



Daily Valuation Time-Weighted Rate of Return

The formula for the Time-Weighted Rate of Return (TWRR) with daily valuation is as follows:

$$R = \frac{MVE}{MVB^*} - 1$$

$$R = \frac{\text{Closing balance (includes accrued interest to end of current period)}}{\text{Opening balance (includes cash flow and accrued interest at end of previous period)}} - 1$$

Where:

R = Rate of Return

MVB* is the market value of the portfolio at the end of the previous period (the beginning of the current period) including any cash flows at the end of the previous period and any accrued income to the end of the previous period.

MVE is the market value of the portfolio at the end of the current period before any cash flows in the period but including any income (distribution paid to client, reinvested, and accrued interest) in the current period.

Cash Flow is defined as an external flow of cash and/or securities (i.e., capital additions or withdrawals). Reinvested distributions and Income paid (from accrued interest) are considered cash flows for MVB calculations. The daily TWRR method assumes that the cash flow is not available for investment or withdrawn from the fund until the beginning of the next day. This means that the fund is "re-valued" on the date of the cash flow, and the investment or withdrawal is not reflected in the MVE, but is added to the MVB at the start of the following period.

Linking Formula

$$\text{Monthly Personal Rate of Return (R}_M\text{)} = \{ [(1 + R_1) \times (1 + R_2) \times \dots (1 + R_n)] - 1 \} \times 100$$

Where:

- R₁ = the first daily period calculation
- R₂ = the second sub-period calculation
- R_n = the last sub-period calculation

$$\text{Quarterly Personal Rate of Return} = \{ [(1 + R_{M1}) \times (1 + R_{M2}) \times (1 + R_{M3})] - 1 \} \times 100$$

Where:

- R_{M1} = two months previous calculation
- R_{M2} = the previous monthly period calculation
- R_{M3} = the current monthly calculation

For calculation and storage purposes the following valuation limitations will be enforced:

- ?? The calculation of the daily factor will be taken to the 13th position (rounded)
- ?? The monthly TWRR factor will store up to the 7th place (rounded).
- ?? For display purposes, the *Personal Rate of Return* (PROR) percentage will round up to the 2nd position

Step A

Calculate the Daily Rate of Return for each day there was financial activity during the month.

Then, calculate the daily ROR factor for the last business day of month.

Date	Price Per Unit	Unit Balance Start of Day	Change \$	Unit Balance End of Day	MVE (\$)	MVB (\$)	(MVE / MVB) -1	Daily ROR (%)
01-02	8.2615	0.00	+ 1000.00	121.0430	0.00	0.00	N/A	N/A
01-20	8.3625	121.0430	+ 100.00	121.0430 + 11.9580 = 133.0010	121.0430 x 8.3625 = 1012.22	121.0430 x 8.2615 = 1000.00	(1012.22/1000.00) -1 = (1.01222) - 1 = 0.01222	1.22
01-31	8.466	133.0010	--	133.0010	133.0010 x 8.466 = 1125.99	133.0010 x 8.3625 = 1112.22	(1125.99/1112.22) -1 = (1.012380644) - 1 = 0.01238064	1.24
02-15	8.475	133.0010	- 500.00	133.0010 - 58.9970 = 74.0040	133.0010 x 8.475 = 1127.18	133.0010 x 8.4660 = 1125.99	(1127.18/1125.99) -1 (1.001056847) - 1 = 0.0010568	0.11
02-20	8.624	74.0040	+ 100.00	74.0040 + 11.5960 = 85.6000	74.0040 x 8.624 = 638.21	74.0040 x 8.475 = 627.18	(638.21/627.18) - 1 (1.017586657) - 1 = 0.01758666	1.76
02-28	8.694 (pre-div) 8.524 (post-div)	85.6000	+15.00 (dist.) ↓	85.6000 + 1.7600 (dist.) = 87.3600	87.3600 x 8.524 = 744.66	85.6000 x 8.624 = 738.21	(744.66/738.21) -1 (1.008737351) - 1 = 0.0087374	0.87
The \$15.00 distribution was calculated by multiplying the per unit dividend of \$0.1752 by the end of regular day unit balance of 85.6000 units.								
03-20	8.595	87.3600	+ 100.00	87.3600 + 11.6350 = 98.9950	87.3600 x 8.595 = 750.86	87.3600 x 8.524 = 744.66	(750.86/744.66) - 1 (1.008325947) - 1 = 0.0083259	0.83
03-31	8.425	98.9950	--	98.9950	98.9950 x 8.425 = 834.03	98.9950 x 8.595 = 850.86	(834.03/850.86) - 1 (0.980220012) - 1 = -0.0197800	-1.98

Step B

Calculate the **Monthly Personal Rate of Return** for each of the three quarters identified in Step A.

Where: **Monthly Personal Rate of Return (R_M)** = $\{[(1 + R_1) \times (1 + R_2) \times \dots (1 + R_n)] - 1\} \times 100$

$$\begin{aligned} \text{Jan/2003} = R_{M1} &= [(1 + 0.01222) \times (1 + 0.0128064) \times 100 \\ &= [(1.01222) \times (1.01238064) \times 100 \\ &= [1.024751931] - 1] \times 100 \\ &= 0.0247519 \times 100 &= \mathbf{2.48\%} \end{aligned}$$

$$\begin{aligned} \text{Feb/2003} = R_{M2} &= [(1 + 0.001056847) \times (1 + 0.017586657) \times (1 + 0.008737351) \times 100 \\ &= [(1.001056847 \times 1.017586657 \times 1.008737351)] - 1] \times 100 \\ &= [1.027562498 - 1] \times 100 \\ &= 0.0275625 \times 100 &= \mathbf{2.76\%} \end{aligned}$$

$$\begin{aligned} \text{Mar/2003} = R_{M3} &= [(1 + 0.008325947) \times (1 - 0.0197800)] - 1] \times 100 \\ &= [1.008325947 \times 0.980220012] - 1] \times 100 \\ &= [0.988381271 - 1] \times 100 \\ &= -0.011619 \times 100 &= \mathbf{-1.16\%} \end{aligned}$$

Step C

Calculate the **Quarterly Personal Rate of Return** for the January through March 2003 period using the monthly factors in Step B.

**** Where:** **Quarterly Personal Rate of Return** = $\{[(1 + R_{M1}) \times (1 + R_{M2}) \times (1 + R_{M3})] - 1\} \times 100$

$$\begin{aligned} R_{Q1} &= [(1 + .0247519) \times (1 + .0275625) \times (1 - 0.011619)] - 1] \times 100 \\ &= [1.0247519 \times 1.0275625 \times 0.9883813] - 1] \times 100 \\ &= [1.040762172 - 1] \times 100 \\ &= 0.0407622 \times 100 \\ &= \mathbf{4.08\%} \end{aligned}$$

Example 2: Fund Level Personal Rate of Return – Fixed Price Fund

Calculate the *personal rate of return* for **RBC Canadian Money Market Fund** using the new daily time-weighted rate of return methodology.

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Activity on the Fund
ending March 31, 2003
is as follows

Date	Transaction	Amount (\$)
Jan. 02/2003	Initial Contribution	1000.00
Jan. 20/2003	Contribution	100.00
Jan. 31/2003	Income Reinvested	34.40
Jan. 31/2003	Closing Balance	1134.40
Feb 01/2003	Opening Balance	1134.40
Feb. 15/2003	Withdrawal	500.00
Feb. 20/2003	Investment Switch (To)	100.00
Feb. 28/2003	Income Paid to Client	29.99
Feb. 28/2003	Closing Balance	734.40
Mar. 01/2003	Opening Balance	734.40
Mar. 20/2003	Contribution	100.00
Mar. 31/2003	Income Paid to Client	27.37
Mar. 31/2003	Closing Balance	834.40

Step A

Calculate the **Accrued & Accumulated Interest** for each day during the month, but calculate the **Daily Rate of Return** for the days during the month with financial activity.

Then, calculate the daily ROR factor for the last business day of month once the Accumulated Interest has been credited to account or paid to client.

Date	Price Per Unit	Daily Yield per unit	Unit Balance Start of Day	Change \$	Unit Balance End of Day	Accrued Interest Daily and Accumulated (in units)	MVE (\$)	MVB (\$)	(MVE/MVB) -1	Daily ROR (%)
01-02	10.0000	0.00114810	0.00	+ 1000.00	100.0000	0.0000				
01-03	10.0000	0.00114810	100.0000	-	100.0000	0.11481 0.11481				
01-04	10.0000	0.00114810	100.0000	-	100.0000	0.11481 0.22962				
01-05	10.0000	0.00114630	100.0000	-	100.0000	0.11463 0.34425				
01-06	10.0000	0.00341380	100.0000	-	100.0000	0.34138 0.68563				
01-09	10.0000	0.00113680	100.0000	-	100.0000	0.11368 0.79931				
01-10	10.0000	0.00113680	100.0000	-	100.0000	0.11368 0.91299				
01-11	10.0000	0.00113740	100.0000	-	100.0000	0.11374 1.02673				
01-12	10.0000	0.00113770	100.0000	-	100.0000	0.11377 1.14050				
01-13	10.0000	0.00342150	100.0000	-	100.0000	0.34215 1.48265				
01-16	10.0000	0.00113410	100.0000	-	100.0000	0.11341 1.59606				
01-17	10.0000	0.00113410	100.0000	-	100.0000	0.11341 1.70947				
01-18	10.0000	0.00113500	100.0000	-	100.0000	0.11350 1.82297				
01-19	10.0000	0.00113400	100.0000	-	100.0000	0.11340 1.93637				
01-20	10.0000	0.00341260	100.0000	+ 100.00	100.0000 + 10.000 = 110.0000	0.341260 2.277630	(100.000 + 2.277630) x 10.000 = 1022.78	100.000 x 10.000 = 1000.00	(1022.78/1000.00) -1 = (1.02278) - 1 = 0.02278	2.28
01-23	10.0000	0.00113930	110.0000	-	110.0000	0.125323 2.402953				

Date	Price Per Unit	Daily Yield per unit	Unit Balance Start of Day	Change \$	Unit Balance End of Day	Accrued Interest Daily and Accumulated (in units)	MVE (\$)	MVB (\$)	(MVE/MVB) -1	Daily ROR (%)
01-24	10.0000	0.00113930	110.0000	-	110.0000	0.125323 2.528276				
01-25	10.0000	0.00113970	110.0000	-	110.0000	0.125367 2.653643				
01-26	10.0000	0.00113940	110.0000	-	110.0000	0.125334 2.778977				
01-27	10.0000	0.00340810	110.0000	-	110.0000	0.374891 3.153868				
01-30	10.0000	0.00113500	110.0000	-	110.0000	0.12485 3.278718				
01-31	10.0000	0.00113500	110.0000	Interest paid = 3.4403568 x 10.0000 = 34.40	110.0000 + 3.4400 = 113.4400	0.124850 3.4403568 Interest paid balance = \$0.00	113.4400 x 10.00 = 1134.40	(110.0000 + 2.277630) x 10.0000 = 1122.78	(1134.40/1122.78) - 1 = (1.010421305) - 1 = 0.0104213	1.04
02-01	10.0000	0.00114810	113.4400		113.4400	0.130240464				
02-02	10.0000	0.00114810	113.4400	-	113.4400	0.130240464 0.2604810928				
02-03	10.0000	0.00341380	113.4400	-	113.4400	0.387261472 0.6477424				
02-06	10.0000	0.00114630	113.4400	-	113.4400	0.130036272 0.777778672				
02-07	10.0000	0.00114810	113.4400	-	113.4400	0.130240464 0.908019136				
02-08	10.0000	0.00113680	113.4400	-	113.4400	0.128958592 1.036977726				
02-09	10.0000	0.00113680	113.4400	-	113.4400	0.128958592 1.165936316				
02-10	10.0000	0.00362050	113.4400	-	113.4400	0.41070952 1.576645836				
02-13	10.0000	0.00113770	113.4400	-	113.4400	0.129060688 1.705706524				
02-14	10.0000	0.00113770	113.4400	-	113.4400	0.129060688 1.834767212				
02-15	10.0000	0.00113410	113.4400	-500.00	113.4400 - 50.0000 = 63.4400	0.128652304 1.963479516	(113.4400 + 1.963419) x 10.0000 = 1154.03	113.4400 x 10.0000 = 1134.40	(1154.03/1134.40) - 1 = (1.017304301) - 1 = 0.0173043	1.73
02-16	10.0000	0.00113410	63.4400	-	63.4400	0.071947304 2.03536682				
02-17	10.0000	0.00352160	63.4400	-	63.4400	0.223410304 2.258777124				

Date	Price Per Unit	Daily Yield per unit	Unit Balance Start of Day	Change \$	Unit Balance End of Day	Accrued Interest Daily and Accumulated (in units)	MVE (\$)	MVB (\$)	(MVE/MVB) -1	Daily ROR (%)
02-20	10.0000	0.00113400	63.4400	+ 100.00	63.4400 + 10.0000 = 73.4400	0.07194096 2.330718084	(63.4400 + 2.330718) x 10.0000 = 657.71	(63.4400 + 1.963419) x 10.0000 = 654.03	$(657.71/654.03) - 1 =$ $(1.005626653) - 1 =$ 0.0056267	0.56
02-21	10.0000	0.00113400	73.4400	-	73.4400	0.08328096 2.413999044				
02-22	10.0000	0.00113930	73.4400	-	73.4400	0.083670192 2.497669236				
02-23	10.0000	0.00113930	73.4400	-	73.4400	0.083670192 2.581339428				
02-24	10.0000	0.00113970	73.4400	-	73.4400	0.083699568 2.665038996				
02-27	10.0000	0.00340810	73.4400	-	73.4400	0.250290864 2.91532986				
02-28	10.0000	0.0011354	73.4400	Income Paid to Client 2.998713636 x 10.0000 = 29.99	73.4400	0.083383776 2.998713636 Interest paid Balance = \$0.00	(73.4400 + 2.9987136) x 10.0000 = 764.39	(73.4400 + 2.330718) x 10.0000 = 757.71	$(764.39/757.71) - 1 =$ $(1.008816037) - 1 =$ 0.0088160	0.88
03-01	10.0000	0.00114810	73.4400		73.4400	0.084316464				
03-02	10.0000	0.00114810	73.4400	-	73.4400	0.084316464 0.168632928				
03-03	10.0000	0.00341380	73.4400	-	73.4400	0.250709472 0.41934240				
03-06	10.0000	0.00114630	73.4400	-	73.4400	0.084184272 0.503526672				
03-07	10.0000	0.00114810	73.4400	-	73.4400	0.084316464 0.587843136				
03-08	10.0000	0.00113680	73.4400	-	73.4400	0.083486592 0.671329728				
03-09	10.0000	0.00113680	73.4400	-	73.4400	0.083486592 0.75481632				
03-10	10.0000	0.00362050	73.4400	-	73.4400	0.26588952 1.02070584				
03-13	10.0000	0.00113770	73.4400	-	73.4400	0.083552688 1.104258528				
03-14	10.0000	0.00113770	73.4400	-	73.4400	0.083552688 1.187811216				
03-15	10.0000	0.00113410	73.4400	-	73.4400	0.083288304 1.27109952				

Date	Price Per Unit	Daily Yield per unit	Unit Balance Start of Day	Change \$	Unit Balance End of Day	Accrued Interest Daily and Accumulated (in units)	MVE (\$)	MVB (\$)	(MVE/MVB) - 1	Daily ROR (%)
03-16	10.0000	0.00113410	73.4400	-	73.4400	0.083288304 1.354387824				
03-17	10.0000	0.00352160	73.4400	-	73.4400	0.258626304 1.613014128				
03-20	10.0000	0.00113400	73.4400	+ 100.00	73.4400 + 10.0000 = 83.4400	0.08328096 1.696295088	(73.4400 + 1.6962950) x 10.0000 = 751.36	73.4400 x 10.0000 = 734.40	$(751.36/734.40) - 1 =$ $(1.023093681) - 1 =$ 0.0230937	2.31
03-21	10.0000	0.00113400	83.4400	-	83.4400	0.09462096 1.790916048				
03-22	10.0000	0.00113930	83.4400	-	83.4400	0.095063192 1.88597924				
03-23	10.0000	0.00113930	83.4400	-	83.4400	0.095063192 1.981042432				
03-24	10.0000	0.00113970	83.4400	-	83.4400	0.095096568 2.0761390				
03-27	10.0000	0.00340810	83.4400	-	83.4400	0.284371864 2.360510864				
03-28	10.0000	0.00113765	83.4400		83.4400	0.094925516 2.45543638				
03-29	10.0000	0.00112680	83.4400		83.4400	0.094020192 2.549456572				
03-30	10.0000	0.00112650	83.4400		83.4400	0.09399516 2.643451732				
03-31	10.0000	0.00112690	83.4400	Income Paid to Client 2.73748026 x 10.0000 27.37	83.4400	0.094028536 2.737480268 Interest paid Balance = \$0.00	(83.4400 + 2.73748026) x 10.0000 = 861.77	(83.4400 + 1.6962950) x 10.0000 = 851.36	$(861.77/851.36) - 1 =$ $(1.012227494) - 1 =$ 0.0122275	1.22

