

1-2-3 Breakouts

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1-2-3 Breakouts

The following article examines the statistical behaviour of price movements in the vicinity of breakout points. By way of introduction, there will be a definition of successful or unsuccessful breakouts, which is based on the concept of inside and outside bars. This will be followed by extensive statistical studies of price development near the breakout points.

Introduction

Market mechanics is a branch of technical analysis which got known to a wide audience through the book of Michael Voigt "Das große Buch der Markttechnik". Arguably the most important part of market mechanics is the trend whose importance is owed to the fact that it establishes a connection between price development and the psychology of the market participants. According to Michael Voigt the alternate phases of movement and correction typical for trends can be interpreted as "feedback" from market participants on price development. As a result, market mechanics provides an important contribution to the so-called field of "behavioural finance". i.e. a branch of finance that tries to explain price movements by looking at the psyche of market participants. When defining trends, a distinction is made between upward and downward trends with different definitions being used for each. The definition used here goes back to Charles H. Dow. A (upward) trend in terms of market mechanics is active when the last two (or more) relevant minima (or maxima) are on the rise (see Figure 1, left). The first minimum of an uptrend is called Point 1, while all of the following maxima are numbered 2 and all of the following minima



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are numbered 3. The trend is established if a Point 2 is broken for the first time. We can talk about a break in the trend when the last Point 3 is broken against the direction of the trend or the new Point 2 is lower than the last one.

Due to their structure, trends provide many interesting trading ideas. At this point, we are only interested in the "best part" of the trend, i.e. the phase of movement from Point 3 to the new Point 2. and here especially in the time when the old Point 2 is broken, the latter being the breakout.

Definition of Successful Breakouts in Market Mechanics Trends

In any trend, the period in which the last Point 2 is reached again is of particular importance. Here the particular trend is established or an existing trend will continue. Often breaking through Point 2 provides the initial impetus for further price increases beyond Point 2. Just as often, however, Point 2 gets only touched and the price drops again.

This ambivalence of Point 2 is generally known. In order to be capable of investigating these situations more closely, we want to determine exactly when such breakouts in market mechanics trends are successful and when they are not. For this we need the concept of the outside bar.

The prerequisite for an outside bar is that the body of the current period (the range between opening and closing price) is completely enclosed by the range of the previous period (the range between the low and the high) (Figure 1, right). The previous period is called the outside bar. and the current period the inside bar. As long as the bodies of the subsequent periods do not leave the range of the outside bar, they are also inside bars.

The success of a trend breakout is determined on the basis of whether the breakout is confirmed (Figure 2, left) or not (Figure 2, right) by the subsequent periods. If both conditions are not given in Figure 2, then the P2 break is an outside bar or itself already an inside bar of the outside bar. If an outside bar occurs at the P2 break. the following will apply:

- The breakout is successful if the outside bar is left in the direction of the trend (Figure 3, left).
- The breakout is not successful if the outside bar is left against the direction of the trend (Figure 3, right).

As can be seen in Figure 3, it may not yet be known at the moment of the P2 break whether an inside or outside bar situation exists. In order to generate

F1) 1-2-3 Uptrend/ Definition of Inside and Outside Bars outside bar broken On the left, you can see an upward trend that is intact in terms of market mechanics. In the right half of the chart, the technical definition of inside and outside bars is shown

Source: www.smp-fe.de



Source: www.smp-fe.de

statistics on breakouts, we use the "Markttechnik" Plugin smpMT. dll offered by SMP Financial Engineering GmbH (SMP FE for short) for the automated retrieval of market mechanics trends (see info box) with the non-default settings listed in Table 4.

Statistics

Let us now consider the Point 2 breakout in upward and downward trends in the DAX future (December 2011 contract. FDAX for short) on a 10-minute chart. The studies are conducted over a period of about 4300 days from 3rd January 2000 to 7th October 2011, using the "Breakout Statistics" program package offered by SMP FE.

At the beginning of a new day, large gaps often occur which simultaneously break the last Point 2. However, these gaps are not tradable and would cause the statistics to be highly skewed. For this reason, breakouts during the first period of a new day will not be taken into account.

Moreover, only those situations will be evaluated where the risk is less than 50 points, the risk being defined by the stop - based on outside bars – as described in the following paragraph.

Definition of Risk

In an upward trend, we define the risk "1R" separately for two different situations. If the P2 break is an inside or outside bar, the risk is tantamount to the difference between the level of the last Point 2 and the minimum of the low of the outside bar and the low of the previous period of the outside bar (A = outside bar):

$1R = P2 - min \{low (A), low (A-1)\}$

In all other cases, 1R is the difference between the last Point 2 and the low of the previous period of the break:

1R = P2 - low (P2 break - 1)

Once the risk R of a trade is known, profits and losses can be

Markttechnik Plugin

Those who want to automate trends need to determine first the relevant highs and lows of a price development. But that is by no means easy. To help you find them, you can use the Markttechnik Plugin which makes use of so-called "SAR processes" (stop and reverse) as signal transmitters in order to look out for new minima or maxima. This is based on the scientific work carried out by Mr S Maier-Paape titled Automatic 1-2-3, 2011 (available at www.smp fe.de-in the "download area" or at www.vtad.de /forschungsarbeiten).

expressed as R multiples. The R multiple of a trade is the profit or loss of the trade divided by the risk (see, for example, Van Tharp's book "Financial Freedom through Electronic Day Trading"). To cite an example, suppose the risk 1R equalled ten points. then the trade would result in a profit of 13 points, equalling an R multiple of 1.3 or a profit of 1.3 R.

Since the following results for upward and downward trends are very similar, we consider both trends simultaneously with the explanations and illustrations referring to uptrends, of which the downtrend is just a horizontal reflection.

Initial Results

First of all, we examine how strong the movement is that we can expect when the last Point 2 is broken. Altogether, there were 3621 situations during the study period. The expected values are shown in Figure 4. It turns out that on average the most movement takes place in the break period. This would lead us to conclude that it would make sense to position ourselves before the break, but this would provide no new insights. After the break, variance rises sharply while the expected value remains approximately constant. This means that after the break almost anything can happen. Whether the break was successful or



This shows the development of a successful breakout (left) and of an unsuccessful breakout (right) with an outside bar being formed in each case after the breakout.

Source: www.smp-fe.de



Figure 4 shows an analysis of the FDAX 10-minute chart over a period of 4300 days and all trends, i.e. a total of 3621 situations. The periods correspond to the expected values E (high), E (low), E (opening price) and E (closing price) for the corresponding period with the mean marked period being the P2 break. The values are measured in R multiples, i.e. as multiples of the risk of each trade. The horizontal line at zero represents the level of the last point 2 and the line at -1 the level of risk. The upper blue and lower red curves are E (high) + StD (high) or E (low) - StD (low), with StD being the standard deviation





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not has not vet been taken into consideration. A successful break will require a certain amount of upward movement even after the break. The probability of a successful break can be seen here in Table 1 and the expected values for the high, the low, opening and closing prices in the case of success or failure are shown in Figure 5.

Here, too, most of the movement occurs in the break period. If the break is successful the price, on average, continues in the direction of the trend with the level of variance continuing to be very high. This situation occurs with a 64 per cent probability.

At this point a brief side note on the subject of trends may

be appropriate: Movement will occur when there happen to be many traders who want to trade the same direction. That is why short-term trends tend to be more relevant when they move in the same direction as big picture trends (for example, daily trends). If we consider only situations where the current trend is in the direction of the overall trend, we will have results very similar to those presented here. So daily filters in the FDAX seem to be unsuitable, one reason could be a strong correlation between it and the Dow Jones. In the following, we will therefore ignore the big picture.

The definition of a successful break consists of an immediate

T1) Probability of a Successful Break			
	Number of Breakouts		Probability
Trends	total	successful	of success
total	3621	2310	64%
upward	1968	1254	64%
downward	1653	1056	64%
	·		

T2) Table 1 Data, Separately for Cases I + II and III + IV				
	Number of Breakouts		Probability	
Trends	total	successful	of success	
total	3621	2310	64%	
I+II	1233	882	72%	
III+IV	2826	1614	57%	

decision in Cases I and II. In Figure 2 as well as in situations with outside bars where a decision on whether or not the break was successful may not be made until a few periods after a break (see Cases III and IV in Figure 3). Considering these situations separately will result in the success rates shown in Table 2. If the P2 break is an outside or inside bar, we only have a 57 per cent probability of success. This means that outside bars are a rather bad sign of a breakout.

On the basis of these results. we know that we can count on a successful break in 64 per cent of all cases. A success here requires the closing price to be correspondingly high and hence a certain price difference to have developed. Whether you are currently in Case I or III can only be seen rather late or even too late. For this reason we need a criterion by which we can decide early whether the current situation tends to be positive or negative.

Conditional Probabilities

The question that arises is: What is a particularly positive sign of a breakout? Our answer is: A strong trend is characterised by a sustained movement at Point 2. That is why situations are distinguished where

(1)	Close (P2 break) > P2
$\dot{2}$	Close (P2 break) < P2



On the left, all successful P2 breaks, 2310 situations, and on the right failed breakouts. 1311 situations



In Case (1) the break period closes above Point 2 (good sign), in Case (2) below point 2 (bad sign). Predictably, the success rate increases when the break period closes above Point 2 (Table 3). Once the break period has fully formed, we can determine whether our initial 64 per cent probability of success has increased or not.

The next interesting question is: How much movement can we expect at a break if condition (1) or (2) is met? For all the trends with these extra conditions the expected values for the high, the low, opening and closing prices at the Point 2 break can be found in Figure 6.

The expected values under extra condition (1) are significantly higher than those under condition (2) but, on average, the entire movement again goes into the break period. This means that this additional condition seems to be pointless rather than helpful. Figure 6 (lefthand side) includes both the successful and the unsuccessful breakouts. Hence it can be seen in Figure 7, left, how the price behaves in the 70 per cent of cases where the break is successful. However, if - despite the extra condition (1) – this is a failed breakout, a price trend can be expected as shown in

T3) Table 1 Data with Additional Condition (1) or (2)					
	Close(P2-break) > P2		$Close(P2-break) \leq P2$		
Trends	Number	Success rate	Number	Success rate	
total	1816	70%	1805	58%	
upward	970	68%	998	60%	
downward	846	72%	807	56%	

T4) Settings of the smpMT Markttechnik Plugin			
Name of Parameter	Level	Note	
sar:Choice	2	MACD-based SAR process	
sar:Percent_or_atr	0		
sarM:Percent_multiple	0.01		
sarM:Timescale	1		
sarIOB:aussenstabIni	1		
sarlOB:aussenstab	2	affects the inside and outside bars	
sarIOB:closeInside	2		

Figure 7 on the right. So under condition (1), a movement can continue to be observed even after the break period, as could already be seen in Figure 5, left.

Specific Times of Breakouts

Finally, here is the following question: At what time of day is it worth looking out for P2 situations? One answer can be found by considering the frequency of the breakouts depending on the time of day (see Figure 8). This illustration tells us that it is worth specifically looking for a Point 2 breakout during the hours from 9 am to 10 am and 2 pm to 5 pm (Central European Time).

Summary

By way of conclusion, let us recap the key insights that we have gained about breakouts. We know that without any filters it is safe to assume with a 64 per cent degree of probability that the breakout will be successful. With regard to a possible trading strategy, this information is just as important as the fact that a limit sell with a 1R profit is a realistic goal.

It should also be noted that condition (2) as well as inside and outside bar situations are rather bad signs of a breakout. Breakouts at market openings in Germany and the US are particularly likely.

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Source: WHS FutureStation



Figure 8 shows the specific times of day of the absolute frequencies of all the breaks (upper curve) and of the successful breaks (lower curve) (the horizontal axis indicates each of the periods considered).

Source: WHS FutureStatior