

Heikin-Ashi (Average Bar) Its Attributes & Application to Japanese Market

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Oct. 10th, 2014





I. What is HA?

II. The Strengths and Weaknesses of HA

III. The Opportunities of Making HA a Stronger Tool



Japanese are Good at Designs/Creations including in the Studies of Technical Analysis





Heikin-Ashi, A Less Known Under-researched Japanese TA Tool



What is it? Should we use it? What are the pros and cons? How to use it?

Source: FIL Tokyo, Bloomberg, Dan Valcu and Sylvain Vervoort



How is Heikin-Ashi Calculated?

Price	Candle	НА	НА		Calculation
Open	0	МО	MO	average	{MO (t=-1), MC (t=-1)}
High	н	МН	МН	max	$\{H(t=0), MO(t=0)\}$
Low	L	ML	ML	min	{L(t=0), MO(t=0)}
Close	С	MC	MC	average	{O(t=0), H(t=0), L(t=0), C(t=0)}

Example

Price	Candle	НА	НА		Calculation	
Open	2	МО	1	average*	{0.5, 1.5}	
High	4	МН	4	max	{4, 1}	
Low	1	ML	1	min	{1,1}	
Close	3	MC	2.5	average	{2,4,1,3}	

* assuming MO (t=-1) =0.5, MC (t=-1) =1.5



Heikin Ashi represents 2 distinct underlying components:

A) A time weighted average of price B) An embedded Trend indicator



Heikin-Ashi 's MO is APPROXIMATELY a time weighted average of Price OHLC over the previous six time periods

- MO t=0 \approx 6M Moving Average of Price t =(-1 ~ -6)
- $MC_{t=0} \approx Price_{t=0}$



A hollow body (MC t=0 > MO t=0) is Bullish A filled body (MC t=0 < MO t=0) is Bearish

Heikin-Ashi is an Embedded Trend Indicator

Source: FIL Tokyo, Bloomberg, Dan Valcu and Sylvain Vervoort



Heikin-Ashi Patterns & Their Implications: Only 3 Basic Patterns

1 & 2: hollow candle & filled candle



3: candle with shadows on both sides



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Pattern	MO vs. PH & PL	MC vs. MO	Trend Implication	Trading Action
big hollow body	MO <= Low Price (PL)	MC way above MO	strong uptrend	stay with trend
big filled body	MO > = High Price (PH)	MC way below MO	strong downtrend	stay with trend
hollow body with lower shadows	PH > MO > PL	MC still above MO, but PL below MO	still above ma, but uptrend gets weaker	watch out reversals
filled body with upper shadows	PH > MO > PL	MC still below MO, but PH above MO	still below ma, but downtrend gets weaker	watch out reversals
spin/doji	PH > MO > PL	MC very close to MO	price crossing over MA	watch out reversals



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The Strengths of Heikin-Ashi

(1) Less is More: Trend & Reversal of Trend Become Clearer with Heikin-Ashi



Why? Color change \approx Price Crossing over MAs



(2) The Strength of Trend Very Obvious:

The Bigger The Body, The Stronger The Trend



Why? The bigger the body, the more powerful the move away from the moving average

Source: FIL Tokyo, Bloomberg, Dan Valcu and Sylvain Vervoort



(3) HA as A Warning Signal upon Emergence of Shadows on Both Sides



Why? Trend is getting weaker, and price is approaching the moving average



(4) HA Delta* as a Price Extremes Detector (Overbought/Oversold)



Why? HA Delta = MC – Mo, a momentum indicator similar to moving average deviations

Source: FIL Tokyo, Bloomberg, Dan Valcu and Sylvain Vervoort



Performance of HA as a Trend Indicator Using Color Changes as Buy/Sell Signals

Back testing Methodology

- Cover and go long on Buy signals at next open price; close and go short on Sell signals at next open price
- Period: 20 years from
 07/31/1994~07/31/2
 014



Good long term performance, yet interim drawdown could be significant. Why?



The Weaknesses of Heikin-Ashi

(1) Too Many Noises/Whipsaws, Especially during Range Markets







(2) Frequent Delays at the Major Turing Point





Why? MO t=0 \approx 6M Moving Average of Price t =(-1 ~ -6)



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Smoothing Methodologies to Reduce Noises/Whipsaws

(1) MC / PC 7M MA



(2) PC / MO 3M WAV

Back testing Methodology

- -> Cover and go long on Buy signals at next open price; close and go short on Sell signals at next open price
- → Period: 20 years from 07/31/1994~07/31/2014

Source: FIL Tokyo, Bloomberg, Dan Valcu and Sylvain Vervoort



(3) PC/average(MO 3MWAV, PC 6MMA)

(1) <u>MC vs. PC's 7M MA</u>





(2) PC vs. MO's 3M WAV





(3) PC vs. Average of (MO's 3M WAV, PC's 6M MA)









Methodologies to Reduce Delays





(1) HADelta Divergence to Rescue at the Market Turning Points



* Requires subjective interpretation, not included in mechanical backtesting



(2) Derivative of HADelta for Earlier Buy-Sell Signals





Performance Improved at Some Turning Points and during Range Markets





Further Smoothing vs. Oscillators, or Further Smoothing & Oscillators?



Correlation between the two model's signal is 0.306



There should be benefits of combining trend and momentum



How to Combine the Trend & Momentum Signals?





Significant Performance Enhancement



1 + 1 > 2



Positive Return Achieved during the Range Markets





Summary

. What is HA?

- In essence HA is a weighted average of OHLC price over the previous 6 time period
- HA by itself can be used as a trend indicator
- There are only **3 basic HA patterns**: hollow candle, filled candle and candle with shadows on both sides (the smaller the body, the closer to turning point)

II. The Strengths and Weaknesses of HA?

- Less is More: Trend, trend reversal as well as warning signals all easily identifiable without using other indicators.
- Noises at range markets and lagging at the turning point are the two major weak points

III. The Opportunities of Making HA a Stronger Tool

- **Both further smoothing and inclusion of a momentum indicator** like HA Delta and its derivative can improve the HA performance
- Combining the two indicators can SIGNIFANTLY enhance the HA performance



<Appendix> Applications of HA in Other Markets and Asset Classes I. S&P 500





II. GOLD



Source: FIL Tokyo, Bloomberg, Dan Valcu and Sylvain Vervoort



III. YEN /U\$





Forecasting the Japanese Stock Market with the BPV Ratio Indicator

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10th October 2014 IFTA Conference London

Masaaki Yamada

Definition of BPV Ratio

$$BPV Ratio(i, N) = \frac{\pi}{2} \times \frac{N}{N-1} \times \frac{BipowerVariation(i, N)}{R ealizedVolatility(i, N)}$$

Bipower Variation(i, N) =
$$|x_i| |x_{i-1}| + |x_{i-1}| |x_{i-2}| + \dots + |x_{i-N+2}| |x_{i-N+1}|$$

Realized Volatility $(i, N) = x_i^2 + x_{i-1}^2 + \dots + x_{i-N+1}^2$

$$x_i = \ln\left(\frac{S_i}{S_{i-1}}\right)$$

 S_i is Stock Price at t.

Binomial tree ud=1



ud=1

Example BPV Ratio Calculation

 $|x_i| = |x_{i-1}| = a$ $i = 1, 2, \cdots$

$$BPV Ratio(i, N) = \frac{\pi}{2} \times \frac{N}{N-1} \times \frac{a \cdot a + a \cdot a + \dots + a \cdot a}{a^2 + a^2 + \dots + a^2} = \frac{\pi}{2}$$

$$BPV Ratio(4,5) = \frac{\pi}{2} \cdot \frac{5}{4} \cdot \frac{|1\%||1\%| + \dots + |1\%||2\%|}{(1\%)^2 + \dots + (1\%)^2 + (2\%)^2}$$
$$= \frac{\pi}{2} \cdot \frac{5}{4} \cdot \frac{3 \times 0.01 + 0.02}{4 \times 0.01 + 0.04} = \frac{\pi}{2} \cdot \frac{5}{4} \cdot \frac{0.05}{0.08} = \frac{\pi}{2} \cdot \frac{25}{32} = \frac{\pi}{2} \cdot 0.78125$$

BPV Ratio Quantifies the Distance (The Binomial Tree, Price Movement)



Hong and Stein, Journal of Finance, 1999.

Newswatcher

Buy or Sell Based on the Cashflow Information

Regardless of the Price Level

Momentum Trader

Buy or Sell Based on the Price Movement

No Cashflow Information

The Period of the Position Taking is predetermined



The Momentum Trader Joins the Market



Market Prices and BPV Ratios



Entry and its Subsequent Return



3614 BPV Ratios 363 entry points (from 2000/1 to 2014/9/18) Threshold=0.933881 median from 2000/1 to 2013/12

Correlation and Statistics

	1	2	3	4	5
Correlation	0.113	0.173	0.173	0.157	0.126
T value	2.162	3.331	3.331	3.024	2.412
Average	0.002	0.004	0.005	0.005	0.004
Std Dev	0.016	0.022	0.027	0.030	0.033
Ann Return	0.045	0.096	0.116	0.117	0.103
Ann Risk	0.080	0.110	0.134	0.148	0.165
Sharpe Ratio	0.566	0.870	0.867	0.788	0.627

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2001/1/1-2014/9/18

Threshold H = 0.933881 Median from 2001/1 to 2013/12

Daily Back Test to Nikkei225 2000-2014



Existence or Absence of Newswatcher



Filtered BPV Ratio by Kalman Filter



Price History from 2005 to 2007



Price History from 2012 to 2014



Actual Price (Black Dot and Red Dot) and Calculated Price (Only Black Dot)



My Forecast to Nikkei225

Rising Potential (the Gap)

Price movement to fill the Gap is "Rise in Red "

Repeat "Rise in Red" until the Gap is Eliminated.





Introduction to Cycle Analysis – Reference charts USDJPY and Topix Transportation Equipment Index (TPTRAN)



Period – Amplitude – Phase - Proportionality

Properties of Cycles

Repeating fluctuation of an observed variable described by a sine wave around a central value.

- Trough cycle low point.
- Peak cycle high point.
- Period length in time units, trough to trough (x-axis).
- Amplitude power / height in price units (y-axis).

Period / Amplitude -

proportional: the longer the cycle greater the amplitude.

 Phase - time elapsed since last trough OR offset between two cycles.

Velocity and Acceleration



Basic Principles General theory of cycles.

- Proportionality the longer the period, the greater the cycle's power / amplitude.
- Nominality a fixed family of Summation cycles cycles from very long to very short.
- Harmonicity cycles are related to one another by a factor of two or three.

- Synchronicity troughs tend to synchronise, peaks tend to be dispersed (in stocks).
- combine by addition.
- Commonality the principles apply to all freely traded financial instruments.

Nominality

A family of cycles from very long to very short

Calendar Days				Trading Days				
Years	Months	Weeks	Days	Years	Months	Weeks	Days	
54				54				
18				18				
9				9				
	54				54			
	18	80 (560D)			18	80 (392D)		
	9	40 (280D)			9	40 (196D)		
		20 (140D)				20 (98D)		
		10 (70D)	80			10 (49D)	56	
			40	-			55	
			20				14	
			10				7	

Harmonicity

Cycles within the composite are harmonically related



Synchronicity

Synchronisation of troughs – Dispersion of peaks



Summation I Complex composite

- Composite of 9, 18, 78, 156 day cycle components + flat underlying trend.
- Same composite + shallow underlying uptrend. Notice the components are swamped.
- Difficult to pick out the components even though known.



Summation II Component cycles

- Component cycles: 9, 18, 78, 156 day cycles + flat underlying trend.
- Underlying trend = straightened out section of much longer cycle.



Phasing model Goal of phasing analysis.

Date	3	Jul	2003	BA	BOEING		Status
Nominal		Avg	Var. /	Phase	Status	Cycle	•
¥	1	V	K	k	K 14		-
54M	230W	230.0	100.0%	17	Bottoming/Up	Equal	Cycle long or short vs. Nominal
18M	80W	76.7	95.8%	17	Up	Short	
9M	40W	38.3	95.8%	17	Topping	Short	•
20W	20W	19.2	95.8%	17	Bottoming	Short	
80D	10W	9.6	96.4%	6	Overdue	Short	

- Phase and average period of component cycles in composite.
- Status of each cycle:
 topping, bottoming, up, down, overdue
- Estimated time location of next cycle lows.



Charts - Updata; Data - Bloomberg



Charts - Updata; Data - Bloomberg



Charts - Updata; Data - Bloomberg