

Keeping Up With Changes

Adaptive Moving Averages

The biggest challenge for any trader is identifying turning points in price movements. You never know if you'll end up getting whipsawed out of a trade. Here's one way to avoid those whipsaws.

T

by Vitali Apirine

he term *adaptive moving average* is associated with the *Kaufman adaptive moving average* (KAMA), developed by Perry Kaufman. In this article I will discuss the *adaptive moving average* (AMA), which is based on the KAMA

but has subtle differences.

The AMA is designed to account for the location of the close relative to the high–low range. You'll find that AMA closely follows prices and can be combined with KAMA to identify turning points and filter price movements.

HOW'S IT CALCULATED?

The values 10, 2, and 30 are the typical settings used with the AMA; however, other values can be substituted depending on your trading style and goals. These settings are similar to KAMA.

- 10 is the number of periods
- 2 is the number of periods for the fastest EMA constant
- 30 is the number of periods for the slowest EMA constant.

THE MULTIPLIER (MLTP)

$$MLTP = \frac{ABS[(Current\ Close - Lowest\ Low) - (Highest\ High - Current\ Close)]}{(Highest\ High - Lowest\ Low)}$$

where:

Lowest low = Lowest low for the lookback period (10+1)

Highest high = Highest high for the lookback period (10+1)

“ABS” stands for *absolute value*.

MLTP fluctuates between 1 and zero and has a value from 0.8–1 if price is near its high or low for the given time period. When the close is in the middle of the range, MLTP equals zero.

SMOOTHING CONSTANT (SC)

The smoothing constant uses the MLTP and two smoothing constants based on an exponential moving average.

$$SC = [MLTP \times (fastest\ SC - slowest\ SC) + slowest\ SC]^2$$

Date	High	Low	Close	Direction ABS (Close - Close 10 periods ago)	Periodic Volatility	Efficiency Ratio ER	Multiplier ABS[(Current Close-Lowest Low) - (Highest High - Current Close)] / (Highest High - Lowest Low)	Fastest EMA Smoothing Con- stant 2/(2+1)	Slowest EMA Smoothing Con- stant 2/(30+1)	Smoothing Con- stant KAMA SCK	Smoothing Con- stant AMA SCA	KAMA	AMA
11/1/2012	828.48	818.43	827.85										
11/2/2012	830.55	814.34	814.37		13.48								
11/5/2012	820.46	812.13	819.54		5.17								
11/6/2012	826.89	821.52	825.81		6.27								
11/7/2012	818.91	802.23	804.52		21.29								
11/8/2012	806.68	793.65	793.65		10.87								
11/9/2012	800.72	789.25	795.02		1.37								
11/12/2012	797.73	792.90	793.76		1.26								
11/13/2012	795.97	788.77	789.01		4.75								
11/14/2012	792.10	772.43	773.20		15.81							773.20	773.20
11/15/2012	775.08	765.03	769.48	58.37	3.72	0.69	0.86	0.67	0.06	0.23	0.34	772.33	771.93
11/16/2012	777.08	763.55	776.28	38.09	6.80	0.49	0.62	0.67	0.06	0.13	0.19	772.85	772.76
11/19/2012	793.07	782.37	793.06	26.48	16.78	0.30	0.07	0.67	0.06	0.06	0.01	774.05	772.99
11/20/2012	794.15	788.96	793.81	32.00	0.75	0.38	0.04	0.67	0.06	0.09	0.01	775.78	773.16
11/21/2012	798.38	793.42	798.38	6.14	4.57	0.09	0.26	0.67	0.06	0.01	0.05	776.10	774.38
11/23/2012	807.19	800.93	807.18	13.53	8.80	0.21	1.00	0.67	0.06	0.04	0.44	777.23	788.95
11/26/2012	809.04	802.50	809.02	14.00	1.84	0.22	1.00	0.67	0.06	0.04	0.44	778.43	797.85
11/27/2012	812.59	807.28	807.74	13.98	1.28	0.21	0.80	0.67	0.06	0.04	0.30	779.53	800.82
11/28/2012	813.56	798.51	813.50	24.49	5.76	0.37	1.00	0.67	0.06	0.08	0.44	782.34	806.43
11/29/2012	823.33	817.95	823.20	50.00	9.70	0.83	1.00	0.67	0.06	0.32	0.44	795.44	813.83
11/30/2012	824.58	818.90	821.92	52.44	1.28	0.91	0.91	0.67	0.06	0.38	0.38	805.40	816.88
12/3/2012	826.58	818.93	820.80	44.52	1.12	0.86	0.82	0.67	0.06	0.34	0.31	810.60	818.09
12/4/2012	823.03	816.08	822.12	29.06	1.32	0.80	0.80	0.67	0.06	0.30	0.30	814.02	819.29
12/5/2012	824.52	816.21	820.60	26.79	1.52	0.72	0.68	0.67	0.06	0.25	0.23	815.65	819.59
12/6/2012	822.90	817.74	821.79	23.41	1.19	0.69	0.71	0.67	0.06	0.23	0.24	817.08	820.12
12/7/2012	825.32	819.83	822.27	15.09	0.48	0.59	0.69	0.67	0.06	0.18	0.23	818.00	820.62
12/10/2012	826.28	822.74	826.26	17.24	3.99	0.62	0.98	0.67	0.06	0.19	0.43	819.60	823.02
12/11/2012	835.32	830.06	834.99	27.25	8.73	0.78	0.98	0.67	0.06	0.28	0.43	823.96	828.17
12/12/2012	837.29	828.58	829.39	15.89	5.60	0.45	0.59	0.67	0.06	0.11	0.18	824.58	828.39
12/13/2012	831.28	822.17	824.20	1.00	5.19	0.03	0.23	0.67	0.06	0.01	0.04	824.58	828.21
12/14/2012	827.24	821.82	823.75	1.83	0.45	0.06	0.28	0.67	0.06	0.01	0.05	824.57	827.97
12/17/2012	835.13	825.14	835.00	14.20	11.25	0.36	0.78	0.67	0.06	0.08	0.29	825.38	830.00
12/18/2012	847.69	835.50	847.69	25.57	12.69	0.50	1.00	0.67	0.06	0.13	0.44	828.37	837.86
12/19/2012	851.83	845.06	847.89	27.29	0.20	0.55	0.78	0.67	0.06	0.16	0.28	831.41	840.71
12/20/2012	852.50	845.73	852.49	30.70	4.60	0.58	1.00	0.67	0.06	0.17	0.44	834.99	845.94
12/21/2012	848.54	842.31	847.92	25.65	4.57	0.45	0.72	0.67	0.06	0.11	0.25	836.44	846.43
12/24/2012	846.35	843.43	844.74	18.48	3.18	0.33	0.49	0.67	0.06	0.07	0.13	837.00	846.21
12/26/2012	845.98	838.31	838.89	3.90	5.85	0.07	0.11	0.67	0.06	0.01	0.02	837.03	846.08
12/27/2012	839.74	827.72	837.40	8.01	1.49	0.16	0.02	0.67	0.06	0.03	0.01	837.04	846.03
12/28/2012	838.36	832.08	832.10	7.90	5.30	0.16	0.33	0.67	0.06	0.03	0.07	836.91	845.07
12/31/2012	849.89	831.18	849.35	25.60	17.25	0.39	0.79	0.67	0.06	0.09	0.29	838.00	846.33
1/2/2013	873.99	849.35	873.42	38.42	24.07	0.49	0.98	0.67	0.06	0.13	0.43	842.51	857.87
1/3/2013	878.43	870.76	872.60	24.91	0.82	0.37	0.77	0.67	0.06	0.08	0.28	844.99	861.98
1/4/2013	880.47	873.19	879.15	31.26	6.55	0.42	0.95	0.67	0.06	0.10	0.41	848.49	868.94
1/7/2013	876.71	873.74	875.80	23.31	3.35	0.32	0.82	0.67	0.06	0.07	0.31	850.31	871.09
1/8/2013	876.32	871.01	874.70	26.78	1.10	0.39	0.78	0.67	0.06	0.09	0.29	852.48	872.12
1/9/2013	879.54	877.01	879.51	34.77	4.81	0.49	0.96	0.67	0.06	0.13	0.42	856.01	875.19
1/10/2013	883.19	876.58	881.24	42.35	1.73	0.64	0.93	0.67	0.06	0.20	0.39	861.08	877.55
1/11/2013	882.62	877.44	880.77	43.37	0.47	0.66	0.91	0.67	0.06	0.21	0.38	865.31	878.76

FIGURE 1: SPREADSHEET CALCULATIONS. Here you see the calculations for KAMA and AMA using an Excel spreadsheet.

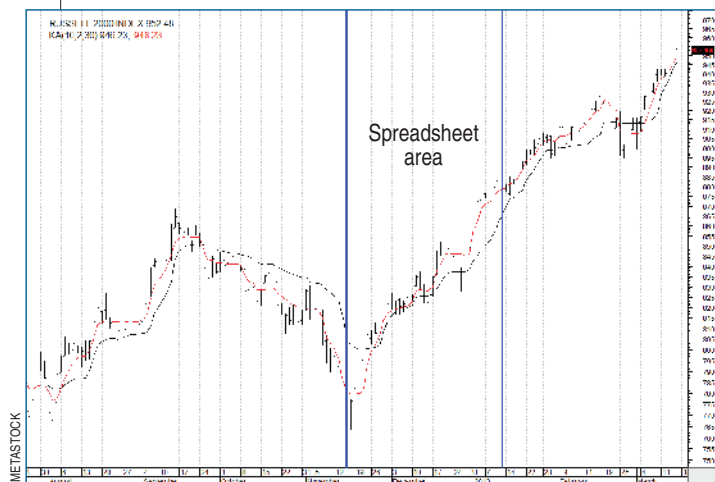


FIGURE 2: VISUAL REPRESENTATION OF KAMA AND AMA. Chart of Russell 2000 index with overlay of KA (10, 2, 30).

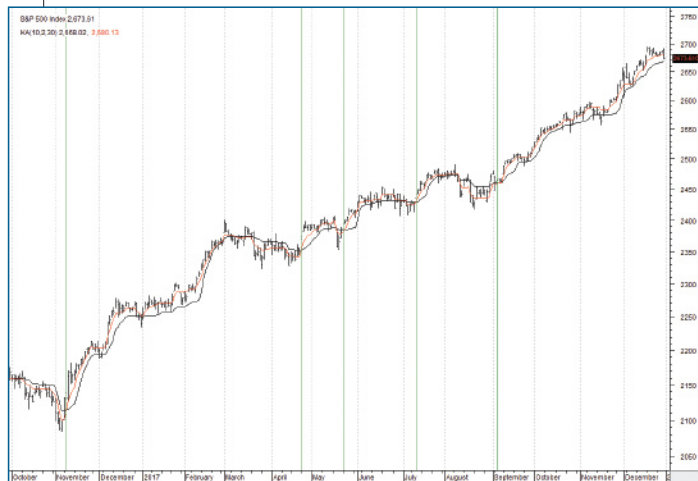


FIGURE 3: BULLISH CROSSES. On this chart of the S&P 500 index with KA (10, 2, 30), the green vertical lines identify low-risk entry points.

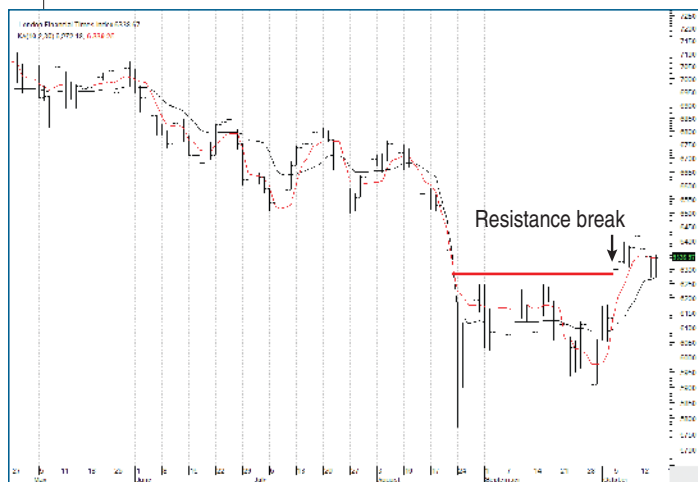


FIGURE 4: BEARISH CROSSES. This chart of the London Financial Times Index (FTSE) with KA (10, 2, 30) displays bearish crosses as red vertical lines. These lines identify entry points to participate in the strong downtrend.

$$SC = [MLTP \times (2/(2+1) - 2/(30+1)) + 2/(30+1)]^2$$

The fastest SC is the smoothing constant for shorter EMA (two periods). The slowest SC is the smoothing constant for the slowest EMA (30 periods). Note the superscripted “2” at the end squares the equation.

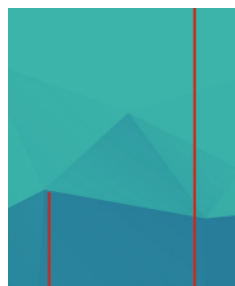
ADAPTIVE MOVING AVERAGE

The first AMA is the close. The current AMA can be calculated using this formula:

$$\text{Current AMA} = \text{Prior AMA} + SC \times (\text{Price} - \text{Prior AMA})$$

The table in Figure 1 shows the KAMA/AMA (10,2,30) values for the Russell 2000 index. The corresponding chart is displayed in Figure 2. Note that the red line on the charts represents AMA.

The KAMA/AMA values in the spreadsheet are not very accurate. But if you increase the lookback calculation period to over 250 days, the values become more accurate.



SIGNALS

Typically, the KAMA/price crossover system will generate many signals and whipsaws, but KAMA/AMA can reduce the number of whipsaws. When the AMA moves above KAMA, you could look for bullish crosses and when AMA moves below KAMA you could look for bearish crosses. Crossovers

can last from a few days to a few weeks. It depends on the move’s strength.

The chart in Figure 3 shows the S&P 500 index with KA(10,2,30). Bullish crosses, displayed as green vertical lines, provide low-risk entry points to participate in the strong uptrend.

The chart in Figure 4 shows London Financial Times Index (FTSE) with KA(10,2,30). Bearish crosses, displayed as red vertical lines, provide entry points to participate in the strong downtrend. Note that the bearish cross in late September 2015 was negated when the FTSE index exceeded the September peak in early October.

You can use KAMA/AMA crossovers for swing trades. Figure 5 shows the Dow Jones Industrial Average with KA (10,2,30). Note there were some good signals and some bad ones. Bullish/bearish crossovers (green/red vertical lines) work better when price swings are relatively big (that is, prices are up over 5%).

Note the whipsaw in early October 2004 was short-lived. AMA’s requirement to hold the cross for a set number of days could avoid this whipsaw.

THE BENEFIT OF TWO

KAMA/AMA can be used together to generate crossover signals. Both have the same parameters and their crossovers



FIGURE 5: SWING TRADING WITH KAMA/AMA. On this chart of the Dow Jones Industrial Average (DJIA), you'll notice there were some good signals and some bad ones. Bullish/bearish crossovers (green/red vertical lines) work better when price swings are relatively big (that is, when prices are up over 5%).

produce relatively late signals. Note that this system employs two lagging-style indicators. You could use KAMA/AMA in conjunction with price analysis and RSI to define overbought and oversold levels.

Vitali Apirine is a programmer engineer with an interest in technical analysis, especially the application of relative strength index to trading. He may be reached at vitapirine@mediacommbb.net.

FURTHER READING

Apirine, Vitali [2018]. "Weekly & Daily Percentage Price Oscillator," *Technical Analysis of STOCKS & COMMODITIES*, Volume 36: February.

—— [2016]. "The Middle-High-Low Moving Average," *Technical Analysis of STOCKS & COMMODITIES*, Volume 34: August.

The AMA closely follows prices and can be combined with KAMA to identify turning points and filter price movements.

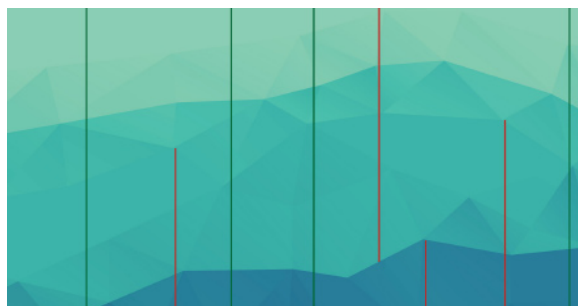
‡MetaStock

‡See Editorial Resource Index

‡See Traders' Glossary for definition

The code given in this article is available in the **Article Code** section of our website, www.Traders.com.

See our **Traders' Tips** section beginning on page 48 for commentary and implementation of Vitali Apirine's technique in various technical analysis programs. Accompanying program code can be found in the Traders' Tips area at Traders.com.



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METASTOCK CODE FOR KAMA AND AMA

```
Periods:=10;
Pds:=Periods+1;
```

```
FastSC:=2/(2+1);
SlowSC:=2/(30+1);
```

```
{Kaufman Adaptive Moving Average}
```

```
Direction:=Abs(CLOSE-Ref(CLOSE,-periods)); Volatility:=Sum
(Abs(ROC(CLOSE,1,$)),periods);
ER:=Direction/Volatility;
```

```
SSC:=ER*(FastSC-SlowSC)+SlowSC;
Constant:= Pwr(SSC,2);
```

```
KAMA:=If(Cum(1) = Pds,Ref(C,-1)+Constant*(C-Ref(C,-
```

```
1)),PREV+Constant*(C-PREV));
KAMA;
```

```
{Adaptive Moving Average}
```

```
Mltp:=Abs((C-LLV(L,Pds))-(HHV(H,Pds)-C))/(HHV(H,Pds)-
LLV(L,Pds));
```

```
SSC:=Mltp*(FastSC-SlowSC)+SlowSC;
Constant:= Pwr(SSC,2);
```

```
AMA:=If(Cum(1) = Pds,Ref(C,-1)+Constant*(C-Ref(C,-
1)),PREV+Constant*(C-PREV));
AMA;
```

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