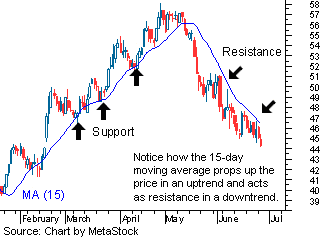
***Technical Indicators***

**BOLD**: this bullet and its subs represent good investment strategies (or how to calculate something).

Bullish: rising share prices, or the belief that prices will rise

Bearish: falling share prices, or the belief that prices will fall

Overlap Studies

1. Bollinger Bands: Two lines, one plotted two standard deviations above the exponential moving average, the other plotted two standard deviations below the simple moving average.
   1. When stock prices continually touch the upper band, they are said to be overbought.
   2. When stock prices continually touch the lower band, they are said to be oversold.
   3. “The Squeeze”: when the bands come close together
      1. A squeeze signals a period of low volatility and indicates the potential for future volatility.
      2. Conversely, separated bands signal a period of high volatility, with the potential for a future lack of volatility.
   4. If the price bounces off the bottom band, and then crosses the center-moving-average line, our upper band is now the upper “price target” (the best possible outcome).
   5. **Any breakout above the top band or below the bottom band is a major event**
      1. 90% of price action occurs between the two bands.
      2. Buy when the price moves below the lower band; consider selling when the price rebounds to anywhere between the center moving-average line and the upper band.
2. Moving Average: MA, smooths out price action by filtering out the noise from random price fluctuations
   1. Because it is based on past prices, it lags slightly behind the current prices. The longer the period of the MA the more it lags behind current prices.
   2. Typically used to identify trend direction and determine support and resistance levels
   3. An ‘X-day Moving Average” deals only with the last X closing prices. If a day doesn’t have X previous days of data, we can’t have an ‘X-day Moving Average’ for that day.
   4. Shorter MAs are used for short-term trading, while longer MAs are used for long term trading.
      1. For example, a 200 day MA is typically used by long-term investors. When a price breaks above or below this average that is an important signal.
   5. A rising MA indicates an uptrend (price movement upwards), while a falling MA indicates a downtrend (price movement downwards).
   6. Upward momentum occurs when a short-term MA crosses above a long-term MA.
   7. Downward momentum occurs when a short-term MA crosses below a long-term MA.
   8. **The Exponential Moving Average and Simple Moving Average are the two most popular**
   9. Exponential: EMA, one of the most popular moving averages
      1. **Calculated by**:
         1. Multiplier: ( 2 / (#ofDays + 1) )
         2. EMA = prevEMA + Multiplier \* ( Close – prevEMA )
         3. EMA = (Weight \* Close) + ((1 – Weight) \* prevEMA) if we want manual weighting
      2. Each data point is not weighted the same, more weight is given to the most recent data. For example, a 10 day EMA applies an 18.18% weight to the most recent price.
      3. The larger the time period the less weight is given to more recent data points.
      4. Treats recent data as more relevant/important as opposed to more historical data.
      5. Essentially a “higher risk for higher reward” when compared to Simple Moving Average. It can potentially give traders signals earlier, but b/c of the weight distribution, it has a higher potential for false signals.
      6. Popular EMAs are 12 and 26 days for short term, and 50 or 200 days for long-term.
      7. **EMA is typically used in conjunction with Simple Moving Average**
      8. Double: DEMA, a calculation of single and double EMAs
         1. **Calculated by**: ( 2\*EMA(n) ) – ( EMA(EMA(n)) ) where ‘n’ is #ofDays
      9. Triple: TEMA, a calculation of single, double, and triple EMAs
         1. **Calculated by:** 3\*EMA(n) – 3\*EMA(EMA(n)) + EMA(EMA(EMA(n)))
         2. TEMA should not be used in a ranging market
         3. It is most easily used for trading purposes with trends sustained over long periods of time
         4. **Triple EMA is typically used in conjunction with MACD**
   10. Fractal Adaptive: Utilizes fractal geometry to generate our EMA Multiplier
       1. **Calculated by:**
          1. Complicated math for this one, come back to it later!
   11. Kaufman Adaptive: KAMA, closely follows prices when price swings are relatively small and noise is low, and adjusts when price swings widen. Basically just a tweaked version of EMA
       1. **Calculated by:** 
          1. Recommended #s: Why did Kaufman recommend these numbers?
             1. Periods for ER: 10
             2. Fastest EMA Constant: 2
             3. Slowest EMA Constant: 30
          2. Efficiency Ratio = Change / Volatility
             1. Change = abs(Close – close10PeriodsAgo)
             2. Volatility is the sum of the absolute value of the last ten price changes
          3. FastestSC = 2/(FastestEMA + 1)
          4. SlowestSC = 2/(SlowestEMA + 1)
          5. Smoothing Constant = [ER \* (FastestSC – SlowestSC) + SlowestSC]^2 = [ER \* (2/3 – 2/31) + 2/31]^2
          6. Current KAMA = ( Close – PrevKAMA ) \* SC + PrevKAMA
       2. Is basically an Exponential Moving Average with a more fine-tuned Multiplier.
   12. MESA Adaptive: adapts to price movement based on the rate of change of a phase as measured by the Hilbert Transform Discriminator.
       1. **To Calculate:**
          1. Input: FastLimit and SlowLimit
          2. Weight = (FastLimit / Phase Rate of Change)
       2. It is based off of the EMA, and relates the phase rate of change to the EMA weight.
       3. In MAMA, the weight is established as a set of two inputs: FastLimit (usually set at .5), and SlowLimit (usually set at .05).
       4. Complicated math for this one, come back to it later!
   13. Simple: SMA, the mean of our data points. One of the most popular moving averages
       1. **Calculated by:** take the mean of our last ‘n’ closes, where ‘n’ represents the time period for this moving average (5 if it is a 5-Day Moving Average, 200 if it is a 200-Day Moving Average)
       2. Each data point is weighted equally
       3. **SMA is typically used in conjunction with Exponential Moving Average**
       4. SMA has two main drawbacks:
          1. Price action (open or close price) isn’t enough to properly indicate buy/sell signals on a crossover.
          2. The timeframe often isn’t appropriate when compared to the influence data at certain times has.
   14. Triangular: a moving average of the Simple Moving Average
       1. **Calculated by:**
          1. Calculate SMAs
          2. TMA = (SMA1 + SMA2 + SMA3 + … + SMAN) / N where N is the size of our period
       2. Most often applied to the price of an asset.
   15. **The more a Moving Average is smoothed the less it can be used as a short term trading indicator, but the more resilient it is to short-term volatility.**
   16. Moving averages are typically used in conjunction with Support and Resistance lines
       1. Resistance: a price ceiling, typically located where the price of a stock has repeatedly gotten close but never gone above. Look for a series of high peaks at similar prices.
          1. If the market is trending upwards, use this resistance line.
          2. When a stock price nears (or crosses above) the resistance line, this is a potential indicator to sell that stock.
       2. Support: a price floor, typically located where the price of a stock has repeatedly gotten close but never gone below. Look for a series of low peaks at similar prices.
          1. If the market is trending downwards, use this support line.
          2. **Prices typically do not drop below the support line**, once the line has been established
          3. When a stock price nears (or crosses below) the support line, this is a potential indicator to buy that stock.
       3. The more peaks that have been used to identify resistance/support, the stronger the trend is considered
       4. Individual traders tend to feel safer when prices are at nice round numbers. This may lead to resistance/support lines at those nice round numbers.
       5. These lines don’t have to be horizontal. In a rising market, their slope may be positive. In a falling market, their slope may be negative.
       6. **Moving averages can be used as resistance/support lines!** (see right)
          1. When the moving average is above the price, and is skimming several peaks, it is a resistance line.
          2. When the moving average is below the price, and is skimming several peaks, it is a support line.
       7. Fibonacci Retracement: utilizes properties of the Fibonacci sequence to predict future support and resistance levels.
          1. This technique uses several horizontal lines, placed on a graph when a trend is occurring, to predict the smaller rises and falls that will occur during that trend.
          2. **Typically confirmed with a Stochastic or MACD oscillator**
3. Hilbert Transform (Instantaneous Trendline):
4. Midpoint over Period: (high – low)/2, simply the direct middle value over a period in terms of closes
   1. Midpoint Price over Period: similar to regular MAP, but with highest high and lowest low prices
   2. Don’t seem too useful…
5. Parabolic SAR: “Parabolic Stop and Reverse”
   1. Helps determine future short term momentum, enabling more accurate placement of stop-orders
   2. SAR trails the price as the trend extends over time
      1. The indicator is below prices when they are rising
      2. The indicator is above price when they are falling
      3. **If the indicator has been consistently “above” or consistently “below”, this is an indicator of a trend**
         1. The longer the trend lasts the more likely it is to break at any time
   3. **Use another indicator that can tell the strength of a trend (e.g. ADX, stochastics) in conjunction with this one**
      1. For example, if the dots move from below the price to above the price AND the price is under a long term moving average, this indicates a downward trend
   4. SAR sensitivity depends on its Step. Decreasing the step decreases SAR’s sensitivity, and vice versa
   5. Parabolic SAR always assumes the trader is holding either a long or short position
   6. **Parabolic SAR indicates to sell when a period of concurrent below points is broken by an above point.**

Momentum Indicators

1. Average Directional Movement Index: Helps to determine the strength of a trend.
   1. It is non-directional, so it works for both up and downtrends
   2. It is typically used in conjunction with DI+ and DI- lines
   3. **A strong trend is occurring if the ADX is above 25; there is no trend if the ADX is below 20**
      1. **25-50 = Strong Trend**
      2. **51-75 = Very Strong Trend**
      3. **76-100 = Extremely Strong Trend**
      4. If DI+ > DI-, the trend is upward. If DI+ < DI-, the trend is downward
      5. ADX > 25 and DI- > DI+ is a strong downtrend, prices are moving down (SELL)
      6. ADX > 25 and DI+ > DI- is a strong uptrend, prices are moving up (BUY)
      7. **Check when DI+ and DI- cross, check if ADX > 25, and evaluate accordingly**
      8. Find the average slope of a moving average over our period to determine the average trend (Probably use KAMA)
      9. **An ADX that has been below 25 for an extended period of time is likely to break out into a trend (we do not know which trend though)**
      10. If analyzing ADX over a long period of time, look to see if the peaks have a correlation (i.e. continually decreasing peaks, or continually increasing peaks) to help indicae the long term trend
      11. **Look at both the trend type for Price and ADX. If Price and ADX are following opposite patterns (e.g. one rising, one falling), this may be a sign of trend reversal**
   4. **ADX is better used for entry into the market, as opposed to exit**
   5. ADX Rating (ADXR):
   6. Directional Movement Index: Composed of ADX, DI+, and DI-
      1. Directional Indicator:
         1. Plus:
         2. Minus:
      2. Directional Movement:
         1. Plus:
         2. Minus:
2. Absolute Price Oscillator: measures the absolute value of the difference between two moving averages, typically EMA
   1. **Calculated by:**
      1. APO = AbsoluteValue(Long Average – Short Average)
   2. These moving averages are typically one long (50+ days) and one short (<50 days).
   3. When the APO crosses above zero, the market is bullish (prices rising), as a positive number indicates an upward trend.
   4. When the APO crosses below zero, the market is bearish (prices falling), as a negative number indicates a downward trend.
   5. **A “Divergence” forms when the APO’s movement is opposite of the price.**
      1. If the price hits a new low, but the APO was/is increasing, this may be a sign of a reversal into an upward trend.
      2. If the price hits a new high, but the APO was/is decreasing, this may be a sign of a reversal into a downward trend.
3. Aroon Indicator: measures if a security’s price is in a trend, the magnitude of that trend, and whether that trend is likely to reverse (or not)
   1. **Calculated by**:
      1. Aroon Up: ( (25 – Days Since 25 Day High) / 25 ) \* 100 Strength of an uptrend
      2. Aroon Down: ( (25 – Days Since 25 Day Low) / 25 ) \* 100 Strength of a downtrend
   2. It fluctuates between zero and 100, with zero indicating a weak trend and 100 indicating a strong trend
   3. Trends are found by combining a low and high value from the two Aroon indicators.
      1. **An Aroon Up > 70 combined with an Aroon Down < 30 indicates a strong uptrend**
      2. **An Aroon Up < 30 combined with an Aroon Down > 70 indicates a strong downtrend**
      3. Above 50 is an upward trend, below 50 is a downward trend
      4. Could also measure this in the absolute value of difference between up and down. The larger the difference, the stronger the trend
      5. Consistently high Aroon Up indicates prices are consistently hitting new high, and vice versa if Aroon Down is high.
   4. Three Stages to an Emerging Aroon Trend:
      1. Aroon lines cross each other
      2. Aroon lines cross the 50 marker
      3. One of the Aroon lines reaches 100
   5. When both Up and Down lines are below 50 this indicates consolidation period and a time period of consistent trading where the price does not fluctuate very much.
      1. For an Aroon Indicator with period ‘X’, readings below 50 means that an X-Day high/low has not been recorded for ‘X+1’ days.
      2. Consolidation tends to form when Aroon Up and Aroon Down decline together in parallel fashion with the distance between the two lines being relatively small
4. Balance of Power: measures the market strength of buyers against sellers by by assessing the ability of each side to drive prices to an extreme.
   1. **Calculated by:**
      1. BOP = (Close Price – Open Price) / (High Price – Low Price)
      2. Can be smoothed by a moving average for “trend” results
   2. BOP ranges from -100 to 100
   3. BOP signals systematic buying when it is above zero, and systematic selling when it is below zero
   4. **Balance of Power is used to find “hidden” patterns of accumulation/distribution.**
      1. Perhaps pair it with A/D line?
   5. Check to see if BOP has been a good indicator of a stock’s history, if so we can maybe predict it.
   6. If BOP is falling, but price is rising, expect that rise to soon falter.
5. Continuation pattern: geometric shapes that can be found in a stock’s price data. Common patterns include Rectangles, Triangles, Pennants, Flags
   1. Rectangle: a pause in the trend where prices do not fluctuate much.
      1. The lines drawn here are horizontal and parallel
      2. These lines can be considered short timeframe resistance and support lines
   2. Triangle: Symmetric, Ascending, Descending.
      1. Triangles indicate a convergence of the price range. Over time, the horizontal lines drawn above and below peaks/pits meet at a single point.
      2. A triangle must have at least two peaks and two pits for us to classify it and begin to predict
      3. **The closer to that meeting point we get, the more likely a breakout is to occur**
      4. Symmetric: When the upper and lower lines are sloped similarly (but opposite)
      5. Ascending: When the top line is horizontal and the bottom line has positive slope
      6. Descending: When the lower line is horizontal and the upper line has negative slope
   3. Flag: a pause in the trend, such as a small decrease in price inside an overall upward trend
      1. During a flag, the price becomes fixed within two parallel lines that can have upward, downward, or horizontal slope
      2. Prices are consistent within the flag; they do not fluctuate
      3. Flags occur on very short time periods
      4. **May be useful to use with Fibonacci prediction!**
   4. Pennant: a triangle that occurs with a similar time period as a flag
      1. **May be useful to use with Fibonacci prediction!**
6. Commodity Channel Index:
7. Chande Momentum Oscillator:
8. Moving Average Convergence/Divergence (MACD):
   1. With Controllable MA Type:
9. Money Flow Index:
10. Momentum:
11. On-Balance Volume: uses volume flow to predict changes in price
    1. **Calculated by:**
       1. If todayClose > yesterdayClose, currentOBV = prevOBV + todayVolume
       2. If todayClose < yesterdayClose, currentOBV = prevOBV – todayVolume
       3. If todayClose == yesterdayClose, currentOBV = prevOBV
       4. Note: OBV starts at zero
    2. When volume increases drastically without a change in price, price will rise soon
    3. When volume decreases drastically without a change in price, price will fall soon
    4. OBV works b/c of the different ways large, institutional investors work as opposed to smaller individual investors. Mutual funds and pension funds buy into securities that these bigger firms are selling, causing volume to increase even though the price remains relatively steady. Eventually the price increases, and as larger investors sell, smaller investors buy.
    5. **The jump in volume without a jump in price indicates a potential future increase in price**
12. Percentage Price Oscillator:
    1. Rate of Change: ( (price / prevPrice) - 1 ) \* 100
    2. Ratio: price/prevPrice
    3. Percentage: (price/prevPrice)/prevPrice
13. Relative Strength Index: compares the magnitude of recent gains and losses over a specified period of time to measure speed and change of price movements
    1. **Calculated by:**
       1. RS = (Avg gain of up periods)/(Avg loss of down periods)
       2. RSI = 100 – 100/(1 + RS)
    2. Measures the speed and change of price movements
    3. This indicator ranges from 0 to 100, and typically has boundaries at 20 and 80, or 30 and 70. It is oversold when below 20/30 and overbought when above 70/80.
14. Stochastic:
    1. Fast:
    2. Relative Strength Index:
15. Ultimate Oscillator:
16. Williams’ %R:

Volume Indicators

1. Accumulation/Distribution Line: attempt to gauge supply and demand by determining whether investors are “accumulating” (buying) or “distributing” (selling) by identifying divergences in stock price and volume flow over a period of time
   1. **Calculated by:**
      1. Money Flow Multiplier (MFM) = [(Close – Low) – (High – Close)] / (High – Low)
         1. This number should fluctuate between -1 and 1.
      2. Money Flow Volume (MFV) = MFM \* (Average Volume for Period)
      3. A/D = (Previous A/D) + MFV
   2. This is used to indicate if a stock is trending (the general direction that stock is going)
   3. It is used to find situations where the A/D line is heading in the opposite direction as the price. When this happens, the trader should confirm the reversal, look at other trusted indicators, and then make their decision.
2. Chaikin A/D Oscillator:
3. On-Balance Volume:

Cycle Indicators:

1. Hilbert Transform:
   1. Dominant Cycle Period:
   2. Dominant Cycle Phase:
   3. Phasor Components:
   4. SineWave:
   5. Trend vs Cycle Mode:

Price Transform

1. Average Price:
2. Median Price:
3. Typical Price:
4. Weighted Close Price:

Volatility Indicators

1. Average True Range:
   1. Normalized:
2. True Range:

Statistic Functions:

1. BETA:
2. Pearson’s Correlation Coefficient:
3. Linear Regression:
   1. Intercept:
   2. Slope:
4. Standard Deviation:
5. Time Series Forecast:
6. Variance:

Other:

1. Divergence: When the price makes a new high/low, and a corresponding indicator fails to confirm

Pattern Recognition

1. Two Crows:
2. Three Black Crows:
3. Three Inside Up/Down:
4. Three Line Strike:
5. Three Outside Up/Down:
6. Three Stars in the South:
7. Three Advancing White Soldiers:
8. Abandoned Baby:
9. Advance Block:
10. Belt-Hold:
11. Breakaway:
12. Closing Marubozu:
13. Concealing Baby Swallow:
14. CounterAttack:
15. Dark Cloud Cover:
16. Doji:
17. Doji Star:
18. Dragonfly Doji
19. Engulfing Pattern:
20. Evening Doji Star:
21. Evening Star:
22. Up/Down Gap Side-By-Side White Lines:
23. Gravestone Doji:
24. Hamer:
25. Hanging Man:
26. Harami Pattern:
27. Harami Cross Pattern:
28. High-Wave Candle:
29. Hikkake Pattern:
30. Modified Hikkake Pattern:
31. Homing Pidgeon:
32. Identical Three Crows:
33. In-Neck Pattern:
34. Inverted Hammer:
35. Kicking:
36. Ladder Bottom:
37. Long-Legged Doji:
38. Long Line Candle:
39. Marubozu:
40. Matching Low:
41. Mat Hold:
42. Morning Doji Star:
43. Morning Star:
44. On-Neck Pattern:
45. Piercing Pattern:
46. Rickshaw Man:
47. Rising/Falling Three Methods:
48. Separating Lines:
49. Shooting Star:
50. Short Line Candle:
51. Spinning Top:
52. Stalled Pattern:
53. Stick Sandwich:
54. Takuri:
55. Tasuki Gap:
56. Thrusting Pattern:
57. Tristar Pattern:
58. Unique 3 River:
59. Upside Gap Two Crows:
60. Upside/Downside Gap Three Methods:

Chart Types:

1. Candlestick: displays each of high, close, open, low for each point in a set of data
   1. Each vertical line shows the price range (high at top, low at bottom).
   2. In addition, each vertical line has a box, or “Real Body”, associated with it.
      1. If a stock closes lower than its opening price, the top of the Real Body is the opening price, and the bottom of the Real Body is the closing price. In this situation the Real Body will be filled with a solid color (aka black).
      2. If a stock closes higher than its opening price, the top of the Real Body is the closing price, and the bottom of the Real Body is the opening price. In this situation the Real Body will be hollow, with just an outline (aka white).
      3. Filled = selling pressure/price fall, Hollow = buying pressure/price rise. The longer the Real Body the stronger this pressure is.
   3. The portions of the vertical line above and below the Real Body are called the Upper and Lower shadows.
   4. Marubozu: when there are no shadows, only a filled or hollow body.
      1. Filled: aka Black Marubozu, this forms when the open was the high and the close was the low. It indicates sellers controlled the price action throughout the time period.
      2. Hollow: aka White Marubozu, this forms when the open was the low and the close was the high. It indicates buyers controlled the price action throughout the time period.
   5. Shadows:
      1. Long Shadows: prices throughout the period extended greatly past the open/close.
      2. Short Shadows: most trading occurred near the open/close.
      3. One long shadow indicates a reversal.
   6. Spinning Top: a long upper shadow, a long lower shadow, and a small Real Body.
      1. These indicate indecision, there was lots of fluctuation but the stock still closed close to its open.
      2. A spinning top following a large advance/white candlestick or decline/black candlestick may indicate a reversal in the trend.
   7. Doji: any candlestick where the open and close price are extremely close together, resulting in the candlestick looking like a plus sign ( + ).
      1. The closer an opening and closing are in a Doji the more robust it is considered.
      2. Alone Doji are a neutral indicator. Any signals occur based on previous price action and future confirmation.
      3. **Long White Candle + Doji: indicates the upward trend may be reversing, if there is a black candle after the Doji this is a reversal.**
         1. This pattern (LWC + D) is known as a Doji Evening Star
      4. **Long Black Candle + Doji: indicates the downward trend may be reversing, if there is a white candle after the Doji this is a reversal.**
         1. This pattern (LBC + D) is known as a Doji Morning Star
      5. Long Legged Doji: small Real Body with long upper and lower shadows of approximately equal length. These indicate a lot of indecision in the market.
      6. Dragonfly Doji: When the open, close, and high are all equal, with a long lower shadow
         1. Could indicate the end (and rally) of a falling trend, as the prices fell during the beginning of the period but rallied at the end.
         2. Look for a Long White before this and a Long Black after to confirm the reversal.
      7. Gravestone Doji: When the open, close, and low are all equal, with a long upper shadow.
         1. Could indicate the end of a rising trend (as this represents a peak). Prices rose during the beginning of the period but fell at the end.
         2. Look for a Long black before this and a Long White after to confirm the reversal.
      8. **Doji require other indicators to confirm the trend**
   8. Star Position: when the second candlestick’s Real Body is entirely outside of the previous candlestick’s Real Body, usually with a vertical gap between the two Real Bodys.
   9. Harami Position: when the second candlestick’s Real Body is entirely within the previous candlestick’s Real Body
   10. Hammer: a small filled real body with a large lower shadow and a small/nonexistent upper shadow.
       1. It is a bullish reversal pattern that forms after a decline (indicating a potential rise)
       2. Sellers drove the price down early, but buyers soon drove it back up.
       3. It can also mark a pit for the purpose of support line measurement.
       4. **To confirm a Hammer (and the potential rise) look for the next candlestick to be long/white with large volume and/or a gap up.**
          1. Gap Up/Down: when a stock opens above or below the previous closing price
          2. Large/heavy volume indicates lots of trading occurring for that stock.
   11. Hanging Man: a small white real body with a large lower shadow and a small/nonexistent upper shadow.
       1. It is a bearish reversal pattern that forms after a rise, as there is increased selling pressure.
       2. Buyers drove the price up early, but sellers soon drove it back down
       3. It can also mark a peak for the purpose of resistance line measurement.
       4. **To confirm a Hanging Man (and the potential fall) look for the next candlestick to be long/black with large volume, and/or a gap down.**
   12. Upside Down Hammer: a small black Real Body with a long upper shadow and a small/nonexistent lower shadow.
   13. Shooting Star: a small white Real Body with a long upper shadow and a small/nonexistent lower shadow.
2. OHLC: displays each of “Open High Low Close” for each point in a set of data
   1. Similar to Candlestick, OHLC is a way of mapping several data points for a time period on one “line”.
   2. Each vertical line shows the price range (high at top, low at bottom).
   3. The left tick mark indicates the opening price, and the right tick mark indicates the closing price.

Favorites:

* Kaufman Adaptive Moving Average
* Relative Strength Index (and StochRSI)
* Aroon Indicator/Oscillator