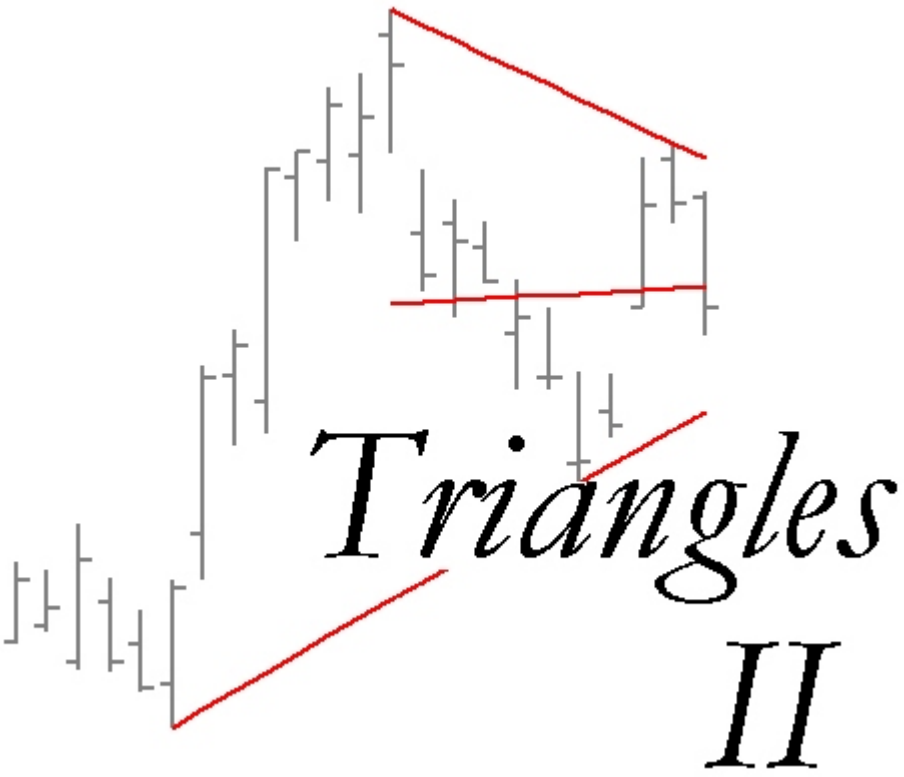

Plug-in for MetaStock – version 7.2 and higher
Version 2.00

Operation Manual

Trading Systems Analysis Group

www.tsagroup.com

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Contact Information

Trading Systems Analysis Group
P.O. Box 521676
Salt Lake City, Utah 84152-1676

Technical support for this product is available through email to
support@tsagroup.com

Suggestions for product improvement should be emailed to
suggest@tsagroup.com

Visit us on the World Wide Web at:
www.tsagroup.com

MetaStock technical support is available from Equis International at:

Equis International
90 South 400 West
Suite 620
Salt Lake City, Utah 84101
Technical Support: (801) 265-9998
By email: support@equis.com

General Information

This software was designed for people who are familiar with the common strategies used in trading triangle breakouts. It gives you an easy way to scan for and select the stocks and commodities that will most likely deliver the best results. It does not automate everything for you, nor does it give you buy or sell recommendations. You will still need to decide for yourself if a stock or commodity is right for you, and if any particular trade is worth doing.

We do not teach you about the markets in this manual, and strategy information in the manual is very limited. You should be familiar with trading triangle breakouts by having attended a seminar or from book o that you understand the strategies BEFORE using these formulas.

The one piece of trading advice we offer is that always having a stop in place is a good idea. If you do not have exit orders in on each position you take, you should be able to see what's happening throughout the day. At the very least, look at the chart and other information at the end of each day.

Introduction

The Triangle II package is a very powerful tool for finding and trading triangle formations. There are many philosophies on how to identify and trade these types of formations and we have found a way to identify many of them.

We assume you are already familiar with the triangle formation. If not, consider purchasing one of the books at the end of this manual. There is a lot of power in the triangle formation, and a good understanding of traditional techniques will help to make this package worthwhile to you.

Before going into the usage of the indicator and exploration, it is ideal to understand how this package interprets triangles and what it uses to identify them. The two methods that are used in this package are the Pattern method and the Swing method.

What is a Triangle?

Technical analysis involves seeing patterns in a security's price movements on a chart. Each type of pattern represents a category of trading activity. Generally, price patterns indicate a continuation of an existing trend (continuation patterns), a reversal of the trend (reversal patterns), or consolidation (consolidation patterns).

Consolidations offer excellent entry opportunities if and when a breakout comes. Triangles, which are a consolidation type of pattern, are thus a popular and easily used technique for making a trading decision. The principle is simple: Support and resistance lines are drawn to show the maximum extreme limit that prices could go. If the price breaks through one of the lines, that tells you what direction the price will most likely go.

A triangle is one of the most basic and recognizable technical analysis patterns. It is created by prices coming to lower highs and higher lows at the same time. This is the "consolidation" of prices. A triangle will typically look like this

As the triangle narrows to the intersection point (the "apex"), prices are expected to break out of one of the two trendlines before the intersection occurs. Whichever direction the breakout occurs, prices are expected to continue in that direction. This breakout movement is called an "expansion" when it occurs and is the purpose of looking for triangles.

Triangles are categorized into three groups; Symmetrical, Ascending, and Descending. A symmetrical triangle is the type previously described, with lower highs and higher lows. The range of triangles can also be widened to include triangles that have higher lows and a flat line of highs, known as an ascending triangle, and triangles that have lower highs and a flat line of lows, known as a descending triangle. This is an example of a descending triangle with an apex line drawn in the middle (an ascending triangle would be the opposite):

The apex line is the midpoint between the upper and lower trendline, and gives you a clear indication as to what direction the triangle is pointing. Many traders will also use an apex line for deciding where to place a stop-loss once a trade has been entered.

Most people have two primary problems with technical patterns of any type. The first is the visual aspect. Everybody sees the pattern they're looking for with their own criteria and experience. This means that 10 people can look at a chart and see 10 different triangles. What accentuates this problem is that technically, they all do qualify for triangle status.

This creates the second problem--too many triangles. At any point in time with a random sampling of stocks, triangles can be found on more than a third of them. With one out of every three stocks showing a triangle of some kind, the technical triangle has become one of the easiest patterns to spot as well as the hardest to trade profitably.

If 10 people can see 10 different triangles, and they are all technically correct, then how do you know which one to trade? The answer for this applies to all technical patterns, not just triangles. **The correct pattern (triangle) to trade is the one that everyone else agrees is the correct one.** Your being able to see what the majority of technical traders see is the only criterion worth using, and in fact, it is the framework for finding the best patterns of any type. If other traders don't see the same triangle that you do, then their money won't be used to trade the breakout. If no money is going into or out of the security, then the security will most likely just move sideways. Not every triangle results in a profit-making breakout. A breakout occurs because a majority of market participants cause it to occur, which they can do only if they see the triangle, too. Not understanding this concept is where most triangle traders fail.

On the good side, there are many tools, techniques, and methods for homing in on the triangles that are most likely to be recognized by other triangle traders. For example, traders more easily recognize faster consolidations than slower consolidations. Triangles that occur in trends stand out from triangles that occur in a sideways market. A breakout that occurs on an increase of volume has a greater chance on continuing than a breakout that occurs on no increase of volume. Some traders will notice small triangles and not see larger ones.

We find triangles. The Triangles II package automates the detection of triangles that have the best chance of breakout success, and you can modify the criteria for judging the probability of breakout if you choose.

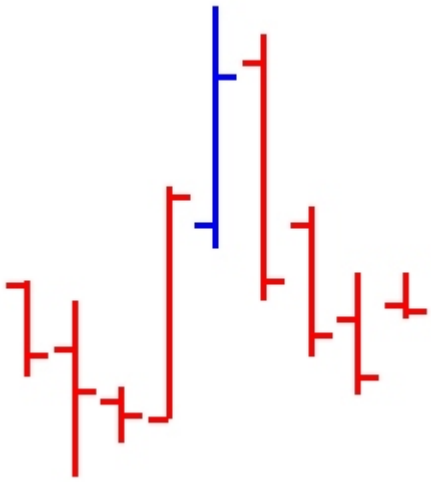
Here are some examples of successful triangle breakouts that Triangles II easily found when the program was run as an Exploration.

Pattern Method

The Pattern method is better at finding triangles in intraday charts (5, 15, 30, and 60-minute charts) since it is looking for a pattern to develop and not requiring any minimum percentage movement.

The Pattern method finds the high point with lower highs on each side, and the low point with higher lows on each side.

For example:

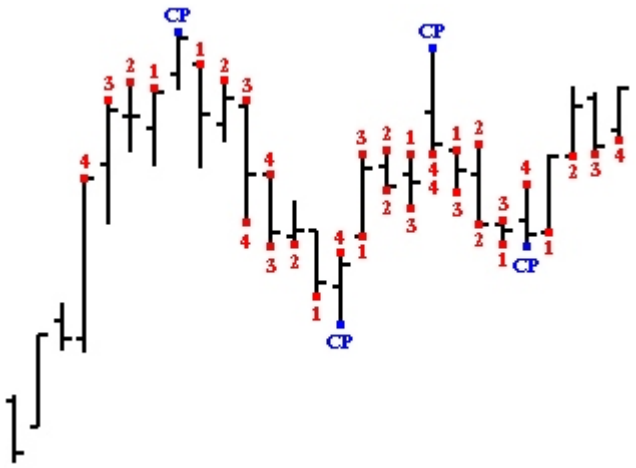


In the bar drawing here, this pattern point qualifies for pattern types 1, 2, 3, and 4. The center bar is surrounded by four lower highs on each side. This creates a type-4 pattern point. Since a type-4 pattern point requires the four lower highs on each side of a central bar, it would also produce 3 lower highs on each side. A type-4 pattern point creates a type-3 pattern point by default, and also creates each lower numbered pattern point.

Once a numbered pattern point has been identified, it looks for a second one of the same type. If a type-4 pattern point of the highs has been identified, it will then look for the next type-4 pattern point of highs going back. The most recent type-4 pattern point high must be lower than the high of the next type-4 pattern point of highs going backwards in the chart. This is because when the software is identifying the resistance line of the triangle formation, it is looking for a progression of lower highs.

After all the topside patterns have been determined, the software then looks for a type-4 pattern point on the low side. If a type-4 pattern point of the lows has been identified, it will then look for the next type-4 pattern point of low's back. The most recent type-4 pattern point low must be greater then the low of the next type-4 pattern point of lows going backward in the chart.

The exploration looks for all of these conditions. If all of the conditions are met (the most recent type-4 pattern point of highs being lower than the second one back, and the most recent type-4 pattern point of lows being higher than the second one back) then the pattern becomes a triangle candidate.



In the image above, the four pattern points of a type-4 triangle have been identified. The top two center points (labeled CP) have the highs lower than the center point numbered, creating two pattern points. The same is shown for the low center points with the lows higher than the center point numbered. Notice that the two low center points share a number 4 bar since the bar is lower than the two center points. Two center points can share bars as long as the triangle criterion is still valid.

Once a candidate has been found, the upper and lower trendlines are calculated and a test is performed to make sure prices do not fall outside of the upper and lower trendlines at any point in the pattern. If the triangle passes this test, then the pattern is determined to be valid.

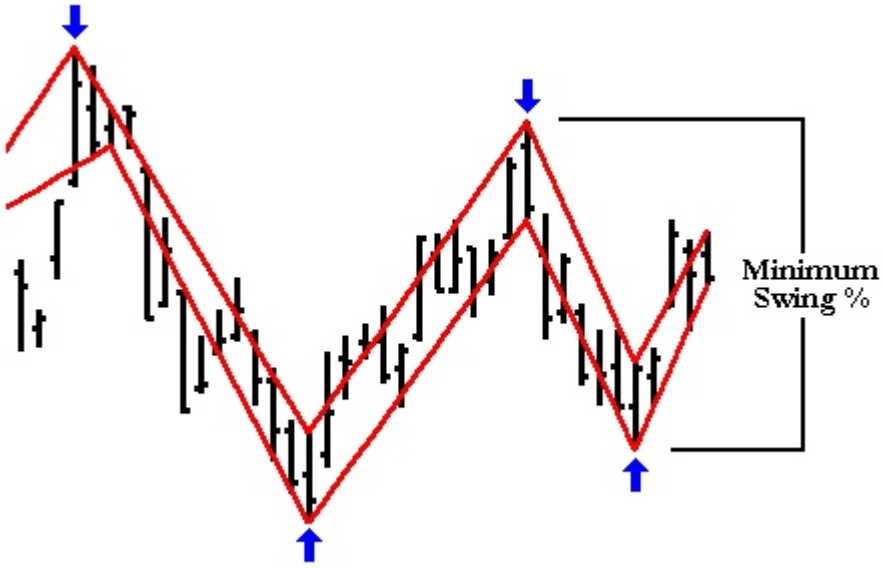
If there is no validation of a complete type-4 pattern, the software will start the process of looking for a type-3 pattern, and so on until there are no patterns left to look for using the pattern method, or the lower search limit is reached. It will then move on to the next security.

Swing Method

The Swing method is better at finding triangles in end-of-day charts (daily and weekly) since it is looking for swings in the chart that can occur over longer periods of time and have larger movements.

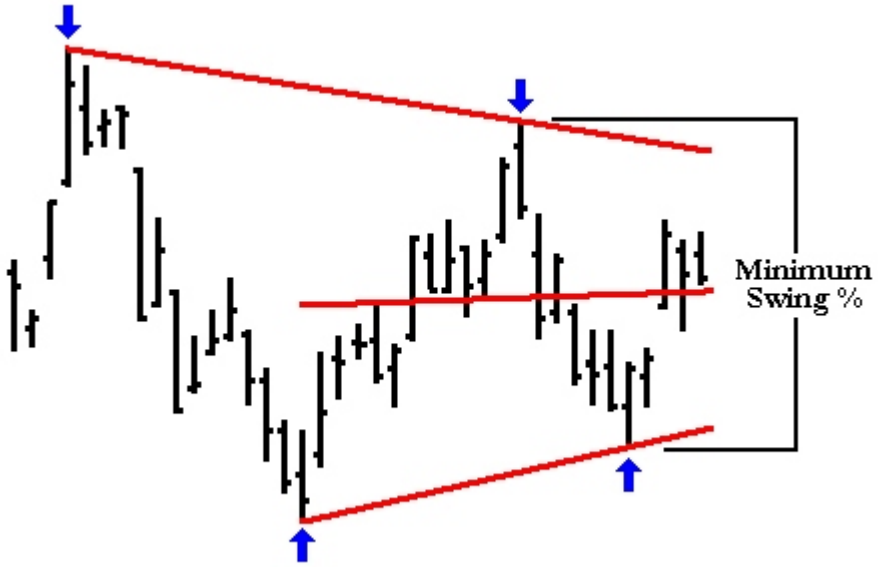
The Swing method finds swings in the price that move by a minimum percentage. It uses the Zig-Zag function to determine when a minimum percentage movement has occurred.

For Example:



Here is a Zig-Zag of the highs and a Zig-Zag of the lows. The Zig-Zag of the highs shows the most recent peak being lower then the next one back. Conversely, the Zig-Zag of the lows shows the most recent trough being higher than the next one back. This becomes the definition of a triangle candidate.

Once a candidate has been found, the upper and lower trendlines are calculated and a test is performed to make sure prices do not fall outside of the upper and lower trendlines prematurely. If the triangle passes this test, then the pattern is determined to be valid.

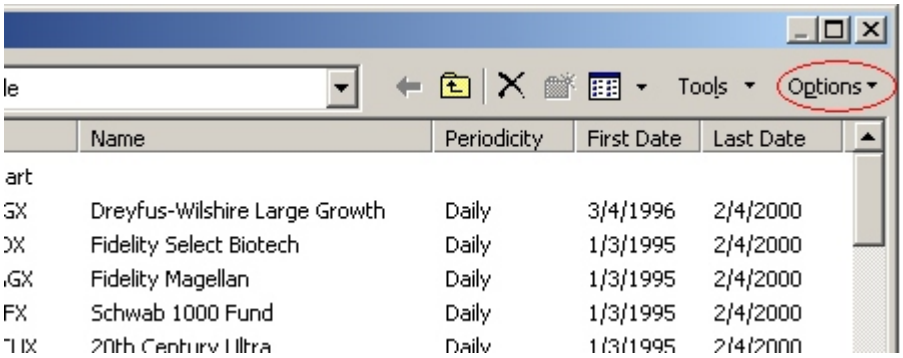


If an exploration is set to begin with a 10 percent swing, then the exploration looks for this situation to occur with a minimum 10 percent move on the highs and the lows. If the conditions are met, then it returns the percentage as valid. If the conditions do not occur, then it will try to match the conditions with a minimum 9 percent move, and so on down to 1 percent or the lower search limit is reached.

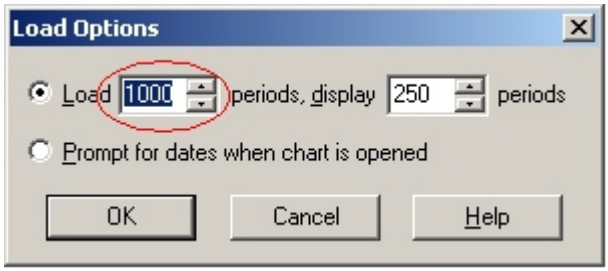
Running the Exploration

For optimum performance, the Explorer should be set to load a minimum of 250 periods (1000 is recommended), NOT load minimum records. Ideally, the Explorer should be set to load the same number of periods that your charts are set to load.

To find out what your MetaStock Load Options are set to, click on File, and then Open. This will bring up an open dialog box. Click on the Options button in the upper right-hand corner:

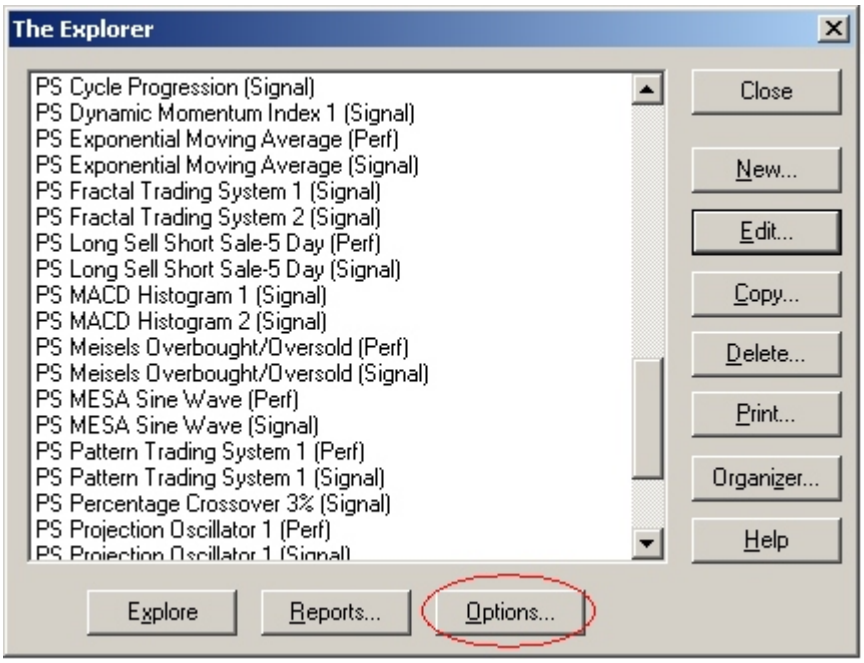


After clicking on this button, move down and click on Load Options. That will open a dialog box like this:

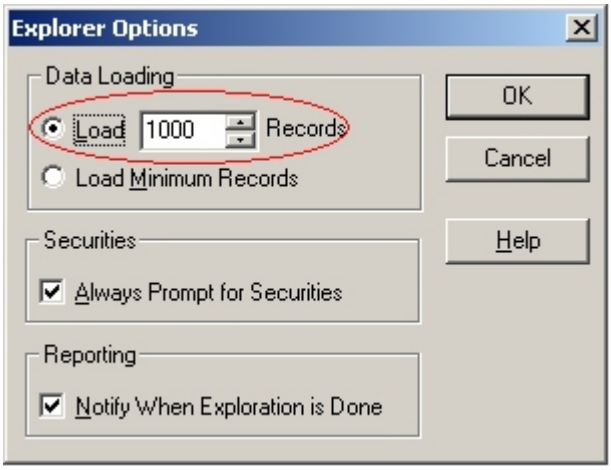


The value where Load is selected is the value to use in the explorer when working with triangles (in this case, 1000 periods).

After you've made note of the value, close out of these boxes and go to the Explorer. Click on the options button at the bottom of the dialog box:



This will open the Explorer Options dialog box. Take the value that you wrote down from the Open Chart Load Options and place it in the Data Loading section with Load Records set (in the above example, 1000) as shown:



Make sure that Load 'number of' Records is selected and not Load Minimum Records.

If Load Minimum Records is selected, MetaStock will reject all of the securities since it doesn't know how much data the triangles software requires to return a result.

When exploring stocks, you will probably not want to use the exploration on the entire stock market. Triangles occur very frequently, even with filtering in place, and exploring the entire stock market could result in a report of hundreds (if not thousands) of valid triangles cases at any time. It's best to run the exploration on securities that you would actually trade. For example, if you don't trade penny stocks, then don't include them in your exploration. This will reduce the size of the exploration report to a more manageable report, and reduce the time it takes to run the exploration.

You should also modify the exploration to search for triangles that you would actually trade. If you have no intention of trading a triangle that is a size 3 Swing or less, then remove it from your exploration. It's also recommended that a maximum convergence length filter be set to prevent triangles that are too weak for your trading style. Instructions for doing this can be found in the "Modifying the Exploration" section of the manual.

Reading the Exploration Report

The triangles exploration is designed to be very powerful in what it is looking for.
Depending on how you set up the exploration, it can search a database of securities and report the following:

1. Whether it found large, medium, or small sized triangle (or any combination thereof)
2. Which method (Pattern, Swing, or Both) detected the triangle
3. Whether the price is still within the triangle or whether it broke out today

Here is a sample report made by the exploration:

Security Name	Swng Sml	Swng Med	Swng Lrg	Pat Sml	Pat Med	Pat Lrg	Ticker Symbol
MONY GRP	103	105	0	0	105	0	MNY
MOODYS COR	103	104	0	0	0	0	MCO
MSDW AS-PAC	0	0	108	0	0	0	APF
MULTEX.COM	2	0	0	1	0	0	MLTX
MULT GMS	0	0	108	0	0	0	MGAM
N C I BD SYS	103	106	110	0	0	0	NCS
N C O GRP INC	0	0	0	0	106	107	NCOG
N C R CORP	0	106	110	0	0	0	NCR
N L IND	0	0	108	0	0	0	NL
N P S PHARM	0	106	107	0	0	0	NPSP
N T L INC	0	0	110	0	0	107	NLI
NANOM INC	103	106	107	0	0	0	NANO
NARA BNC	0	106	110	0	0	0	NARA
NAT AUS BK	0	0	110	0	0	0	NAB
NAT COM BNC	103	106	0	3	0	0	NCBC
NAU ENT INC	0	106	0	0	0	0	NAUT
NAV INTL	0	0	110	0	0	0	NAV
NOVARTIS	0	106	0	0	0	0	NVS
NOV PHARM	0	0	0	103	105	0	NOVN
NVIDIA CORP	103	0	0	101	0	0	NVDA
NYSE Comp	0	106	110	0	0	0	NYA.X

For example purposes, National Commerce Bancorp (NCBC) will be used.

Security Name	Swng Sml	Swng Med	Swng Lrg	Pat Sml	Pat Med	Pat Lrg	Ticker Symbol
NAT COM BNC	103	106	0	3	0	0	NCBC

First, the sizes and types of patterns are identified

1. Swng Sml	Small size triangles using the Swing method (1, 2, and 3-percent swings)
2. Swng Med	Medium size triangles using the Swing method (4, 5, and 6-percent swings)
3. Swng Lrg	Large size triangles using the Swing method (7, 8, 9, and 10-percent swings)
4. Pat Sml	Small size triangles using the Pattern method (Types 1, 2, and 3)
5. Pat Med	Medium size triangles using the Pattern method (Types 4, 5, and 6)
6. Pat Lrg	Large size triangles using the Pattern method (Types 7, 8, 9, and 10)

With NCBC, three columns were returned with values and three were returned with 0 (zero). If a column returns zero, that means the condition was not met for that method and size. Here, there are three columns with values: Swng Sml with 103, Swng Med with 106, and Pat Sml with 3.

If the exploration returns a value between 101 and 110, a triangle has formed, but has not broken out yet. You are still in a position to set entries upon crossings of the upper or lower trendlines. In this case, the Swng Sml column has a value of 103, and the Swng Med column has a value of 106. This means that two triangle sizes have been identified using the Swing method, with a 3-percent swing and a 6-percent swing, and that the price is between the upper descending and lower ascending trendlines.

If the exploration returns a value between 1 and 10, that means a triangle has broken out on the day the exploration was run, as well as the size of the triangle that was broken out. In the case of the Pat Sml column, the exploration returned a value of 3. Therefore, a breakout occurred on the day of exploration of a Pattern method triangle with a size 3 pattern.

When there are two triangles of the same type but different sizes, it can mean that there are in fact two different triangle sizes (as in the case above), or they can be the same triangle. Since the 'triangle detect' function used in the exploration returns the largest triangle found in its size specifications, in the case above it is possible that the criteria that matched a 3-percent swing detection also matched a 6-percent swing detection. The 3-percent would still be shown since in the explorer, the Sml Swng column would detect the largest triangle still functional at that size. Whether they are the same triangle or different triangles isn't known until the Triangle indicator is applied.

It is also possible that the Swing method and Pattern method will detect the same triangle. This can only be determined by applying the Triangle indicator.

Once these values have been discovered, then the Triangle indicator can be applied to the chart. (See Applying the Triangle Indicator on page 24)

Exploring Triangles on Indicators

One of the new powerful features of Triangles II is the ability to find triangle patterns in indicators, not just price data. This is useful in volatility and momentum analysis, as well as for many other applications.

Performing an indicator triangle analysis requires either modifying an existing exploration, or creating a new one. (A sample indicator exploration is provided.) *See your MetaStock manual for instructions on how to make explorations.*

The formulas to use for indicator triangle detection are the same as for price triangle detection, except that the last two parameters in the software call are different. In the sixth parameter in the software call, there is an option to choose 'price' or 'data'. Normally price is chosen, and if so, then the last parameter passed to the software is ignored. But for exploring triangles on indicators, data needs to be selected as below.

```
ExtFml(''tsatriangle.triangle_detect'', Pattern, 20, 50, 0,
Pending, Data, RSI(14))
```

This tells the software that you will be passing in a data array and to evaluate triangles on that. In the above example, a 14-period RSI has been chosen.

If the formula is put into a column, then it will return either the value of a pending triangle if one is found, or a zero if no triangle is found. If modified slightly as below:

```
ExtFml(''tsatriangle.triangle_detect'', Swing, 20, 50, 0, Pending,
Data, RSI(14))>0
```

and placed in the filter of the exploration, then only securities that have a triangle (between 20 and 50% swing) will be returned and all others will be left out of the results.

Depending on the type of indicator you are exploring, you may need to exaggerate the swing or pattern sizes beyond what you would for prices. In the above example, the exploration starts at a swing size of 50% and cycles down to 20% to find a triangle. In the case of the RSI, this may be appropriate since the RSI moves between 0 and 100 and approaches both extremes fairly often. If a 3 to 5% swing range were chosen, then a triangle may be too small to be worth anything (if found at all). Remember to adjust your swing and pattern sizes appropriate to the indicator you're exploring and the technique you intend to use with it.

Note: All other properties of the software call work the same for both price and data.

Modifying the Exploration

The basics of working with explorations and programming them can be found in the MetaStock Users Manual that came with the MetaStock program. These types of processes can be utilized for anything that the user can program. Refer to the MetaStock Users Manual for further information on custom formula programming.

Modifying your exploration is a key component to your triangle success. Without modification, an average of more than 25% of all securities explored will return a triangle candidate. Typically, this is far too many to be examined, and there is no qualifying information used to make sure it's actually the triangle type that you are looking for.

Most modifications fall into two categories:

1. Modifying the triangle software call, or
2. Modifying the triangle support criteria.

Modifying the DLL call requires some understanding as to what is being called and how. The appendix of this manual contains the basic information for calling the DLL's for the triangle package as well as for the modifiable parameters for the DLL.

This section will focus on modifying the triangle support criteria.

When modifying an exploration, it is best to either make a new one from scratch, or to copy an existing one. This way there will be a base point of reference of the original for future use.

If ever using the existing criteria of the supplied exploration, then the filter contents should always be enclosed in parenthesis. This should be done before any other user-supplied modifications occur.

Change this:

```
ExtFml("tsatriangles.triangle_detect", Swing, 1, 10, 0, Both,
Price, 0)>0 OR
ExtFml("tsatriangles.triangle_detect", Pattern, 1, 10, 0, Both,
Price, 0)>0
```

to this:

```
(ExtFml("tsatriangles.triangle_detect", Swing, 1, 10, 0, Both,
Price, 0)>0 OR
ExtFml("tsatriangles.triangle_detect", Pattern, 1, 10, 0, Both,
Price, 0)>0)
```

(The parentheses in red should be added first)

After the parentheses are added, user additions can take place with minimal problems.

Detecting Increased Volume on Breakout

Volume increases on breakouts are a great way for validating a triangle. If there is a significant volume increase on the bar of breakout, then there is a good chance that other traders are agreeing that it was a valid triangle (or trendline) and are trading accordingly. If no increase in volume occurs, then most likely it was a false breakout, or a false triangle all together (the market didn't agree that a true triangle was present)

To add increased volume detection, here are two examples that can be used.

First, single day increase in volume:

The triangle filter should be modified so that it returns 'Crossing' triangles instead of 'Both'. Next, with the enclosing parentheses added, to the end of the filter add:

```
AND  V>(Ref(V,-1)*1.5)
```

This compares takes the volume and requires that it be at least 50% greater than the previous day's volume for it to be considered a valid breakout. Another alternative to this is:

```
AND  V>(Ref(Mov(V,5,S),-1)*1.5)
```

This makes the volume requirement be at least 50% greater than the 5-day average volume on the day of the breakout.

Minimum/Maximum Price and Minimum Volume

This is a good filter to have to prevent triangles from showing up on securities that you otherwise may not trade normally. A maximum and minimum price can be set up simply by adding greater then and less than parameters like this:

```
AND  C>5  AND  C<140
```

This requires that any triangles returned have at least a price of $5.00 per share and has a maximum price of $140.00 per share to be valid (assuming that stocks are being traded). (This type of function isn't typically useful in commodities/futures since the quoted values in one security are not cross compatible with the values in another security.)

Adding a minimum volume requirement requires an understanding as to how your data provider supplies volume to MetaStock. Most data suppliers transmit volume/100 instead of true volume (for stocks). This example will assume that Reuters is the data provider, and Reuters transmits volume/100 for stocks. So, to reject all stocks that have volume less than 200,000 shares on average, a filter would be added like this:

```
AND  Mov(V,20,S)>=2000
```

This takes a 20-period moving average of the volume and requires that the average be greater than 200,000 shares. (If the data provider uses true volume, then 200000 would be used instead of 2000). With the above example, the volume would refer to a minimum of 2,000 contracts traded if explored on commodities/futures. (Futures contracts are not transmitted as volume/100.)

If both a price and volume filter were to be added, then they would occur sequentially like this:

```
AND  C>5  AND  C<140  AND  Mov(V,20,S)>=2000
```

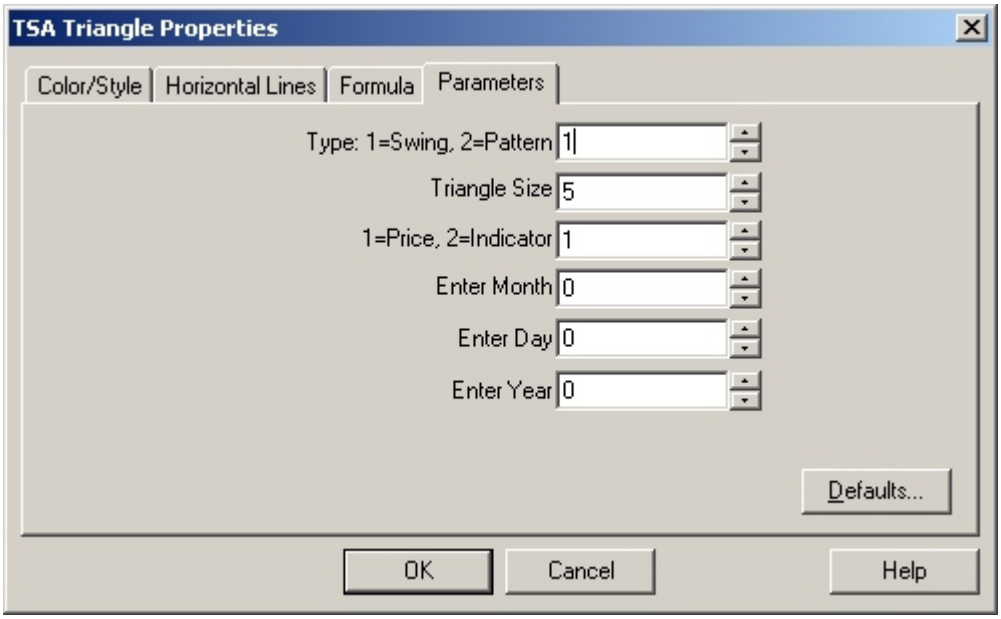
Applying the Triangle Indicator

In this example, there are three options; a 6-percent Swing triangle, a 3-percent Swing triangle, and a size 3 Pattern triangle.

In the drop down Indicator Quicklist, apply the indicator called 'TSA Triangle' to the chart directly on top of the price data.

A dialog box will come up asking for six options:

1. The type of triangle. This is whether to use a Swing method (1) or a Pattern method (2).
2. The size of the triangle. If Swing is chosen, then this is the size of the swing in percent. If Pattern is chosen, the this is the number of bars that need to be contained on each side of a point for measurement (how many bars on each side have to be lower than a central point for the upper line, and how many bars on each side have to be higher than a central point for the upper line).
3. Whether to use price data or an indicator to calculate the triangle. This is set to price data by default (1). For an indicator calculation to work the triangle needs to be plotted directly on the indicator, and indicator (2) selected in this option.
4. The month to plot back. Defaulted to zero.
5. The day to plot back. Defaulted to zero.
6. The year to plot back. Defaulted to zero.



Options 4, 5, and 6 are only for placing a triangle on a chart that needs to be retained (discussed later in this chapter).

For the examples given above, the indicator would be plotted three times to see all of the triangles returned in the exploration. Plotting the first triangle listed (Swing 103) involves subtracting 100 from the value for the triangle size (103 refers to a 'pending' 3-percent swing). In the dialog box, the type would be '1' for Swing, the size would be '3', and the rest of the options would be left alone set on their defaults. Once set, click on the 'OK' button

When the indicator is first applied to the chart, MetaStock will ask about scaling options. You should merge with whatever scale your prices are being displayed on (usually the right side). If not merged on the proper side, the lines will plot auto-scaled and will not align properly on the chart. Once the indicator is plotted, you will see three lines:

1. An upper trendline
2. A lower trendline
3. A center line (the Apex line)

The upper trendline shows at what point the price must cross above to break out. The lower trendline shows at what point the price must cross below to break out. The middle line (Apex line) is provided to show the general direction of the triangle movement and is also provided for strategies that use an Apex line for stop-loss purposes.

The apex shows which direction to expect a breakout to occur. If the apex is pointing upward, then you should be looking for a breakout of the upper trendline. The opposite is true if the apex is pointing downward. If trending sideways (or nearly sideways) then a breakout in either direction can be expected.

Depending on your trading style and philosophy, you may want to use the apex as a point to place a stop-loss once the position is entered. This stop-loss needs to be changed daily until your price objective is met or until you are stopped out of the position. (This should be a stop-loss that moves in the direction of the trade.)

Keeping the Triangle On the Chart

New in Triangles II is the ability to place a static triangle on a chart that doesn't disappear as new data comes in. Once a triangle has been found that a trade decision is based on, the triangle should be re-applied in a way that keeps in on the chart throughout the trade.

If intending to keep an existing triangle on the chart, double-click on one of the plotted lines in the triangle indicator OR right-click on one of the plotted triangle lines and click on 'TSA Triangle Properties' This will bring up the properties dialog box. Click on the parameters tab to bring the user entries to the front to edit.

If there isn't a triangle already plotted, then apply the 'TSA Triangle' indicator to the chart. This will bring up the 'TSA Triangles Properties' dialog box. If the parameters tab isn't already at the front, click on it to bring up the user entries to edit.

Select the Type of triangle, the Size, and Price (of being plotted on price). Then enter in the month (1-12), the day (1-31), and the year (1900-2100) that you want the triangle placed on. This date is the last date for the triangle to plot, not the first date of the triangle lines. Once the triangle is placed, it will remain there as long as you don't delete the indicator and also as long as you save the chart (or smart chart). As long as your chart is saved, MetaStock should retain the settings that your triangle indicator has.

MetaStock will allow you to have many triangles plotted on your chart, so a history of triangles traded can be kept on the chart. How many triangles can be applied and retained is dependent on your systems resources.

Note: There has to be a calculatable triangle on the date entered for a triangle to show. As with a triangle applied to a chart normally, if no triangle is present with the specified parameters, nothing will show.

If a date is entered that is not on the chart, then the TSA Triangles indicator will try to plot a triangle on the last date (bar) on the chart. If there is not a valid triangle with the specified parameters, then nothing will plot.

Deleting an Existing Triangle

Deleting a visible triangle is as easy as clicking on one of the triangle lines and pressing the delete key on your keyboard, or right clicking on an indicator line and clicking delete on the side-menu that comes up.

Sometimes a triangle is plotted improperly (wrong size, wrong type, wrong date, etc.), which causes the indicator not to plot, even though the indicator is technically on the chart.

Deleting a triangle that was plotted improperly requires a different process than a visible triangle, and there are a couple of ways to do it.

First, if the triangle was just applied and nothing else has been done to the chart, then you can click on Edit, and then Undo. This will undo the last operation on the chart (in this case, applying an invalid triangle). Holding down the Ctrl key and then pressing 'z' will do the same thing (Microsoft's universal Undo hotkey command).

The second way is to click on something on the chart (price data, volume, another indicator, etc.) so that handles come up on the chart (little black boxes to show you the 'selected' item). Once the boxes are displayed, press the Tab key on your keyboard. This will move the black boxes to another item on the chart. If the tab key is continually pressed, then eventually the boxes will disappear. This means that an item is now selected that can't be seen (like an improperly applied triangle, for example). At this point, press the delete key on your keyboard and delete the triangle. This should remove the triangle from the gray title bar of the chart.

Changing Colors of Triangles

When several triangles are on the chart, it can be advantageous to color-code them, especially when they are close together.

The easiest way to set a triangle's color is right when it's applied. With the TSA Triangle Parameters box up (the one where you enter your triangle parameters), click on the Color/Style tab and select the color you want the triangle to be. This is the best way since all colors are set simultaneously.

If a triangle is already applied, then each line in the triangles needs to be set individually. Either double-click on a triangle line, or right-click on one of the three lines and select 'TSA Triangle Properties'. This will bring up the Properties dialog box. Click on the Color/Style tab select the color you want the line to be, and then click on OK. This will have to be repeated again on the other two remaining lines for all three to be changed.

Plotting Triangles on Indicators.

If a triangle exploration is run on an indicator instead of price data, then it becomes worthwhile to plot the triangle on indicators that come up in the exploration report. Once the chart is open and the corresponding indicator applied to the chart, then the triangle can be applied to the indicator. Unlike plotting a triangle on price data, plotting a triangle on an indicator is not simply dropping the triangle indicator into the same inner window as the indicator that the triangle should be applied to.

Once the primary indicator is applied to the chart (this would be something like Stochastics, the RSI, or whatever indicator that was explored on) then the TSA Triangles needs to be dragged down to the same inner window as the indicator and dropped **right on top of the indicator itself**. The indicator that the triangle is being applied to will change color to purple. Only when the indicator is purple should the mouse button be released. This will send the indicator to the TSA Triangles DLL. When the dialog box comes up, the third option down the user entry screen will need to be changed from Price (1) to Indicator (2). Once all of the other triangle parameters are set, click OK and the triangle will plot.

If the actual indicator is not selected (not having turned purple when the mouse button is released) then no triangle will plot and it will need to be applied again with the indicator actually changed to purple.

Appendix

Frequently Asked Questions.

Why isn't a trend considered when determining a triangle condition?

There are two main reasons for this:

1. Many trading philosophies don't require a trend to be occurring or don't agree on the direction of the trend to take the trade.
2. Few people can agree as to what rules determine a trend and to how strong the trend should be.

To be able to accommodate the philosophies of many users, it wasn't realistic to claim the parameters that should be used. While many people believe that triangles are a continuation pattern, others view them as a reversal pattern, and some don't care about any trend at all.

The user is able to add their own trending parameters if desired.

Why doesn't the indicator plot all of the occurrences of the triangles on a chart (and why do they ultimately disappear from the chart)?

The base indicator can only show the active triangle, and will only show it for as long as the specific triangle is maintained. This means that as a new piece of a pattern or a new swing comes into form, the indicator will disappear if the new information doesn't also conform to the definition of the triangle.

Why does the exploration return breakouts as the specific sizes and tradable securities as the specific sizes plus 100 instead of the other way around?

There are two reasons for this. The first reason is that adding 100 makes the results stand out more visually as opposed to the specific size by itself. If using a setting of "Both", this makes it easy to identify tradable securities quickly by just glancing at the report.

The second reason is that the majority of people want to view the larger triangles first. If the exploration report is sorted in descending order then the largest will be displayed at the top of the report. If the results were returned the other way around, then ascending order would show the tradable securities first but the smallest triangles would be at the top of the report.

Books that Reference Triangle Patterns

Some standard references on triangles include (but are not limited to) the following:

Technical Analysis of the Financial Markets
By John Murphy

Schwager of Futures – Technical Analysis
By Jack D. Schwager

Technical Analysis and Stock Market Profits
By Richard W. Schabacker

Curtis Arnold's PPS Trading System
By Curtis M. Arnold

Trading the Odds
By Cynthia Kase

Encyclopedia of Chart Patterns
By Thomas Bulkowski

Trading Classic Chart Patterns
By Thomas Bulkowski

Technical Analysis of Stock Trends
By Robert Edwards and John Magee

These books and others in this field can by purchased from our bookstore at www.tsagroup.com

DLL Parameters

The DLL's are not allowed to be redistributed to other users or packaged in any distributed product for any reason. This is a violation of the license agreement. They are allowed to be used by the purchaser of the Triangles package only.

The information for calling the two triangle DLL's are provided here for those that wish to use them in their own formulas. It is assumed that the user is familiar with programming MetaStock and calling functions.

triangle DLL Call

This call is for generating the high and low lines to plot on a chart. Example Format:

ExtFml("tsatriangles.triangle", type, size, high/lowline, Price/Data, Data Array, Bars Back)

1. Type: This is for the triangle type, either 1 for Swing, or 2 for Pattern.
2. Size: This determines the size of the triangle. If Swing is selected, then this value represents the swing percentage to use. If Pattern is selected, then this represents how many lower highs or higher lows must occur from a central point for a high or low point to be calculated. Regardless as to whether Swing or Pattern is selected, this value needs to be an integer. If swing is selected and a 10-percent triangle is desired, then 10 would be the value entered, not .1 or 10%. A valid size is any whole number between 1 and 99.
3. High/Lowline: This is whether the DLL will return a data array for an upper trendline to plot, or for a lower trendline to plot. Acceptable entries are H, Highline, L, or Lowline.
4. Price/Data: This is for declaring whether the calculation will be performed on either 1 for Price information (highs and lows of the charts prices), or 2 for a user supplied data array (such as an indicator).
5. Data Array: This is only used if Data is chosen from the Price/Data selection. This can be any data array that MetaStock can handle, i.e., Stochastics, RSI, etc. For example, if a 14-period RSI of the price needs to be passed, then this would have RSI(14) in this section. If Price is selected from above, then any array entered here will be ignored. For clarification when writing your formulas, 0 (zero) should be used here if Price is selected above.
6. Bars Back: This is used to determine how many bars looking back from the last bar should be used in the triangle calculation. If a triangle is to be calculated and applied for five days ago, then 5 would go in this section. The TSA Triangle indicator for plotting a triangle on a specific date uses this part. Note that MetaStock handles the date to bars back conversion in the MetaStock code of the indicator. Reference the indicator to see how this is done.

Example of Use:

ExtFml("tsatriangles.triangle", 2, 2, L, 2, RSI(14), 10)

If a valid triangle exists with these parameters, then this will evaluate a Pattern triangle, size 2, and return the lower trendline. It will calculate on Data instead of Price, and it will use the 14-period RSI for the data array. It will perform the calculation on the RSI as of 10 bars ago looking backwards from the end.

(Colors are added for clarity and are not part of the formula call.)

triangle_detect DLL Call

This call is for detecting triangles on a chart. It's primary use is in the explorer. Example Format:

ExtFml("tsatriangles.triangle_detect", type, low search size, high search size, Max Convergence, Crossing/Pending/Both, Price/Data, Data Array)

1. Type: This is for the triangle type to look for. The choices available are S, Swing, P, or Pattern.
2. Low Search Size: This is the smallest triangle to search for given the supplied criteria (Type, Max Convergence, etc.). The triangles_detect DLL will search in order from the largest to the smallest and return the largest triangle found. Regardless as to whether Swing or Pattern is selected, this value needs to be an integer. If swing is selected and a 10-percent triangle is desired, then 10 would be the value entered, not .1 or 10%. A valid size is any whole number between 1 and 99. This value needs to be equal to or less than the High Search Size.
3. High Search Size: This is the largest triangle to search for given the supplied criteria (Type, Max Convergence, etc.). The triangles_detect DLL will search in order from the largest to the smallest and return the largest triangle found. Regardless as to whether Swing or Pattern is selected, this value needs to be an integer. If swing is selected and a 10-percent triangle is desired, then 10 would be the value entered, not .1 or 10%. A valid size is any whole number between 1 and 99. This value needs to be equal to or greater than the High Search Size.
4. Max Convergence: This is a filter that eliminates triangles that don't converge fast enough for trading purposes. This value is the maximum number of bars that can exist before a triangle convergence (the upper and lower trendlines intersect) is required. For example, if a value of 20 is placed here, then the triangle will have to have an upper and lower trendline that will converge sometime within the next 20 bars. If it takes more than 20 bars to converge, then the triangle will be rejected and the next smaller triangle will be evaluated. Note that this is the maximum time to convergence, NOT the maximum time to breakout. A breakout can (and usually will) occur long before the convergence of a triangle occurs. The values allowed for an actual convergence are 1 to 65500. If all triangles are to be allowed (no maximum convergence), then set this value to 0 (zero).
5. Crossing/Pending/Both: This entry determines what status a triangle needs to have to be returned. A crossing triangle is a triangle that has a breakout (of either the upper or lower trendline) as of the last bar of exploration. A pending triangle is a triangle that has formed but has not yet broken out, and is therefore still tradable. Both returns crossing and pending triangles. Acceptable entries are C, Crossing, P, Pending, B, or Both. If a crossing triangle is returned, then 100 will be added onto the value to distinguish between a pending and a crossing triangle.
6. Price/Data: This is for declaring whether the calculation will be performed on either 1 for Price information (highs and lows of the charts prices), or 2 for a user supplied data array (such as an indicator).
7. Data Array: This is only used if Data is chosen from the Price/Data selection. This can be any data array that MetaStock can handle, i.e., Stochastics, RSI, etc. For example, if a 14-period RSI of the price needs to be passed, then this would have RSI(14) in this section. If Price is selected from above, then any array entered here will be ignored. For clarification when writing your formulas, 0 (zero) should be used here if Price is selected above.

There are no bars back in the triangle_detect function since an exploration can be edited to explore on a specific day.

Example of Use:

ExtFml("tsatriangles.triangle_detect", Swing, 8, 20, 30, Pending, Price, 0)

Explore for Swing method triangles, returning the largest found between 8 and 20, that the upper and lower trendlines will intersect within 30 periods. Return only Pending (not yet broken out) triangles and evaluate on the securities Price data. (The last value is left at zero since price is being evaluated and not a user supplied data array.)

Supplied MetaStock Formulas

TSA Triangle (Indicator)

```
type:=Input("Type:  1=Swing,  2=Pattern",  1,  2,  1);
size:=Input("Triangle Size",  1,  99,  5);
pp:=Input("1=Price,  2=Indicator",  1,  2,  1);
m1:=Input("Enter  Month",  0,  12,  0);
d1:=Input("Enter  Day",  0,  31,  0);
y1:=Input("Enter  Year",  0,  2100,  0);

m2:=If(LastValue(IsDefined(BarsSince(Month()=m1  AND  DayOfMonth()=d1
AND  Year()=y1))),m1,LastValue(Month()));
d2:=If(LastValue(IsDefined(BarsSince(Month()=m1  AND  DayOfMonth()=d1
AND  Year()=y1))),d1,LastValue(DayOfMonth()));
y2:=If(LastValue(IsDefined(BarsSince(Month()=m1  AND  DayOfMonth()=d1
AND  Year()=y1))),y1,LastValue(Year()));

date:=LastValue(BarsSince(Month()=m2  AND  DayOfMonth()=d2  AND
Year()=y2));

a:=ExtFml("tsatriangles.triangle",type,size,H,PP,P,date);
b:=ExtFml("tsatriangles.triangle",type,size,L,PP,P,date);
a;b;(a+b)/2
```

TSA Triangle (Exploration)

Column A: Swng Sml
```
ExtFml("tsatriangles.triangle_detect",  Swing,  1,  3,  0,  Both,
Price,  0)
```

Column B: Swng Med
```
ExtFml("tsatriangles.triangle_detect",  Swing,  4,  6,  0,  Both,
Price,  0)
```

Column C: Swng Lrg
```
ExtFml("tsatriangles.triangle_detect",  Swing,  7,  10,  0,  Both,
Price,  0)
```

Column D: Pat Sml
```
ExtFml("tsatriangles.triangle_detect",  Pattern,  1,  3,  0,  Both,
Price,  0)
```

Column E: Pat Med
```
ExtFml("tsatriangles.triangle_detect",  Pattern,  4,  6,  0,  Both,
Price,  0)
```

Column F: Pat Lrg
```
ExtFml("tsatriangles.triangle_detect",  Pattern,  7,  10,  0,  Both,
Price,  0)
```

Filter:
```
ExtFml("tsatriangles.triangle_detect",  Swing,  1,  10,  0,  Both,
Price,  0)>0  OR
ExtFml("tsatriangles.triangle_detect",  Pattern,  1,  10,  0,  Both,
Price,  0)>0
```

Triangles with Trends (Reprinted and Modified from the TSAGroup Website)

Note that since this was originally written with the original triangle package, the images are using the old package and may have titles within the charts that reflect that. The information is still valid and functional with Triangles II.

One of the largest problems with triangles is that most experts don't agree on the rules that define valid triangle patterns. Some experts require a certain type of triangle in an uptrend, while others say that the same type of triangle should only be used in a downtrend. Some say to take either side of a triangle breakout, while others say to only take a certain direction based upon some class of rules. The fact of the matter is that there are many ways to trade triangles successfully, as well as many ways to loose money with them.

What is going to be shown is not a guaranteed success to your trading. After all, this is trading and there are no guarantees at all. But you will see a method to make your triangle trades have a higher percentage of success.

The basic method of trading a triangle pattern is to wait for one to develop, and then take a long position if it breaks above the triangle's resistance or a short position if it breaks below the triangle's support. The general premise is that since a triangle is a consolidation pattern, then whichever way prices break out of the triangle should be the direction that they should continue, and you as a trader would then hop on board this breakout to acquire the profits.

The losses occur when the breakout from the triangle doesn't result in an up or down trend but instead continues to move sideways, whipsawing you in and out of the trade while you're trying to jump on the trend.

This technique is designed to reduce (not eliminate) the chances of that happening. It can be associated with the classical physics concept of "a body in motion tends to stay in motion, and a body at rest tends to stay at rest." (While classical physics has no true relevance here, it does get the point across as to the nature of the technique.) If you are watching a market that is trading sideways, there is a higher probability that any triangle pattern that develops is not a true consolidation pattern, but is just a common movement in an ordinary market. Therefore you don't have a real breakout, instead you just have steady sideways movement (more designed for ordinary support and resistance techniques, as opposed to a consolidation type).

The basis of this technique is to trade triangles that are in a trending state. This way, prices are actually consolidating from something. If prices are trending in a particular direction (showing control by the bulls/bears) and a triangle occurs, then we see that at the point of consolidation there is a struggle going on. If looking at a triangle in an uptrend and prices break to the upside then the triangle was a continuation pattern. If it breaks to the downside, then the triangle becomes a reversal pattern. Either way, it will typically show a "winner" at the point of the breakout. In a non-trending sideways channel, a triangle normally occurs due to common fluctuations as opposed to a struggle for control.

While the chances of a price breakout from this type of pattern turning into a sideways market is still highly possible, we have removed a very significant percentage of the failing patterns that would typically occur from taking all available triangles. "Qualifying" the triangle with a known parameter (a trend) increases the odds of success.

There are several ways to identify a trend condition. It can be observed visually (which is the primary way it has been done through time), or using the Triangles software we can use indicators to determine if a trend exists. The indicator approach will be used for the examples here.

Many people choose to make their own trending indicator, and there are no problems with that. Since what defines a trend is fairly subjective, you should always use the indicator that fits best into your trading philosophy and style. But there are also several fairly good trend-identifying indicators that are already built-in to most software programs. Indicators like Wilder's ADX, r-Squared, or the Vertical-Horizontal Filter (VHF) are all valid indicators that can be used.

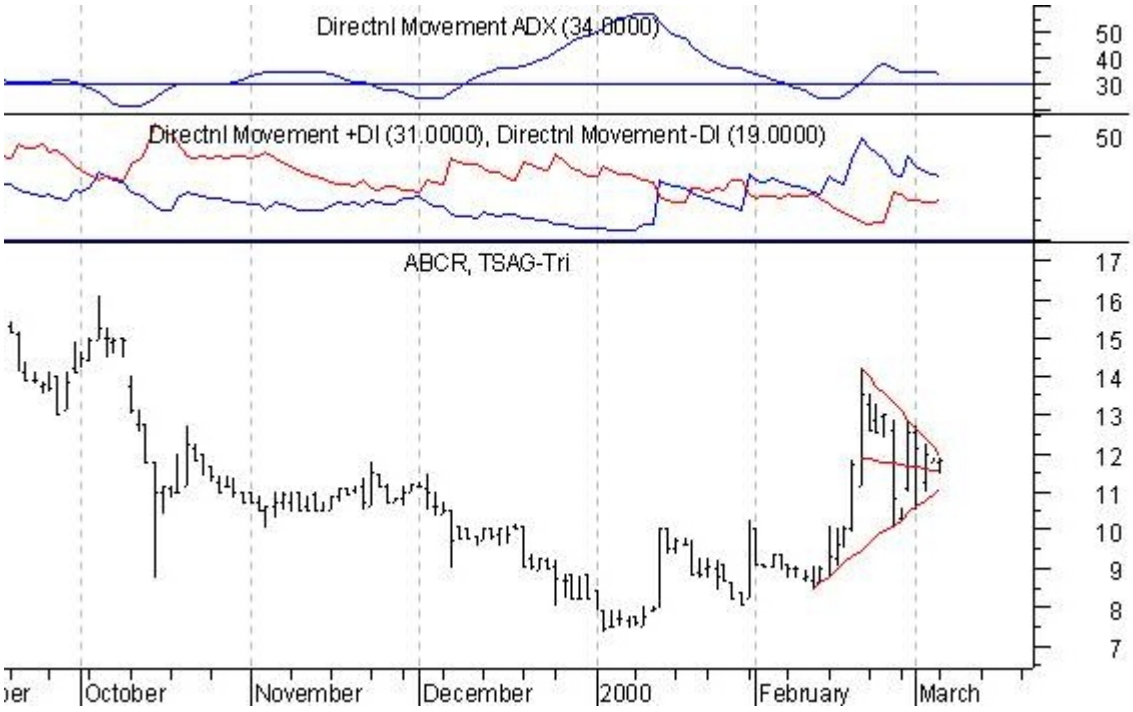
When using a trend-identifying indicator, the trend length will want to be matched up with an appropriate triangle size. For example, r-Squared and the Vertical-Horizontal Filter are both fairly fast indicators and therefore you would want to use them with fairly small triangle patterns. If you use an r-Squared indicator with a large triangle, then you run into the probability that the r-squared is identifying a short-term trend within the triangle instead of the trend that is causing the triangle to occur. A 21-period r-Squared will typically work well with triangles that are 8-bars or less (in total triangle size, not pattern or swing size). More than that will cause it to either not show a trend when the triangle occurs, or to show the trend within the triangle (which defeats the purpose of identifying the trend in the first place).

For the examples here, the 14-period Average Directional Movement Index (ADX) will be used. This was chosen because it has a slower response than either the r-Squared or the Vertical-Horizontal Filter, and can therefore allow the use of larger triangles.

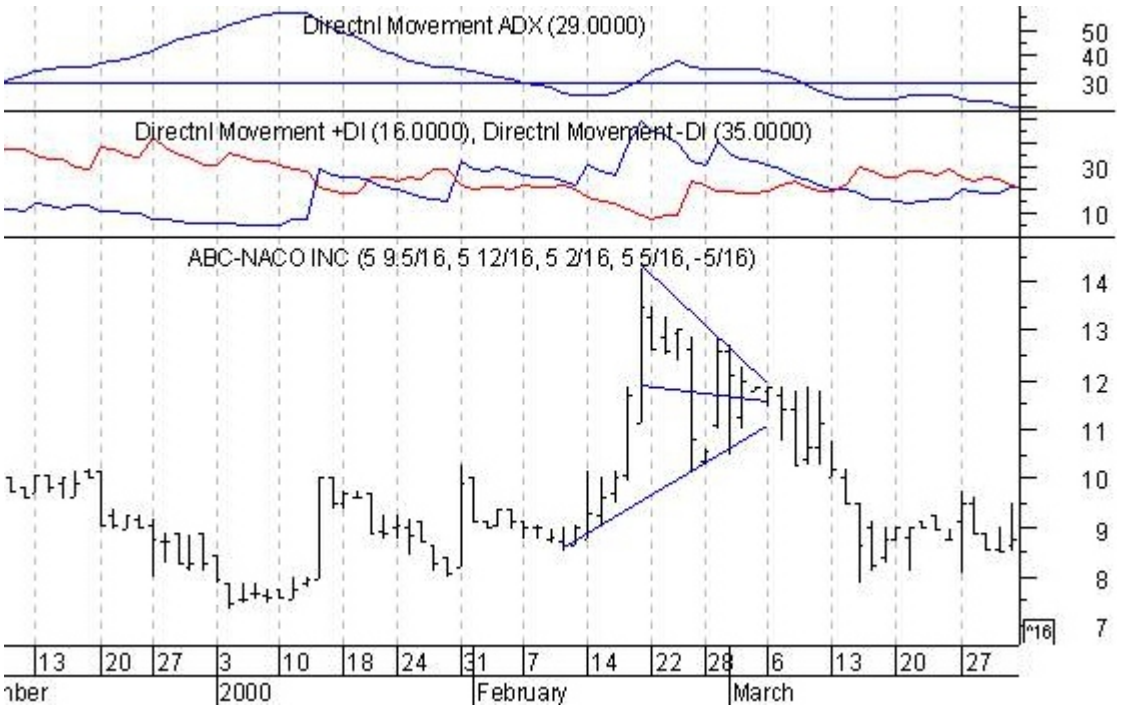
A value of 30 was chosen to be the threshold for determining whether a trend existed or not. If a value of 45 - 60 were chosen it would be a greater qualifier, but would also result in a less likely chance of detection. Since a triangle involves both up and down movement to be created, by nature it will reduce the value of a trend-finding indicator when the triangle occurs. Good triangles may force the indicator below the threshold values before it can be taken advantage of.

From a truly technical point (as opposed to a software one), the application of this method is as simple as visually spotting a triangle pattern, and then applying the ADX indicator to the chart to see what its reading is. If the ADX is above 30, then the triangle is qualified.

Here is an example of how all of this works:



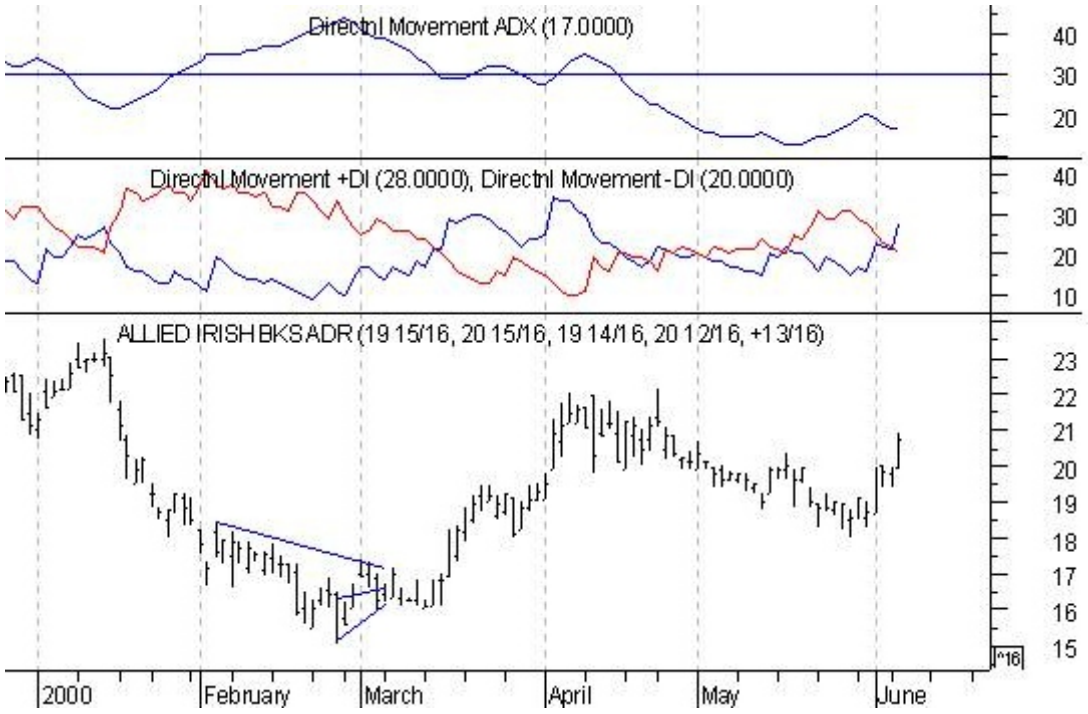
Here are actually several good triangle patterns. While the ADX was at its highest point at the beginning of January, there was a very small triangle (about 5 bars long at the beginning of January, or longer if you show the resistance back to late December) that resulted in a successful breakout just before the middle of January. Then towards the end of January another small triangle pattern developed, with the ADX still being above 30, as well as another successful trade to the upside that could have been taken. In mid February, another triangle setup occurs that looks almost exactly like the January triangle, except the ADX is below 30, so the trade would never have been made. At the end of the chart there is a very definite triangle. The ADX is above 30 and is starting to pull back (since the triangle pattern has significant down moves within it.) The trend is up (according to the +DI and -DI indicators) and so either a trend continuation or trend reversal would be expected.



The prices broke out to the short side with a potential gain of almost 20% in less than 2-weeks had a short position been taken. Also notice that at the end of the short downtrend that another small triangle develops, ultimately turning into a sideways market. The ADX is far below 30 at that point so this next triangle would have never been taken.

Example 2:

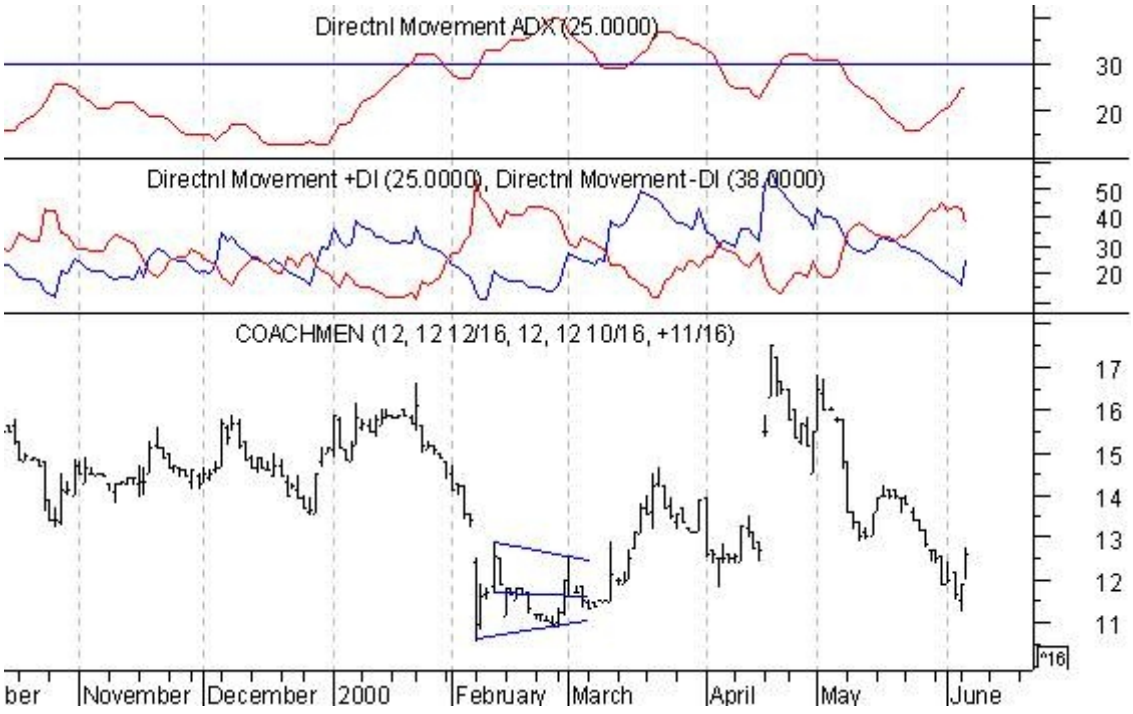
Here, a triangle develops during a definite downtrend. The ADX is still around 40 even after an expected pullback. The breakout could be taken on either side.



What happened is something that occurs frequently with triangles. In this case, the triangle broke out to both sides during the next two consecutive days. It then huddled around those prices for several days before taking off to the upside in mid March. Often a triangle will have a false breakout only to reverse harshly in the opposite direction (as seen here). A trader with a good understanding of this type of phenomenon realizes that when they occur, it is best to be onboard for the sudden move. The small loss that occurred due to the false breakout would have been minimal to the potential profits by closing the position and taking the long side (almost another 20% in 3 weeks).

Example 3:

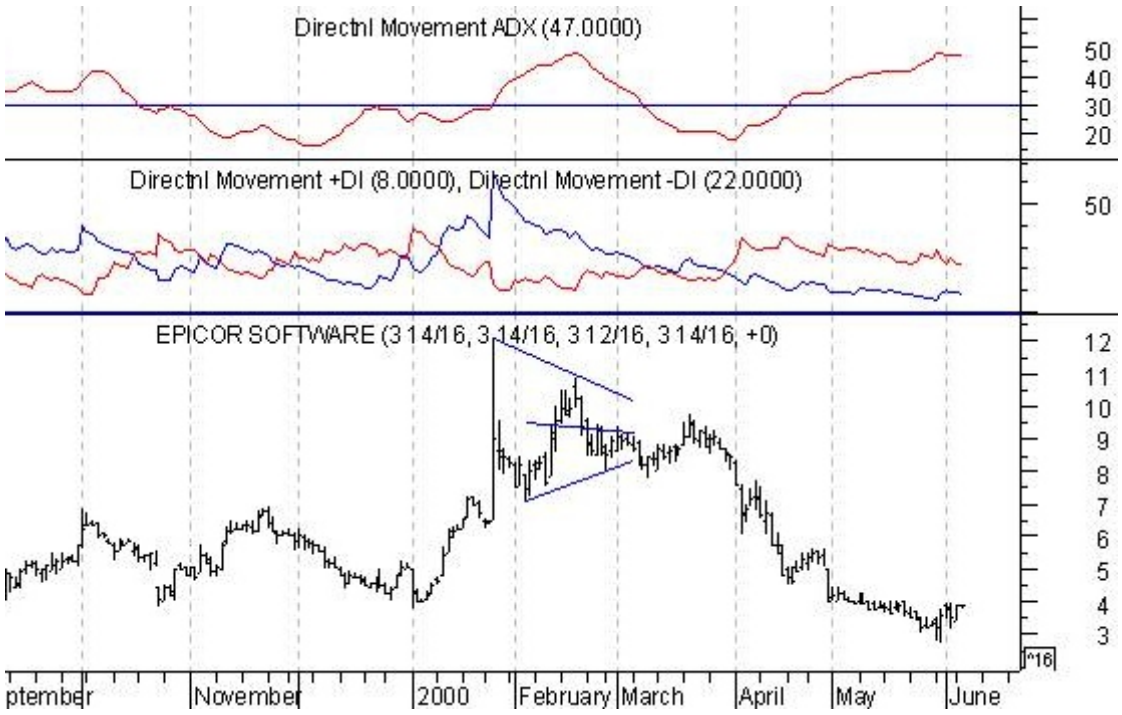
Here, a triangle develops with definite breakout levels established, as well as a strong ADX reading to the downside.



A breakout occurs on the eighth trading day into March, pulls back slightly, and then jumps to a short-term high in less than two weeks. Assuming a trader was willing to wait, a large profit could have been acquired

Example 4:

A much longer and larger triangle, though still within a defined uptrend as shown by the ADX reading above 30.



This is another common occurrence with triangle patterns that should be watched for. A breakout to the downside occurs with a complete pullback to the apex (middle line), and then forcefully moves in the original direction of the breakout. This is another example of how getting stopped out and reentering the position can result in a substantial return, more than offsetting the potential losses that can occur from getting stopped out initially.

Note that it is also possible that at the retracement to the apex line, that the triangle could have been redrawn to extend to the middle of March. This would also be a valid triangle pattern, but would have failed the qualifying criteria since at that point the ADX was far below 30. (At the TSAGroup, we believe that it is better to be excluded from potential gain than to be exposed to substantial losses, so not taking the trade based upon that perspective would be consistent with our philosophy. You should determine ahead of time what perspective you will take on such a scenario.)

Final Notes:

Qualifying a pattern is nothing new, and the concept certainly shouldn't be excluded from visual patterns such as triangles. The ADX was used for its availability in most software, but remember that there are hundreds of trend-defining indicators that already do exist or can easily be created. You may want to use the ADX with more periods and at different thresholds for a stronger trend, or a completely new indicator based upon your own ideas. Visually defining a trend also works well, as trends can sometimes be seen even though the indicators don't show it. Find a method that works for you.

Modifying the TSA Triangles Exploration for Trends

For the examples here, a 14-period ADX will be used to identify the trend. The original TSA Triangle filter is set to:

```
ExtFml("tsatriangles.triangle_detect", Swing, 1, 10, 0, Both,
Price, 0)>0 OR
ExtFml("tsatriangles.triangle_detect", Pattern, 1, 10, 0, Both,
Price, 0)>0
```

Adding on to the formula requires enclosing the original portion in parenthesis and then putting a space at the end and adding an:

```
AND ADX(14)>30
```

The final Exploration filter would look like this

```
(ExtFml("tsatriangles.triangle_detect", Swing, 1, 10, 0, Both,
Price, 0)>0 OR
ExtFml("tsatriangles.triangle_detect", Pattern, 1, 10, 0, Both,
Price, 0)>0)
AND ADX(14)>30
```

This is the same way that you can add your own mechanical criteria to your explorations, which will also narrow the available signals that are returned each night.