FINCAD

Day Count Conventions and Accrual Factors

Overview

Description of Supported Accrual Methods

An accrual method or day count convention is used to calculate an accrual factor, which represents the fraction of a year a given period accounts for. There are two components that make up an accrual factor. The first component uses a day count convention to determine how many days fall in the accrual period, which will be the numerator in the calculation of the accrual factor. The second component is a day count convention to determine the number of days that make up a full period, which will be the denominator in the calculation of the accrual factor.

Accrual Method List

Accrual Method	Description
Actual/365 (fixed)	The number of accrued days is equal to the actual number of days between the effective date and the terminating date. The accrual factor is the number of accrued days divided by 365.
Actual/360	The number of accrued days is equal to the actual number of days between the effective date and the terminating date. The accrual factor is the number of accrued days divided by 360.
Actual/365 (actual)	The number of accrued days is equal to the actual number of days between the effective date and the terminating date. Calculation of the accrual factor assumes the year basis to be 365 days for non-leap years and 366 for leap years. If a short stub period (< 1 year) contains a leap day, the number of days is divided by 366; otherwise, the number of days is divided by 365.
30/360 (ISDA) (same as U.S. Muni – 30/360)	The number of accrued days is calculated on the basis of a year of 360 days with 12 30-day months, subject to the following rules: (1) If the first date of the accrual period falls on the 31st of the month, the date will be changed to the 30th. (2) If the first date of the accrual period falls on the 30th of the month after applying (1) above, and the last date of the accrual period falls on the 31st of the month, the last date will be changed to the 30th.

	The accrual factor is calculated as the number of accrued days divided by 360.
30E/360 (30/360 ISMA)	The number of accrued days is calculated on the basis of a year of 360 days with 12 30-day months, subject to the following rules: (1) If either the first date or last date of the accrual period falls on the 31st of a month, that date will be changed to the 30th. (2) If the last day of the accrual period falls on the last day of February, the month of February will not be extended to a 30-day month. Rather, the actual number of days in February will be used. The accrual factor is calculated as the number of accrued days divided by 360.
30E+/360	The number of accrued days is calculated on the basis of a year of 360 days with 12 30-day months, subject to the following rules: (1) If the first date of the accrual period falls on the 31st of a month, it will be changed to the 30th of that month. (2) If the last date of the accrual period falls on the 31st of a month, it will be changed to the 1st of the next month. The accrual factor is calculated as the number of accrued days divided by 360.
Actual/Actual (ISMA-99)	This accrual method is primarily related to bonds. In the context of accrual factors, the time in years is calculated as follows: if the period is less than one year the accrual factor is equal to the actual number of days between the effective date (d_e) and the terminating date (d_t) divided by the number of days in the period from (d_t – 1 year) to d_t (either 365 or 366). If the period is greater than one year, the accrual factor is equal to the number of whole years plus the accrual of a stub period calculated as above. In the context of bonds, there are two ISMA-99 methods: Normal and Ultimo. The methods differ only in the assumption made regarding coupon dates. The ISMA-99 Normal method assumes that regular coupons fall on the same day of the month (non end-of-month), and the ISMA-99 Ultimo method assumes that regular coupons fall on the last day of the month (end-of-month). The ISMA-99 methods make a distinction between regular and irregular interest periods. Regular interest periods are always an exact multiple of a number of months long, whereas irregular interest periods require that notional interest periods be generated. The accrual factor for a period is the number of accrued days falling in that period divided by the actual number of days in the period. The overall accrual factor is then the sum of the individual interest period accrual factors, multiplied by the year fraction of a regular interest period. For more details, see Reference [1].
Actual/Actual (ISDA)	The number of accrued days is equal to the actual number of days between the effective date and the terminating date. The accrual factor is the sum of the accrued days falling in a non-leap year divided by 365 and the accrued days falling in a leap year divided by 366.
30/360 (Old)	This method is old and should not be used. This method used to be labeled 30/360 (ISDA).
30E/360 (Old)	This method is old and should not be used. This method used to be labeled 30E/360 (ISDA).

30/360 (SIA)	The number of accrued days is calculated on the basis of a year of 360 days with 12 30-day months, subject to the following rules: (1) If the last date of the accrual period is the last day of February and the first date of the period is the last day of February, then the last date of the period will be changed to the 30th. (2) If the first date of the accrual period falls on the 31st of a month or is the last day of February, that date will be changed to the 30th of the month. (3) If the first date of the accrual period falls on the 30th of a month after applying (2) above, and the last date of the period falls on the 31st of a month, the last date will be changed to the 30th of the month. The accrual factor is calculated as the number of accrued days divided by 360. Note that these rules assume that the security follows the end-of-month rule. If the security does not follow the end-of-month rule, then 30/360 (ISDA) should be used.
30/360 (BMA)	The number of accrued days is calculated on the basis of a year of 360 days with 12 30-day months, subject to the following rules: (1) If the first date of the accrual period falls on the 31st of a month or is the last day of February, the date will be changed to the 30th. (2) If the first date of the accrual period falls on the 30th of the month after applying 1) above, and the last date of the accrual period falls on the 31st of the month, the last date will be changed to the 30th. The accrual factor is calculated as the number of accrued days divided by 360. Note that prior to 1997, the BMA was known as the PSA, and this method was referred to as 30/360 (PSA).
30/360 (German)	The number of accrued days is calculated on the basis of a year of 360 days with 12 30-day months, subject to the following rules: (1) If either the first date or last date of the accrual period falls on the 31st of a month, that date will be changed to the 30th. (2) If either the first date or last date of the accrual period is the last day of February, that date will be changed to the 30th. The accrual factor is calculated as the number of accrued days divided by 360.
Bus/252	The number of accrued days is calculated as the number of market days in the accrual period. The accrual factor is calculated as the number of accrued (market) days divided by 252.
Actual/365L	The number of accrued days is calculated as the actual number of days between the effective date and the terminating date. This number is divided by 366 if the terminating date falls in a leap year and 365 otherwise.
NL365	The number of days is calculated as the actual number of days between the effective date and the terminating date without including any occurrences of the leap day, February 29th. This number is divided by 365.

The main differences between the various 30/360 methods is the treatment of dates landing on the 31st of a month, or the end of February. The ISMA, ISDA, and 30E+/360 methods make adjustments for dates landing on the 31st of a month, but not for dates landing on the last day of February. The SIA, BMA, and German methods make adjustments for dates landing on the 31st of a month, as well as for dates landing on the last day of February.

Accrual Switches

There are three main accrual switches used in FINCAD:

sw_376

Switch Value	Accrual Method
1	actual/365 (fixed) (eom)
2	actual/360 (eom)
3	actual/365 (actual) (eom)
4	30/360 (ISDA) (eom)
5	30E/360 (30/360 ISMA) (eom)
6	30E+/360 (eom)
7	actual/actual (ISMA-99 Ultimo) (eom)
8	actual/actual (ISDA) (eom)
9	30/360 (old) (eom)
10	30E/360 (old) (eom)
11	actual/365 (fixed)
12	actual/360
13	actual/365 (actual)
14	30/360 (ISDA)
15	30E/360 (30/360 ISMA)
16	30E+/360
17	actual/actual (ISMA-99)
18	actual/actual (ISDA)
19	30/360 (old)
20	30E/360 (old)

This switch is used by bond functions that are from versions prior to Version 9. It is a dual purpose switch that is used to define the accrual method, as well as the end-of-month rule.

sw_1102

Switch Value	Accrual Method
1	actual/actual (ISMA-99)
2	actual/actual (ISDA)
3	actual/365 (actual)
4	actual/365 (fixed)
5	actual/360
6	30E/360 (30/360 ISMA)

Switch Value	Accrual Method
7	30E+/360
8	30/360 (SIA)
9	30/360 (ISDA)
10	30/360 (BMA)
11	30/360 (German)
12	bus/252
13	actual/365L
14	NL365

This switch is used by bond functions that are from Version 9 or later. It includes some accrual methods that sw_376 does not, and is strictly an accrual method switch. Bond functions using this switch will have an additional switch indicating the end-of-month rule.

sw_331

Switch Value	Accrual Method
1	actual/365 (fixed)
2	actual/360
3	actual/365 (actual)
4	30/360 (ISDA)
5	30E/360 (30/360 ISMA)
6	30E+/360
7	actual/actual (ISMA-99)
8	actual/actual (ISDA)
9	30/360 (old)
10	30E/360 (old)
11	30/360 (SIA)
12	30/360 (BMA)
13	30/360 (German)
14	actual/365L
15	NL365

This switch is widely used in many areas, such as swaps, interest rate derivatives, credit derivatives, and others.

FINCAD Functions

The supported accrual methods described above are used throughout FINCAD functions. Note that not all methods are supported by all functions that use accrual methods. Specifically, the Bus/252 accrual method is only supported by functions new to Version 9 or later. In addition, there are FINCAD functions for calculating the number of accrued days, the accrual factor, or the accrued interest using a specific method. These functions are:

aaAccrual_days(d_e, d_t, acc)

Calculates the number of days between two dates according to an accrual method.

aaAccrual_factor(d_e, d_t, acc)
Calculates the accrual factor for a time period according to an accrual method.

aaAccrued(princ_m, cpn, freq, d_n_cf, d_v, d_prev_cf, acc)
Calculates accrued interest according to an accrual method.

aaAccrual_days_act252(d_e, d_t, hl)
Calculates the number of accrual days between two dates using the Bus/252 accrual method. Days counted are market days only.

aaAccrual_factor_act252(d_e, d_t, hl)
Calculates the accrual factor for a time period using the Bus/252 accrual method.

aaAccrued_act252(princ_m, cpn, freq, d_v, d_prev_cf, hl)
Calculates accrued interest using the Bus/252 accrual method.

Description of Inputs

Input Argument	Description
d_e	effective date of the accruing period
d_t	termination date of the accruing period
acc	accrual method
hl	holiday list (for act252 functions only)
princ_m	principal at maturity
cpn	coupon
freq	coupon frequency (used by actual/actual (ISMA-99))
d_n_cf	next cash flow date
d_v	value (settlement) date
d_prev_cf	previous cash flow date
acc	accrual method

Description of Outputs

aaAccrual_days and aaAccrual_days_act252:

Output	Description
days	number of accrual days for given accrual method

aaAccrual_factor and aaAccrual_factor_act252:

Output	Description
acc_fac	accrual factor for given accrual method

aaAccrued and aaAccrued_act252:

Output	Description
acc_int	accrued interest

Examples

Example 1

Suppose d_e (effective date of the accruing period) = 25-Oct-1996 and d_t (termination date of the accruing period) = 31-Dec-1996. Using **aaAccrual_days** and **aaAccrual_factor** with various accrual methods, we get:

Results:

Day Count	Number of Accrual Days	Accrual Factor
Act/365 (fixed)	67	0.183561644
Act/360	67	0.186111111
Actual/365 (actual)	67	0.183561644
30/360 (ISDA)	66	0.183333333
30E/360	65	0.180555556
30E+/360	66	0.183333333
Actual/Actual (ISMA-99)	67	0.183060109
Actual/Actual (ISDA)	67	0.183060109
30/360 (Old)	66	0.183333333
30E/360 (Old)	66	0.183333333
30/360 (SIA)	66	0.183333333
30/360 (PSA)	66	0.183333333
30/360 (German)	65	0.180555556
Actual/365L	67	0.183060109
NL365	67	0.183561644

Example 2

Suppose d_e (effective date of the accruing period) = 27-Jan-1998 and d_t (termination date of the accruing period) = 1-Feb-1999. Using **aaAccrual_days** and

aaAccrual_factor with various accrual methods, we get:

Results:

Day Count	Number of Accrual Days	Accrual Factor
Act/365 (fixed)	370	1.01369863
Act/360	370	1.027777778
Actual/365 (actual)	370	1.01369863
30/360 (ISDA)	364	1.011111111
30E/360	364	1.011111111
30E+/360	364	1.011111111
Actual/Actual (ISMA-99)	370	1.01369863
Actual/Actual (ISDA)	370	1.01369863
30/360 (Old)	365	1.013888889
30E/360 (Old)	364	1.011111111
30/360 (SIA)	364	1.011111111
30/360 (PSA)	364	1.011111111
30/360 (German)	364	1.011111111
Actual/365L	370	1.01369863
NL365	370	1.01369863

Example 3

Suppose the accrual days and accrual factor using the Bus/252 method are required for various effective and terminating dates given the following table of holidays:

Holiday List

1-Jan-2005
21-Feb-2005
14-Apr-2005
23-May-2005
4-Jul-2005
4-Sep-2005
9-Oct-2005
23-Nov-2005
25-Dec-2005
26-Dec-2005

Using **aaAccrual_days_act252** and **aaAccrual_factor_act252**, we get:

Results:

Effective Date	Terminating Date	Number of Accrual Days	Accrual Factor
1-Jan-2005	1-Jan-2006	254	1.007936508
22-Mar-2005	22-Apr-2005	22	0.087301587
10-Jun-2005	23-Oct-2005	95	0.376984127
30-Aug-2005	23-Oct-2005	39	0.154761905
28-Sep-2005	25-Dec-2005	62	0.246031746

References

[1] Christie, David, (2003), Accrued Interest & Yield Calculations and Determination of Holiday Calendars, SWX Swiss Exchange,

[2] Mayle, Jan. (1993), *Standard Securities Calculation Methods: Fixed Income Securities Formulas, Volume 1, Third Edition*, New York, Securities Industry Association.

[3] *Annex to the 2000 ISDA Definitions,* (2000), New York, International Swap Dealers Association, Inc.

[4] *BMA Uniform Practices, Second Edition*, (1999), New York, The Bond Market Association.

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