

CREF Accounts, TIAA-CREF Funds - All Share Classes, and TIAA-CREF Life Funds 3 & 5 Year Annualized Tracking Error & Information Ratio for the period ending 6/30/17

Definitions:

Excess Return (ER): a measure of an investment's annualized return in excess of a benchmark.

Tracking Error (TE): a measure of the volatility of excess returns relative to a benchmark.

Information Ratio (IR): a measure of excess annualized return per unit of risk.

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CREF Accounts, TIAA-CREF Funds - All Share Classes, and TIAA-CREF Life Funds 3 & 5 Year Annualized Tracking Error & Information Ratio for the period ending 6/30/2017

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Fund/Account	Benchmark	3 YR Tracking Error (BP)	3 YR Information Ratio (%)	5 YR Tracking Error (BP)	5 YR Information Ratio (%)
CREF Accounts					
CREF Bond Market Account	Bloomberg Barclays Aggregate Bond Index	40	-0.23	41	0.21
CREF Equity Index Account	Russell 3000 Index	5	NA	5	NA
CREF Global Equities Account	MSCI World Index	141	-0.29	135	-0.31
CREF Growth Account	Russell 1000 Growth Index	174	-0.34	162	-0.11
CREF Inflation-Linked Bond Account	Bloomberg Barclays TIPS 1-10 Year Index	44	-1.43	36	-1.44
CREF Social Choice Account	SCA Composite Index	57	-1.23	65	-0.48
CREF Stock Account	CREF Composite Index	71	-0.74	68	-0.69
Retirement Share Class Funds					
Bond Fund	Bloomberg Barclays Aggregate Bond Index	64	0.55	77	1.00
Bond Index Fund	Bloomberg Barclays Aggregate Bond Index	26	NA	22	NA
Bond Plus Fund	Bloomberg Barclays Aggregate Bond Index	114	0.39	103	0.97
Emerging Markets Equity Fund	MSCI Emerging Markets Index	461	-0.24	407	-0.09
Emerging Markets Equity Index Fund	MSCI Emerging Markets Index	142	NA	162	NA
Equity Index Fund	Russell 3000 Index	8	NA	9	NA
Global Natural Resources Fund	MSCI AC World Index Commodity Producers Sec. Cap. Index	962	-0.29	759	-0.31
Growth & Income Fund	S&P 500 Index	233	-0.33	242	-0.11
High-Yield Fund	BofA ML BB-B Cash Pay Issuer Constrained Index	120	-0.56	102	-0.61
Inflation-Linked Bond Fund	Bloomberg Barclays TIPS 1-10 Year Index	37	-1.32	34	-1.44
International Equity Fund	MSCI EAFE Index	499	0.10	486	0.29
International Equity Index Fund	MSCI EAFE Index	210	NA	191	NA
International Opportunities Fund	MSCI All Country World Index ex-USA	493	0.42	NA	NA
Large-Cap Growth Fund	Russell 1000 Growth Index	350	-0.07	360	0.15
Large-Cap Growth Index Fund	Russell 1000 Growth Index	6	NA	7	NA
Large-Cap Value Fund	Russell 1000 Value Index	259	-0.34	219	-0.26
Large-Cap Value Index Fund	Russell 1000 Value Index	8	NA	9	NA
Lifecycle 2010 Fund	Lifecycle 2010 Fund Composite Index	82	0.05	87	0.24
Lifecycle 2015 Fund	Lifecycle 2015 Fund Composite Index	91	0.04	96	0.19
Lifecycle 2020 Fund	Lifecycle 2020 Fund Composite Index	97	0.01	101	0.14
Lifecycle 2025 Fund	Lifecycle 2025 Fund Composite Index	108	-0.06	112	0.08
Lifecycle 2030 Fund	Lifecycle 2030 Fund Composite Index	121	-0.09	124	0.02
Lifecycle 2035 Fund	Lifecycle 2035 Fund Composite Index	125	-0.12	131	-0.05
Lifecycle 2040 Fund	Lifecycle 2040 Fund Composite Index	137	-0.17	140	-0.11
Lifecycle 2045 Fund	Lifecycle 2045 Fund Composite Index	142	-0.16	141	-0.12
Lifecycle 2050 Fund	Lifecycle 2050 Fund Composite Index	141	-0.20	142	-0.14
Lifecycle 2055 Fund	Lifecycle 2055 Fund Composite Index	142	-0.20	142	-0.15
Lifecycle Retirement Income Fund	Lifecycle Retirement Income Fund Composite Index	81	0.08	82	0.30
Lifecycle Index 2010 Fund	Lifecycle Index 2010 Composite Benchmark	33	NA	29	NA
Lifecycle Index 2015 Fund	Lifecycle Index 2015 Composite Benchmark	35	NA	32	NA
Lifecycle Index 2020 Fund	Lifecycle Index 2020 Composite Benchmark	37	NA	34	NA
Lifecycle Index 2025 Fund	Lifecycle Index 2025 Composite Benchmark	42	NA	39	NA
Lifecycle Index 2030 Fund	Lifecycle Index 2030 Composite Benchmark	50	NA	45	NA

CREF Accounts, TIAA-CREF Funds - All Share Classes, and TIAA-CREF Life Funds 3 & 5 Year Annualized Tracking Error & Information Ratio for the period ending 6/30/2017

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Fund/Account	Benchmark	3 YR Tracking Error (BP)	3 YR Information Ratio (%)	5 YR Tracking Error (BP)	5 YR Information Ratio (%)
Lifecycle Index 2035 Fund	Lifecycle Index 2035 Composite Benchmark	50	NA	47	NA
Lifecycle Index 2040 Fund	Lifecycle Index 2040 Composite Benchmark	54	NA	49	NA
Lifecycle Index 2045 Fund	Lifecycle Index 2045 Composite Benchmark	58	NA	52	NA
Lifecycle Index 2050 Fund	Lifecycle Index 2050 Composite Benchmark	53	NA	49	NA
Lifecycle Index 2055 Fund	Lifecycle Index 2055 Composite Benchmark	58	NA	51	NA
Lifecycle Index Retirement Income Fund	Lifecycle Index Retirement Income Composite Benchmark	29	NA	27	NA
Lifestyle Aggressive Growth Fund	Lifestyle Aggressive Composite Benchmark	167	-0.20	172	-0.04
Lifestyle Conservative Fund	Lifestyle Conservative Composite Benchmark	89	-0.02	90	0.40
Lifestyle Growth Fund	Lifestyle Growth Composite Benchmark	144	-0.14	145	0.10
Lifestyle Income Fund	Lifestyle Income Composite Benchmark	67	0.12	70	0.54
Lifestyle Moderate Fund	Lifestyle Moderate Composite Benchmark	122	-0.06	122	0.26
Managed Allocation Fund	Managed Allocation Composite Index	109	0.06	107	0.26
Mid-Cap Growth Fund	Russell Midcap Growth Index	248	-0.75	244	-0.77
Mid-Cap Value Fund	Russell Midcap Value Index	194	-0.81	184	-1.01
Real Estate Securities Fund	FTSE NAREIT All Equity REITs Index	216	-0.08	205	-0.41
S&P 500 Index Fund	S&P 500 Index	6	NA	8	NA
Short-Term Bond Fund	Bloomberg Barclays Short (1-3 Yr) Govt Credit Index	33	0.40	38	0.67
Small-Cap Blend Index Fund	Russell 2000 Index	9	NA	12	NA
Small-Cap Equity Fund	Russell 2000 Index	233	0.45	216	0.33
Social Choice Bond Fund	Bloomberg Barclays Aggregate Bond Index	53	1.25	NA	NA
Social Choice Equity Fund	Russell 3000 Index	103	-1.36	119	-0.54
Institutional Share Class Funds					
Bond Fund	Bloomberg Barclays Aggregate Bond Index	62	0.98	76	1.36
Bond Index Fund	Bloomberg Barclays Aggregate Bond Index	33	NA	28	NA
Bond Plus Fund	Bloomberg Barclays Aggregate Bond Index	109	0.64	104	1.18
Emerging Markets Equity Fund	MSCI Emerging Markets Index	462	-0.19	409	-0.02
Emerging Markets Equity Index Fund	MSCI Emerging Markets Index	144	NA	158	NA
Enhanced Intl Equity Index Fund	MSCI EAFE Index	281	NA	254	NA
Enhanced Large-Cap Growth Index Fund	Russell 1000 Growth Index	92	NA	97	NA
Enhanced Large-Cap Value Index Fund	Russell 1000 Value Index	112	NA	114	NA
Equity Index Fund	Russell 3000 Index	8	NA	10	NA
Global Natural Resources Fund	MSCI AC World Index Commodity Producers Sec. Cap. Index	961	-0.27	759	-0.28
Growth & Income Fund	S&P 500 Index	233	-0.22	241	-0.01
High-Yield Fund	BofA ML BB-B Cash Pay Issuer Constrained Index	116	-0.36	99	-0.37
Inflation-Linked Bond Fund	Bloomberg Barclays TIPS 1-10 Year Index	36	-0.64	33	-0.68
International Equity Fund	MSCI EAFE Index	495	0.15	484	0.35
International Equity Index Fund	MSCI EAFE Index	209	NA	193	NA
International Opportunities Fund	MSCI All Country World Index ex-USA	492	0.47	NA	NA
Large-Cap Growth Fund	Russell 1000 Growth Index	351	0.02	360	0.23
Large-Cap Growth Index Fund	Russell 1000 Growth Index	7	NA	8	NA
Large-Cap Value Fund	Russell 1000 Value Index	262	-0.24	222	-0.15
Large-Cap Value Index Fund	Russell 1000 Value Index	8	NA	9	NA
Lifecycle 2010 Fund	Lifecycle 2010 Fund Composite Index	84	0.33	86	0.54
Lifecycle 2015 Fund	Lifecycle 2015 Fund Composite Index	87	0.32	92	0.45

CREF Accounts, TIAA-CREF Funds - All Share Classes, and TIAA-CREF Life Funds 3 & 5 Year Annualized Tracking Error & Information Ratio for the period ending 6/30/2017

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Fund/Account	Benchmark	3 YR Tracking Error (BP)	3 YR Information Ratio (%)	5 YR Tracking Error (BP)	5 YR Information Ratio (%)
Lifecycle 2020 Fund	Lifecycle 2020 Fund Composite Index	98	0.29	103	0.39
Lifecycle 2025 Fund	Lifecycle 2025 Fund Composite Index	108	0.21	112	0.32
Lifecycle 2030 Fund	Lifecycle 2030 Fund Composite Index	118	0.11	123	0.22
Lifecycle 2035 Fund	Lifecycle 2035 Fund Composite Index	124	0.08	132	0.13
Lifecycle 2040 Fund	Lifecycle 2040 Fund Composite Index	140	0.03	143	0.08
Lifecycle 2045 Fund	Lifecycle 2045 Fund Composite Index	140	0.00	141	0.04
Lifecycle 2050 Fund	Lifecycle 2050 Fund Composite Index	140	-0.01	143	0.04
Lifecycle 2055 Fund	Lifecycle 2055 Fund Composite Index	143	-0.03	145	0.04
Lifecycle Retirement Income Fund	Lifecycle Retirement Income Fund Composite Index	78	0.39	81	0.62
Lifecycle Index 2010 Fund	Lifecycle Index 2010 Composite Benchmark	33	NA	30	NA
Lifecycle Index 2015 Fund	Lifecycle Index 2015 Composite Benchmark	37	NA	33	NA
Lifecycle Index 2020 Fund	Lifecycle Index 2020 Composite Benchmark	39	NA	35	NA
Lifecycle Index 2025 Fund	Lifecycle Index 2025 Composite Benchmark	41	NA	37	NA
Lifecycle Index 2030 Fund	Lifecycle Index 2030 Composite Benchmark	45	NA	42	NA
Lifecycle Index 2035 Fund	Lifecycle Index 2035 Composite Benchmark	48	NA	42	NA
Lifecycle Index 2040 Fund	Lifecycle Index 2040 Composite Benchmark	53	NA	49	NA
Lifecycle Index 2045 Fund	Lifecycle Index 2045 Composite Benchmark	52	NA	47	NA
Lifecycle Index 2050 Fund	Lifecycle Index 2050 Composite Benchmark	58	NA	51	NA
Lifecycle Index 2055 Fund	Lifecycle Index 2055 Composite Benchmark	57	NA	51	NA
Lifecycle Index Retirement Income Fund	Lifecycle Index Retirement Income Composite Benchmark	35	NA	33	NA
Lifestyle Aggressive Growth Fund	Lifestyle Aggressive Composite Benchmark	170	-0.06	172	0.11
Lifestyle Conservative Fund	Lifestyle Conservative Composite Benchmark	89	0.29	92	0.67
Lifestyle Growth Fund	Lifestyle Growth Composite Benchmark	144	0.05	143	0.27
Lifestyle Income Fund	Lifestyle Income Composite Benchmark	66	0.49	67	0.93
Lifestyle Moderate Fund	Lifestyle Moderate Composite Benchmark	120	0.14	121	0.47
Managed Allocation Fund	Managed Allocation Composite Index	105	0.32	107	0.52
Mid-Cap Growth Fund	Russell Midcap Growth Index	244	-0.66	243	-0.67
Mid-Cap Value Fund	Russell Midcap Value Index	194	-0.68	184	-0.87
Real Estate Securities Fund	FTSE NAREIT All Equity REITs Index	219	0.03	207	-0.28
S&P 500 Index Fund	S&P 500 Index	7	NA	7	NA
Short-Term Bond Fund	Bloomberg Barclays Short (1-3 Yr) Govt Credit Index	34	1.13	40	1.26
Small-Cap Blend Index Fund	Russell 2000 Index	9	NA	10	NA
Small-Cap Equity Fund	Russell 2000 Index	232	0.57	213	0.45
Social Choice Bond Fund	Bloomberg Barclays Aggregate Bond Index	50	1.83	NA	NA
Social Choice Equity Fund	Russell 3000 Index	100	-1.17	118	-0.32
Tax-Exempt Bond Fund	Bloomberg Barclays 10 Year Municipal Bond Index	72	-1.31	82	-1.39
Retail Share Class Funds					
Bond Fund	Bloomberg Barclays Aggregate Bond Index	63	0.52	79	0.90
Bond Index Fund	Bloomberg Barclays Aggregate Bond Index	26	NA	23	NA
Bond Plus Fund	Bloomberg Barclays Aggregate Bond Index	108	0.38	103	0.89
Emerging Markets Equity Fund	MSCI Emerging Markets Index	469	-0.27	413	-0.12
Emerging Markets Equity Index Fund	MSCI Emerging Markets Index	151	NA	163	NA

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Fund/Account	Benchmark	3 YR Tracking Error (BP)	3 YR Information Ratio (%)	5 YR Tracking Error (BP)	5 YR Information Ratio (%)
Equity Index Fund	Russell 3000 Index	9	NA	9	NA
Global Natural Resources Fund	MSCI AC World Index Commodity Producers Sec. Cap. Index	967	-0.30	764	-0.32
Growth & Income Fund	S&P 500 Index	236	-0.35	241	-0.14
High-Yield Fund	BofA ML BB-B Cash Pay Issuer Constrained Index	115	-0.60	100	-0.67
Inflation-Linked Bond Fund	Bloomberg Barclays TIPS 1-10 Year Index	37	-1.45	35	-1.54
International Equity Fund	MSCI EAFE Index	492	0.09	483	0.28
International Opportunities Fund	MSCI All Country World Index ex-USA	499	0.39	NA	NA
Large-Cap Growth Fund	Russell 1000 Growth Index	350	-0.08	360	0.13
Large-Cap Value Fund	Russell 1000 Value Index	260	-0.37	220	-0.30
Lifecycle Retirement Income Fund	Retirement Income Fund Composite Index	79	0.07	81	0.30
Lifestyle Aggressive Growth Fund	Lifestyle Aggressive Composite Benchmark	171	-0.24	173	-0.08
Lifestyle Conservative Fund	Lifestyle Conservative Composite Benchmark	88	-0.01	91	0.37
Lifestyle Growth Fund	Lifestyle Growth Composite Benchmark	141	-0.16	143	0.06
Lifestyle Income Fund	Lifestyle Income Composite Benchmark	63	0.08	66	0.52
Lifestyle Moderate Fund	Lifestyle Moderate Composite Benchmark	122	-0.06	122	0.26
Managed Allocation Fund	Managed Allocation Composite Index	106	0.07	107	0.28
Mid-Cap Growth Fund	Russell Midcap Growth Index	247	-0.78	246	-0.80
Mid-Cap Value Fund	Russell Midcap Value Index	196	-0.82	185	-1.03
Real Estate Securities Fund	FTSE NAREIT All Equity REITs Index	219	-0.11	207	-0.44
Short-Term Bond Fund	Bloomberg Barclays Short (1-3 Yr) Govt Credit Index	40	0.19	41	0.46
Small-Cap Equity Fund	Russell 2000 Index	230	0.42	214	0.29
Social Choice Bond Fund	Bloomberg Barclays Aggregate Bond Index	49	1.24	NA	NA
Social Choice Equity Fund	Russell 3000 Index	100	-1.41	119	-0.56
Tax-Exempt Bond Fund	Bloomberg Barclays 10 Year Municipal Bond Index	78	-1.59	83	-1.73
Premier Share Class Funds					
Bond Fund	Bloomberg Barclays Aggregate Bond Index	64	0.71	78	1.10
Bond Index Fund	Bloomberg Barclays Aggregate Bond Index	32	NA	27	NA
Bond Plus Fund	Bloomberg Barclays Aggregate Bond Index	110	0.50	104	1.04
Emerging Markets Equity Fund	MSCI Emerging Markets Index	465	-0.22	411	-0.06
Emerging Markets Equity Index Fund	MSCI Emerging Markets Index	145	NA	162	NA
Equity Index Fund	Russell 3000 Index	9	NA	9	NA
Global Natural Resources Fund	MSCI AC World Index Commodity Producers Sec. Cap. Index	958	-0.28	757	-0.29
Growth & Income Fund	S&P 500 Index	235	-0.28	242	-0.07
High-Yield Fund	BofA ML BB-B Cash Pay Issuer Constrained Index	122	-0.47	104	-0.52
Inflation-Linked Bond Fund	Bloomberg Barclays TIPS 1-10 Year Index	34	-1.15	31	-1.23
International Equity Fund	MSCI EAFE Index	494	0.12	485	0.31
International Equity Index Fund	MSCI EAFE Index	209	NA	193	NA
International Opportunities Fund	MSCI All Country World Index ex-USA	495	0.44	NA	NA
Large-Cap Growth Fund	Russell 1000 Growth Index	352	-0.03	361	0.19
Large-Cap Value Fund	Russell 1000 Value Index	261	-0.30	221	-0.22
Lifecycle 2010 Fund	Lifecycle 2010 Fund Composite Index	82	0.17	86	0.36
Lifecycle 2015 Fund	Lifecycle 2015 Fund Composite Index	88	0.13	92	0.30
Lifecycle 2020 Fund	Lifecycle 2020 Fund Composite Index	98	0.12	102	0.25
Lifecycle 2025 Fund	Lifecycle 2025 Fund Composite Index	105	0.06	112	0.18
Lifecycle 2030 Fund	Lifecycle 2030 Fund Composite Index	120	0.01	125	0.10
Lifecycle 2035 Fund	Lifecycle 2035 Fund Composite Index	122	-0.05	130	0.01
Lifecycle 2040 Fund	Lifecycle 2040 Fund Composite Index	139	-0.09	142	-0.04
Lifecycle 2045 Fund	Lifecycle 2045 Fund Composite Index	141	-0.10	143	-0.05
Lifecycle 2050 Fund	Lifecycle 2050 Fund Composite Index	139	-0.13	141	-0.06
Lifecycle 2055 Fund	Lifecycle 2055 Fund Composite Index	140	-0.15	143	-0.07
Lifecycle Retirement Income Fund	Lifecycle Retirement Income Fund Composite Index	77	0.20	80	0.45

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Fund/Account	Benchmark	3 YR Tracking Error (BP)	3 YR Information Ratio (%)	5 YR Tracking Error (BP)	5 YR Information Ratio (%)
Lifecycle Index 2010 Fund	Lifecycle Index 2010 Composite Benchmark	36	NA	32	NA
Lifecycle Index 2015 Fund	Lifecycle Index 2015 Composite Benchmark	31	NA	29	NA
Lifecycle Index 2020 Fund	Lifecycle Index 2020 Composite Benchmark	39	NA	35	NA
Lifecycle Index 2025 Fund	Lifecycle Index 2025 Composite Benchmark	41	NA	37	NA
Lifecycle Index 2030 Fund	Lifecycle Index 2030 Composite Benchmark	45	NA	40	NA
Lifecycle Index 2035 Fund	Lifecycle Index 2035 Composite Benchmark	50	NA	46	NA
Lifecycle Index 2040 Fund	Lifecycle Index 2040 Composite Benchmark	52	NA	46	NA
Lifecycle Index 2045 Fund	Lifecycle Index 2045 Composite Benchmark	51	NA	48	NA
Lifecycle Index 2050 Fund	Lifecycle Index 2050 Composite Benchmark	58	NA	52	NA
Lifecycle Index 2055 Fund	Lifecycle Index 2055 Composite Benchmark	50	NA	45	NA
Lifecycle Index Retirement Income Fund	Lifecycle Index Retirement Income Composite Benchmark	32	NA	27	NA
Lifestyle Aggressive Growth Fund	Lifestyle Aggressive Composite Benchmark	170	-0.13	173	0.03
Lifestyle Conservative Fund	Lifestyle Conservative Composite Benchmark	86	0.11	89	0.51
Lifestyle Growth Fund	Lifestyle Growth Composite Benchmark	142	-0.08	144	0.15
Lifestyle Income Fund	Lifestyle Income Composite Benchmark	66	0.28	69	0.70
Lifestyle Moderate Fund	Lifestyle Moderate Composite Benchmark	120	0.06	121	0.37
Mid-Cap Growth Fund	Russell Midcap Growth Index	247	-0.71	245	-0.73
Mid-Cap Value Fund	Russell Midcap Value Index	194	-0.76	184	-0.95
Real Estate Securities Fund	FTSE NAREIT All Equity REITs Index	215	-0.04	205	-0.36
Short-Term Bond Fund	Bloomberg Barclays Short (1-3 Yr) Govt Credit Index	34	0.69	40	0.88
Small-Cap Equity Fund	Russell 2000 Index	231	0.50	214	0.39
Social Choice Bond Fund	Bloomberg Barclays Aggregate Bond Index	52	1.47	NA	NA
Social Choice Equity Fund	Russell 3000 Index	101	-1.29	117	-0.46
LIFE Funds					
Bond Fund	Bloomberg Barclays Aggregate Bond Index	78	0.68	77	0.99
Growth & Income Fund	S&P 500 Index	233	-0.25	240	-0.03
Growth Equity Fund	Russell 1000 Growth Index	351	0.04	364	0.26
International Equity Fund	MSCI EAFE Index	488	0.22	481	0.38
Large-Cap Value Fund	Russell 1000 Value Index	264	-0.30	224	-0.19
Real Estate Securities Fund	FTSE NAREIT All Equity REITs Index	221	-0.03	209	-0.29
Small-Cap Equity Fund	Russell 2000 Index	228	0.51	212	0.39
Social Choice Equity Fund	Russell 3000 Index	106	-1.30	122	-0.44
Stock Index Fund	Russell 3000 Index	4	NA	5	NA
Balanced Fund	Life Balance Composite Benchmark	93	0.27	NA	NA

Definitions:

Excess Return (ER)*: a measure of an investment's return in excess of a benchmark.

ER = Portfolio Return - Benchmark Return

Tracking Error (TE)*: a measure of the volatility of excess returns relative to a benchmark.

TE = Standard Deviation of Excess Return

$$\text{TE (Sample)} = \sqrt{\frac{n \sum_{i=1}^n e_i^2 - (\sum_{i=1}^n e_i)^2}{n(n-1)}} * \text{sqrt (frequency)}$$

Information Ratio (IR)*: a measure of excess return per units of risk.

Arithmetic IR* (*methodology is used by TIAA Risk Management*):

underlying Portfolio and Benchmark return information is generated from geometrically linked daily returns. The monthly excess return observations are then arithmetically averaged and then annualized to generate the Excess Return component. Information Ratio is derived by taking the ER component and dividing it by the Tracking Error.

$$\text{IR Arithmetic} = \frac{\text{Avg (Port Monthly Ret - Bmk Monthly Ret)}}{\text{TE (Sample)}} * 12$$

* ER, TE, and IR are annualized