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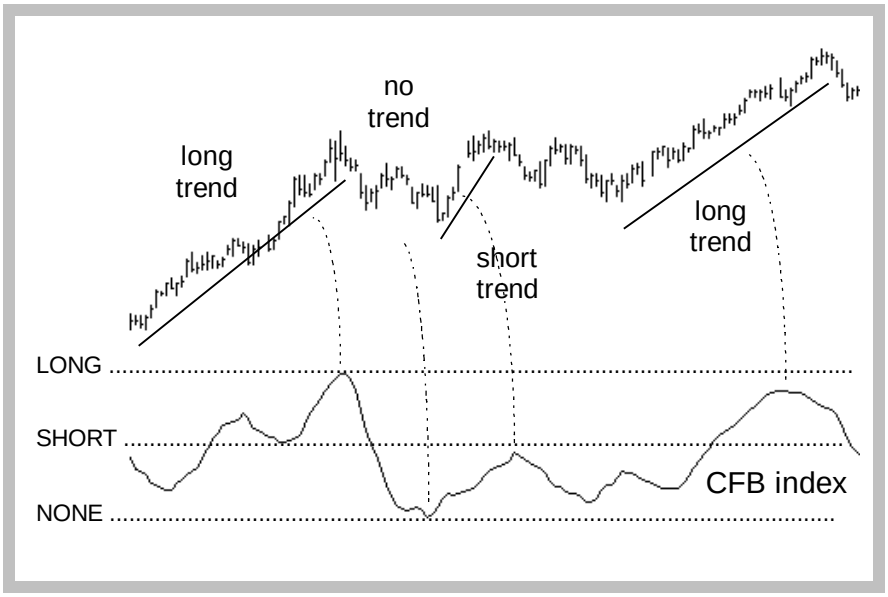
JURIK RESEARCH

CFB

Composite Fractal Behavior Index
DLL module
for Windows® Application Developers



USER'S GUIDE

 Jurik Research & Consulting PO 460669, Aurora, CO 80046 303-680-4409 fax: 303-680-4605

Requirements

- Windows 95, 98, 2000 or NT 4.
- Application software that can access DLL functions.

Installing the 32 bit DLL module

1. Execute the Installer, JRS_DLL.EXE. It will analyze your computer and give you a computer identification number. Write it down.
2. Get your access PASSWORD from Jurik Research Software. You can do so by calling 323-258-4860 (USA), faxing 323-258-0598 (USA), e-mailing support@nfsmith.net, or writing Jurik Research Software at 686 South Arroyo Parkway, Suite 237, Pasadena, California 91105. Be sure to give your full name, mailing address and computer identification number. You will then be given a password.
3. Rerun the installer JRS_DLL.EXE, this time entering the password when asked. Also enter **all the Jurik Research modules that you currently are licensed to run**. It will copy the latest version of these modules to any directory you specify.

You may now code your software to access the DLL as described below.

ABOUT NEW PASSWORDS

If you upgrade to a new computer, you will need a new password to run CFB. If you want to run CFB on additional computers, you will need additional passwords. Call 323-258-4860 for details.

Why Use CFB ?

To measure the market's trending time frame without cycles!

CFB is an index that reveals the market's trending time frame, ideal for creating adaptive window sizes of various technical indicators.

All around you mechanisms adjust themselves to their environment. From simple thermostats that react to air temperature to computer chips in modern cars that respond to changes in engine temperature, r.p.m.'s, torque, and throttle position. It was only a matter of time before fast desktop computers applied the mathematics of self-adjustment to systems that trade the financial markets.

Unlike basic systems with fixed formulas, an adaptive system adjusts its own equations. For example, start with a basic channel breakout system that uses the highest closing price of the last N bars as a threshold for detecting breakouts on the up side. An adaptive and improved version of this system would adjust N according to market conditions, such as momentum, price volatility or acceleration.

Since many systems are based directly or indirectly on cycles, another useful measure of market condition is the periodic **length** of a price chart's **dominant cycle**, (DC), that cycle with the greatest influence on price action.

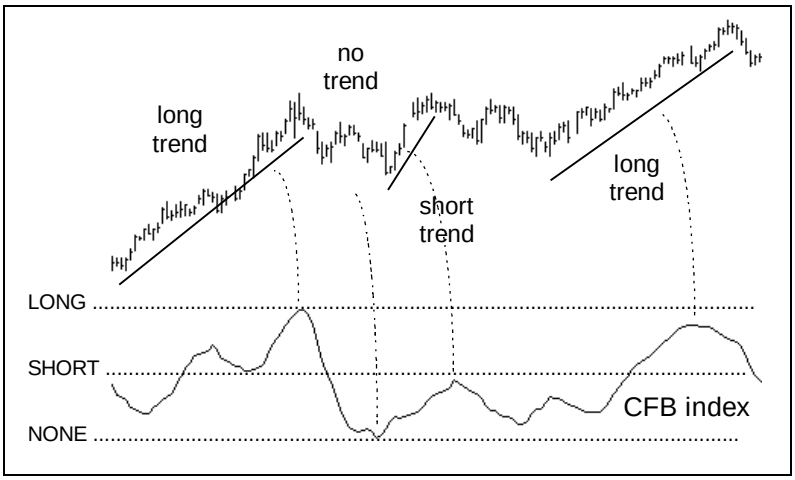
The utility of this new DC measure was noted by author Murray Ruggiero in the January '96 issue of Futures Magazine. In it, Mr. Ruggiero used it to adaptively adjust the value of N in a channel breakout system. He then simulation-traded 15 years of D-Mark futures in order to compare its performance to a similar system that had a fixed optimal value of N. The adaptive version produced 20% more profit!

This DC index utilized the popular MESA algorithm (a formulation by John Ehlers adapted from Burg's maximum entropy algorithm, MEM). Unfortunately, the DC approach is problematic when the market has no real dominant cycle momentum. Therefore, we replaced the DC index with a proprietary indicator that does not presuppose the presence of market cycles. It's called **CFB** (Composite Fractal Behavior) and it works well whether or not the market is cyclic.

CFB examines price action for particular fractal patterns, categorizes them by size, and then outputs a composite fractal size index. This index is smooth, timely and accurate.

Essentially, **CFB** reveals the length of the market's trending action time frame. Long trending activity produces a large **CFB** index and short choppy action produces a small index value. Investors have found many uses for **CFB**, all related to scaling other existing technical indicators adaptively, on a bar-to-bar basis.

Now you can also benefit from the powerful information CFB produces.



C Programming the 32 bit CFB DLL

The file **JRS_32.DLL** contains the function CFB. In your C code, you should declare CFB as externally defined and, if using MS VC++, use the _declspec(dllimport) keywords. The function is exported as a C function, so if you are using C++, you should insert "C" (with the quotes) between the words "extern" and "_declspec". Also, you should link with JRS_32.LIB, which we provide.

```
extern _declspec(dllimport) int WINAPI CFB(double *pdSeries,
     double *pdCFB, int iDataLength, int iSmooth, int iSpanSize);
```

PARAMETERS

pdSeries: a pointer to the memory location of an array of double precision numbers containing the input data
pdCFB: a pointer to the memory location of an array of double precision numbers which will contain the output data
iDataLength: a signed integer specifying the number of elements in the input and output arrays
iSmooth: a signed integer specifying output smoothness.
iSpanSize: a signed integer specifying the largest fractal size CFB is to consider.

NOTES

Both input and output arrays must be of the same size.

iSmooth must be between 1 and 50 inclusive. Larger values produce smoother results.

iSpanSize must be either 24, 48, 96, or 192. Larger values make CFB consider more data and move slower.

Although CFB reads all the input data, it does not attempt to produce true CFB output for the first N elements of the input array, where N = iSpanSize+6. Instead, the first N elements of the output array are assigned a constant value of ½ iSpanSize. For example, if iSpansize = 48, then the first 54 output elements are set equal to 24.

RETURN VALUES

The CFB function returns an integer, which will indicate success or an error as below:

```
    0        SUCCESSFUL. NO ERROR ENCOUNTERED
   -1        INSTALLATION / PASSWORD PROBLEM
10101        MEMORY IS NOT ABLE TO BE INSTALLED
10102        INPUT DATA POINTER IS NULL
10103        OUTPUT DATA POINTER IS NULL
10104        NUMBER OF DATAROWS IS MORE THAN VALUE OF SIGNED INT
10105        NUMBER OF DATA ROWS IS LESS THAN 32 OR LESS THAN ISPANSIZE+2
10106        SPAN IS NOT 24,48,96 OR 192
10107        SMOOTH VALUE IS LESS THAN 1 OR GREATER THAN 50
```

PROGRAMMING EXAMPLE

```
iDataLength = 2500;
iSmooth = 8;
iSpanSize = 48;
pdSeries = (double *) GlobalAllocPtr(GHND, sizeof(double) * iDataLength);
pdCFB    = (double *) GlobalAllocPtr(GHND, sizeof(double) * iDataLength);

/* At this location in code, fill up your input array */

error_code = CFB(pdSeries, pdCFB, iDataLength, iSmooth, iSpanSize);
```

VISUAL BASIC PROGRAMMING EXAMPLE

INTRODUCTION

In your Jurik Research DLL installation directory (e.g., `C:\JRS_DLL`) the workbook CFB_DLL.XLS contains a working example of how to use Excel's VBA to operate RSX automatically. The workbook includes the following:

- Worksheet "DLL VBA Results" -- where you can apply the Visual Basic macro that calls the DLL
- Visual Basic Module – containing the VB macro code

In this example, run the VBA macro called "**CFB_Test**" on the worksheet titled "**DLL VBA Results**". The macro gets the data in column 1 and sends it to the CFB function in the DLL four times, each time requesting a different CFB span size (fractal length). The output array produced by CFB is then written back into columns 3 to 6 of the worksheet.

VBA MACRO DESCRIPTION

The VBA subroutine **CFB_Test** is shown below. This code will read data from column 1 of the active worksheet, call the CFB DLL four times, and output the results back to the worksheet. Note that function **CFB** is the DLL function that analyzes the data and produces values for the output array.

```
Declare Function CFB Lib "JRS_32.dll" ( _
                        ByRef pdData As Double, _
                        ByRef pdOutData As Double, _
                        ByVal iDatalength As Long, _
                        ByVal iSmooth As Long, _
                        ByVal iSpanSize As Long) As Long
Option Base 1

Sub CFB_test()

    Dim InputData() As Double
    Dim OutputData() As Double
    Dim iK, iJ, iDatalength, iResult, iSmooth As Long
    Dim iPower As Long
    Dim iaSpan() As Long
    Dim calctype As Long

    '--- CFB DLL return error codes ---
    '    0        NO ERROR CONDITIONS MET
    '   -1        PROBLEM WITH PASSWORD/INSTALLATION
    '10102        POINTER TO DATA NULL
    '10103        POINTER TO OUTPUT MEMORY NULL
    '10104        datarows > signed int
    '10105        data rows < 32 or < span+2
    '10106        span != 24,48,96, or 192
    '10107        smooth<2 || >50

    iDatalength = 1000   ' length of input array
    iSmooth = 10     ' CFB smoothness factor
    iSpans = 4       ' total number of possible span parameter values

    ReDim InputData(1 To iDatalength)
    ReDim OutputData(1 To iDatalength)
    ReDim iaSpan(1 To iSpans)
```

```
    'disable automatic calculation
    calctype = Application.Calculation
    Application.Calculation = xlManual


    'assign fractal lengths into array of span values
    iaSpan(1) = 24
    iaSpan(2) = 48
    iaSpan(3) = 96
    iaSpan(4) = 192

    'copy data from spreadsheet into array
    For iK = 1 To iDatalength
        InputData(iK) = Cells(iK + 1, 1)
    Next iK


    ' Apply CFB to input array, using all 4 fractal lengths
    For iJ = 1 To iSpans

       iResult = CFB(InputData(1), OutputData(1), iDatalength, iSmooth, iaSpan(iJ))
       If (iResult <> 0) Then

            ' Post Error Message
            Call Error_handler(iResult, calctype)
       Else
            ' Put data into spreadsheet and ZERO it out from array
            For iK = 1 To iDatalength
                Cells(1 + iK, 2 + iJ).FormulaR1C1 = OutputData(iK)
                OutputData(iK) = 0
            Next iK
       End If
    Next iJ

    ' restore calulation type
    Application.Calculation = calctype

End Sub
```

```
' The following subroutine is a simple way to handle run-time errors that may occur
' It is good practice to handle each error type mentioned in the user manual.

Private Sub Error_handler(ByVal error_code As Long, ByVal calctype As Long)
    Dim result As Long
    result = MsgBox("Error number " & Str(error_code) &
                    " was returned by CFB.", , "CFB Error")
    Application.Calculation = calctype
    End   ' this END command will halt execution of the VBA code.
End Sub
```

IF YOU FIND A BUG . . . YOU WIN

If you discover a legitimate bug in any of our preprocessing tools, please let us know! We will try to verify it on the spot. If you are the first to report it to us, you will receive the following two coupons redeemable toward your acquisition of any of our preprocessing tools:

- a $50 discount coupon
- a free upgrade coupon

You may collect as many coupons as you can.
You may apply more than one discount coupon toward the purchase of your next tool.

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3. We register portions of our software with the U.S. Copyright office, entitling us to demand the offender compensate Jurik Research for all legal costs, which is typically over $10,000 per lawsuit.
4. We offer up to $5000 reward for information leading to the prosecution of any offender(s).

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