|  |  |
| --- | --- |
| MESA9  ***MESA9*** is as easy to use as any of the indicators built into TradeStation. As opposed to fixed rule indicators, all MESA indicators dynamically adjust to current market conditions.  The premise of MESA is that market cycles are the one characteristic that can be scientifically measured. The MESA (Maximum Entropy Spectral Analysis) algorithm makes a high resolution estimate of the entire range of potential cycles. Experience has shown that there is typically only one tradable cycle in the market at a time. This is the "dominant cycle" that is extracted from the spectral estimate by using a center of gravity approach so that the dominant cycle is the one containing the majority of the cyclic power. A real-world example of the spectrum as measured by ***MESA9*** is shown in the following figure for the SPY for the year prior to November 2005. The spectrum is displayed as a heat map, running from white-hot, through red-hot, to ice cold over a 20 dB range. Colorizing the spectrum this way enables the spectrum to be displayed in time synchronization with the price data.  http://www.mesasoftware.com/mesa_clip_image002.jpg  **MESA9 Spectral Estimate for SPY  for the Year Prior to July 2010**  Notice that the dominant cycle is ephemeral - it comes and goes, sometimes very quickly. ***MESA9*** provides the dominant cycle as an output that enables other indicators to be adaptive to current market conditions. The dominant cycle indicator also enables you to smooth the dominant cycle with any degree of smoothing you desire.  Since there is typically only a single tradable dominant cycle present at a time, a simplified model of the market consisting of just a trend and a cycle seems reasonable. With this, we can build trading strategies based on the premise of a trend mode and a cycle mode. Since the cycle period is known, we therefore know the trend by removing the cyclic components by filtering. The ***MESA9*** "Instantaneous Trendline" is shown in cyan in the following figure. This Trendline (shown in cyan) is created by filtering out all the cyclic components of the price whose periods are at the Dominant Cycle and Shorter. In other words, the Trendline is comprised of only the longer cycle period components. The red line is a low lag smoothed version of the prices, produced by removing all frequency components shorter than half the Dominant Cycle period.  http://www.mesasoftware.com/mesa_clip_image004.jpg  **MESA9 Instantaneous Trendline and Detrended Data**  Computed this way, the instantaneous trendline forms the mean value of the prices, around which the cycle component swings. The detrended price is computed by subtracting the instantaneous trendline from the prices. In the figure above, ***MESA9*** scales the detrended price to the +1 sigma and -1 sigma values for you to easily visualize when the prices can be expect to revert to the mean.  **TRADE THE TREND?**  The trend is always the momentum taken across the full period of the Dominant cycle. It is not advisable to trade cycles if the cycle amplitude is swamped by the trend slope or if the signal to noise ratio is so low that profit expectation is diminished significantly.  In ***MESA9*** we accurately measure the cycle period, show the cycle and instantaneous trend components. We also consolidate the conditions under which one should trade the cycle mode or the trend mode of the market by the use of our unique Trend Vigor Indicator. The Trend Vigor Indicator is simply the ratio of the trend slope to the peak-to-peak cycle amplitude. If the Trend Vigor is greater than +1, then the trend trade should be to the long side. Cycle indicators can still be used for timing the dip in the long direction. If the Trend Vigor is less than -1, then the trend trade should be to the short side. As before, cycle indicators can still be used for timing the peak in the short direction. If the Trend Vigor falls between -1 and +1. then it is most advisable to trade the cycle and ignore the trend. The following figure shows the Trend Vigor Indicator in the first subgraph. The Trend Vigor Indicator has an optional "corona" when it falls in the range between -1 and +1, indicating that trading the trend is not advisable. Alternatively, the Trend Vigor Indicator can be viewed without the corona and with the +1 and -1 boundaries displayed.  The second subgraph shows the Trend Vigor as a Heatmap for all cycle periods between a 12 bar period and a 60 bar period. Green indicates uptrend, Red indicates downtrend, and blue indicates the cycle mode.  http://www.mesasoftware.com/mesa_clip_image006.jpg  **MESA9Trend Vigor and Heat Map**  **TRADE THE CYCLE?**  Returning to the cyclic component, the figure below shows several aspects of ***MESA9*** . The first subgraph shows the **MESA9 BandPass** filtered output of the prices in the main chart. Since the data are simply filtered, the amplitude of the cyclic response at the Dominant Cycle is retained and you are viewing the wave of the Dominant Cycle directly.  http://www.mesasoftware.com/mesa_clip_image008.jpg  **MESA9 Cyclic Indicators**  The problem with virtually all indicators is that they are causal. That means they directly depend on data for their computation. As a result, the computation cannot be accomplished until after the data arrives, and - as a result - all causal indicators have lag. Lag is perhaps the traders' worst enemy, particularly when trading the cycle mode when relatively short term entries and exits are expected. ***MESA9*** offers a solution to the lag problem by offering the **MESA9 Sinewave** indicator. The market is coherent in the cycle mode, meaning that the dominant cycle has existed for a short while in history. It is further assumed that the dominant cycle will continue for a short time into the future. Since the dominant cycle is known, and its phase can be computed, we can advance time by advancing phase of the coherent dominant cycle. The Sinewave indicator shown in the figure above is computed using the phase of the dominant cycle. The **MESA9 Sinewave** Indicator includes an input for you to compensate for any computational lag, should you detected it. The Lead Sine indicator is computed simply by advancing the phase of the dominant cycle by 45 degrees. This creates an indicator that produces a crossing signal 1/8th of a cycle ahead of its turning point. For an 16 bar cycle, the crossing occurs 2 bars ahead of the cyclic turning points - just right for making a timely trade entry. Clearly, the Sinewave indicator does not work so well when the market is in a trend mode.  Not only is it not advisable to trade on the basis of cycles when the market is in a trend, but also trading with cycles should be avoided when the Signal to Noise Ratio is low. Noise is the short term and bar-to-bar variation of prices as opposed to the measurable cyclic swings. A ratio less than 6 dB is considered inadvisable for cyclic trading because the cyclic variation can get lost in the noise. In the figure below the **MESA9 SNR** is shown in the first subgraph and the **MESA9 Sinewave** indicator is shown in the second subgraph. The **MESA9 SNR** warns of inadvisable cycle with a corona display when the signal to noise ratio is less than 6 dB. Optionally, the corona display can be suppressed and the 6 dB level shown as an indicator line.  http://www.mesasoftware.com/mesa_clip_image010.jpg  **MESA9 SNR and Sinewave Indicators**  **PREDICT THE FUTURE?**  The ***MESA9*** program uses TradeStation's probability map to display a prediction 10 bars into the future. The prediction uses both trend and cycle mode components to make a startlingly accurate prediction of future price movement. As shown in the figure below, the prediction can be backtested for any bar on the chart. The prediction is located at the center of the chart and clearly shows the expected downward movement 10 bars into the future after the cyclic turning point.  http://www.mesasoftware.com/mesa_clip_image012.jpg  **MESA9 Backtested Prediction**  We have attempted to describe all the major features of the ***MESA9*** Package, built as a plug-in into the TradeStation platform. We are sure you can some, if not all, of the features to your trading advantage. At a minimum, you will not be looking at the market the same way ever again. You are bound to abandon your tired old Stochastics, RSIs, and moving averages.  The following is a brief description of the ***MESA9*** indicators on alphabetical order and probability map:  **MESA9 Bandpass**  Displays the cycle that has been filtered through a narrow bandpass filter tuned to the current dominant cycle. The amplitude of the cycle is scaled absolutely to the price data.  **MESA9 BandStop**  Frankly, the BandStop Indicator may of limited benefit. It is included in the ***MESA9*** package of indicators to show you how price history looks with the Dominant Cycle removed. The BandStop filtered output is compared to a smoothed version of the closing prices. The BandStop Indicator can possibly be of benefit for those traders wanting to trade the trend using the crossings of the two lines.  **MESA9 Detrend**  This ***MESA9*** Indicator detrends the price by subtracting the Instantaneous Trendline from the price. The display is scaled to show the price relative to the plus one sigma and minus one sigma values. Exceeding the one sigma values and then starting to return signals a reversion to the mean.  **MESA9 Heatmap**  Gives a colorized graphic display of the Trend Vigor for all cycle periods from 12 bar cycles to 60 bar cycles. The vertical scale is the cycle period. The Trend Vigor is colorized - green for uptrends, red for downtrends, and blue for cyclic activity.  **MESA9 Sinewave**  The sinewave indicator plots a pure sinewave based upon the measured phase of the dominant cycle. The phase is advanced 45 degrees to produce the LeadSine component. The Sine and LeadSine lines cross 1/8 th of a cycle prior to the actual cyclic reversals. The **MESA9 Sinewave** indicator is a non-causal filter (does not depend directly on data for its computation). Therefore, it is a valid advance indication of a turning point when the market is in a cycle mode. The Sinewave Indicator includes a user-supplied compensation for computational lag when it is detected.  **MESA9 SNR**  The Signal to Noise Ratio (SNR) indicator displays the Dominant Cycle Signal amplitude relative to the average bar range (taken to be noise because entry and exits within a bar are most likely random. The SNR is displayed in decibels. When the SNR is less than 6 dB, trading with the cycle mode should be done with great caution, if at all. When the Signal to Noise Ratio is less than 6 dB the indicator develops a corona, advising that caution trading the cycle should be exercised.  **MESA9 Spectrum**  Displays the spectrum and Dominant Cycle over a default range of 12 to 60 bars, with the amplitude colorized to run from white hot (maximum amplitude), through ranges of red hot, to ice cold - over a 20 decibel range. Colorizing the spectral component amplitudes enables the spectrum to be displayed in synchronism with the barchart. . You can change the shortest and longest periods within the default range to magnify periods of interest. The spectrum components are shown by default, however, setting the Show Spectrum input to "false" removes the spectral components, leaving only the Dominant Cycle displayed.  **MESA9 Trend Vigor**  The Trend Vigor Indicator is simply the ratio of the trend slope to the peak-to-peak cycle amplitude. If the Trend Vigor is greater than +1, then the trend trade should be to the long side. Cycle indicators can still be used for timing the dip in the long direction. If the Trend Vigor is less than -1, then the trend trade should be to the short side. As before, cycle indicators can still be used for timing the peak in the short direction. If the Trend Vigor falls between -1 and +1. then it is most advisable to trade the cycle and ignore the trend. The Trend Vigor Indicator has an optional "corona" when it falls in the range between -1 and +1, indicating that trading the trend is not advisable. Alternatively, the Trend Vigor Indicator can be viewed without the corona and with the +1 and -1 boundaries displayed.  **MESA9 Trendline**  The Instantaneous Trendline is displayed as an overlay on the price bars. The ***MESA9*** "Instantaneous Trendline" is created by filtering out all the cyclic components of the price whose periods are at the Dominant Cycle and Shorter. In other words, the Trendline is comprised of only the longer cycle period components. The Trendline Indicator includes low lag smoothed version of the prices, produced by removing all frequency components shorter than half the Dominant Cycle period.  **MESA9 Prediction (Probability Map)**  Produces a 10 bar prediction into the future based on the continuation of the trend and the cycle components. The prediction can be backtested by right clicking on a selected bar and then left click your mouse to compute the prediction forward from that bar. You should ensure formatting includes setting the Maximum number of bars study will reference to be user defined at 100. Otherwise, erratic results can result.    We have attempted to describe all the major features of the MESA9 Package, built as a plug-in into the TradeStation platform. We are sure you can use some, if not all, of the features to your trading advantage. At a minimum, you will not be looking at the market the same way ever again. You are bound to abandon your tired old Stochastics, RSIs, and moving averages. |  |

|  |
| --- |
|  |