

Automated Stock Trading System

<http://spreadsheetml.com/automatedstocktradingsystem>

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1. Introduction

The aim of this course is to allow you to use the various Stock Technical Indicators and create an Automated Stock Trading System using Microsoft Excel. We assume that you have some basic knowledge of Excel and is interested in putting into practice the financial concepts of a technical stock trading system.

We will start from downloading Stock data and move into the calculation of the different Technical Indicators. The Technical Indicators include Moving Average, Directional Movement, Directional Movement Indicator, Average Directional Movement Index and Average True Range. The focus is on two aspects. The first is the understanding of the specific Technical Indicators and the second is the implementation of the indicators in Excel.

We do not guarantee that you will get rich by going through these materials but we are confident that you will become a better technical trader as you will be able to apply many of these Technical Indicators to analyse your portfolio.

2. Download Stock Trading Prices

2.1 Download Data from Yahoo Finance

Launch Microsoft Excel and create a new workbook. You may call your workbook DownloadData.xls. We are going to provide the information to Excel where to download the stock information.

Excel 2003: Click on Data->Import External Data->New Web Query

Excel 2007: Click on Data->From Web

A Mini Browser will appear. Browse to <http://finance.yahoo.com>. On the top left hand corner, it allows you to Get Quotes. Enter "YHOO" for the stock price of Yahoo. A summary of the Stock price for Yahoo will appear. Click on the "Historical Prices"

Alternatively, once you are comfortable, the next time you can just simply enter full URL, appended with the Stock Code as follows <http://finance.yahoo.com/q/hp?s=YHOO>

On the web page you will be able to select download prices based on the following frequency

- Daily
- Weekly
- Monthly
- Dividends Only

You can leave the defaults and click on the Get Prices.

							First Prev Next Last
PRICES							
Date	Open	High	Low	Close	Volume	Adj Close*	
2-Sep-08	19.63	19.77	18.74	18.75	16,943,700	18.75	
29-Aug-08	19.54	19.60	19.28	19.38	11,204,900	19.38	
28-Aug-08	19.48	19.76	19.38	19.65	11,729,500	19.65	
27-Aug-08	19.08	19.45	18.93	19.37	9,300,100	19.37	
26-Aug-08	19.12	19.20	19.00	19.09	8,770,500	19.09	
25-Aug-08	19.34	19.40	19.05	19.09	13,779,300	19.09	
22-Aug-08	19.11	19.68	19.10	19.53	11,087,500	19.53	
21-Aug-08	19.06	19.18	18.87	19.11	16,995,100	19.11	
20-Aug-08	19.57	19.65	19.10	19.17	16,336,900	19.17	
19-Aug-08	19.78	19.91	19.41	19.42	12,837,300	19.42	
18-Aug-08	20.47	20.52	19.66	19.73	14,571,600	19.73	
15-Aug-08	20.27	20.82	20.27	20.44	14,945,100	20.44	
14-Aug-08	20.20	20.57	20.14	20.28	11,103,300	20.28	
13-Aug-08	20.33	20.48	20.06	20.36	11,954,500	20.36	
12-Aug-08	20.21	20.60	20.04	20.43	13,883,700	20.43	
11-Aug-08	19.89	20.28	19.65	20.26	12,903,700	20.26	
8-Aug-08	20.19	20.19	19.87	19.90	13,640,000	19.90	

Click on the 3rd Yellow Arrow to turn it into a check mark, and then click the Import button. The "Import Data" dialog will appear, you can click on the Properties button on this dialog to alter the import properties.

External Data Range Properties

Name:

Query definition

☒ Save query definition

☐ Save password

Refresh control

☒ Enable background refresh

☐ Refresh every minutes

☐ Refresh data when opening the file

☐ Remove external data from worksheet before closing

Data formatting and layout

☒ Include field names ☐ Preserve column sort/filter/layout

☐ Include row numbers ☒ Preserve cell formatting

☒ Adjust column width

If the number of rows in the data range changes upon refresh:

☒ Insert cells for new data, delete unused cells

☐ Insert entire rows for new data, clear unused cells

☐ Overwrite existing cells with new data, clear unused cells

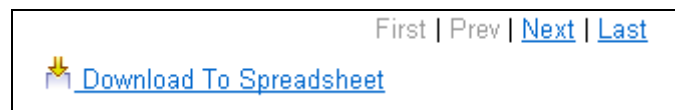
☐ Fill down formulas in columns adjacent to data

OK Cancel

Click the OK button to close the dialog and you will see the following in Excel. The actual data might be different from the screen shown below as you will be importing the latest data. The following is captured during the 2nd of September 2008.

	A	B	C	D	E	F	G
1	Date	Open	High	Low	Close	Volume	Adj Close*
2	2-Sep-08	19.63	19.77	18.74	18.75	16,943,700	18.75
3	29-Aug-08	19.54	19.6	19.28	19.38	11,204,900	19.38
4	28-Aug-08	19.48	19.76	19.38	19.65	11,729,500	19.65
5	27-Aug-08	19.08	19.45	18.93	19.37	9,300,100	19.37
6	26-Aug-08	19.12	19.2	19	19.09	8,770,500	19.09
7	25-Aug-08	19.34	19.4	19.05	19.09	13,779,300	19.09
8	22-Aug-08	19.11	19.68	19.1	19.53	11,087,500	19.53
9	21-Aug-08	19.06	19.18	18.87	19.11	16,995,100	19.11
10	20-Aug-08	19.57	19.65	19.1	19.17	16,336,900	19.17
11	19-Aug-08	19.78	19.91	19.41	19.42	12,837,300	19.42
12	18-Aug-08	20.47	20.52	19.66	19.73	14,571,600	19.73
13	15-Aug-08	20.27	20.82	20.27	20.44	14,945,100	20.44
14	14-Aug-08	20.2	20.57	20.14	20.28	11,103,300	20.28

Instead of downloading the data through the steps above, an alternative is to launch your browser and navigate to <http://finance.yahoo.com/q/hp?s=YHOO>. Click on the link as shown below "Download To Spreadsheet" to download the entire data to Excel.

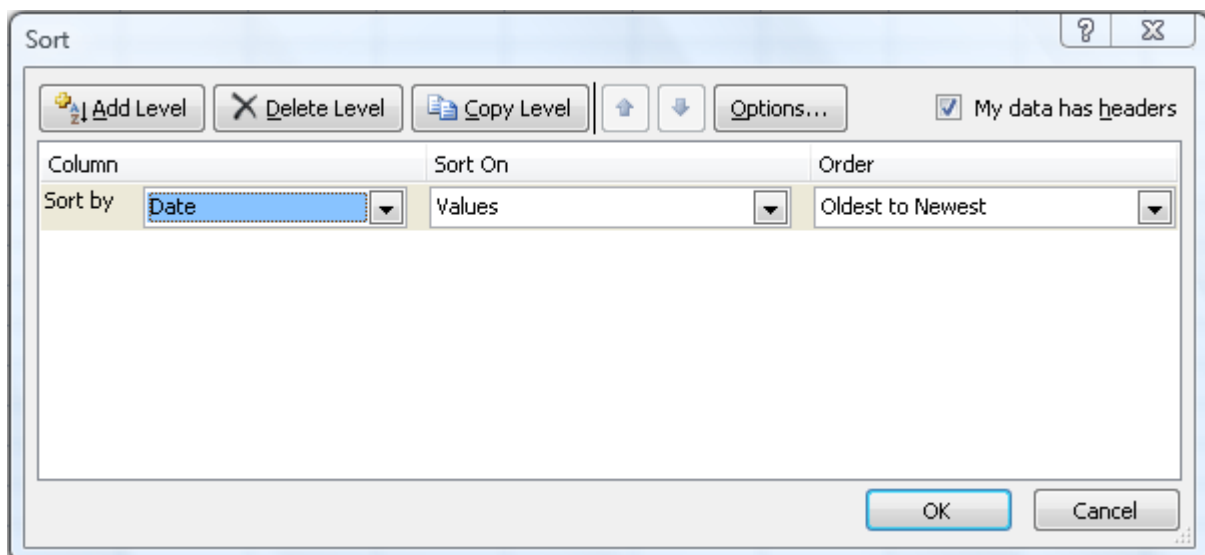


2.1.1 **Sort the Data**

You can also sort the data to display the latest stock prices on top or at the bottom of the spreadsheet.

Excel 2003: Click on Data->Sort to sort by the Column "Date" with the data in "Ascending" order.

Excel 2007: Click on Data->Sort and specify the options as shown below to sort the data from "Oldest to Newest".



2.2 Automating the download of Stock Prices

The methods above are useful when you are exploring what kind of data to download to Excel. However it will be laborious to go through all the steps to download the price of a specific Stock symbol. This section will show you how to automate the download of the Stock Prices. We will be using a simple programming language called Visual Basic for Applications (VBA). If you will like to find out more about VBA, you will be interested to know that spreadsheetml.com offers a VBA course on our website. Otherwise, please be assured that we will be going through the steps, one at a time to allow you to construct the models without prior knowledge of VBA.

Launch Excel and create a new workbook. Call this workbook AutomatedDownloadData.xls.

In Microsoft Excel 2003: Go to Tools->Macro->Visual Basic Editor

In Microsoft Excel 2007: Go to Developer->Visual Basic

Right click on VBAProject (your Excel Filename) and select Insert->Module. A default Module1 will be inserted. Click on Module1 and paste the VBA code below on the right hand side of the Visual Basic Editor. The following VBA codes allow you to download data from Yahoo Finance based on a specified Stock symbol, Start Date and End Date.

```
Sub GetStock(ByVal stockSymbol As String, ByVal StartDate As Date, ByVal EndDate As Date)

    Dim DownloadURL As String
    Dim StartMonth, StartDay, StartYear, EndMonth, EndDay, EndYear As String
    StartMonth = Format(Month(StartDate)-1, "00")
    StartDay = Format(Day(StartDate), "00")
    StartYear = Format(Year(StartDate), "00")

    EndMonth = Format(Month(EndDate)-1, "00")
    EndDay = Format(Day(EndDate), "00")
    EndYear = Format(Year(EndDate), "00")
    DownloadURL = "URL;http://table.finance.yahoo.com/table.csv?s=" + stockSymbol + "&a=" +
    StartMonth + "&b=" + StartDay + "&c=" + StartYear + "&d=" + EndMonth + "&e=" + EndDay +
    "&f=" + EndYear + "&g=d&ignore=.csv"

    With ActiveSheet.QueryTables.Add(Connection:=DownloadURL, Destination:=Range("$A$1"))
        .FieldNames = True
        .RowNumbers = False
        .FillAdjacentFormulas = False
        .PreserveFormatting = True
        .RefreshOnFileOpen = False
        .BackgroundQuery = True
        .RefreshStyle = xlInsertDeleteCells
        .SavePassword = False
        .SaveData = True
        .AdjustColumnWidth = True
        .RefreshPeriod = 0
        .WebSelectionType = xlSpecifiedTables
        .WebFormatting = xlWebFormattingNone
        .WebTables = "20"
        .WebPreFormattedTextToColumns = True
        .WebConsecutiveDelimitersAsOne = True
        .WebSingleBlockTextImport = False
        .WebDisableDateRecognition = False
    End With
End Sub
```



```

.WebDisableRedirections = False
.Refresh BackgroundQuery:=False
End With
ActiveWindow.SmallScroll Down:=-12
Columns("A:A").TextToColumns Destination:=Range("A1"), DataType:=xlDelimited, _
    TextQualifier:=xlDoubleQuote, ConsecutiveDelimiter:=False, Tab:=True, _
    Semicolon:=False, Comma:=True, Space:=False, Other:=False, FieldInfo _
    :=Array(Array(1, 4), Array(2, 1), Array(3, 1), Array(4, 1), Array(5, 1), Array(6, 1), _
    Array(7, 1))
Columns("A:F").EntireColumn.AutoFit
End Sub

Sub Download()
    Call GetStock("YHOO", "02/01/2007", "09/05/2008")
End Sub

```

Click on Save and then File->Close to return to Microsoft Excel. In Excel, try out the downloading of data by going to

Excel 2003: Go to Tools->Macro->Macros..., select the Download macro and click run

Excel 2007: Go to Developer->Macros, select the Download macro and click run.

and press the Enter key. This will initiate a download of Stock Prices from Yahoo! Finance.

What we have is a subroutine that downloads stock data automatically and can be executed by Excel. It takes "stockSymbol", "StartDate" and "EndDate" as parameters.

In the whole block of code above, the most important line is the following.

```

With ActiveSheet.QueryTables.Add(Connection:=DownloadURL, Destination:=Range("$A$1"))

```

It basically says that we will be downloading data from DownloadURL and placing the result into the cell A1. The DownloadURL is constructed based on the parameters explained below.

<http://table.finance.yahoo.com/table.csv?s=YHOO&a=01&b=01&c=2007&d=08&e=05&f=2008&g=d&ignore=.csv>

- "s=YHOO" means to download the stock prices of Yahoo. YHOO is the stock symbol of Yahoo.
- "a=01&b=01&c=2007" specifies the start date in Month, Day, Year. You might have noticed that the month is subtracted with 1, which is the format required by Yahoo.
- "d=08&e=05&f=2008" specifies the end date in Month, Day, Year. You might have noticed that the month is subtracted with 1, which is the format required by Yahoo.

Save this workbook as we will be using it for our next section.

3. Moving Average Trends

Many successful investors and traders make use of trends to profit from the market, and Moving Average is one of the most important methods for identifying market trends. The stock prices for successive periods are used for the calculation of a moving average. Moving average reduces the effects of short term volatility and allows the investors or traders to see the underlying trends of a market.

The aim of this section is to allow you to calculate simple moving average using Excel and make use of Moving Average Crossover to determine buy / sell signal and resistance level in a stock. After that, the simple moving average will be expanded with Welles Wilder method of moving average, Directional Movement and Average Directional Movement Indicators. Welles Wilder is the founding father who had introduced many of the modern trend concepts in his book New Concepts in Technical Trading System.

3.1 Simple Moving Average

A moving average reduces the effect short term price volatility. For example, a 10 day simple moving average of the closing price is calculated by averaging the closing price of the last 10 days.

$$\text{Simple Moving Average} = \text{Sum}(\text{Closing Price of Last 10 Days}) / 10$$

Applying this simple concept, let's go to our Excel file to calculate the following

- 10 Day Moving Average
- 14 Day Moving Average
- 20 Day Moving Average
- 30 Day Moving Average

3.1.1 10 Days Moving Average

Open the AutomatedDownloadData.xls in Excel. Save it as a new workbook call it MovingAverage.xls. Run the Download macro if the data has not yet been downloaded. Remember to sort the data based on Date from Oldest to Newest (or in Ascending order for Excel 2003).

Next, we are going to calculate a 10 Day Moving Average. Follow the steps below:

1. Click on the Cell H11.
2. Type in `"=ROUND(AVERAGE(E2:E11),2)"`. This will calculate the average (of ten values of the closing price) from row 2 to row 11 of column E and round them to 2 decimal places.
3. Drag this cell downwards to the end of the Stock Prices. For Excel 2003, copy this cell (we are actually copying the formula of this cell) drag a range downwards to the last value of the Stock Prices, and paste it.
4. Go to Cell H1, and type in "10 Day SMA"

3.1.2 14 Days Moving Average

Next, we are going to calculate the 14 Day Moving Average. Follow the steps below:

1. Click on the Cell I15.
2. Type in `"=ROUND(AVERAGE(E2:E15),2)"`. This will calculate the average (of fourteen values of the closing price) from row 2 to row 15 of column E and round them to 2 decimal places.
3. Drag this cell downwards to the end of the Stock Prices. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
4. Go to Cell I1, and type in "14 Day SMA"

3.1.3 20/30 Days Moving Average

Repeat the above steps for column J and column K for the 20 days/30 days moving average.

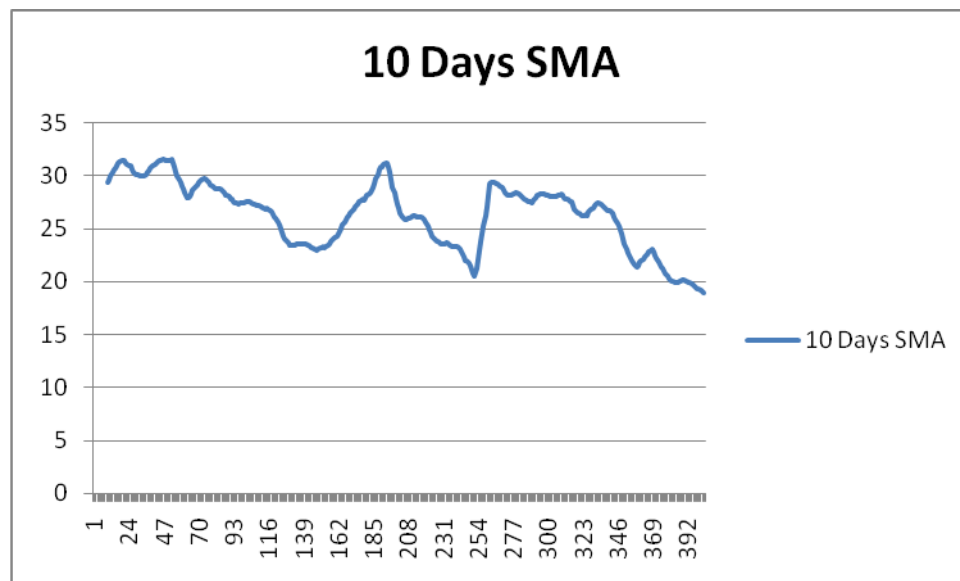
3.1.4 Charting the Moving Average

Select the 10 Days SMA column and

Excel 2003: Go to Insert->Chart, and select Line as the Standard Types, and click the Next button repeatedly until the dialog closes.

Excel 2007: Go to Insert->Line. Choose the first line graph. You will be getting a graph like below.

You will be able to change the X-Axis to date. We will leave that as an Exercise for you.



Repeat the above steps for the 14 / 20 / 30 Days SMA. Alternatively, you may create a chart to display the moving average together with the actual closing price, in a single graph in order to compare them. At this point, you will be able to apply the concepts of the Moving Average trends mentioned in the various Financial Technical Indicators papers.

3.2 Using the Moving Average

Compare a 10 day versus a 20 day moving average. One uses 10 values to compute the average while the other uses 20 values.

A 20 day moving average gives you less fluctuation and sees the underlying trend more clearly. However it does not mean that the 20 day average is better. Imagine that you are going to calculate the moving average for a new day, the 20 day moving average includes more values in its averaging, and thus, might be slower to respond to changes compared to the 10 day one. So if a trend is reversing, you will be able to see it faster in the 10 day moving average. However, sometimes, the reverse trends in the 10 days moving average might be a false signal.

If you overlap the different moving averages in a single graph, notice

- A support level usually occurs when two moving averages cross / intersects each other.
- When the shorter (faster changing) moving average crosses above the longer (slower changing) one, it usually means a rising trend of the prices.
- When the shorter (faster changing) moving average crosses below the longer (slower changing) one, it usually means a declining trend of the prices.
- Moving average is actually a mean of the price, thus when the actual price deviates too far from its moving average, it will typically start moving back (tends) towards the moving average.

3.3 Wilders Moving Average

A new trading day simple moving average is calculated by dropping off the earliest trading day's price. This can cause a problem if the recent price data shows little changes. This is not acceptable to some traders or analysts. On the other hand, it is also often argued that the recent prices are often the most important in identifying trends.

Wilders devised a simple mechanism to overcome the above problem. This is done by taking into account previous days moving average and also placing more weight on the recent prices.

Launch Excel and load the MovingAverage.xls workbook. Remove the charts and save the workbook as Wilders.xls.

Wilder's Current Day Moving Average = (Previous Day Wilder's Moving Average * (n-1) + Current Day Price)/n

We are going to calculate a 14 Days Wilder's Moving Average.

1. Copy the value from Cell I15 to the Cell L15. We are initializing the first Wilder's Moving Average with the value of a Simple Moving Average.
2. Click on Cell L16. Type in "=ROUND((L15*13+E15)/14,2)".
3. Drag Cell L16 downwards to the end of the Stock Prices. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
4. Go to Cell L1, type in "Wilder's MA"

3.4 True Range

If in a new trading day, a stock start it's trading at a higher or lower price than the previous day's closing price, then a gap is said to have occurred. Welles Wilder feels that this gap needs to be taken into account when measuring fluctuations.

The True Range of a stock price (as defined by Wilder) will need to take into account the gaps. He thus suggests True Range to be calculated as the Greatest number among the following values:

- Difference between the current High and the current Low
- Absolute difference between the current High with the previous Close
- Absolute difference between the current Low with the previous Close

Open the Wilders.xls file, launch the Visual Basic Editor, and key in the following into Module1.

```
Function TrueRange(ByVal high As Double, ByVal low As Double, ByVal previousclose As Double) As Double

Dim returnValue As Double
diffHighLow1 = Math.Abs(high - low)
diffHighLow2 = Math.Abs(high - previousclose)
diffHighLow3 = Math.Abs(previousclose - low)

If (diffHighLow1 > diffHighLow2) Then
    returnValue = diffHighLow1
Else
    returnValue = diffHighLow2
End If

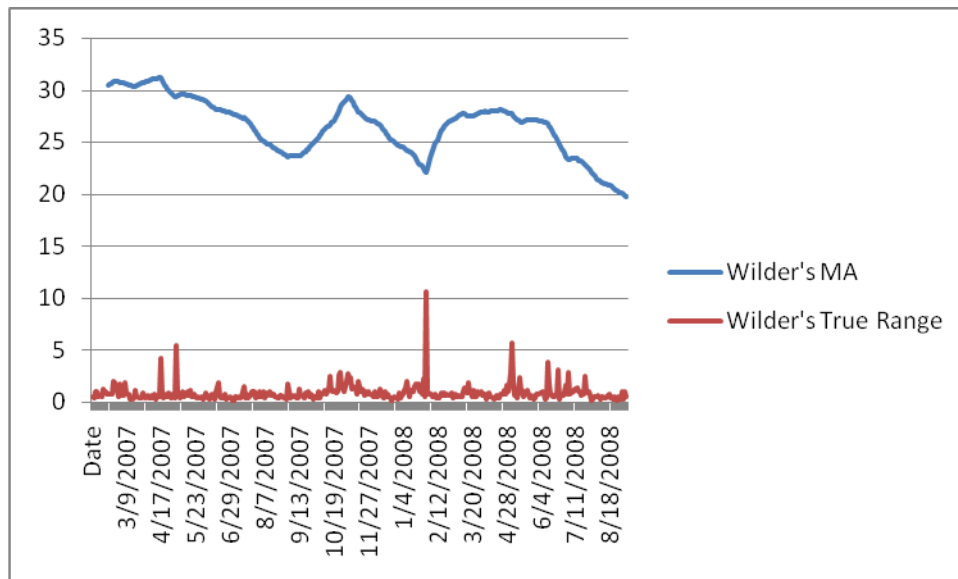
If (diffHighLow3 > returnValue) Then
    returnValue = diffHighLow3
End If

TrueRange = returnValue

End Function
```

1. Click on the Cell M3.
2. Key in "=TrueRange(C3,D3,E2)".
3. Drag this cell downwards to the end of the Stock Prices.
4. Click on Cell M1 and type in "Wilder's True Range"

If you chart the Wilder's Moving Average and Wilder's True Range, the following is what you will be getting.

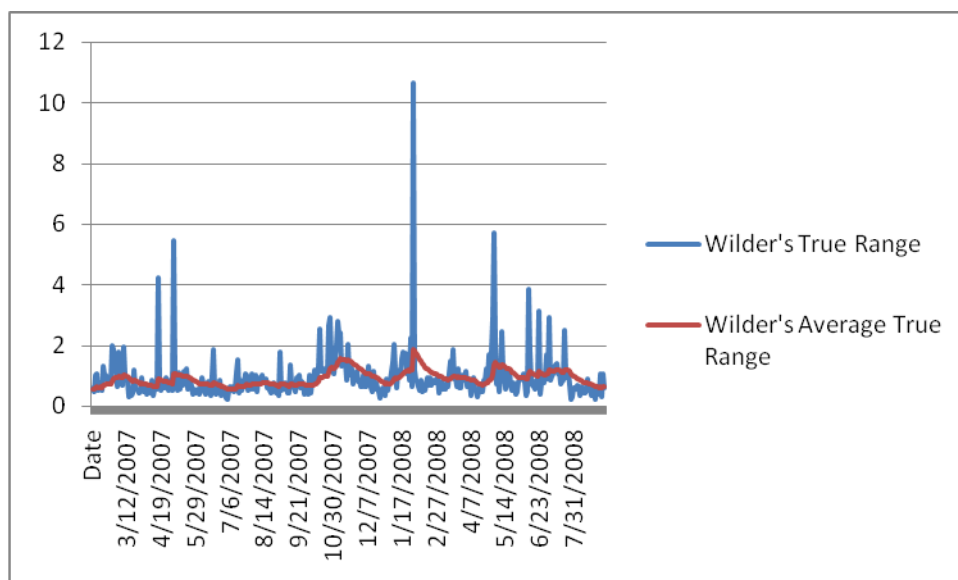


3.5 Average True Range

The Average True Range is calculated as the average of the True Ranges using Wilder's method of moving average. The Average True Range is not used to predict prices but for determining the daily activity level of a stock. Low Average True Range indicates a stock is trading within narrow ranges without much swing while High Average True Range indicates period with sharp swings of prices.

1. Click on the Cell N3.
2. Key in "`=TrueRange(C3,D3,E2)`". We initialize the first True Range to be our first Average True Range. **Some technical analysts will initialize the first value with a 14 Day Simple Moving Average of the True Range.**
3. Click on the Cell N4.
4. Type in "`=ROUND((N3*13+M4)/14,2)`".
5. Drag this cell downwards to the end of the Stock Prices.
6. Click on Cell N1 and type in "Wilder's Average True Range"

You can proceed to chart out the Average True Range versus the True Range.



3.6 Directional Movement

Wilder compares the stock trading range of the current day and previous day, and use them to measure trend. If the current High is higher then the previous day High then a Positive Directional Movement is said to have occurred. If the current Low is lower then the previous day Low then a Negative Directional Movement is said to have occurred. If both Positive and Negative Directional Movement occurred, then the bigger of the two is taken. During days when the trading range is within the previous day range, it is considered to have no Directional Movement.

Using the Wilders.xls file, launch the Visual Basic Editor. Key in the following into Module1. PDM stands for Positive Directional Movement while NDM stands for Negative Directional Movement.

```
Function PDM(ByVal high As Double, ByVal low As Double, ByVal previousHigh As Double, ByVal previousLow As Double) As Double
Dim highdifference As Double
Dim lowdifference As Double

highdifference = 0
lowdifference = 0

If (high > previousHigh) Then
    highdifference = high - previousHigh
End If

If (low < previousLow) Then
    lowdifference = previousLow - low
End If

If (highdifference > lowdifference) Then
    PDM = highdifference
Else
    PDM = 0
End If

End Function

Function NDM(ByVal high As Double, ByVal low As Double, ByVal previousHigh As Double, ByVal previousLow As Double) As Double
Dim highdifference As Double
Dim lowdifference As Double

highdifference = 0
lowdifference = 0

If (high > previousHigh) Then
    highdifference = high - previousHigh
End If

If (low < previousLow) Then
    lowdifference = previousLow - low
End If

If (lowdifference > highdifference) Then
    NDM = lowdifference
Else
    NDM = 0
End If
```

Click on Save and then File->Close and Return to Microsoft Excel.

1. Click on the Cell O3.
2. Key in “=PDM(C3,D3,C2,D2)”.
3. Drag this cell downwards to the end of the Stock Prices. This will give us the Positive Directional Movement. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
4. Click on Cell O1 and type in “Wilder’s PDM”
5. Click on the Cell P3.
6. Key in “=NDM(C3,D3,C2,D2)”.
7. Drag this cell downwards to the end of the Stock Prices. This will give us the Positive Directional Movement. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
8. Click on Cell P1 and type in “Wilder’s NDM”

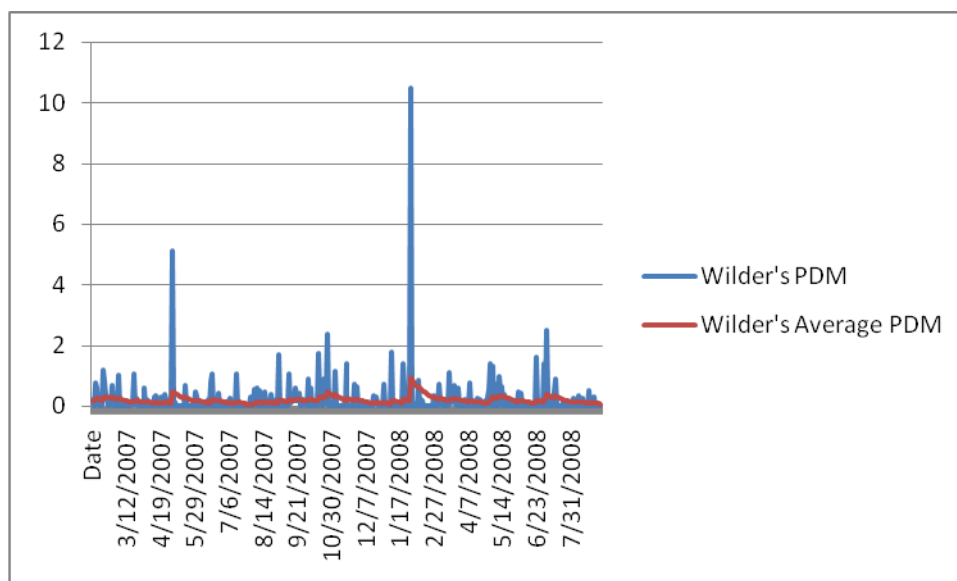
3.7 Directional Movement Indicator

Positive Directional Movement Indicator is the ratio of the Average Positive Directional Movement to the Average True Range. Negative Directional Movement Indicator is the ratio of the Average Negative Directional Movement to the Average True Range. Thus whichever Directional Movement Indicator is larger; it will mean that the trend of the price is in the direction.

First we must calculate the Wilder’s Average for both the PDM and NDM.

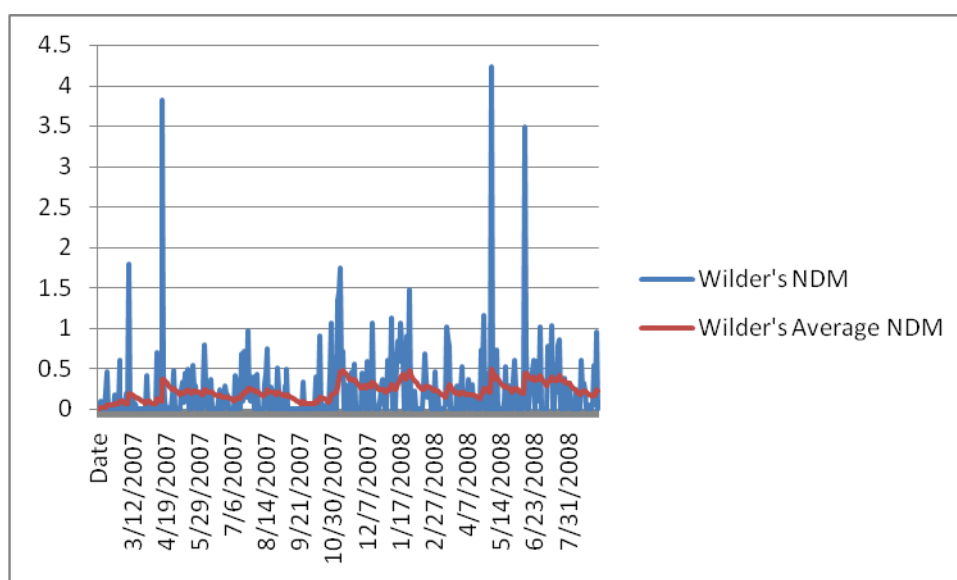
1. Copy the value in the Cell O3 to Cell Q3. This is the first value we used for initializing the Wilder’s Average. **Some technical analysts will initialize the first value with a 14 Day Simple Moving Average of the PDM.**
2. Select Cell Q4. Key in “=ROUND((Q3*13+O4)/14,2)”.
3. Drag this cell downwards to the end of the Stock Prices. This will give us the Wilder’s Average Positive Directional Movement. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
4. Click on Cell Q1 and type in “Wilder’s Average PDM”

If you chart the Wilder’s PDM with Wilder’s Average PDM, the following is what you will get.



1. Copy the value in the Cell P3 to Cell R3. This is the first value we used for initializing the Wilder's Average. **Some technical analysts will initialize the first value with a 14 Day Simple Moving Average of the NDM.**
2. Select Cell R4. Key in `"=ROUND((R3*13+P4)/14,2)"`.
3. Drag this cell downwards to the end of the Stock Prices. This will give us the Wilder's Average Positive Directional Movement. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
4. Click on Cell R1 and type in "Wilder's Average NDM"

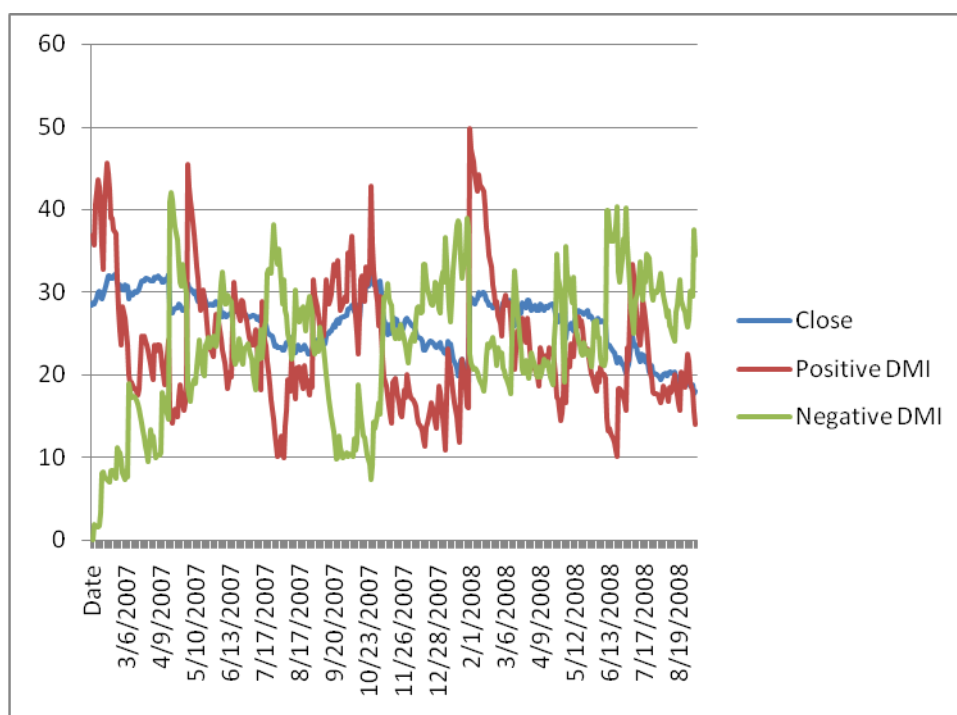
If you chart the Wilder's NDM with Wilder's Average NDM, the following is what you will get.



3.7.1 Positive/Negative Directional Movement Indicator

1. Click on the Cell S3.
2. Key in “=ROUND((Q3/N3)*100,2)”.
3. Drag this cell downwards to the end of the Stock Prices. This will give us the **Positive Directional Movement Indicator**. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
4. Click on Cell S1 and type in “Positive DMI”
5. Click on the Cell T3.
6. Key in “=ROUND((R3/N3)*100,2)”.
7. Drag this cell downwards to the end of the Stock Prices. This will give us the **Negative Directional Movement Indicator**. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
8. Click on Cell T1 and type in “Negative DMI”

Chart out the Positive DMI, Negative DMI and the Closing Price. Use it to analyze trends observed and published by the different Technical Traders or by Wilder himself. Or refer to Section 3.9 for an analysis of the trends.

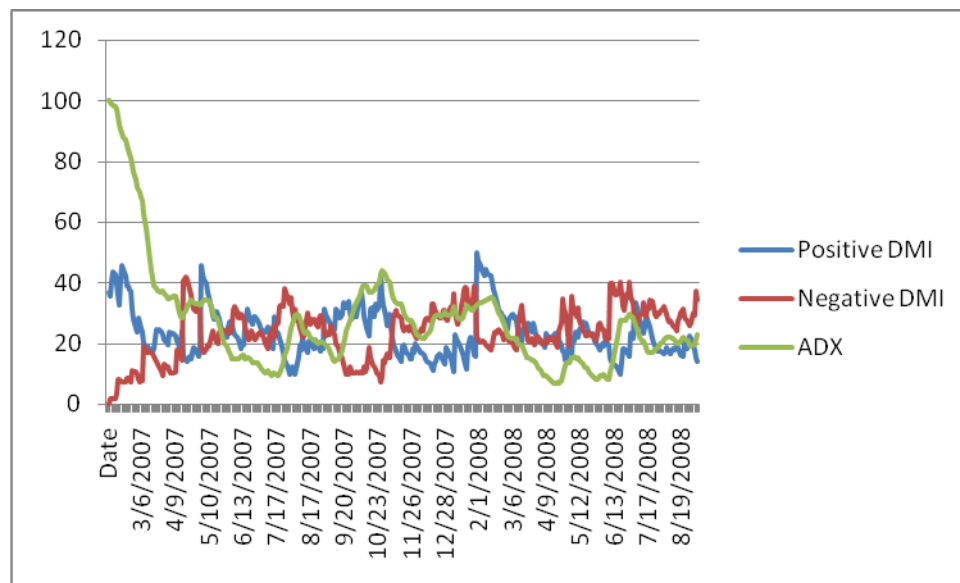


3.8 Average Directional Movement Index

Directional Index (DX) is calculated as the ratio of the absolute *difference* between the values of the two Directional Movement Indicators to the *sum* of the two Directional Movement Indicators. This allows us to measure the strength of a trend. The DX will be a larger value when the price is moving towards one direction. The Average DX can be calculated using Wilder's Moving Average. This allows the fluctuations in the Directional Index to be reduced.

1. Click on the Cell U3.
2. Key in “=ROUND((ABS(S3-T3)/(S3+T3))*100,2)”.

3. Drag this cell downwards to the end of the Stock Prices. This will give us the **Directional Movement Index**. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
4. Click on Cell U1 and type in "DX"
5. Copy the value on Cell U3 to the Cell V3. This value is used to initialize our Wilder's Average. **Some technical analysts will initialize the first value with a 14 Day Simple Moving Average of the Directional Movement Index.**
6. Click on Cell V4 and key in " $=\text{ROUND}((V3*13+U4)/14,2)$ ". This will give us the Wilder's Average of DX. For Excel 2003, copy this cell (we are actually copying the formula of this cell), drag a range downwards to the last value of the Stock Prices, and paste it.
7. Drag this cell downwards to the end of the Stock Prices. This will give us the **Average Directional Movement Index**.
8. Click on Cell V1 and type in "ADX"



3.9 Using the Indicators

We now have three very useful indicators, the Positive DMI, Negative DMI and Average Directional Index (ADX). If the Positive Directional Movement Indicator crossover above the Negative Directional Movement Indicator, it meant that the price is on the upward trend, whereas when the Positive Directional Movement Indicator crossover below the Negative Directional Movement Indicator, it meant the price is on the downward trend. The Average Directional Index is used to indicate how strongly the price is moving towards one direction. So if the chart shows Average Directional Index increasing, it means the price is increasing in trend in a particular direction indicated by the Positive Directional Movement Indicator or Negative Directional Movement Indicator (whichever is larger).

4. What Next?

We hope you have enjoyed the training so far and have gained a better understanding of several useful Technical Indicators. These Technical Indicators are definitely useful in the creation of an Automated Stock Trading System. Please also be assured that we are in the process of adding new materials to our website at <http://www.spreadsheetml.com>.

If you have any comments or suggestions to help improve this document, please contact us at info@spreadsheetml.com.