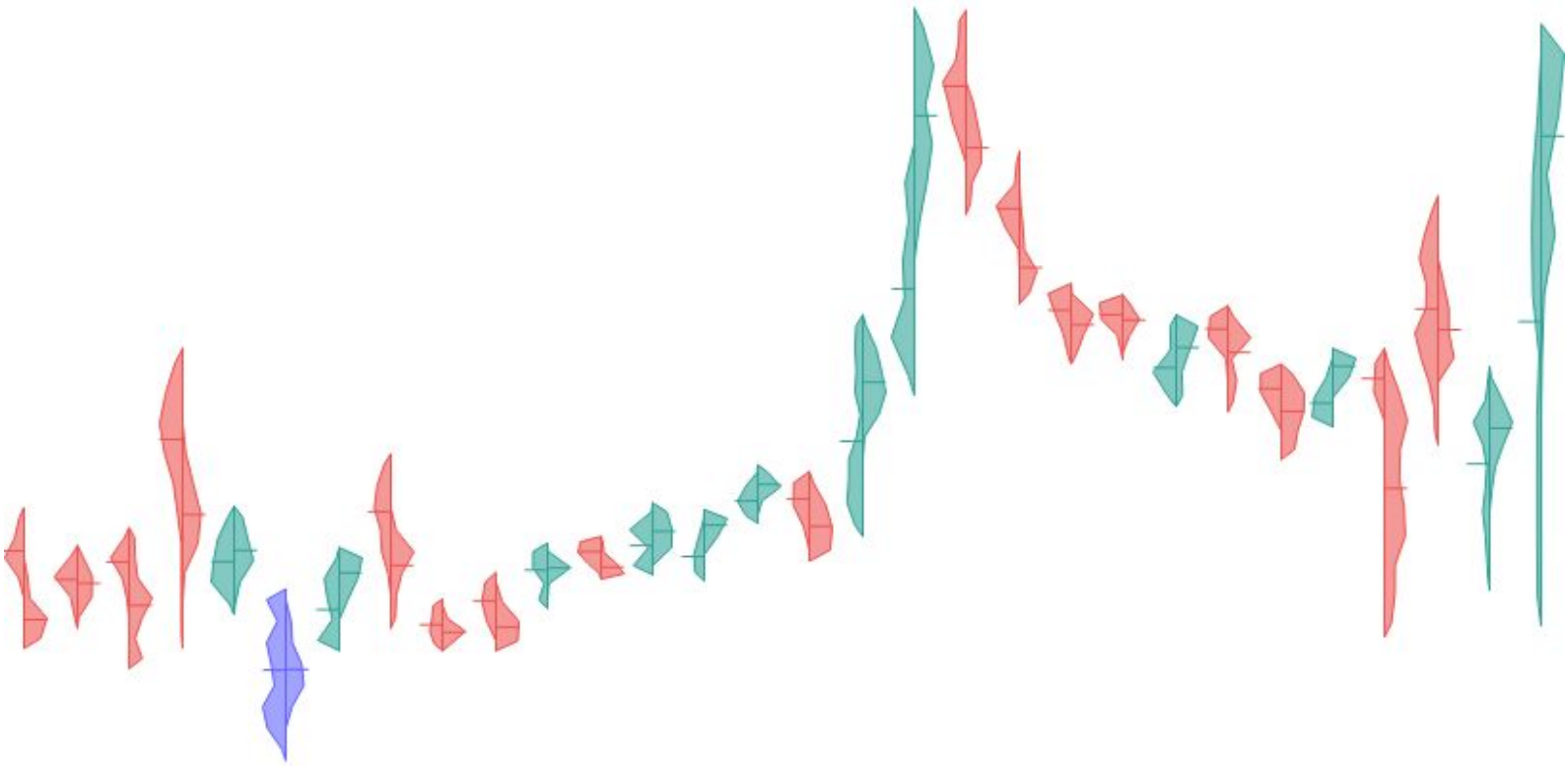


May 28, 2019



# Raindrop Charts™

A human-friendly volume profile chart

by Ruslan Lagutin, Co-Founder and CTO, TrendSpider

# Introduction

There are many different styles of charts used by financial analysts to illustrate changes in price action over a period of time. In order to be functional and useful, these ‘time-scale price charts’ must illustrate the passage of time, the change in price, and the trading volume. All such price charts have a mechanism to illustrate changes in price time by using a high, low, open and close prices to create a visualization. This is a constant among most of the popular types of charts used in trading today, including:

- Traditional Japanese Candlesticks
- Hollow Candlesticks
- Heikin Ashi
- Renko

Since these chart types do not contemplate trading volume, to add it, a secondary sub-chart or some other indicator is needed. Most of the time this is a simple ‘volume underlay’ chart—a bar chart that shows volume by period along the bottom. In other situations, an oscillator or volume profile chart is used. Without this additional element, whatever it may be, the utility of price charts is limited for those who consider volume to be an important part of the analysis equation.

One type of candlestick chart, the Equivolume chart, attempts to show the total sum of the volume during each candlestick by varying the thickness. This is roughly the same type of information available in a volume underlay, just presented differently.

This challenge with traditional volume underlays and equivolume charts is that they are very high level and thus lack context, granularity and detail. This forces traders to make decisions using incomplete information.

In this white paper, we propose a novel solution to this problem - *new* type of chart, one that combines volume and price data into a single visualization while also filtering out some of the noise like arbitrary open and close prices. We call this new type of chart the Raindrop Chart™.

# Abstract

The Raindrop Chart is a new type of financial timescale price chart that attempts to abstract away arbitrary constructs, such as open and close prices, to instead focus on changes in volume and market sentiment. In other words, Raindrop charts ignore artificial breakpoints wherever possible. The Raindrop visualization illustrates *price and volume movement* instead of just the price change. Briefly, it's a human-friendly Volume Profile chart.

Each bar, known as a *Raindrop*, covers a fixed period of time (such as one hour) and includes four key data points — Left Mean, Right Mean, High and Low — as well as a body. The Body of each Raindrop has two sides — Left and Right.

Here is what each of the elements represents:

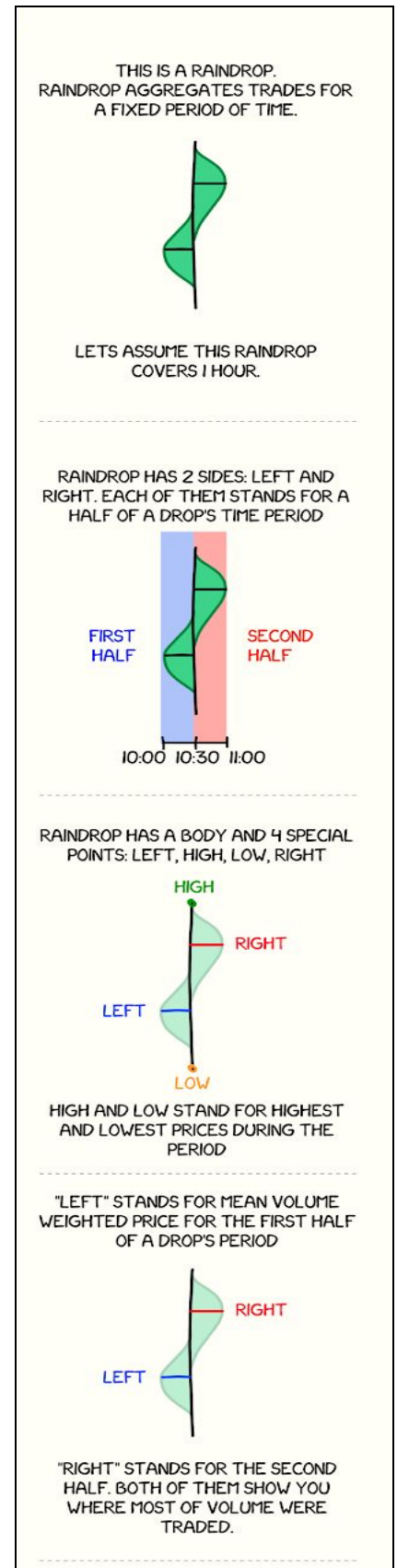
- High: The highest price for the period.
- Low: The lowest price for the period.
- Left Mean: The mean price (weighted by volume) for the **first half** (Left side) of the period.
- Right Mean: The mean price (weighted by volume) for the **second half** (Right side) of the period.

The Body of each Raindrop illustrates Volume by Price for each half of the time period (shown as the left and right sides of the period).

The Left and Right mean prices essentially represent the Volume-Weighted Average Prices (VWAPs) for that half of the period. The VWAP is a popular indicator that is used to benchmark the average price of a security during a specific period of time.

Each drop is colored, depending on the relative position of the Left and Right mean prices. Raindrops where the Left price is greater than Right are colored red, Raindrops where the Right greater than Left are colored green. Raindrops where both the Left and Right are equal are colored blue.

Examples of real charts: [AAPL,10](#) [AAPL,D](#)



# Concept

TrendSpider Raindrop charts lets you see how the market has changed within a single period and overtime, telling the full story, not just a summary of it. For example, since each Raindrop has two sides, Left and Right, you can see how both volume and price *flowed* between the first and second half of the period.

The amount of volume is illustrated by the width of a Raindrop at any particular price level, which will vary based on the volume of transactions traded at that price level. The width on both sides of a Raindrop is plotted using the same scale to make them easy to compare. Here are a few examples of potential distinct Raindrop formations:

1. This type of “flip” Raindrop occurs when the majority of the trading volume was on at a higher price during the first half of the period (left side) and then moved to a lower price during the second half of the period (right side). The Volume on left and right sides is approximately equal, meaning that the market is moving in one direction. In this example, the market has moved lower during this Raindrop.
2. This type of Raindrop occurs when the majority of trading volume starts and ends around the same price levels, but volume doubles during the second half of the Raindrop. It suggests that the market has preserved its sentiment through the whole period with relative consensus as volume has increased. This is visible because the thickness of the volume histogram on the right side is greater than the thickness of the histogram on the left.
3. A blue Raindrop occurs when the VWAP prices are the same on both sides of the bar. In this example, volume on the right is slightly lower than on the left. This formation is not very common. We suspect it is a Doji-like formation indicating indecision and tight trading. (see Further Research).



Due to the unique way in which blue Raindrops are formed, they may indicate potential support/resistance zones.

4. A long Raindrop like this occurs when there was a wide trading price range, but most of the volume is concentrated in a tighter sub-range. In other words, the volume on the tail is negligible while the price movement itself was meaningful. This Raindrop also illustrates another important point: the function of the VWAP dashes. You can see that the Left Mean (VWAP) price resides inside the left volume histogram, meaning that there was little to no volume during the lower prices at the left part.

Right Mean price is shifted lower, which suggests that *the sum of the volume* of the right side of the long tail is high enough relative to the concentrated volume at the top to affect the Mean value. This is a rare Raindrop.

5. This type of thick, even and long Raindrop seems to sometimes occur when a market trades in a wide price range without any obvious consensus along the way. The Right and Left Mean lines are close to each other, and volume is relatively the same general thickness on both sides of the Raindrop. There is about the same levels of volume traded at all different prices with no clear peak or consolidation point. This is a rare Raindrop.



## Features

There are a number of unique properties and features of TrendSpider Raindrop charts especially when compared against traditional candlestick charts. This page contains a list of the key features as we see them.

1. **Reduces noise.** We start with the observation that in traditional candlestick charts, the open/close prices are actually random and arbitrary numbers, formed more by the passage of time than anything meaningful in the data. Thus, we ignore open and close prices and instead focus on the movement of volume and market sentiment during a period of time.

For example, this long red Raindrop (which looks like a long red candle when using Japanese candlesticks) actually tells you that there was no real volume behind this downside part of the move.



2. **Visualizes the flow of sentiment.** Raindrops make it easy to visualize how bullish and bearish sentiment flowed inside of each period, which tells a more complete story than a candlestick could. You also can easily see how sentiment, price and volume change from the start of period to its end. Where a traditional candlestick tells you the open, close, high and low prices, Raindrops will show you the high, low of a price range, plus the volume-weighted average price, and volume levels during two halves of the time period. The flow of price and volume often looks like a wave as it moves from one side to the other.

This example Raindrop indicates that most trading occurred during the first half of its period and at lower prices. Then, in the second half of the period, the market shifted towards higher prices. This is an example of a bullish movement.



3. **Identifies true price consensus.** Raindrops that look like a small circle or ball illustrate a doji like formation where the market was rather steady on price during a period. Raindrops like this are believed to illustrate true consensus and indecision. When the VWAP prices on both sides of the period are at the exact same levels, these Raindrops turn blue and indicate a rare and interesting example of near perfect balance.



4. **Volume-weighted candlestick patterns.** Raindrops are backwards compatible with most Japanese candlestick formations or patterns (Hammer, Doji etc.) Indeed, at times, it seems like many of these candlestick patterns were designed for Raindrop charts

from the start. In addition to traditional patterns, there also are many distinct patterns to Raindrops that have yet to be identified and isolated.

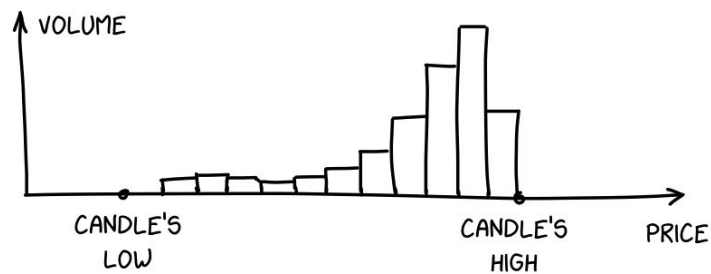
5. **Volume-weighted trendlines.** Raindrop charts also support building trend lines and offer new ways to do so. Instead of drawing from the highs or lows, you could instead add volume to the trendline equation and draw using the average of the left and right mean price (the central calculated point) of each Raindrop.
6. **Volume-weighted indicators.** In addition to trendlines, most classic indicators, such as simple and exponential moving averages, keltner channels, etc. can be drawn on Raindrop charts using any of the following as the basis for calculating the indicators position: the high, low, right mean, left mean, the average of both means (central calculated point).

Using the central calculated point, the left mean or the right mean for indicators effectively converts any indicator into a volume-weighted indicator. Instead of only reflecting price movement, they now also incorporate volume data. This is likely to yield interesting results (more research needed).

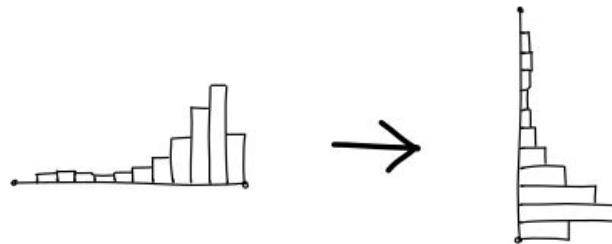
# Construction

To construct a Raindrop Chart, the following steps must be undertaken:

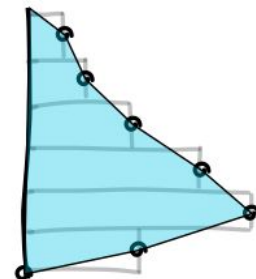
1. Decide on the period you want to build your chart on (e.g., 60min.) Then, select the first period — i.e., Mon 08 Oct 09:30 - 10:30 am EST.
2. Get the second half of the candle's period (i.e., last 30 minutes of a 60min candle). Build a Volume at Price histogram for this candle (use the most granular data you have, such as 1min candles or tick data).



3. Rotate the histogram by 90 degrees (minding direction of a price axis).



4. Re-paint this histogram as Area chart. This Area chart will comprise the right-side piece of the Raindrop.



5. Repeat the points 2-4 for the first half of a drop's period to get the left side.



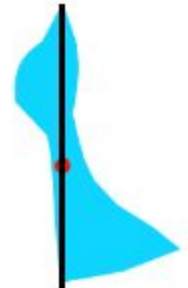
6. Join left and right pieces together to form one Raindrop



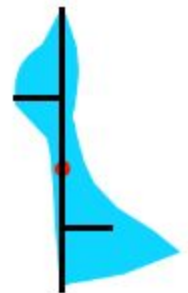
7. Put a mass center point on a price level. This is the same as the volume-weighted price



8. Paint a vertical line to illustrate high/low range of a drop that indicates the price range



9. Paint dash lines on both the left and right sides, each of them illustrating a Volume-Weighted Average Price for respective half-period.



11. Color each Raindrop. For Raindrops where the Left price is greater than Right, color it red. For Raindrops where the Right greater than Left, color it green. Raindrops where both the Left and Right are equal are colored blue.

12. Repeat of rest of your periods until the chart is complete.

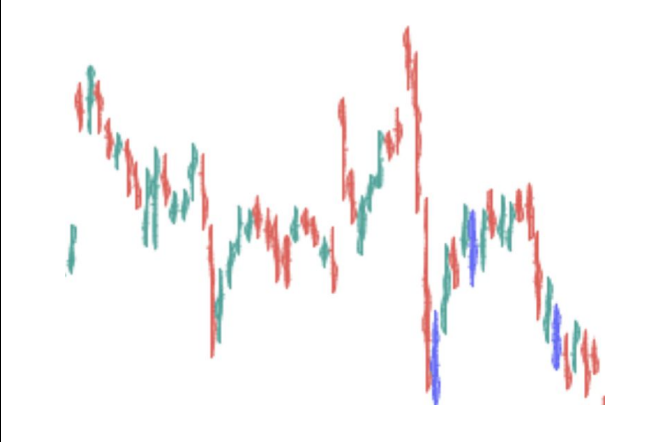

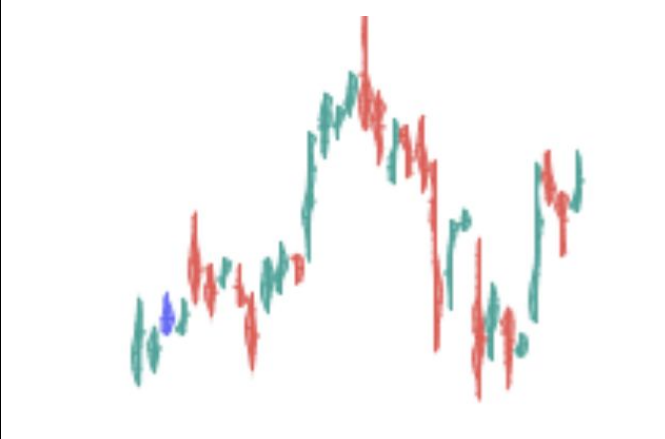



## Research

The Raindrop Chart is was conceptualized by Ruslan Lagutin, CTO of TrendSpider in October of 2018. We have implemented it in the TrendSpider platform to make it available to the world and to facilitate additional testing to determine the worth of the Raindrop Chart to the trading community. We recommend the following in order to realize the full potential of Raindrop charts:

1. Extensive backtesting to see if patterns are meaningful on Raindrop charts for the following identified formations, and any others that are isolated and identified in the future. Flip (See Raindrops Explained, Pattern #1), Double Flip, Doji (Pattern #3) and Baguette (Pattern #5) are the obvious candidates.
2. Analysis of the meaning of a sequence of Raindrops and their colors and what kind of indication they may provide for a trend changing its direction. For example, in bearish markets most Raindrops tend to be red, and in bullish markets, most Raindrops tend to be green.
3. It's not clear if there is a relation between adjacent drops' Left and Right prices. What if next drop's prices are somehow related to a previous drop's Right price or right piece of its Volume at Price?
4. A more concrete theory and specific best practices for building Trendlines and utilizing Indicators needs to be researched, identified and developed.
5. More research needs to be conducted into the validity of Raindrops on different timeframes. We suspect that Raindrops won't offer the same level of utility at higher time frames (45min) than lower ones since sentiment can change more than once during a time frame which is that long. More research is needed in this area.

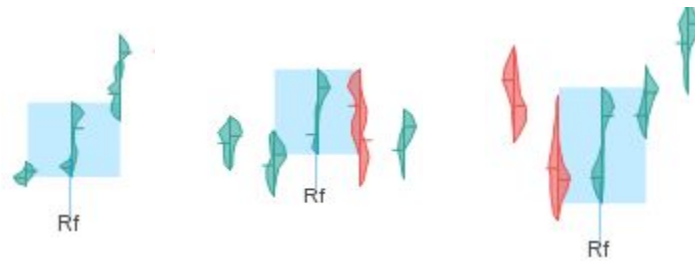
# Appendix A: Examples

Here are some examples of Raindrops alongside their equivalent candlesticks.

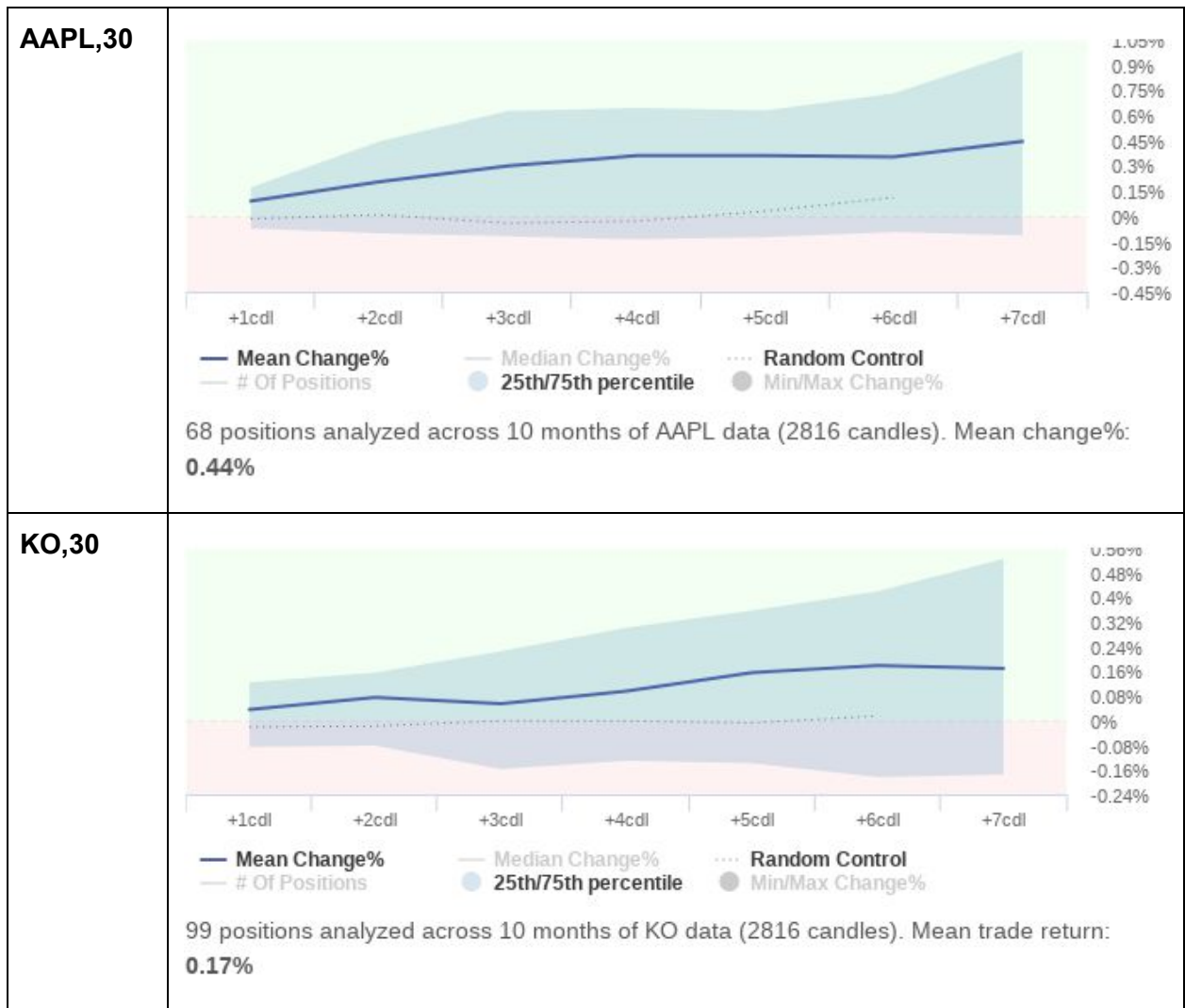
Raindrop	Candlestick
	
	
	

# Appendix B: Backtesting data for select patterns

## Flip (Upside)

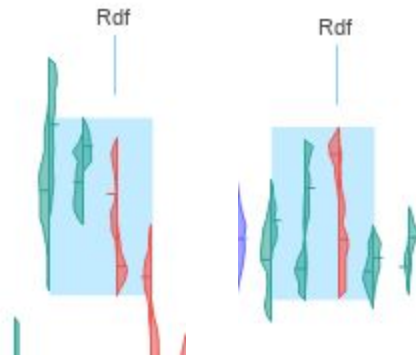


Definition: Left price stands apart from Right by at least 50% of a drop's body.



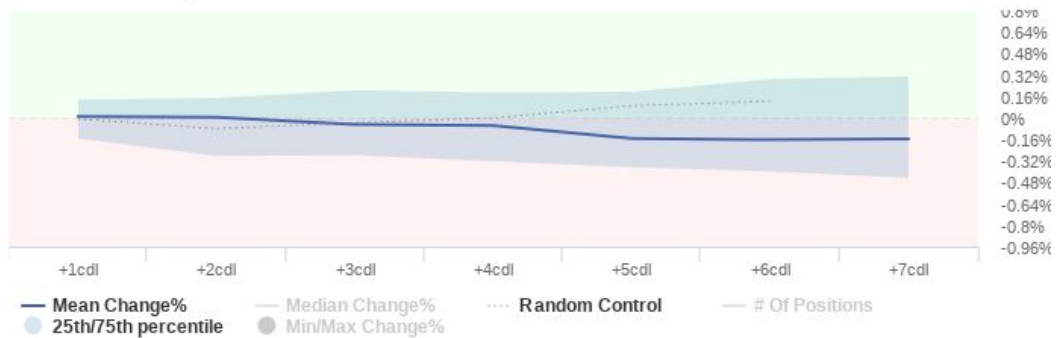
## Double Flip (Downside)

Definition: Upside flip followed by downside flip, flip depth 33% (instead of 50% for single Flip)



### MCD,30

#### Price Behavior Explorer



#### Entry Conditions:

All of the following ▾ ...

30 min Rainfall/Double Flip Downside Evolved

30 min Candle.Close Greater than 30 min Std. Deviation Bands (BB) (20, 2, 2, oc2), Mid.

ADD PARAMETER HERE