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DAY COUNT CONVENTIONS DESCRIBED

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Also known as Day Count Fraction (DCF) convention describes how accrued interest is calculated on a variety of financial products like bonds, notes, FRAs, Interest rate swaps etc. While Interest rates are usually expressed on a per annum basis (reference period = 1 year), the periodic payments are generally due over shorter intervals (monthly, quaterly etc.). The Day Count Fraction (DCF), expressed as a number of days in the accrual period divided by the total number of days in the reference (often 360 or 365) period, determines the accrual payment for the period. Different conventions (or rules) determine how number of days are calculated for the accrual and the reference period. The followed convention generally depends on the market type, location and (or) the curriency in which the instrument of interest is denominated. Some of the most commonly followed conventions have been described here.

Accrued interest is calculated using the following formula:

Accrued Interest (AI) = Principal Amount * Rate (Per Annum Basis) * DCF (1)

A single convention may be referred by different names depending on the market(Money/Bond/Swaps), currency denomination (USD or EUR etc.) and the partes involved. Table 1 lists the most common day count conventions along with some of the alternate names they may be referred to as.

Table 1: Alternate names for day conventions

Convention	Alternate Name(s)
Act/Act	Actual/Actual, Actual/Actual (ISDA)
Act/365F	Actual/365 Fixed, English
Act/360	Actual/360 , French
Act/365A	Actual/365 Actual
Act/365L	Actual/365 Leap year
NL/365	Actual/365 No leap year , NL365
30/360 ISDA	30/360 U.S. Municipal, Bond basis
30E/360	30/360 ISMA, 30/360 European, 30S/360 Special German, Eurobond Basis
30E+/360	30E+/360
30/360 German	30E/360 ISDA
30/360 US	30U/360,30US/360

Quantobjects' Schedules And Business Calendar Library

QO's schedules and business calendar library can be downloaded from here. Other libraries and their respective documentation are available here.

Calculating DCFs

Let the dates D1.M1.Y1 (Period start date) and D2.M2.Y2 (Period end date) define the accrual period for interest rate calculations. Table 2 below describes how day count fraction is calculated for various day count conventions. These day conventions are amongst the most commonly used in the financial world today.

"SINCE THE
MATHEMATICIANS HAVE
INVADED THE THEORY OF
RELATIVITY, I DO NOT
UNDERSTAND IT MYSELF

Glossary

FAQ

ANY MORE."

— ALBERT EINSTEIN
"IT IS EASIER TO SQUARE
THE CIRCLE THAN TO GET
ROUND A MATHEMATICIAN."
— AUGUSTUS DE MORGAN

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"I'm thinking of making you redundant, George But I'll discuss it further with you at home tonight."

World Clock

Today: Feb 11, 2023

SYD	TKY	HKG
03:00	02:00	01:00
SGP	MUM	DUB
01:00	22:30	21:00
FFM	LDN	NYK
19:00	18:00	13:00

Table 2: DCF calculations

Day count DCF calculation

DCF = Days1 /366 + Days2 / 365

Act/Act Days1 = Actual number of days in period that fall in a leap year.

Days2 = Actual number of days in period that fall in a normal year.

DCF = Num/Den

Act/365F Num = Actual number of days within the accrual period

Den = 365

DCF = Num/Den

Act/360 Num = Actual number of days within the accrual period

Den = 360

DCF = Num/Den

Act/365A Num = Actual number of days within the accrual period

Den = 366 if the Leap day (29th Feb) falls within the accrual period else 365

DCF = Num/Den

Act/365L Num = Actual number of days within the accrual period

Den = 366 if the accrual period end date (D2.M2.Y2) falls in a leap year else 365

DCF = Num/Den

Num: If the Leap day (29th Feb) does not fall within the accrual period

then,

NL/365 Actual number of days within the accrual period

Otherwise,

Actual number of days within the accrual period -1

Den=365

DCF = Num/Den

Num:

30/360 ISDA 1. If D1 = 31, Set D1 = 30

2. If D1 = 30 after applying 1 and D2 = 31, Set D2 = 30 3. Num = (D2 - D1) + 30 * (M2 - M1) + 360 * (Y2 - Y1)

Den = 360

DCF = Num/Den

Num:

1. If D1 = 31, Set D1 = 30

30E/360 2. If D2 = 31, Set D2 = 30

3. Last day of February not treated specially

4. Num = (D2 - D1) + 30 * (M2 - M1) + 360 * (Y2 - Y1)

Den = 360

DCF = Num/Den Num:

1. If D1 = 31, Set D1 = 30

2. If D2 = 31, Set D2.M2.Y2 to the 1st day of the next month - (D2 = 1, Y2 = Y2 + Integer

part of (M2+1)/12, M2= M2 + 1 Mod 12)

3. Num = (D2 – D1) + 30 * (M2 – M1) + 360 * (Y2 – Y1)

Den = 360

DCF = Num/Den

Num:

30E+/360

1. If D1 (and/or D2) = 31, Set D1 (and/or D2) = 30

30/360 1. II D1 (and/of D2) = 31, Set D1 (and/of D2) = 30

German

2. If D1.M1.Y1 (and/or D2.M2.Y2) falls on the last day of the February set use D1 = 30

(and/or D2 = 30)

3. Num = (D2 – D1) + 30 * (M2 – M1) + 360 * (Y2 – Y1)

Den = 360

Day count method

DCF calculation

DCF = Num/Den

Num:

1. If D2.M2.Y2 is the last day of February (28 in a non leap year; 29 in a leap year) and

30/360 US D1.M1.Y1 is the last day of February, Set D2 = 30

2. If D1 is the last day of February, Set D1 = 30 3. If D2 = 31 and D1 = 30 or 31, Set D2 = 30

4. If D1 = 31, Set D1 = 30

Den = 360

Below are few of the examples chosen to highlight the differences between the stated conventions

Example 1

Let us assume D1.M1.Y1 = 28/12/2007 and D2.M2.Y2 = 28/2/2008 (Remember Y2 is Leap).

Table 3: DCF calculations (1/4)

Convention	Calculation	DCF
Act/Act	4/365+58/366	0.16942884946478
Act/365F	62/365	0.16986301369863
Act/360	62/360	0.17222222222222
Act/365A	62/365	0.16986301369863
Act/365L	62/366	0.169398907103825
NL/365	62/365	0.16986301369863
30/360 ISDA	60/360	0.166666666666666
30E/360	60/360	0.166666666666666
30E+/360	60/360	0.166666666666666
30/360 German	60/360	0.166666666666666
30/360 US	60/360	0.166666666666666

Example 2

Now let us suppose D1.M1.Y1 = 28/12/2007 and D2.M2.Y2 = 29/2/2008 (Remember Y2 is Leap).

Table 4: DCF calculations (2/4)

Convention	Calculation	DCF
Act/Act	4/365+59/366	0.172161089901939
Act/365F	63/365	0.172602739726027
Act/360	63/360	0.175
Act/365A	63/366	0.172131147540984
Act/365L	63/366	0.172131147540984
NL/365	62/365	0.16986301369863
30/360 ISDA	61/360	0.169444444444444
30E/360	61/360	0.169444444444444
30E+/360	61/360	0.169444444444444
30/360 German	62/360	0.1722222222222
30/360 US	61/360	0.169444444444444

Example 3

Now let us suppose D1.M1.Y1 = 31/10/2007 and D2.M2.Y2 = 30/11/2008 (Remember Y2 is Leap).

Table 5: DCF calculations (3/4)

Convention	Calculation	DCF
Act/Act	62/365+334/366	1.08243131970956
Act/365F	396/365	1.08493150684932
Act/360	396/360	1.1000000000000
Act/365A	396/366	1.08196721311475
Act/365L	396/366	1.08196721311475
NL/365	395/365	1.08219178082192
30/360 ISDA	390/360	1.083333333333333
30E/360	390/360	1.083333333333333
30E+/360	390/360	1.083333333333333
30/360 German	390/360	1.083333333333333
30/360 US	390/360	1.083333333333333

Example 4

Let's take one last example. D1.M1.Y1 = $\frac{2}{1}$ 2008 and D2.M2.Y2 = $\frac{5}{3}$ 1/2009

Table 6: DCF calculations (4/4)

Convention	Calculation	DCF
Act/Act	335/366+150/365	1.32625945055768
Act/365F	485/365	1.32876712328767
Act/360	485/360	1.3472222222222
Act/365A	485/366	1.32513661202186
Act/365L	485/365	1.32876712328767
NL/365	484/365	1.32602739726027
30/360 ISDA	480/360	1.333333333333333
30E/360	479/360	1.3305555555556
30E+/360	480/360	1.333333333333333
30/360 German	479/360	1.3305555555556
30/360 US	480/360	1.333333333333333

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