MESA96

MESA SOFTWARE

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Are There Cycles in the Market?

- My Experience
  - Tradeable cycles are present only 15% - 30% of the time
  - Randomness is related to timing and the length of observation
- A trading system must include procedures for the other 70% - 85% of the time
- I relate the market to known physical phenomena
  - Smoke plume for Trend Modes
  - Meandering river for Cycle Modes

Theoretical Problem Solution

- Both randomness and short term cycles can arise from the solution to the random walk problem
- Solution is the “Diffusion Equation” for Trend Modes
- Solution is the “Telegraphers Equation” for Cycle Modes

Diffusion Equation

- "Drunkard's Walk" is a special form of the random walk problem
  - The drunk flips a coin to determine right or left with each step forward
  - The random variable is direction
- The Diffusion equation is the solution
  - describes smoke coming from a smokestack
- The smoke plume is analogous to market conditions
  - Breeze bends the plume to an average trendline
  - Plume widens with distance - distant predictions are less accurate
  - Smoke density is analogous to prediction probability - the best estimator is the average

Telegrapher's Equation

- **Modify the "Drunkard's Walk" problem**
  - Coin flip decides whether the drunk will reverse his direction, regardless of the direction of the last step
  - The random variable is now momentum, not direction
- **Solution is now the Telegrapher's Equation**
  - Describes the electric wave on a telegraph wire
  - Also describes a meandering river
- **A river meander is a short term cycle**
  - Random probability exists (Diffusion Equation) IF:
    - Individual meanders are overlaid
    - Or a long data span is taken

The Market is Similar to a Meandering River

- Both follow the path of least resistance
- Rivers attempt to keep a constant water slope - maintains the conservation of energy.
- Conservation of Energy produces the path of least resistance
  - Paths of uniform resistance look like pieces of sinewaves
- Market Forces (greed, fear, profit, loss, etc.) are similar to physical forces, producing paths of uniform resistance.
- Think about how the masses ask the question:

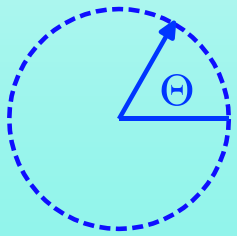
  Will the market change?

  OR

  Will the trend continue?

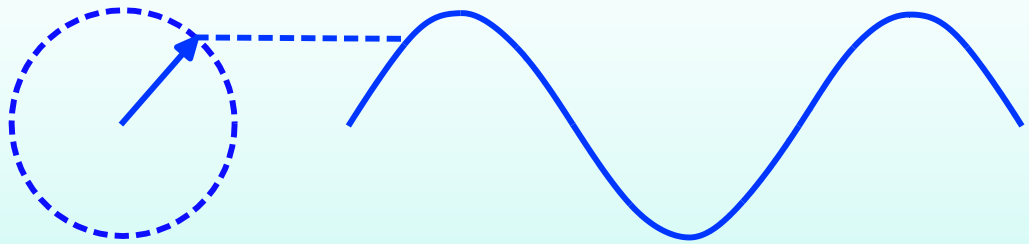
What is a cycle?

- A cycle is a variation where the point of observation returns to its point of origin
- Frequency is the repetition rate of the cycle
  - An engine turns at 2000 rpm, each rotation is a cycle
- Period is the reciprocal of frequency
  - For example: a 14 day market cycle
- A simple cycle can be pictured as a rotating arrow
  - A full rotation returns to the origin
  - Fractions of a complete cycle are measured by phase angle

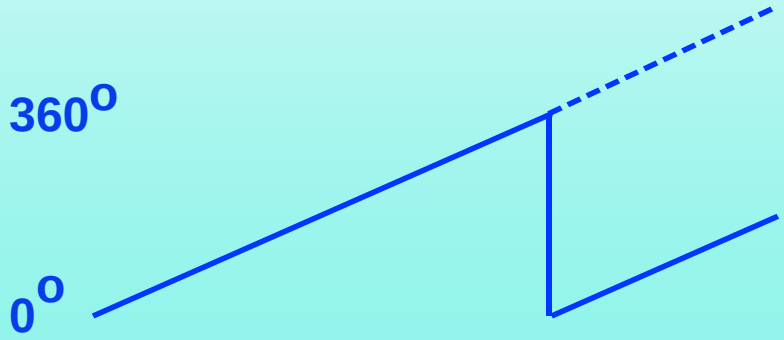


Sinewaves

- A sinewave can be generated by connecting a pen to the arrow and pulling a piece of paper

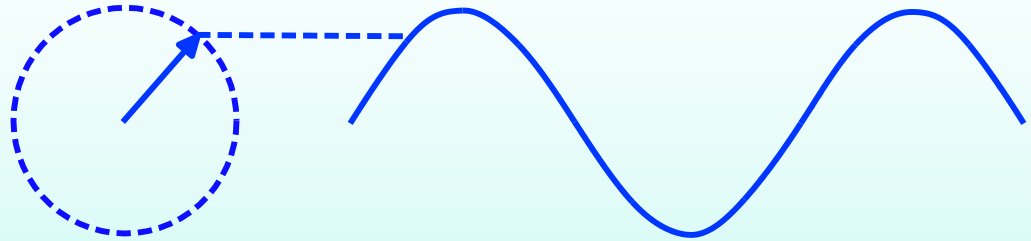


- Phase angles increase uniformly

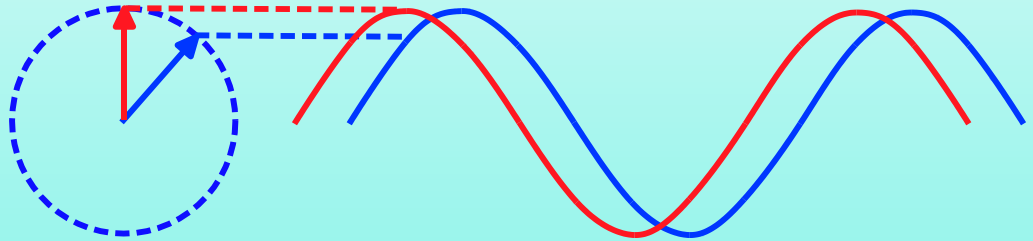


Phase Advance Produces a Leading Indicator

- Conventional Sinewave



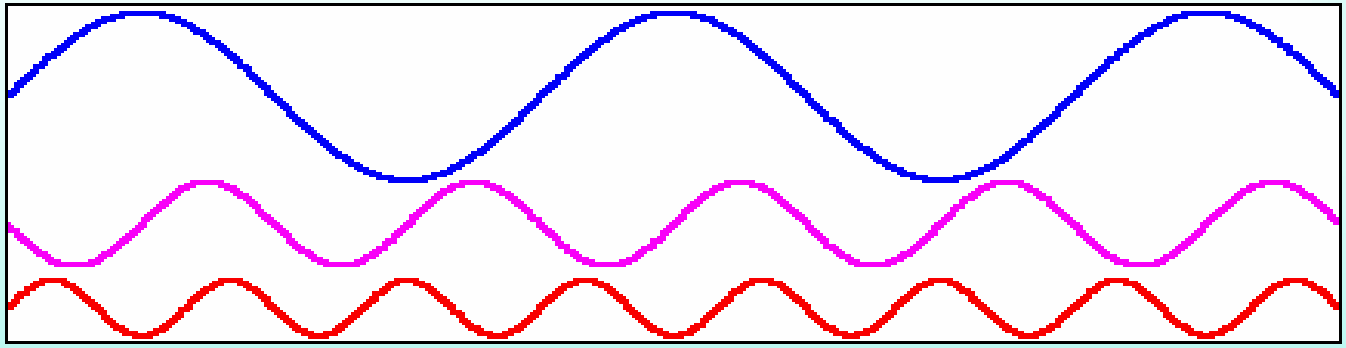
- Crossover Trading Signals using phase lead



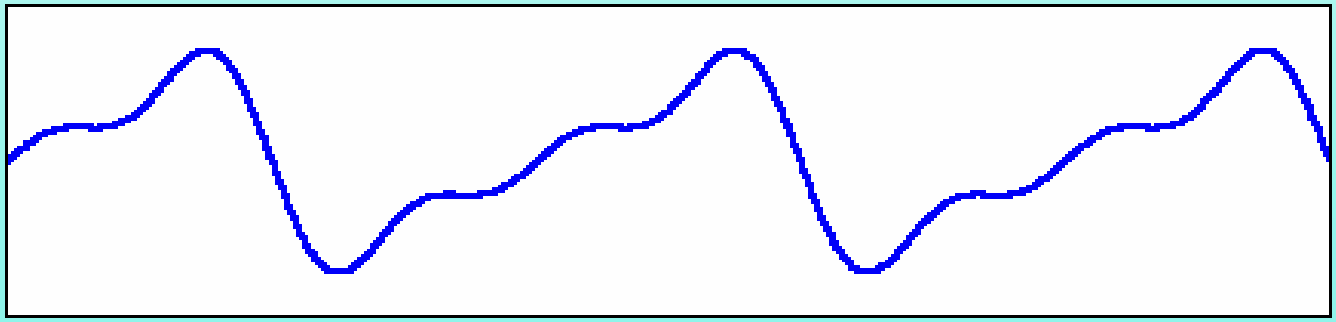
Wave Synthesis is Easy

- Sinewaves are the primitives to synthesize more complex waves

wave = SIN(F*T) - SIN(2*F*T)/2 + SIN(3*F*T)/3



Combined Waveform: Elliott Wave?



Cycle Measurement

- Cycle Finders
- FFT (Fast Fourier Transform)
- MESA (Maximum Entropy Spectral Analysis)

Cycle Finders

- Basically count the number of bars between successive lowest lows or successive highest highs.
- Ehrlich cycle finder is a pantograph that enables cycle count on paper charts
- All software toolboxes have cycle finders
- Disadvantages:
  - Depend on a long term correlation - therefore assume the cycle is continuously present
  - Even the shortest measurement is discrete and cannot adjust for changing cycles

FFT

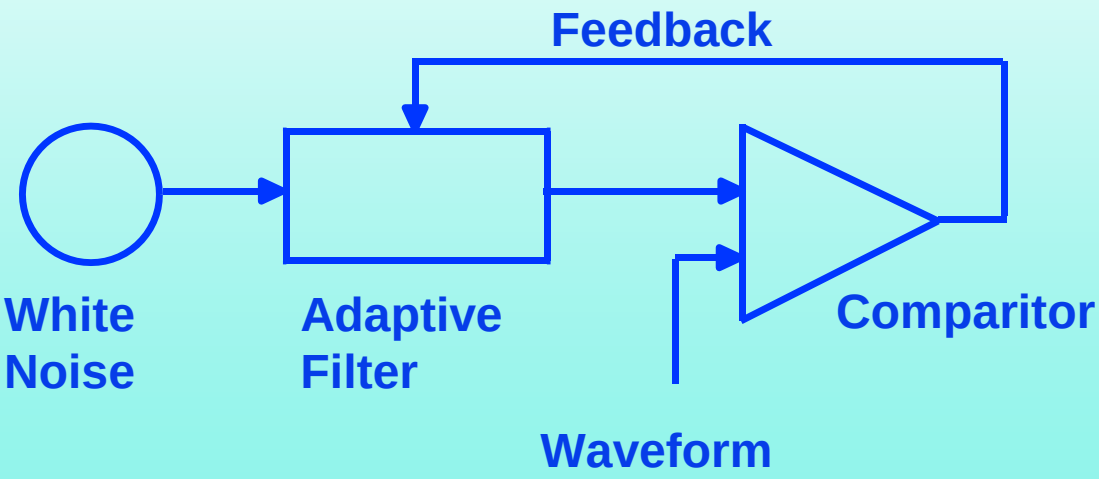
- **Constraints:**
  - Data is a representative sample of an infinitely long wave
  - Data must be stationary over the sample time span
  - Must have an integer number of cycles in the time span
- **Assume a 64 day time span**
  - Longest cycle is 64 days
  - Next longest is 64/2 = 32 days
  - Next longest is 64/3 = 21.3 days
  - Next longest is 64/4 = 16 days
- **Result is poor resolution - gaps between measured cycles**

FFT (Continued)

- **Paradox:**
  - The only way to increase resolution is to increase the data length
  - Increased data length makes realization of the stationarity constraint highly unlikely
    - 256 data points are required to realize a 1 bar resolution for a 16 bar cycle (right where we want to work). This would require the 16 day cycle to be present and consistent for an entire year!
- **Conclusion: FFT measurements are not suitable for market analysis!**

MESA Cycle Measurement

- **Feedback optimally adjusts filter so the filter output is the same as the data waveform**
  - **Pattern matching in the time domain**
  - **No intrinsic resolution limitation or frequency distortions**



How MESA Works

- The White Noise Source contains all frequencies
  - The tuned filter output is the same as the real data
  - The frequency response of the filter is the same as the frequency response of the data
- The frequency response of the filter is examined after the filter is tuned
- The digital clock can run into the future so the filter output forms a prediction. (If the cycles continue with the same amplitude and phase.)

Moving Averages

- All moving averages smooth the data
  - They are filters that remove the high frequency content (the shorter cycles)
  - Longer averages provide more smoothing
- All moving averages lag in the time domain
  - Longer averages provide more Lag
- Use of moving averages is always a tradeoff between desired smoothing and tolerable Lag

Kinds of Moving Averages

- **Simple Moving Average**
  - Simple algorithm
  - Fast Computation
- **Exponential Moving Average**
  - Simple recursive algorithm
  - Fast Computation
- **Weighted Moving Average**
  - Very small lag
  - Approximates a Bessel Filter (equal time lag at all frequencies)
  - Nonrecursive, but now reasonable to use with faster computers

Summary

THEORY

- MESA is the best way to measure cycles
- Phase is an important parameter
- Phase lead anticipates cycle turning points
- Cycle is constant rate change of phase
- Weighted moving averages are superior

EASY TO USE

Practical MESA96 Displays

- Dominant Cycle and Spectral Contour correlate to price bars
- Measured Phase correlates to price bars
- Sinewave Indicator provides clear crossover signals
- Trend Mode signaled by price bar color change
- Weighted Moving Averages indicate trend direction

MESA96 Measurements