

Modified IRR and Adjusted Modified IRR

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Agenda

- Internal rate of return (IRR)
- Modified internal rate of return (MIRR)
- Adjusted modified internal rate of return (AMIRR)
- Contact details and disclaimer

Internal rate of return (IRR)

IRR – Definition

(1/2)

- Internal rate of return (IRR) is a money-weighted rate of return (MWRR) and is called a "true" MWRR as it is a precise method for calculating a MWRR that solves the full calculation problem and is no approximation of the MWRR.
- IRR is the (average) return or interest rate that causes the ending market value and the intermediate external cash flows to be discounted to the beginning market value.
- Due to its specific compounding characteristics, the IRR is also the (average) return or interest rate that causes the beginning value and intermediate cash flows to grow to the ending market value.
- IRR is the average annual rate of return that will be earned if the external cash flows are financed or reinvested using an implicit reinvestment assumptions.

IRR – Definition

(2/2)

- The implicit reinvestment assumption of the IRR methodology with respect to the interim external cash flows is that:
 1. Cash inflows are financed at an interest rate (finance rate) – maybe seen as the cost of capital – that is identical to the IRR.
 2. Cash outflows are reinvested at an interest rate (reinvestment rate) – maybe seen as the cost of capital – that is identical to the IRR.

IRR – Formula

(1/2)

$$0 = \frac{EMV_T}{(1 + IRR)^{Y_T}} + \left(\sum_{t=1}^{T-1} \frac{-C_t}{(1 + IRR)^{Y_{t-0}}} \right) - \frac{-BMV}{(1 + IRR)^{Y_{t-0}}}$$

$$0 = \frac{EMV_T}{(1 + IRR)^{Y_T}} + \left(\sum_{t=1}^{T-1} \frac{-C_t}{(1 + IRR)^{Y_{t-0}}} \right) - BMV$$

Note: Here cash inflows (outflows) have a negative (positive) algebraic sign.

The beginning market value (BMV) is treated like a cash inflow.

Depending on the used industry convention, Y_T may be 365, 360 or the actual days in the calendar year.

IRR – Formula

(2/2)

BMV = Beginning market value.

EMV_T = Ending market value at T.

IRR = Internal rate of return (annualized).

C_t = Cash flow at t.

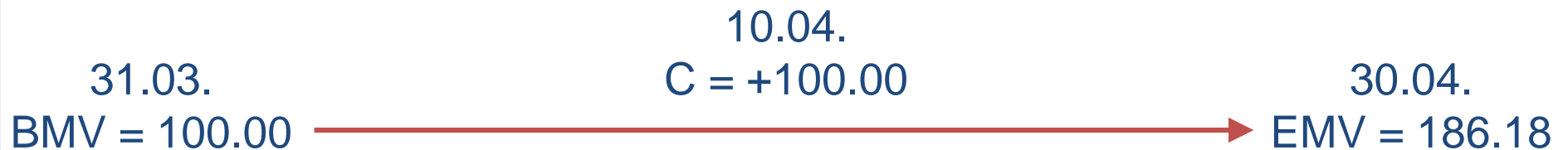
Y_T = Length of measurement period (to be measured in years - 365).

Y_{t-0} = Length of time period between the beginning of the measurement period and the date of the cash flow (to be measured in years - 365).

IRR – Simple example

(1/3)

Example 1a:



$$0 = \frac{186.18}{(1 + IRR)^{\frac{30}{365}}} + \left(\frac{-100.00}{(1 + IRR)^{\frac{10}{365}}} \right) - 100.00 \Rightarrow IRR (ann) = -64.91\%$$

$$0 = \frac{186.18}{(1 - 8.25\%)^{\frac{30}{30}}} + \left(\frac{-100.00}{(1 - 8.25\%)^{\frac{10}{30}}} \right) - 100, \Rightarrow IRR (not ann) = -8.25\%$$

IRR – Simple example

(2/3)

- Due to its specific compounding characteristics, the IRR is the return or interest rate that causes the ending market value and intermediate cash flows to be discounted to the beginning market value.

Example 1b:

	31.03.	10.04.	30.04.
	- 100.00	- 100.00	+ 186.18
	- 102.91	←	
↓	+ 202.91	←	
	= 0.00		

IRR – Simple example

(3/3)

- Due to its specific compounding characteristics, the IRR is also the return or interest rate that causes the beginning market value and intermediate cash flows to grow to the ending market value.

Example 1c:

31.03.	10.04.	30.04.
- 100.00	- 100.00	+ 186.18
		- 94.42
		- 91.76
		= 0.00

Diagram illustrating the cash flows and their growth over time. Arrows indicate the flow of cash from the beginning to the end of the period. A downward arrow indicates the final result.

IRR – More extensive example

Example 2:

Portfolio data	31.12.2010	31.03.2011	30.06.2011	30.09.2011	31.12.2011	31.03.2012
Assets	100.0	105.0	111.3	86.8	85.1	80.9
Cash flows (end of sub-period)		0.0	0.0	-20.0	0.0	0.0
IRR cash flow stream	-100.0	0.0	0.0	20.0	0.0	80.9
TWRRs		5.00%	6.00%	-4.00%	-2.00%	-5.00%
Annualized total period IRR	0.74%					
Annualized total period TWRR	-0.42%					

IRR – Critics

(1/2)

- IRR is a money-weighted rate of return as it is influenced by the timing of cash flows and the amount of capital invested – therefore may not be appropriate to assess a portfolio manager without discretion over the cash in- and outflows.
- Implicit interim profit and loss is not equal to the profit and loss observed on the balance sheet.
- IRR is an average rate of return not based on the actual interim values but on the actual cash flows.
- IRR is not easy to calculate.
- IRR is path-dependent with respect to the cash flows.
- IRR imply unrealistic (re-) investment assumptions – means the IRR reinvestment rate is a result of the cash flows and their timing.
- IRR can not always be calculated and is sometimes not unique – means has an issue with multiple solutions.

IRR – Critics

(2/2)

- IRR is useful for both ex-ante investment decision-making and ex-post performance evaluation.

Modified internal rate of return (MIRR)

MIRR – Starting point

- IRR solution might not be unique – multiple solutions.
- IRR equation might not be solvable.

MIRR – Definition

(1/2)

- Modified internal rate of return (MIRR) is a modification of the internal rate of return (IRR) which uses explicit reinvestment assumptions.
- MIRR is a money-weighted rate of return and is called a "true" MWRR as it is a precise method for calculating a MWRR that solves the full calculation problem and is no approximation of the MWRR.
- MIRR is the discount rate that makes the investments (cash inflows) equal to the future market value of the cash flows from the investment (cash outflows).
- MIRR is the average annual rate of return that will be earned if the external cash flows are financed or reinvested using explicit reinvestment assumptions.

MIRR – Definition

(2/2)

- The explicit reinvestment assumption of the MIRR methodology with respect to the interim external cash flows is that:
 1. Cash inflows are financed at an interest rate (so called finance rate) – that does not have to be identical to the IRR.
 2. Cash outflows are reinvested at an interest rate (so called reinvestment rate) – that does not have to be identical to the IRR.
- By using explicit reinvestment assumptions the MIRR resolves the two main issues with the IRR methodology:
 1. The (unrealistic) implicit reinvestment assumptions.
 2. The problem of having multiple solutions.
- The idea is to transform the original cash flow stream into a portfolio of zero bond cash flow streams. In an arbitrage free world that portfolio of "zero bonds" has the same absolute profit and loss than the original cash flow stream and therefore has the same return and average invested capital.

MIRR – Formula

(1/2)

$$MIRR = \left(\frac{\text{Future market value of all cash outflows at } T}{\text{Present market value of all cash inflows at } t = 0} \right)^{\left(\frac{1}{Y_T}\right)} - 1$$

$$MIRR = \left(\frac{EMV + \sum_{k=1}^K (Cof_k \times (1 + ri_{t,T})^{Y_T-t})}{BMV + \sum_{l=1}^L \frac{Cif_l}{(1 + rf_{0,t})^{Y_t-0}}} \right)^{\left(\frac{1}{Y_T}\right)} - 1$$

Note: MIRR assumes consistent finance and reinvestment rates throughout the whole measurement period. The formula can be adjusted to reflect changing finance and reinvestment rates and to add other costs or revenues like taxes (Adjusted MIRR).

As it is an ex-post measurement, the future date refers to the end date of the measurement period.

MIRR – Formula

(2/2)

MIRR = Modified internal rate of return (annualized).

Cof_k = Cash outflow k.

Cif_l = Cash inflow l.

ri_{t,T} = Reinvestment rate for the time period t to T.

rf_{0,t} = Finance rate for the time period 0 to t.

Y_T = Length of measurement period (to be measured in years – 365).

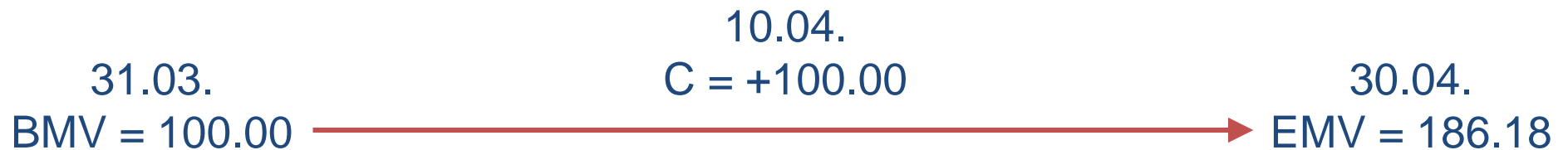
Y_{T-t} = Length of time period between the date of the cash outflow and the end of the measurement period (to be measured in years – 365).

Y_{t-0} = Length of time period between the beginning of the measurement period and the date of the cash inflow (to be measured in years – 365).

MIRR – Simple example

Remark: Here MIRR is not annualized and Y_T is 30 days as period is less than a year.

Example 3a:



$$MIRR = \left(\frac{186.18}{100.00 + \frac{100.00}{(1 + 5.00\%)^{\frac{10}{365}}}} \right)^{\left(\frac{30}{30}\right)} - 1 = \left(\frac{186.18}{199.87} \right)^{\left(\frac{30}{30}\right)} - 1 = -6.85\%$$

Finance rate (ann) = 5.00%, reinvestment rate (ann) = 5.00%

MIRR – Different perspective

- Due to its specific compounding characteristics, the MIRR is the return or interest rate that causes the sum of the beginning market value and discounted intermediate cash inflows to grow to the sum of the compounded intermediate cash outflows and the ending market value.

Example 3b:

31.03.	10.04.	30.04.
- 100.00	- 100.00	+ 186.18
- 99.87	←	↓
↓		↓
= - 199.87	→	- 186.18 => 0.00

MIRR – More extensive example

Example 4:

Portfolio data	31.12.2010	31.03.2011	30.06.2011	30.09.2011	31.12.2011	31.03.2012
Assets	100.0	105.0	111.3	86.8	85.1	80.9
Cash flows (end of sub-period)		0.0	0.0	-20.0	0.0	0.0
IRR cash flow stream	-100.0	0.0	0.0	20.0	0.0	80.9
TWRRs		5.00%	6.00%	-4.00%	-2.00%	-5.00%
Annualized total period IRR	0.74%	Finance and reinvestment rate = 0.00%				
Annualized total period MIRR	0.68%					

- Here finance and reinvestment rate are assumed to be 0.00% – in reality one may choose more realistic finance and reinvestment rates.

MIRR – Critics

(1/2)

- MIRR is a money-weighted rate of return as it is influenced by the timing of cash flows and the amount of capital invested – therefore may not be appropriate to assess a portfolio manager without discretion over the cash in- and outflows.
- MIRR is an average rate of return but in comparison to the IRR based on realistic reinvestment assumptions.
- MIRR is an average rate of return not based on the actual interim values but on the actual cash flows.
- MIRR contribution or decomposition not addressed yet.
- MIRR can always be calculated and is unique – means has no issue with multiple solutions.
- MIRR is quite easy to calculate.
- MIRR is more realistic than the IRR as the calculation is based on actual reinvestment assumptions.

MIRR – Critics

(2/2)

- MIRR is equal to the IRR if the reinvestment and finance rate equal the IRR.
- MIRR is depending on the used rates for the finance rate and the reinvestment rate.
- MIRR is path-dependent with respect to the cash flows.
- MIRR is useful for both ex-ante investment decision-making and ex-post performance evaluation, using an appropriate cost of capital.
- MIRR can be calculated using different reinvestment assumptions – e.g. risk free rate, benchmark return, target return, etc. – where in addition the assumptions do not have to be static but can be dynamic throughout the measurement period (=> dynamic reinvestment assumptions would make the MIRR more "realistic").
- MIRR uses the unrealistic assumption that the financing rate and the reinvestment rate are constant over time for the whole measurement period.

Adjusted modified internal rate of return (AMIRR)

AMIRR – Starting point

- IRR solution might not be unique – multiple solutions.
- IRR equation might not be solvable.
- MIRR solve the IRR issues by using explicit reinvestment assumptions but assume that the financing rate and reinvestment rate are constant over time.

AMIRR – Definition

(1/2)

- Adjusted modified internal rate of return (AMIRR) is a modification of the internal rate of return (IRR) which uses explicit reinvestment assumptions.
- AMIRR is a money-weighted rate of return and is called a "true" MWRR as it is a precise method for calculating a MWRR that solves the full calculation problem and is no approximation of the MWRR.
- AMIRR is the discount rate that makes the investments (cash inflows) equal to the future market value of the cash flows from the investment (cash outflows).
- AMIRR is the average annual rate of return that will be earned if the external cash flows are financed or reinvested using explicit reinvestment assumptions.

AMIRR – Definition

(2/2)

- The explicit reinvestment assumption of the AMIRR methodology with respect to the interim external cash flows is that:
 1. Cash inflows are financed at an interest rate (so called finance rate) – that does not have to be identical to the IRR – that is time specific.
 2. Cash outflows are reinvested at an interest rate (so called reinvestment rate) – that does not have to be identical to the IRR – that is time specific.
- By using explicit reinvestment assumptions the AMIRR resolves the two main issues with the IRR methodology:
 1. The (unrealistic) implicit reinvestment assumptions.
 2. The problem of having multiple solutions.
- The idea is to transform the original cash flow stream into a portfolio of zero bond cash flow streams. In an arbitrage free world that portfolio of "zero bonds" has the same absolute profit and loss than the original cash flow stream and therefore has the same return and average invested capital.

AMIRR – Formula

(1/2)

$$AMIRR = \left[\frac{\text{Ending market value} + \text{future value of all cash outflows} - \text{future value of all cash inflows}}{\text{Beginning market value}} \right]^{\left(\frac{1}{Y_T}\right)} - 1$$

AMIRR

$$= \left[\frac{EMV + \sum_{k=1}^K (Cof_k \times (1 + ri_{t,T})^{Y_T-t}) - \sum_{l=1}^L (Cif_l \times (1 + rf_{t,T})^{Y_T-t})}{BMV} \right]^{\left(\frac{1}{Y_T}\right)} - 1$$

Note: As it is an ex-post measurement, the future date refers to the end date of the measurement period.

AMIRR – Formula

(2/2)

AMIRR = Adjusted modified internal rate of return (annualized).

Cof_k = Cash outflow k .

Cif_l = Cash inflow l .

$ri_{t,T}$ = Reinvestment rate for the time period t to T .

$rf_{t,T}$ = Finance rate for the time period t to T .

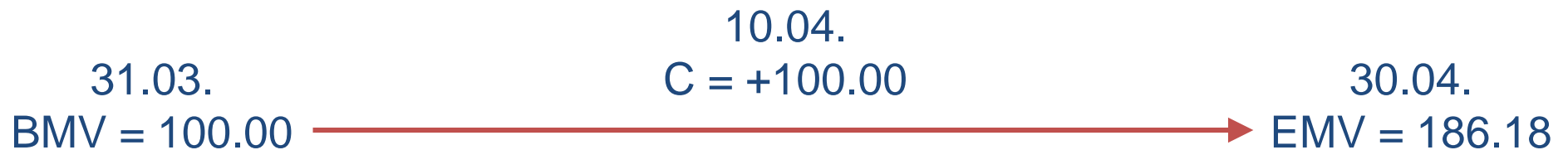
Y_T = Length of measurement period (to be measured in years – 365).

Y_{T-t} = Length of time period between the date of the cash flow and the end of the measurement period (to be measured in years – 365).

AMIRR – Simple example

Example 5a:

Remark: Here AMIRR is not annualized as the period is less than a year.



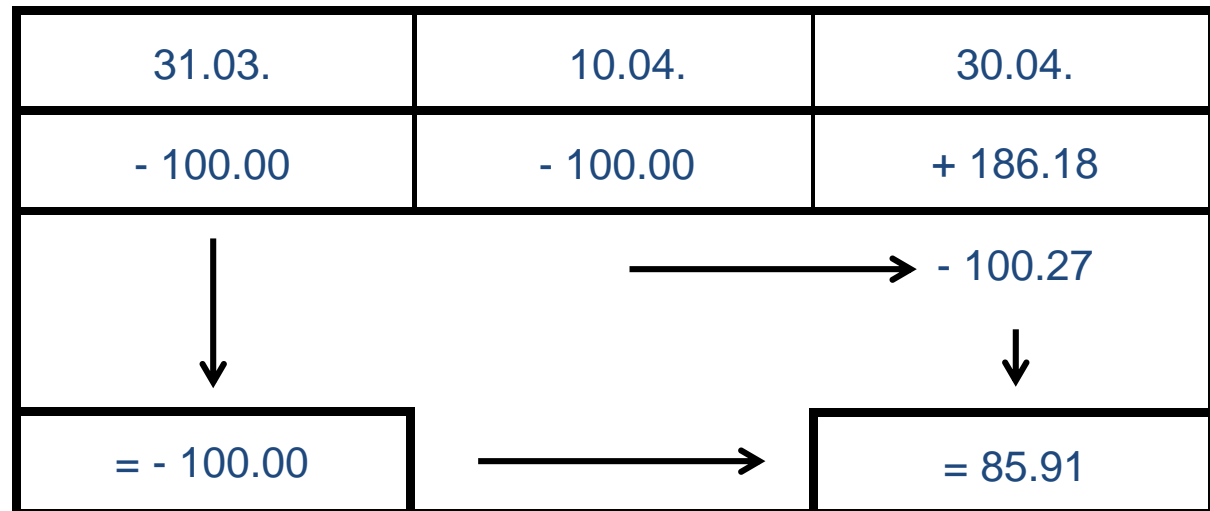
$$AMIRR = \frac{186.18 - 100 * (1 + 5.00\%)^{\frac{20}{365}}}{100.00} - 1 = \frac{85.91}{100.00} - 1 = -14.09\%$$

Finance rate (ann) = 5.00%, reinvestment rate (ann) = 5.00%

AMIRR – Different perspective

- Due to its specific compounding characteristics, the AMIRR is the return or interest rate that causes the beginning market value to grow to the sum of the compounded intermediate cash in- and outflows and the ending market value.

Example 5b:



AMIRR – More extensive example (Basis)

(0/5)

Date	Portfolio cashflow	Portfolio TWRR	Portfolio cumulative TWRR	Portfolio market values before cash flow	Portfolio market values after cash flow	Portfolio cash flow stream for IRR	Portfolio profit and loss	Portfolio cumulative profit and loss
31.12.2010	20 000.00				20 000.00	-20 000.00		
31.01.2011	-	0.6000%	0.60%	20 120.00	20 120.00	-	120.00	120.00
28.02.2011	-	0.6000%	1.20%	20 240.72	20 240.72	-	120.72	240.72
31.03.2011	10 000.00	0.6000%	1.81%	20 362.16	30 362.16	-10 000.00	121.44	362.16
30.04.2011	-	0.6000%	2.42%	30 544.34	30 544.34	-	182.17	544.34
31.05.2011	-	0.6000%	3.04%	30 727.60	30 727.60	-	183.27	727.60
30.06.2011	-15 000.00	0.6000%	3.65%	30 911.97	15 911.97	15 000.00	184.37	911.97
31.07.2011	-	0.1000%	3.76%	15 927.88	15 927.88	-	15.91	927.88
31.08.2011	-	0.1000%	3.86%	15 943.81	15 943.81	-	15.93	943.81
30.09.2011	-	0.1000%	3.97%	15 959.75	15 959.75	-	15.94	959.75
31.10.2011	-	0.1000%	4.07%	15 975.71	15 975.71	-	15.96	975.71
30.11.2011	-	0.1000%	4.17%	15 991.69	15 991.69	-	15.98	991.69
31.12.2011	-	0.1000%	4.28%	16 007.68	16 007.68	16 007.68	15.99	1 007.68

Portfolio returns	
Portfolio cum IRR	5.03%
Portfolio cum TWRR	4.28%
Portfolio timing effect	0.76%

AMIRR – More extensive example 1

(1a/5)

Example 6a:

Date	Financing rate	Reinvestment rate	IRR time adjusted	IRR time adjusted	Portfolio TWRR	Benchmark TWRR	Portfolio AMIRR	5.0377%
31.12.2010			5.0336%	365.00	4.2779%	3.6575%	Delta to TWRR	not Zero
31.01.2011	0.1000%	0.1000%	0.4180%	31.00	0.6000%	0.1000%	Delta to IRR	not Zero
28.02.2011	0.1000%	0.1000%	0.3774%	28.00	0.6000%	0.1000%		
31.03.2011	0.1000%	0.1000%	0.4180%	31.00	0.6000%	0.1000%	BMV	20'000.00
30.04.2011	0.1000%	0.1000%	0.4045%	30.00	0.6000%	0.1000%	EMV	21'007.54
31.05.2011	0.1000%	0.1000%	0.4180%	31.00	0.6000%	0.1000%	Return	5.04%
30.06.2011	0.1000%	0.1000%	0.4045%	30.00	0.6000%	0.1000%		
31.07.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		
31.08.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		
30.09.2011	0.1000%	0.1000%	0.4045%	30.00	0.1000%	0.5000%		
31.10.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		
30.11.2011	0.1000%	0.1000%	0.4045%	30.00	0.1000%	0.5000%		
31.12.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		

- Case 1:** Here finance and reinvestment rate are assumed to be 0.10% for all monthly sub-periods – in reality one may choose more realistic finance and reinvestment rates.

AMIRR – More extensive example 1

(1b/5)

Example 6a: Cumulated reinvestment and finance rates

Financing rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%	1.0045%	1.1055%	1.2066%
31.01.2011			0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%	1.0045%	1.1055%
28.02.2011				0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%	1.0045%
31.03.2011					0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%
30.04.2011						0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%
31.05.2011							0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%
30.06.2011								0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%
31.07.2011									0.1000%	0.2001%	0.3003%	0.4006%	0.5010%
31.08.2011										0.1000%	0.2001%	0.3003%	0.4006%
30.09.2011											0.1000%	0.2001%	0.3003%
31.10.2011												0.1000%	0.2001%
30.11.2011													0.1000%
31.12.2011													

Reinvestment rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%	1.0045%	1.1055%	1.2066%
31.01.2011			0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%	1.0045%	1.1055%
28.02.2011				0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%	1.0045%
31.03.2011					0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%	0.9036%
30.04.2011						0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%	0.8028%
31.05.2011							0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	0.7021%
30.06.2011								0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%
31.07.2011									0.1000%	0.2001%	0.3003%	0.4006%	0.5010%
31.08.2011										0.1000%	0.2001%	0.3003%	0.4006%
30.09.2011											0.1000%	0.2001%	0.3003%
31.10.2011												0.1000%	0.2001%
30.11.2011													0.1000%
31.12.2011													

AMIRR – More extensive example 1

(1c/5)

Example 6a: (Compounded) cash flows

Cash inflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-10'000.00									-10'090.36
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						-
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

1

Cash outflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							15'000.00						15'090.23
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

2

AMIRR – More extensive example 1

(1d/5)

Example 6a: New aggregated (zero bond like) cash flow stream

Aggregated cash flows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	20'000.00												16'007.68
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-10'090.36
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						15'090.23
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

1 + 2

From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
Total	20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'007.54
Total	-20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'007.54

- AIMRR transfers the whole cash flow stream into a fictitious (zero bond like) cash flow stream starting with the initial cash flow and ending with a final market value considering financing costs and reinvestment revenues – without any intermediate cash flows.

AMIRR – More extensive example 2

(2a/5)

Example 6b:

Date	Financing rate	Reinvestment rate	IRR time adjusted	IRR time adjusted	Portfolio TWRR	Benchmark TWRR	Portfolio AMIRR	5.0384%
31.12.2010			5.0336%	365.00	4.2779%	3.6575%	Delta to TWRR	not Zero
31.01.2011	0.0000%	0.0000%	0.4180%	31.00	0.6000%	0.1000%	Delta to IRR	not Zero
28.02.2011	0.0000%	0.0000%	0.3774%	28.00	0.6000%	0.1000%		
31.03.2011	0.0000%	0.0000%	0.4180%	31.00	0.6000%	0.1000%	BMV	20'000.00
30.04.2011	0.0000%	0.0000%	0.4045%	30.00	0.6000%	0.1000%	EMV	21'007.68
31.05.2011	0.0000%	0.0000%	0.4180%	31.00	0.6000%	0.1000%	Return	5.04%
30.06.2011	0.0000%	0.0000%	0.4045%	30.00	0.6000%	0.1000%		
31.07.2011	0.0000%	0.0000%	0.4180%	31.00	0.1000%	0.5000%		
31.08.2011	0.0000%	0.0000%	0.4180%	31.00	0.1000%	0.5000%		
30.09.2011	0.0000%	0.0000%	0.4045%	30.00	0.1000%	0.5000%		
31.10.2011	0.0000%	0.0000%	0.4180%	31.00	0.1000%	0.5000%		
30.11.2011	0.0000%	0.0000%	0.4045%	30.00	0.1000%	0.5000%		
31.12.2011	0.0000%	0.0000%	0.4180%	31.00	0.1000%	0.5000%		

- Case 2: Here finance and reinvestment rate are assumed to be 0.00% for all monthly sub-periods – in reality one may choose more realistic finance and reinvestment rates.

AMIRR – More extensive example 2

(2b/5)

Example 6b: Cumulated reinvestment and finance rates

Financing rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.01.2011			0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
28.02.2011				0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.03.2011					0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
30.04.2011						0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.05.2011							0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
30.06.2011								0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.07.2011									0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.08.2011										0.0000%	0.0000%	0.0000%	0.0000%
30.09.2011											0.0000%	0.0000%	0.0000%
31.10.2011												0.0000%	0.0000%
30.11.2011													0.0000%
31.12.2011													

Reinvestment rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.01.2011			0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
28.02.2011				0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.03.2011					0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
30.04.2011						0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.05.2011							0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
30.06.2011								0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.07.2011									0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
31.08.2011										0.0000%	0.0000%	0.0000%	0.0000%
30.09.2011											0.0000%	0.0000%	0.0000%
31.10.2011												0.0000%	0.0000%
30.11.2011													0.0000%
31.12.2011													

AMIRR – More extensive example 2

(2c/5)

Example 6b: (Compounded) cash flows

Cash inflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-10'000.00									-10'000.00
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						-
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

1

Cash outflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							15'000.00						15'000.00
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

2

AMIRR – More extensive example 2

(2d/5)

Example 6b: New aggregated (zero bond like) cash flow stream

Aggregated cash flows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	20'000.00												16'007.68
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-10'000.00
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						15'000.00
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
Total	20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'007.68
Total	-20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'007.68

- AIMRR transfers the whole cash flow stream into a fictitious (zero bond like) cash flow stream starting with the initial cash flow and ending with a final market value considering financing costs and reinvestment revenues – without any intermediate cash flows.

AMIRR – More extensive example 3

(3a/5)

Example 6c:

Date	Financing rate	Reinvestment rate	IRR time adjusted	IRR time adjusted	Portfolio TWRR	Benchmark TWRR	Portfolio AMIRR	4.2779%
31.12.2010			5.0336%	365.00	4.2779%	3.6575%	Delta to TWRR	Zero
31.01.2011	0.6000%	0.6000%	0.4180%	31.00	0.6000%	0.1000%	Delta to IRR	not Zero
28.02.2011	0.6000%	0.6000%	0.3774%	28.00	0.6000%	0.1000%		
31.03.2011	0.6000%	0.6000%	0.4180%	31.00	0.6000%	0.1000%	BMV	20'000.00
30.04.2011	0.6000%	0.6000%	0.4045%	30.00	0.6000%	0.1000%	EMV	20'855.58
31.05.2011	0.6000%	0.6000%	0.4180%	31.00	0.6000%	0.1000%	Return	4.28%
30.06.2011	0.6000%	0.6000%	0.4045%	30.00	0.6000%	0.1000%		
31.07.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		
31.08.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		
30.09.2011	0.1000%	0.1000%	0.4045%	30.00	0.1000%	0.5000%		
31.10.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		
30.11.2011	0.1000%	0.1000%	0.4045%	30.00	0.1000%	0.5000%		
31.12.2011	0.1000%	0.1000%	0.4180%	31.00	0.1000%	0.5000%		

- **Case 3:** Here finance and reinvestment rate are assumed to be the respective TWRR for all sub-periods.

AMIRR – More extensive example 3

(3b/5)

Example 6c: Cumulated reinvestment and finance rates

Financing rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.6000%	1.2036%	1.8108%	2.4217%	3.0362%	3.6544%	3.7581%	3.8618%	3.9657%	4.0697%	4.1737%	4.2779%
31.01.2011			0.6000%	1.2036%	1.8108%	2.4217%	3.0362%	3.1393%	3.2424%	3.3456%	3.4490%	3.5524%	3.6560%
28.02.2011				0.6000%	1.2036%	1.8108%	2.4217%	2.5241%	2.6266%	2.7293%	2.8320%	2.9348%	3.0378%
31.03.2011					0.6000%	1.2036%	1.8108%	1.9126%	2.0145%	2.1166%	2.2187%	2.3209%	2.4232%
30.04.2011						0.6000%	1.2036%	1.3048%	1.4061%	1.5075%	1.6090%	1.7106%	1.8123%
31.05.2011							0.6000%	0.7006%	0.8013%	0.9021%	1.0030%	1.1040%	1.2051%
30.06.2011								0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%
31.07.2011									0.1000%	0.2001%	0.3003%	0.4006%	0.5010%
31.08.2011										0.1000%	0.2001%	0.3003%	0.4006%
30.09.2011											0.1000%	0.2001%	0.3003%
31.10.2011												0.1000%	0.2001%
30.11.2011													0.1000%
31.12.2011													

Reinvestment rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.6000%	1.2036%	1.8108%	2.4217%	3.0362%	3.6544%	3.7581%	3.8618%	3.9657%	4.0697%	4.1737%	4.2779%
31.01.2011			0.6000%	1.2036%	1.8108%	2.4217%	3.0362%	3.1393%	3.2424%	3.3456%	3.4490%	3.5524%	3.6560%
28.02.2011				0.6000%	1.2036%	1.8108%	2.4217%	2.5241%	2.6266%	2.7293%	2.8320%	2.9348%	3.0378%
31.03.2011					0.6000%	1.2036%	1.8108%	1.9126%	2.0145%	2.1166%	2.2187%	2.3209%	2.4232%
30.04.2011						0.6000%	1.2036%	1.3048%	1.4061%	1.5075%	1.6090%	1.7106%	1.8123%
31.05.2011							0.6000%	0.7006%	0.8013%	0.9021%	1.0030%	1.1040%	1.2051%
30.06.2011								0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%
31.07.2011									0.1000%	0.2001%	0.3003%	0.4006%	0.5010%
31.08.2011										0.1000%	0.2001%	0.3003%	0.4006%
30.09.2011											0.1000%	0.2001%	0.3003%
31.10.2011												0.1000%	0.2001%
30.11.2011													0.1000%
31.12.2011													

AMIRR – More extensive example 3

(3c/5)

Example 6c: (Compounded) cash flows

Cash inflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-10'000.00									-10'242.32
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						-
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

1

Cash outflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							15'000.00						15'090.23
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

2

AMIRR – More extensive example 3

(3d/5)

Example 6c: New aggregated (zero bond like) cash flow stream

Aggregated cash flows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	20'000.00												16'007.68
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-10'242.32
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						15'090.23
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
Total	20'000.00	-	-	-	-	-	-	-	-	-	-	-	20'855.58
Total	-20'000.00	-	-	-	-	-	-	-	-	-	-	-	20'855.58

- AIMRR transfers the whole cash flow stream into a fictitious (zero bond like) cash flow stream starting with the initial cash flow and ending with a final market value considering financing costs and reinvestment revenues – without any intermediate cash flows.

AMIRR – More extensive example 4

(4a/5)

Example 6d:

Date	Financing rate	Reinvestment rate	IRR time adjusted	IRR time adjusted	Portfolio TWRR	Benchmark TWRR	Portfolio AMIRR	5.0336%
31.12.2010			5.0336%	365.00	4.2779%	3.6575%	Delta to TWRR	not Zero
31.01.2011	0.4180%	0.4180%	0.4180%	31.00	0.6000%	0.1000%	Delta to IRR	Zero
28.02.2011	0.3774%	0.3774%	0.3774%	28.00	0.6000%	0.1000%		
31.03.2011	0.4180%	0.4180%	0.4180%	31.00	0.6000%	0.1000%	BMV	20'000.00
30.04.2011	0.4045%	0.4045%	0.4045%	30.00	0.6000%	0.1000%	EMV	21'006.73
31.05.2011	0.4180%	0.4180%	0.4180%	31.00	0.6000%	0.1000%	Return	5.03%
30.06.2011	0.4045%	0.4045%	0.4045%	30.00	0.6000%	0.1000%		
31.07.2011	0.4180%	0.4180%	0.4180%	31.00	0.1000%	0.5000%		
31.08.2011	0.4180%	0.4180%	0.4180%	31.00	0.1000%	0.5000%		
30.09.2011	0.4045%	0.4045%	0.4045%	30.00	0.1000%	0.5000%		
31.10.2011	0.4180%	0.4180%	0.4180%	31.00	0.1000%	0.5000%		
30.11.2011	0.4045%	0.4045%	0.4045%	30.00	0.1000%	0.5000%		
31.12.2011	0.4180%	0.4180%	0.4180%	31.00	0.1000%	0.5000%		

- Case 4: Here finance and reinvestment rate are assumed to be the respective IRR for all sub-periods.

AMIRR – More extensive example 4

(4b/5)

Example 6d: Cumulated reinvestment and finance rates

Financing rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.4180%	0.7970%	1.2183%	1.6277%	2.0525%	2.4652%	2.8935%	3.3236%	3.7415%	4.1751%	4.5965%	5.0336%
31.01.2011			0.3774%	0.7970%	1.2047%	1.6277%	2.0387%	2.4652%	2.8935%	3.3097%	3.7415%	4.1611%	4.5965%
28.02.2011				0.4180%	0.8241%	1.2455%	1.6551%	2.0799%	2.5066%	2.9212%	3.3514%	3.7694%	4.2031%
31.03.2011					0.4045%	0.8241%	1.2319%	1.6551%	2.0799%	2.4928%	2.9212%	3.3375%	3.7694%
30.04.2011						0.4180%	0.8241%	1.2455%	1.6687%	2.0799%	2.5066%	2.9212%	3.3514%
31.05.2011							0.4045%	0.8241%	1.2455%	1.6551%	2.0799%	2.4928%	2.9212%
30.06.2011								0.4180%	0.8377%	1.2455%	1.6687%	2.0799%	2.5066%
31.07.2011									0.4180%	0.8241%	1.2455%	1.6551%	2.0799%
31.08.2011										0.4045%	0.8241%	1.2319%	1.6551%
30.09.2011											0.4180%	0.8241%	1.2455%
31.10.2011												0.4045%	0.8241%
30.11.2011													0.4180%
31.12.2011													

Reinvestment rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.4180%	0.7970%	1.2183%	1.6277%	2.0525%	2.4652%	2.8935%	3.3236%	3.7415%	4.1751%	4.5965%	5.0336%
31.01.2011			0.3774%	0.7970%	1.2047%	1.6277%	2.0387%	2.4652%	2.8935%	3.3097%	3.7415%	4.1611%	4.5965%
28.02.2011				0.4180%	0.8241%	1.2455%	1.6551%	2.0799%	2.5066%	2.9212%	3.3514%	3.7694%	4.2031%
31.03.2011					0.4045%	0.8241%	1.2319%	1.6551%	2.0799%	2.4928%	2.9212%	3.3375%	3.7694%
30.04.2011						0.4180%	0.8241%	1.2455%	1.6687%	2.0799%	2.5066%	2.9212%	3.3514%
31.05.2011							0.4045%	0.8241%	1.2455%	1.6551%	2.0799%	2.4928%	2.9212%
30.06.2011								0.4180%	0.8377%	1.2455%	1.6687%	2.0799%	2.5066%
31.07.2011									0.4180%	0.8241%	1.2455%	1.6551%	2.0799%
31.08.2011										0.4045%	0.8241%	1.2319%	1.6551%
30.09.2011											0.4180%	0.8241%	1.2455%
31.10.2011												0.4045%	0.8241%
30.11.2011													0.4180%
31.12.2011													

AMIRR – More extensive example 4

(4c/5)

Example 6d: (Compounded) cash flows

Cash inflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-10'000.00									-10'376.94
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						-
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

1

Cash outflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							15'000.00						15'375.99
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

2

AMIRR – More extensive example 4

(4d/5)

Example 6d: New aggregated (zero bond like) cash flow stream

Aggregated cash flows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	20'000.00												16'007.68
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-10'376.94
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						15'375.99
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
Total	20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'006.73
Total	-20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'006.73

- AIMRR transfers the whole cash flow stream into a fictitious (zero bond like) cash flow stream starting with the initial cash flow and ending with a final market value considering financing costs and reinvestment revenues – without any intermediate cash flows.

AMIRR – More extensive example 5

(5a/5)

Example 6e:

Date	Financing rate	Reinvestment rate	IRR time adjusted	IRR time adjusted	Portfolio TWRR	Benchmark TWRR	Portfolio AMIRR	5.6431%
31.12.2010			5.0336%	365.00	4.2779%	3.6575%	Delta to TWRR	not Zero
31.01.2011	0.1000%	0.1000%	0.4180%	31.00	0.6000%	0.1000%	Delta to IRR	not Zero
28.02.2011	0.1000%	0.1000%	0.3774%	28.00	0.6000%	0.1000%		
31.03.2011	0.1000%	0.1000%	0.4180%	31.00	0.6000%	0.1000%	BMV	20'000.00
30.04.2011	0.1000%	0.1000%	0.4045%	30.00	0.6000%	0.1000%	EMV	21'128.63
31.05.2011	0.1000%	0.1000%	0.4180%	31.00	0.6000%	0.1000%	Return	5.64%
30.06.2011	0.1000%	0.1000%	0.4045%	30.00	0.6000%	0.1000%		
31.07.2011	0.5000%	0.5000%	0.4180%	31.00	0.1000%	0.5000%		
31.08.2011	0.5000%	0.5000%	0.4180%	31.00	0.1000%	0.5000%		
30.09.2011	0.5000%	0.5000%	0.4045%	30.00	0.1000%	0.5000%		
31.10.2011	0.5000%	0.5000%	0.4180%	31.00	0.1000%	0.5000%		
30.11.2011	0.5000%	0.5000%	0.4045%	30.00	0.1000%	0.5000%		
31.12.2011	0.5000%	0.5000%	0.4180%	31.00	0.1000%	0.5000%		

- **Case 5:** Here finance and reinvestment rate are assumed to be the respective benchmark TWRR for all sub-periods.

AMIRR – More extensive example 5

(5b/5)

Example 6e: Cumulated reinvestment and finance rates

Financing rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	1.1045%	1.6100%	2.1181%	2.6287%	3.1418%	3.6575%
31.01.2011			0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	1.0035%	1.5085%	2.0161%	2.5261%	3.0388%	3.5540%
28.02.2011				0.1000%	0.2001%	0.3003%	0.4006%	0.9026%	1.4071%	1.9142%	2.4237%	2.9358%	3.4505%
31.03.2011					0.1000%	0.2001%	0.3003%	0.8018%	1.3058%	1.8123%	2.3214%	2.8330%	3.3472%
30.04.2011						0.1000%	0.2001%	0.7011%	1.2046%	1.7106%	2.2192%	2.7303%	3.2439%
31.05.2011							0.1000%	0.6005%	1.1035%	1.6090%	2.1171%	2.6277%	3.1408%
30.06.2011								0.5000%	1.0025%	1.5075%	2.0151%	2.5251%	3.0378%
31.07.2011									0.5000%	1.0025%	1.5075%	2.0151%	2.5251%
31.08.2011										0.5000%	1.0025%	1.5075%	2.0151%
30.09.2011											0.5000%	1.0025%	1.5075%
31.10.2011												0.5000%	1.0025%
30.11.2011													0.5000%
31.12.2011													

Reinvestment rate													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010		0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	0.6015%	1.1045%	1.6100%	2.1181%	2.6287%	3.1418%	3.6575%
31.01.2011			0.1000%	0.2001%	0.3003%	0.4006%	0.5010%	1.0035%	1.5085%	2.0161%	2.5261%	3.0388%	3.5540%
28.02.2011				0.1000%	0.2001%	0.3003%	0.4006%	0.9026%	1.4071%	1.9142%	2.4237%	2.9358%	3.4505%
31.03.2011					0.1000%	0.2001%	0.3003%	0.8018%	1.3058%	1.8123%	2.3214%	2.8330%	3.3472%
30.04.2011						0.1000%	0.2001%	0.7011%	1.2046%	1.7106%	2.2192%	2.7303%	3.2439%
31.05.2011							0.1000%	0.6005%	1.1035%	1.6090%	2.1171%	2.6277%	3.1408%
30.06.2011								0.5000%	1.0025%	1.5075%	2.0151%	2.5251%	3.0378%
31.07.2011									0.5000%	1.0025%	1.5075%	2.0151%	2.5251%
31.08.2011										0.5000%	1.0025%	1.5075%	2.0151%
30.09.2011											0.5000%	1.0025%	1.5075%
31.10.2011												0.5000%	1.0025%
30.11.2011													0.5000%
31.12.2011													

AMIRR – More extensive example 5

(5c/5)

Example 6e: (Compounded) cash flows

Cash inflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-10'000.00									-10'334.72
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						-
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

1

Cash outflows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	-												-
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							15'000.00						15'455.66
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

2

AMIRR – More extensive example 5

(5d/5)

Example 6e: New aggregated (zero bond like) cash flow stream

Aggregated cash flows													
From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
31.12.2010	20'000.00												16'007.68
31.01.2011		-											-
28.02.2011			-										-
31.03.2011				-									-10'334.72
30.04.2011					-								-
31.05.2011						-							-
30.06.2011							-						15'455.66
31.07.2011								-					-
31.08.2011									-				-
30.09.2011										-			-
31.10.2011											-		-
30.11.2011												-	-
31.12.2011													-

From / to	31.12.2010	31.01.2011	28.02.2011	31.03.2011	30.04.2011	31.05.2011	30.06.2011	31.07.2011	31.08.2011	30.09.2011	31.10.2011	30.11.2011	31.12.2011
Total	20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'128.63
Total	-20'000.00	-	-	-	-	-	-	-	-	-	-	-	21'128.63

- AIMRR transfers the whole cash flow stream into a fictitious (zero bond like) cash flow stream starting with the initial cash flow and ending with a final market value considering financing costs and reinvestment revenues – without any intermediate cash flows.

AMIRR – Critics

(1/3)

- AMIRR is a money-weighted rate of return as it is influenced by the timing of cash flows and the amount of capital invested – therefore may not be appropriate to assess a portfolio manager without discretion over the cash in- and outflows.
- AMIRR is an average rate of return but in comparison to the IRR based on realistic and time specific reinvestment assumptions.
- AMIRR is an average rate of return not based on the actual interim values but on the actual cash flows.
- AMIRR contribution or decomposition not addressed yet.
- AMIRR can always be calculated and is unique – means has no issue with multiple solutions.
- AMIRR is quite easy to calculate.
- AMIRR is more realistic than the IRR as the calculation is based on actual reinvestment assumptions.

AMIRR – Critics

(2/3)

- AMIRR is equal to the IRR if the reinvestment and finance rate equal the IRR.
- AMIRR is depending on the used rates for the finance rate and the reinvestment rate.
- AMIRR is path-dependent with respect to the cash flows.
- AMIRR is useful for both ex-ante investment decision-making and ex-post performance evaluation, using an appropriate cost of capital.
- AMIRR can be calculated using different reinvestment assumptions – e.g. risk free rate, benchmark return, target return, etc. – where in addition the assumptions do not have to be static but can be dynamic throughout the measurement period.
- In contrast to the MIRR, the AMIRR does not use the unrealistic assumption that the financing rate and the reinvestment rate are constant over time for the whole measurement period.

AMIRR – Critics

(3/3)

- The concept can be expanded considering assumptions for taxes, fees, and other profit and loss influencing cost or revenue drivers.

Contact details and disclaimer

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