

Quantum Baked ETFs (QBE)

yyaniQ

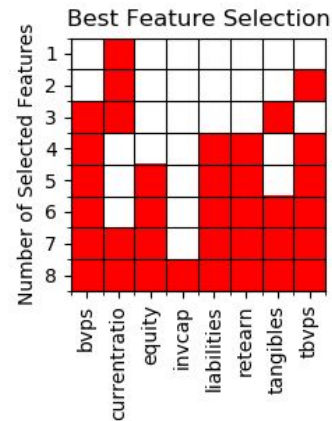
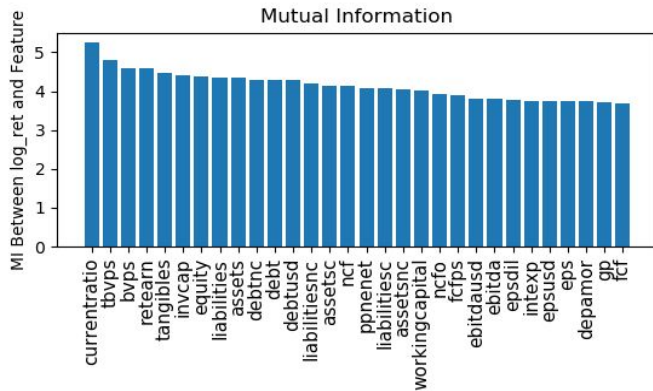




What is QBE?

- Near term quantum devices provide a chance for creating a new ETF that takes advantage of the speed of optimization in NISQ devices.
- QBE utilizes:
 - Mutual Information QUBO (MIQUBO) scoring for portfolio composition
 - D-wave's LeapHybridSolver for dynamic portfolio optimization

Quantum Feature Selection (MIQUBO)





Static Portfolio Optimization

SIMULATED ANNEALING RESULTLS

	Number of stocks	Number of stocks	Number of stocks	Number of stocks	Number of stocks	Number of stocks
0	5	0.07156421463857290	0.0382027384557147	0.04610896110534670	15	2^15
1	10	0.7357157588484570	0.46137550698317200	0.08736991882324220	30	2^30
2	20	2.81922960766307	2.044118545307860	0.1944589614868160	60	2^60
3	50	3.145239234219270	1.7805423923596200	1.0075957775116000	150	2^150
4	100	-0.1587934946536610	-0.08768256039747570	2.8797991275787400	300	2^300
5	200	0.6975258686071230	0.39360494144168400	11.240008354187000	600	2^600
6	450	0.4526074444327920	0.3793172189157180	58.82443904876710	1350	2^1350

DWave LEAP SOLVER RESULTS

	Number of stocks	Sharpe ratio	Profits (in %)	Runtimes (in s)	Number of parameters	Hilbert space
0	5	0.014380602384134100	0.007642709261836910	2.942355155944820	15	2^15
1	10	0.9196806018278030	0.4938532023041790	2.779998779296880	30	2^30
2	20	2.82409488902355	1.7306967951455400	3.270850658416750	60	2^60
3	50	3.530689528371310	1.6140734235491800	3.251215934753420	150	2^150
4	100	1.3423067501601700	0.871275465341886	4.139371156692510	300	2^300
5	200	0.6856007646261490	0.4297511584858870	8.839293241500850	600	2^600
6	450	0.42015618949075700	0.3768118326420830	22.277909994125400	1350	2^1350

The 100 assets in the portfolio are: ['AES', 'BOX', 'VRSK', 'ADM', 'VRTX', 'TDY', 'BIO', 'BR', 'ALGN', 'AJG', 'WEC', 'CAT', 'AVY', 'TYL', 'ITW', 'HII', 'FNTT', 'PENN', 'GOOG', 'IGPP', 'INTU', 'LYB', 'PCAR', 'EL', 'GNRC', 'DXT', 'M', 'ENPH', 'ETR', 'NVDA', 'INTAP', 'CME', 'MLM', 'ICE', 'IDXX', 'NWS', 'FOX', 'ILMN', 'MCK', 'HPE', 'PKT', 'SNPS', 'CMS', 'ONC', 'NCL', 'JNJ', 'CO', 'ROST', 'RNL', 'KPG', 'CPRT', 'K', 'REGN', 'KHC', 'PWR', 'DFS', 'PNR', 'DT', 'E', 'CRL', 'ICE', 'FAST', 'LEN', 'DHR', 'DRI', 'KO', 'TXN', 'M', 'HOLX', 'SPGI', 'LH', 'INCY', 'ABT', 'ABMD', 'KLAC', 'ZBRA', 'WLTH', 'WY', 'UPS', 'AKAM', 'SWK', 'COB', 'ROK', 'TER', 'PH', 'PFE', 'BF.B', 'PEG', 'TTWO', 'HES', 'EIX', 'EMR', 'EOG', 'FB', 'APA', 'AON', 'FBHS', 'VZAC', 'GM', 'MCO', 'EMN', 'ZTS'] and are traded for 100 days.

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[[0.  0.  0.  ... 0.  0.  0. ]
 [0.  0.1 0.  ... 0.  0.  0. ]
 [0.  0.  0.  ... 0.  0.  0. ]
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[illegible]

The hybrid solver ran for 102.92326188087463 s.

Hybrid solver Sharpe ratio is -0.7735583658033727, and the profits are -5.137044265162761%

The 100 assets in the portfolio are: ['AES', 'BOX', 'VRSK', 'ADM', 'VRTX', 'TDX', 'BIO', 'BR', 'ACN', 'AJG', 'WEC', 'CAT', 'AVY', 'TYL', 'ITW', 'HII', 'FTNT', 'PENN', 'GOOG', 'IGPP', 'INTU', 'LYB', 'PCAR', 'EL', 'GNRC', 'DXT M', 'ENPH', 'ETR', 'NVDA', 'NTAP', 'CME', 'MLM', 'ICE', 'IDXX', 'NWS', 'FOXA', 'ILMN', 'MKC', 'HPE', 'PKT', 'SNPS', 'CMS', 'CNC', 'NCL', 'JNJ', 'CO', 'ROST', 'ROL', 'K', 'REGN', 'KHC', 'PWR', 'DFS', 'PNR', 'DT E', 'CRL', 'ICE', 'FAST', 'LEN', 'DHR', 'DRI', 'KO', 'TXN', 'M', 'HOLX', 'SPGI', 'LH', 'INCY', 'ABT', 'ABMD', 'KLAC', 'ZBRA', 'WLTH', 'WY', 'UPS', 'AKAM', 'SWK', 'COB', 'ROK', 'TER', 'PH', 'PFE', 'BF.B', 'PEG', 'TTWO', 'HES', 'EIX', 'EMR', 'EOG', 'FB', 'APA', 'AON', 'FBHS', 'VZAC', 'GM', 'MCO', 'EMN', 'ZTS'] and are traded for 100 days.

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[[0.  0.  0.  ... 0.  0.1 0. ]
 [0.  0.  0.  ... 0.  0.1 0. ]
 [0.2 0.  0.1 ... 0.  0.  0. ]
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The trajectory normalization is : [1. 1.]

The SA solver ran for 333.3997542858124 s.

SA solver Sharpe ratio is -1.9787230913105445, and the profits are -12.293086528856362%



Why QBE?

- QBE can be tailored to value or growth investment strategy
- QBE advantage: optimization speed and state-of-the-art feature selection signals great market performance
- QBE will be the hot cake of the ETF market