

FINANCIAL CALCULATIONS

STOCK MARKET AND OTHER FINANCIAL ANALYSIS

GENERAL INFORMATION - This manual section describes general financial analysis operations which have no connection to optics, optical design or optical analysis except as an adjunct to running a business or for investment purposes. I wrote these for my own use and decided to use the framework of the optical design program to host them. They come with no warranty whatsoever. There are general financial calculations available as well as sophisticated stock market analysis.

STOCK MARKET ANALYSIS - All the the following stock market analysis operations are based upon the analysis of historical stock market data contained in the ASCII file, PROFIT.DAT. Each line of PROFIT.DAT comprises the following data:

SYM (up to 8 characters representing the stock's symbol) , Opening Price , Day's High Price , Day's Low Price , Day's Closing Price , Day's Volume (number of shares traded) , Date (YYYYMMDD format) , Company Descriptor (up to 80 characters)

The assumption is that the data for each stock is always grouped together and within each group, entries are in assending date order. See the PROFSAMP.DAT file for an example. The user can us any methoe to generate the PROFIT.DAT file. The author currently uses the Worden Bros TC2005 program and data service to generate a daily updated PROFIT.DAT file. Trading days are the only days kept track of. Weekends, holidays and other days when no trading is performed are not considered.

ISSUE CONTROL PARAMETERS

PMP (qualifier word) - The "PMP" command displays the current value of the parameter identified by "qualifier word". This command is also described in the CMD section.

PM (qualifier word) , i - The "PM" command is used to set a control parameter, identified by "qualifier word", to the numeric value specified by "i". This command is also described in the CMD section. The table below lists the various control parameters:

QUALIFIER	DESCRIPTION
SHORT	This is the "short" time interval used in "short" moving averages. Default value = 5 days
MEDIUM	This is the "medium" time interval used in "medium" moving averages. Default value = 10 days
LONG	This is the "long" time interval for "long" moving averages. Default value = 30 days
BUYDELAY	This is the "buy delay" time interval used in automatic "buy" alarm routines to help avoid false "buy" alarms. Default value = 5 days
SELDELAY	This is the "sell delay" time interval used in automatic "sell" alarm routines to help avoid false "sell" alarms. Default value = 5 days
DAYS	This is the number of days to display in a graphical stock plot. It counts back from the last day in the database or the last day to be displayed or analyzed. Minimum number of days is 30. Default value = 60 days

If any of the above operating condition qualifier words is issued as a command word rather than a qualifier word, and if they are issued without numeric input, they are then treated as if they had been preceded by the "PMP" command. If they are entered with appropriate numeric input, they are then treated as if they had been preceded by the "PM" command.

PROFIT OPERATING CONDITIONS

LOADPROF (OPTIONAL FILE NAME) - The "LOADPROF" command causes the current PROFIT.DAT file to be read and processed. If an optional file name is entered, that file is loaded. After each stock item (data with the same stock symbol) is processed, All the items are written into an archieival binary file PROFDAT.DAT. A second binary file PROFLIB.PRF is written which remembers the sequential number of each stock in the current database, the stock's symbol, the company descriptor, the starting and ending record number for that symbol and the total number or days for that symbol as saved in PROFDAT.PRF. If the optional file associated with the optional file name exists and it is a single issue file, and automatic "LOADISSU (issue name)" and "PLOTISSU" commands will be issued.

The following data is computed for each stock and is stored in the .PRF binary files:

The first record of each .PRF binary file holds the integer number of days (N) represented in the .PRF file. This number is one less than the total number of records in the file.

The next N records consist each of up to 100, 8-byte, REAL*8 or Double Precision values. Each record represents data associated with one day of stock issue data though some values are based on averages of earlier days values.

- Item 1: The day's highest price
- Item 2: The days lowest price
- Item 3: The day's closing price
- Item 4: The short moving average
- Item 5: The medium moving average
- Item 6: The long moving average
- Item 7: The short oscillator
- Item 8: The long oscillator
- Item 9: The short trend
- Item 10: The long trend
- Item 11: The spread
- Item 12: The days volume (number of shares traded)
- Item 13: Date (YYYYMMDD)
- Item 14: High price delta
- Item 15: Low price delta
- Item 16: Closing price delta
- Item 17: Short moving average delta
- Item 18: Medium moving average delta
- Item 19: Long moving average delta
- Item 20: Short oscillator delta
- Item 21: Long oscillator delta
- Item 22: Short trend delta
- Item 23: Long trend delta
- Item 24: Spread delta
- Item 25: Volume delta
- Item 26: (NOT IN USE)
- Item 27: Second delta of high price
- Item 28: Second delta of low price
- Item 29: Second delta of closing price
- Item 30: Second delta of short moving average
- Item 31: Second delta of medium moving average
- Item 32: Second delta of long moving average
- Item 33: Second delta of short oscillator
- Item 34: Second delta of long oscillator
- Item 35: Second delta of short trend
- Item 36: Second delta of long trend
- Item 37: Second delta of spread
- Item 38: Second delta of volume
- Item 39: (NOT IN USE)
- Item 40: Julian day number
- Item 41: Julian day number delta
- Item 42: Second delta of Julian day number
- Item 43: (NOT IN USE)
- Item 44: (NOT IN USE)
- Item 45: (NOT IN USE)
- Item 46: Opening price
- Item 47: Issue number in the PROFIT.DAT file (SREC)
- Item 48: Sequential entry number in the PROFIT.DAT file (IREC)
- Item 49: Sequential entry for the particular issue (JREC)
- Item 50: Current total number of entries for current issue
- Item 51: Short moving average of the spread
- Item 52: Medium moving average of the spread
- Item 53: Long moving average of the spread.

Items 54 - 100 (NOT IN USE)

FUNCTIONAL DEFINITIONS

The following is a functional definition of every item tracked in the binary (SYM).PRF files. The actual fortran code is included to avoid any ambiguity as to how the calculations are performed

```
C
C      SHORT_TIME, MEDIUM_TIME, LONG_TIME, BUY_DELAY AND
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C      SELL DELAY ARE HANDLED WITH THE PM AND PMP COMMANDS
C      SHORT,MEDIUM, LONG, SELDELAY, BUYDELAY
C
C      SHORT INTERMEDIATE VARIABLES
C      D2=2.0/DBLE (SHORT_TIME+1)
C      D2=(ANINT (D2*100))/100
C      D1=1.0-D2
C
C      MEDIUM INTERMEDIATE VARIABLES
C      D4=2.0/DBLE (MEDIUM_TIME+1)
C      D4=(ANINT (D4*100))/100
C      D3=1.0-D4
C
C      LONG INTERMEDIATE VARIABLES
C      D6=2.0/DBLE (LONG_TIME+1)
C      D6=(ANINT (D6*100))/100
C      D5=1.0-D6
C
C      J IS THE SEQUENTIAL COUNTER OF DAYS SINCE THE
C      BEGINNING OF AN ISSUES' DATABASE
C
C      ITEMS 1,2,3 AND 13 ARE INPUT NUMBERS
C
C      PRICE HI
C      PROFITDATA(J,1), READ FROM PROFIT.DAT
C
C      PRICE LOW
C      PROFITDATA(J,2), READ FROM PROFIT.DAT
C
C      PRICE CLOSE
C      PROFITDATA(J,3), READ FROM PROFIT.DAT
C
C      VOLUME
C      PROFITDATA(J,12), READ FROM PROFIT.DAT
C
C      SHORT MOVING AVERAGE
C      IF(J.GT.SHORT_TIME) THEN
C      PROFITDATA(J,4)=
1 ANINT((D1*PROFITDATA(J-1,4)+
2 D2*PROFITDATA(J,3)*100))/100
C      ELSE
C      IF(J.EQ.1) THEN
C      PROFITDATA(J,4)=PROFITDATA(J,3)
C      ELSE
C      PROFITDATA(J,4)=((DBLE(J-1)*(PROFITDATA(J,4))
1 +PROFITDATA(J,3))/DBLE(J)
C      END IF
C      END IF
C
C      MEDIUM MOVING AVERAGE
C      IF(J.GT.MEDIUM_TIME) THEN
C      PROFITDATA(J,5)=
1 ANINT((D3*PROFITDATA(J-1,5)+
2 D4*PROFITDATA(J,3)*100))/100
C      ELSE
C      IF(J.EQ.1) THEN
C      PROFITDATA(J,5)=PROFITDATA(J,3)
C      ELSE
C      PROFITDATA(J,5)=((DBLE(J-1)*(PROFITDATA(J,5))
1 +PROFITDATA(J,3))/DBLE(J)
C      END IF
C      END IF
C
C      LONG MOVING AVERAGE
C      IF(J.GT.LONG_TIME) THEN
C      PROFITDATA(J,6)=
1 ANINT((D5*PROFITDATA(J-1,6)+
2 D6*PROFITDATA(J,3)*100))/100
C      ELSE
C      IF(J.EQ.1) THEN
C      PROFITDATA(J,6)=PROFITDATA(J,3)
C      ELSE
C      PROFITDATA(J,6)=((DBLE(J-1)*(PROFITDATA(J,6))
1 +PROFITDATA(J,3))/DBLE(J)
C      END IF
C      END IF
C
C      SHORT TREND
C      SHORT MOVING AVERAGE MINUS LONG MOVING AVERAGE
C      PROFITDATA(J,9)=
1 ANINT((PROFITDATA(J,4)-PROFITDATA(J,6))*100)
C
C      LONG TREND
C      MEDIUM MOVING AVERAGE MINUS LONG MOVING AVERAGE
C      PROFITDATA(J,10)=
1 ANINT((PROFITDATA(J,5)-PROFITDATA(J,6))*100)
C

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C      SHORT AND LONG OSCILLATORS ARE RELATED TO THE
C      SHORT AND LONG TRENDS
C      IF(J.EQ.1) THEN
C      SHORT OSCILLATOR
C      PROFITDATA(J,7)=
1 ANINT((PROFITDATA(J,9))*100)
C
C      LONG OSCILLATOR
C      PROFITDATA(J,8)=
1 ANINT((PROFITDATA(J,10))*100)
      ELSE
C      SHORT OSCILLATOR
C      PROFITDATA(J,7)=
1 ANINT((PROFITDATA(J,9)-PROFITDATA(J-1,9))*100)
C
C      LONG OSCILLATOR
C      PROFITDATA(J,8)=
1 ANINT((PROFITDATA(J,10)-PROFITDATA(J-1,10))*100)
      END IF
C
C      SPREAD
C      SHORT TREND MINUS LONG TREND
C      PROFITDATA(J,11)=
1 PROFITDATA(J,9)-PROFITDATA(J,10)
C
C      I ADDED THE SHORT, MEDIUM AND LONG MOVING AVERAGES
C      OF THE SPREAD TO GIVE US SOMETHING FOR AN APPLES TO APPLES
C      TYPE COMPARISON WITH THE SHORT, MEDIUM AND LONG MOVING AVERAGES
C
C      SHORT MOVING AVERAGE OF THE SPREAD
C      (NEED TO BE INTO THE DATA AT LEAST SHORT+LONG DAYS TO BE MEANINGFULL)
C      IF(J.GT.SHORT_TIME) THEN
C      PROFITDATA(J,51)=
1 ANINT((D1*PROFITDATA(J-1,51)+
2 D2*PROFITDATA(J,11)*100))/100
      ELSE
C      IF(J.EQ.1) THEN
C      PROFITDATA(J,51)=PROFITDATA(J,11)
      ELSE
C      PROFITDATA(J,51)=(DBLE(J-1)*(PROFITDATA(J,51))
1 +PROFITDATA(J,11))/DBLE(J)
      END IF
      END IF
C
C      MEDIUM MOVING AVERAGE OF THE SPREAD
C      (NEED TO BE INTO THE DATA AT LEAST MEDIUM+LONG DAYS TO BE MEANINGFULL)
C      IF(J.GT.MEDIUM_TIME) THEN
C      PROFITDATA(J,52)=
1 ANINT((D3*PROFITDATA(J-1,52)+
2 D4*PROFITDATA(J,11)*100))/100
      ELSE
C      IF(J.EQ.1) THEN
C      PROFITDATA(J,52)=PROFITDATA(J,11)
      ELSE
C      PROFITDATA(J,52)=(DBLE(J-1)*(PROFITDATA(J,52))
1 +PROFITDATA(J,11))/DBLE(J)
      END IF
      END IF
C
C      LONG MOVING AVERAGE OF THE SPREAD
C      (NEED TO BE INTO THE DATA AT LEAST LONG+LONG DAYS TO BE MEANINGFULL)
C      IF(J.GT.LONG_TIME) THEN
C      PROFITDATA(J,53)=
1 ANINT((D5*PROFITDATA(J-1,53)+
2 D6*PROFITDATA(J,11)*100))/100
      ELSE
C      IF(J.EQ.1) THEN
C      PROFITDATA(J,53)=PROFITDATA(J,11)
      ELSE
C      PROFITDATA(J,53)=(DBLE(J-1)*(PROFITDATA(J,53))
1 +PROFITDATA(J,11))/DBLE(J)
      END IF
      END IF
C
C      VOLUME STORED IN 12
C
C      JULIAN DAY IN 40
C
C      FIRST DELTA JULIAN DAY IN 41
C
C      DECOND DELTA JULAIN DAY IN 42
C
C      DATE STORED IN 13 AS YYYYMMDD
C      IDATE=INT(PROFITDATA(J,13))
C      WRITE(ADATE,10) IDATE
10  FORMAT(I8)
C      AYEAR=ADATE(1:4)
C      AMONTH=ADATE(5:6)
C      ADAY=ADATE(7:8)

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11 READ (AYEAR,11) IYEAR
12 READ (AMONTH,12) IMONTH
13 READ (ADAY,13) IDAY
   FORMAT (I4)
   FORMAT (I2)
   FORMAT (I2)
   JD=JULDAY (IMONTH, IDAY, IYEAR)
   PROFITDATA (J,40)=DBLE (JD)
   IF (J.LT.2) THEN
   PROFITDATA (J,41)=0.0D0
   ELSE
   PROFITDATA (J,41)=PROFITDATA (J,40) -PROFITDATA (J-1,40)
   END IF
   IF (J.LT.3) THEN
   PROFITDATA (J,41)=0.0D0
   ELSE
   PROFITDATA (J,42)=PROFITDATA (J,41) -PROFITDATA (J-1,41)
   END IF

C FIRST DELTAS (SLOPES)
C
C   IF (J.LT.2) THEN
C   PROFITDATA (J,14:25)=0.0
C   ELSE
C   K=14, HI PRICE DELTA
C   PROFITDATA (J,14)=PROFITDATA (J,1) -PROFITDATA (J-1,1)
C   K=15, LO PRICE DELTA
C   PROFITDATA (J,15)=PROFITDATA (J,2) -PROFITDATA (J-1,2)
C   K=16, CLOSING PRICE DELTA
C   PROFITDATA (J,16)=PROFITDATA (J,3) -PROFITDATA (J-1,3)
C   K=17, SHORT MOVING AVERAGE DELTA
C   PROFITDATA (J,17)=PROFITDATA (J,4) -PROFITDATA (J-1,4)
C   K=18, MEDIUM MOVING AVERAGE DELTA
C   PROFITDATA (J,18)=PROFITDATA (J,5) -PROFITDATA (J-1,5)
C   K=19, LONG MOVING AVERAGE DELTA
C   PROFITDATA (J,19)=PROFITDATA (J,6) -PROFITDATA (J-1,6)
C   K=20, SHORT OSCILLATOR DELTA
C   PROFITDATA (J,20)=PROFITDATA (J,7) -PROFITDATA (J-1,7)
C   K=21, LONG OSCILLATOR DELTA
C   PROFITDATA (J,21)=PROFITDATA (J,8) -PROFITDATA (J-1,8)
C   K=22, SHORT TREND DELTA
C   PROFITDATA (J,22)=PROFITDATA (J,9) -PROFITDATA (J-1,9)
C   K=23, LONG TREND DELTA
C   PROFITDATA (J,23)=PROFITDATA (J,10) -PROFITDATA (J-1,10)
C   K=24, SPREAD DELTA
C   PROFITDATA (J,24)=PROFITDATA (J,11) -PROFITDATA (J-1,11)
C   K=25, VOLUME DELTA
C   PROFITDATA (J,25)=PROFITDATA (J,12) -PROFITDATA (J-1,12)
C   K=26, NOT USED
C   END IF

C SECOND DELTAS (SLOPES OF SLOPES)
C
C   IF (J.LT.3) THEN
C   PROFITDATA (J,27:39)=0.0
C   ELSE
C   K=27, HI PRICE DELTA
C   PROFITDATA (J,27)=PROFITDATA (J,14) -PROFITDATA (J-1,14)
C   K=28, LO PRICE DELTA
C   PROFITDATA (J,28)=PROFITDATA (J,15) -PROFITDATA (J-1,15)
C   K=29, CLOSING PRICE DELTA
C   PROFITDATA (J,29)=PROFITDATA (J,16) -PROFITDATA (J-1,16)
C   K=30, SHORT MOVING AVERAGE DELTA
C   PROFITDATA (J,30)=PROFITDATA (J,17) -PROFITDATA (J-1,17)
C   K=31, MEDIUM MOVING AVERAGE DELTA
C   PROFITDATA (J,31)=PROFITDATA (J,18) -PROFITDATA (J-1,18)
C   K=32, LONG MOVING AVERAGE DELTA
C   PROFITDATA (J,32)=PROFITDATA (J,19) -PROFITDATA (J-1,19)
C   K=33, SHORT OSCILLATOR DELTA
C   PROFITDATA (J,33)=PROFITDATA (J,20) -PROFITDATA (J-1,20)
C   K=34, LONG OSCILLATOR DELTA
C   PROFITDATA (J,34)=PROFITDATA (J,21) -PROFITDATA (J-1,21)
C   K=35, SHORT TREND DELTA
C   PROFITDATA (J,35)=PROFITDATA (J,22) -PROFITDATA (J-1,22)
C   K=36, LONG TREND DELTA
C   PROFITDATA (J,36)=PROFITDATA (J,23) -PROFITDATA (J-1,23)
C   K=37, SPREAD DELTA
C   PROFITDATA (J,37)=PROFITDATA (J,24) -PROFITDATA (J-1,24)
C   K=38, VOLUME DELTA
C   PROFITDATA (J,38)=PROFITDATA (J,25) -PROFITDATA (J-1,25)
C   K=39, NOT USED
C   END IF

C K=43 TO 45 NOT YET USED
C
C K=46 : OPENING PRICE
C K=47 : SREC (THE ISSUE NUMBER IN THE PROFIT.DAT FILE)
C K=48 : IREC (SEQUENTIAL ENTRY NUMBER IN THE PROFIT.DAT FILE)
C K=49 : JREC (SEQUENTIAL ENTRY FOR THE PARTICULAR ISSUE)

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C K=50 : TOTAL NUMBER OF VALID RECORDS FOR STOCK ITEM I, UPDATED EACH TIME A NEW DAY IS PROCESSED
C K=51 TO 100 NOT YET USED

The julian day number is computed with the following Fortran function:

```

FUNCTION julday(mm,id,iyyy)
INTEGER julday,id,iyyy,mm,IGREG
PARAMETER (IGREG=15+31*(10+12*1582))
INTEGER ja,jm,jy
jy=iyyy
if (jy.eq.0) jy=1
if (jy.lt.0) jy=1
if (mm.gt.2) then
jm=mm+1
else
jy=jy-1
jm=mm+13
endif
julday=int(365.25*jy)+int(30.6001*jm)+id+1720995
if (id+31*(mm+12*iyyy).ge.IGREG) then
ja=int(0.01*jy)
julday=julday+2-ja+int(0.25*ja)
endif
return
END
FUNCTION julday1()
INTEGER julday1,id,iyyy,mm,IGREG
PARAMETER (IGREG=15+31*(10+12*1582))
INTEGER ja,jm,jy,dt(10)
CHARACTER*10 DATE,TIME,ZONE
INCLUDE 'DATMAI.INC'
CALL MY_DATE_AND_TIME(DATE,TIME,ZONE,DT)
IYYY=DT(1)
MM=DT(2)
ID=DT(3)
jy=iyyy
if (jy.eq.0) jy=1
if (jy.lt.0) jy=1
if (mm.gt.2) then
jm=mm+1
else
jy=jy-1
jm=mm+13
endif
julday1=int(365.25*jy)+int(30.6001*jm)+id+1720995
if (id+31*(mm+12*iyyy).ge.IGREG) then
ja=int(0.01*jy)
julday1=julday1+2-ja+int(0.25*ja)
endif
return
END

```

LISTING THE PROCESSED DATA

LISTPROF - After the PROFIT.DAT file has been read and processed by the "LOADPROF" command, the "LISTPROF" command is used to produce a listing of the sequential number assigned to each stock issue, it's symbol and its company descriptor. Output can be directed to any of the usual output devices. The file LISTSAMP.DAT is a listing run after the S&P 500 data base was processed by the "LOADPROF" command.

LOADING AN ISSUE

LOADISSU, i - After the PROFIT.DAT file has been read and processed by the "LOADPROF" command, the "LOADISSU" command is used to load all of the data in the (SYM).PRF binary file associated with the "i" th issue (see the "LISTPROF" command generated listing) into program internal memory where it may be analyzed and or graphically displayed by analysis and graphics display commands.

PLOTTING A LOADED ISSUE

PLOTISSU (plottype) , end date back count - After an issue has been loaded, it may be graphically displayed with the "PLOTISSU" command. The number of days displayed is set using the "DAYS" operating condition setting. The default is 60 days. The minimum is 30 days. The default plot type is a Type 1. "end date back count" is the number of trading day, counted backwards from the last trading date in the database for the issue in question, which will be displayed. The default "end date back count" is 0 days.

Plot Type	Data Displayed
1	Top plot: Closing Price (black - 15) Short Moving Average Price (dark red - 11) Medium Moving Average Price (dark green - 13) Long Moving Average Price (light blue - 6) Bottom plot: Spread (black - 15)

	Short Moving Average of Spread (dark red - 11) Medium Moving Average of Spread (dark green - 13) Long Moving Average of Spread (light blue - 6)
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