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The Stability and Predictability of Betas: Evidence from the Kuala Lumpur Stock Exchange

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ABSTRAK

Beta mengukur risiko bersistem atau risiko tidakboleh di pelbagai sesuatu sekuriti. Para pelabur inginkan nilai beta yang stabil (yang boleh diramal) untuk membolehkan mereka menilai pulangan terjangka atas pelaburan mereka dengan tepat. Nilai beta yang tidak stabil akan menyebabkan nilai pulangan terjangka kurang tepat dan seterusnya tidak dapat menunjukkan prestasi sebenar sesuatu pelaburan. Kajian ini meniliti soal kestabilan dan kebolehramalan beta Fowler-Rorke (beta ini mengambilkira soal ketipisan dagangan kebanyakan saham-saham di Bursa Saham Kuala Lumpur) bagi 148 firma yang tersenarai di BSKL. Penemuan kajian ini menunjukkan bahawa beta saham individu dan portfolio adalah pegun mengikut masa. Seperti dijangka beta portfolio adalah lebih stabil dari beta saham individu dan cara pembentukan portfolio mempengaruhi kestabilan beta portfolio. Kestabilan beta portfolio tercapai dengan sekurang-kurangnya 15 saham atau lebih, tidak kira cara mana portfolio itu dibentuk. Secara keseluruhannya, penemuan ini mencadangkan bahawa tahap kebolehpercayaan terhadap beta saham individu dan portfolio yang dianggarkan di BSKL tidak boleh diperkecilkan (diendahkan) oleh para pelabur apabila membuat keputusan pemilihan portfolio dan pelaburan.

ABSTRACT

Beta measures the systematic or undiversifiable risk of a security. Investors desire stable (and hence predictable) measures of beta to enable them to accurately estimate the expected returns on their investment. Instable betas lead to inaccurate estimates of expected returns over time and hence provide misleading signals on performance of investments. This study examines the stability and predictability of the three leads/lags version of Fowler-Rorke betas (unlike OLS betas, these betas address the problem of thinness of trading peculiar to the KLSE) of 148 firms listed on the Kuala Lumpur Stock Exchange (KLSE). The findings suggest that the beta of both individual securities and portfolios are quite stationary over time. As expected the portfolio betas are relatively more stable than individual securities betas. Furthermore, the method of portfolio formation affects the relative portfolio beta stability. However, portfolio beta stability is achieved with 15 or more securities, irrespective of method of portfolio formation. Overall, the findings indicate that investors can reliably utilise estimated individual security and portfolio betas for their portfolio selection and investment decisions.

INTRODUCTION

Since the introduction of the systematic risk coefficient or beta in Capital Market Theory (Sharpe, 1964) as an important stastistic in estimating the returns on assets and consequently in the making of investment decisions, considerable effort has been expended on obtaining empirical estimates of betas (Wallace, 1980). It is generally accepted that the total risk of an asset consists of diversifiable and non-diversifiable portions. Diversifiable risk is attributed to factors which are specific to the asset and can be eliminated through diversification. Non-diversifiable risk is due to factors which influence all assets in the market and hence constitute the only relevant risk for each asset. Investment theory suggests that beta is the appropriate measure of risk for diversified portfolios (Jensen,1968) and the efficient market theory suggests that the amount of return above the risk-free rate an investment manager can expect depends solely upon beta or the sensitivity of the investment's return to the changes in market returns. Sharpe (1964) and Lintner (1965) developed the Capital Asset Pricing Model (CAPM) to explain the relevant risk and returns on assets in the market. The CAPM states that the risk premium for any asset is related to the risk premium of the market expressed in the following way:

$$E(R_i) = R_f + B_i(E(R_m) - R_f)$$

Where $E(R_i)$ is the expected return on asset i,
R_f is the risk-free rate,
B_i is the beta coefficient.

The importance of beta as a tool for making investment decisions has been increasingly recognised and some local brokerage firms regularly provide information on the beta coefficients of a large number of stocks listed on the Kuala Lumpur Stock Exchange. Institutional investors desire to have the best possible estimates of ongoing or possibly changing betas of competitive funds to develop investment strategies relative to expected performance of their portfolios and those of their competitors' in the market cycle ahead. These estimates will allow inferences to be made with respect to their competitors expected market outlook. For example, a gradually increasing fund beta would indicate a bullish outlook on the part of the competitor. A stable and predictable beta estimate will also enhance the validity of the beta-based investment performance ranking tools such as Treynor's (1965) and Jensen's (1968) performance measures. The portfolio manager's ability to select securities is reflected in the sum of returns above or below expectations as defined by beta. If beta values are not accurate measures of risk, they will provide misleading signals about the portfolio manager's performance.

The estimation of betas is important for understanding the risk-return relationship in a thinly traded market. The investment community desires an efficient market (at least in a semi-strong sense), as it will help to optimally allocate scarce resources (Fama 1970). To ascertain the efficiency of the market, the information-content or event-type of studies in finance and accounting rely on the ordinary least squares (OLS) beta to forcast returns. Excess returns based on the OLS beta estimates then form the basis for testing the capital market effects of various accounting information or signals. Under this approach, any fluctuation in beta is captured in the OLS residuals, a characteristic that adversely affects the efficiency estimates and the power of the tests. The stability of the beta is important in this case, and if the beta is not stable, then appropriate adjustments need to be made to the beta to enhance the power of conventional capital market tests of information content. The concern over the accuracy of beta is its non-stationarity beyond some acceptable level.

Though there is evidence that beta is a robust description of how investors analyse risk under conditions of uncertainty and how they expect their portfolios to perform under these conditions (Sharpe and Cooper, 1972), Fama and French (1992) observed that the positive relationship between OLS beta and the average returns on US stocks observed by Black, Jensen and Scholes (1972) and Fama and MacBeth (1973) does not seem to hold anymore, and the book-to-market value of equity is a better explanatory variable of the cross-section of average returns. However, the existing tests cannot conclusively indicate whether this anomaly results from a faulty single-index asset pricing model and/or a persistent mispricing of securities; hence market professionals and academics still use beta as a measure of market risk or market sensitivity. However, as long as securities continue to move in line with the broad market movements, portfolio managers must be concerned about the sensitivity of their portfolios to the general market, the stability of that relationship and the accuracy of the investment tools they utilise. The use of beta coefficients in security portfolio analysis and investments strategy selection will only be of value if betas are stable and thus predictable.

The OLS technique is usually used to estimate beta as the regression coefficient of a simple linear regression based on data of at least four to six years to ensure relative stability of the beta (Alexander and Chervany (1980)). However, the OLS beta for common stocks has been found to be unstable over time (Levy (1971), Sharpe and Cooper (1972)). The KLSE is a thinly-traded market and as such the beta in the market model is estimated with a serious bias leading to a non-synchronous trading problem (Ariff and Lim, 1989; Annuar and Shamsher, 1991). This problem arises when the market index at time t is based on stocks whose closing prices do not synchronise at t. Consequently, any estimate of return or systematic risk on a thinly-traded share is strictly not comparable with another thinly-traded share or with continuously traded shares. Scholes-Williams (1977), Dimson (1979) and Fowler-Rorke (1983) suggest corrections to the OLS beta estimate to mitigate this non-synchronous trading problem.

The objective of this study is to examine the stability and predictability of the three leads/lags version of Fowler-Rorke betas of firms listed on the Kuala Lumpur Stock Exchange (KLSE). The Fowler-Rorke betas are used as there is evidence (Ariff and Lim, 1989) that these betas efficiently mitigate the thinness of the trading problem more effectively with the three leads/lags version.

The rest of the paper is organised as follows: Section 2 describes the data and the distribution of betas while Section 3 discusses the stability of individual security betas. Section 4 presents the stability of portfolio betas and Section 5 evaluates the predictability of betas. Section 6 concludes the paper.

DATA AND DISTRIBUTION OF BETAS

This study covers the monthly returns of 148 ordinary stocks traded on the KLSE over the period from January 1975 to December 1989. The stability and predictability of the betas are studied over three 5-year periods: January 1975 to December 1979; January 1980 to December 1984; and January 1985 to December 1989, and two 7-year periods: January 1976 to December 1982 and January 1983 to December 1989. The Fowler-Rorke (FR) betas are estimated as suggested by Fowler-Rorke (1983)[1]. The equally-weighted index of all listed stocks (compiled by the authors) on KLSE is used as a proxy for market index. The profile of the FR beta coefficients of the sampled firms for the 5 and 7-year estimation intervals are summarised in Table 1.

For both the 5 and 7-year estimation intervals there were negative betas; the minimum beta for the former interval is –5.36 and for the latter interval –7.18. The mean of all betas is 1.00 for the 75/79 period with a standard deviation of 1.15, whereas the mean beta for the 76/82 period is 0.96 with a standard deviation of 1.10. To ascertain the distribution of betas, the sample was categorised into six risk classes according to their beta values in ascending order. The frequency distribution is summarised in Table 2.

For the 5-year estimation interval, less than 40 stocks (27%) for periods 1 and 2 and 72 stocks (48.6%) for period 3 had beta values of less than 0.3, whereas 26 stocks (17.5%) of periods 1 and 2 and one stock of the third period had beta values greater than 1.8. The number of stocks outside the beta range of 0.3 to 1.8 was small. A similar distribution of betas was observed for betas in the 7-year interval.

STABILITY OF SECURITIES BETAS

The stability of beta has received considerable attention in the literature of financial economics. Baesel (1974) provides evidence that the stability of beta is dependent upon the estimation period length. However, Theobald (1981) demonstrated that beta stability does not increase indefinitely with the estimation period length, thereby implying an optimal estimation period. This study examines the stability of beta estimates for individual stocks and portfolios on the KLSE over five-year and seven-year periods using the transition matrix and product moment correlation. If the betas are stable and hence predictable, then investors can assess the future riskiness of their investments from past riskiness. The correlation analysis measures the strength of co-movement of the two variables (betas in this case) as well as test of significance[2].

To test the stability of betas over different lengths of estimation period, the rates of return were first calculated for each stock and the market index. Then for the 15-year sample period (1975-1989), beta coefficients were calculated for the consecutive 5 years resulting in 3 betas per stock. Two betas per stock were calculated for two consecutive 7-year estimation intervals. The stocks were then ranked into different risk classes and the number of stocks that remained in the same risk class over the various estimation intervals were

[1]The procedures to estimate the Fowler-Rorke (FR) betas are explained in Ariff and Johnson [1990].

[2]The significance of correlation coefficient is evaluated using the F-statistics [Ramanathan, 1992 pp. 105-106].

TABLE 1
Profile of the estimated FR beta coefficients for the sampled firms

Period	Mean	Std. Dev.	Min. Value	Max. Value	Std. Error	Variance
			5-year Interval			
1/75 – 12/79	1.00	1.157	–5.357	4.351	0.095	1.339
1/80 – 12/84	0.482	0.746	–1.100	8.426	0.061	0.557
1/85 – 12/89	0.621	0.658	–2.080	3.716	0.054	0.433
			7-year Interval			
1/76 – 12/82	0.960	1.100	–7.180	3.499	0.090	1.210
1/83 – 12/89	0.436	0.787	–3.241	7.334	0.065	0.619

TABLE 2
Frequency distribution of betas

Risk Class	Beta Midpoint	Period 1 75/79		Period 2 80/84		Period 3 85/89	
		Frq.	Cum. Frq.	Frq.	Cum. Frq.	Frq.	Cum. Frq.
(Low Risk)							
1	0.2	40	40(27%)	40	40(27%)	72	72(48.65)
2	0.4	18	58(39.2%)	18	58(39.2%)	63	135(91.2%)
3	0.8	27	85(57.4%)	27	85(47.4%)	9	144(97.3%)
4	1.2	25	110(74.3%)	25	110(74.3%)	2	146(98.6%)
5	1.6	12	122(82.4%)	12	122(82.4%)	1	147(99.3%)
6	2.0	26	148(100%)	26	148(100%)	1	148(100%)
(High Risk)							

7-year Interval

Risk Class	Beta Midpoint	Period 1 76/82		Period 2 83/89	
		Frq.	Cum. Frq.	Frq.	Cum. Frq.
(Low Risk)					
1	0.2	29	29(19.56%)	38	38(25.67%)
2	0.4	35	64(43.24%)	32	70(47.29%)
3	0.8	31	95(64.14%)	28	98(66.21%)
4	1.2	21	116(78.37%)	27	125(84.45%)
5	1.6	18	134(90.54%)	13	138(93.24%)
6	2.0	14	148(100%)	10	148(100%)

estimated. Tables 3 and 4 summarise the findings for five and seven year estimation intervals respectively.

The findings in Table 3 show that, on average, more than 50 percent of the stocks in the risk class one and 29 percent in risk class two remained in the same risk class over the three periods, whereas 7 percent (periods 1 and 2), 19 percent (periods 1 and 3) and 56 percent (periods 2 and 3) of the stocks in risk class three remained in the same risk class over the three periods. In general, there is substantial stability over the 5-year estimation interval in the low risk class memberships of individual securities. Similar results were observed for betas in the 7-year estimation interval (Table 4).

TABLE 3
Stability of FR betas for individual securities (5 years)

Risk Class	Beta Midpoint	Period 1 and 2 75/79-80/84		Period 1 and 3 75/79-85/89		Period 2 and 3 80/84-85/89	
		Number and % in the same risk class	Total number of stocks	Number and % in the same risk class	Total number of stocks	Number and % in the same risk class	Total number of stocks
1	0.2	25(63%)	40	21(53%)	40	38(53%)	72
2	0.4	9(50%)	18	5(28%)	18	18(29%)	63
3	0.8	2(7%)	27	5(19%)	27	5(56%)	9
4	1.2	–	25	3(12%)	25	–	2
5	1.6	–	12	–	12	–	1
6	2.0	–	26	2(7%)	26	–	1

TABLE 4
Stability of FR betas for individual securities (7 years)

Risk Class	Beta Midpoint	Period 1 and 2 76/82-83/89	
		Number and % in the same risk class	Total number of stocks
1	0.2	19 (66%)	29
2	0.4	11 (31%)	35
3	0.8	3 (10%)	31
4	1.2	–	21
5	1.6	–	18
6	2.0	–	14

STABILITY OF PORTFOLIO BETAS

Seven portfolios were formed each consisting of 21 randomly selected stocks. Table 5 shows the risk-class membership of the seven portfolios for the various betas. The findings show that irrespective of the estimation interval, portfolios in a lower risk class were more stable than those in a higher risk class. The risk class membership of portfolios is more stable than individual securities, as securities moving to higher classes are offset by those moving to lower classes.

PREDICTABILITY OF BETAS

The reliability of beta coefficients as a tool for investment analysis is observed only if betas can be estimated with a certain degree of accuracy from historical values, and used as a reliable indicator for forecasting future beta values. The degree of association between past and future beta values is measured by product-moment and rank-order correlation coefficients[3]. The higher the association, the more reliable are the historical betas as estimates of future beta values. The product-moment and rank-order correlation analysis of the beta values of the sampled firms for the 5-year (Panel A) and 7-year (Panel B) estimation intervals are presented in Table 6. The results in Panel A indicate that there is significant rank-order and product-moment correlation between beta values for the three periods. Similar results were observed in Panel B. This implies that the beta coefficients of the 148 stocks could be predicted from those of the previous periods.

To ascertain the predictability of portfolio betas, the product-moment and rank-order correlation coefficients of beta values of 7 portfolios were observed. Each portfolio consists of 21 stocks randomly chosen in the first period (historical betas) with their corresponding values in the following period (future betas). The correlation coefficients are summarised in Table 7. The results show that

[3]For a discussion on product moment and rank order correlation, see Siegel [1956].

TABLE 5
Stability of beta portfolios

Risk Class	Beta Midpoint	Period 1 and 2: Number and% in the same risk class	Period 1 and 2: Total number of portfolios	Period 1 and 3: Number and % in the same risk class	Period 1 and 3: Total number of portfolios	Period 2 and 3: Number and % in the same risk class	Period 2 and 3: Total number of portfolios
		5-year estimation interval					
1	0.2	2 (50%)	4	2 (50%)	4	2 (67%)	3
2	0.4	2 (100%)	2	1 (100%)	1	1 (100)	1
3	0.8	–	1	1 (50%)	2	2 (67%)	3
		7-year estimation interval 76/82 - 83/89					
1	0.2	1 (100%)	1				
2	0.4	2 (50%)	4				
3	0.8	2 (100%)	2				

TABLE 6
Product-moment and Rank-Order Correlation of security betas
(Prob > R under Ho: ρ = 0, N = 148 individual securities)

	Rank-Order Correlation: Period 2 Beta	Rank-Order Correlation: Period 3 Beta	Product-Moment Correlation: Period 2 Beta	Product-Moment Correlation: Period 3 Beta
Panel A: 5-year estimation interval				
Period 1 Beta	0.395 (0.001)	0.450 (0.002)	0.342 (0.004)	0.406 (0.002)
Period 2 Beta	–	0.107 (0.031)	–	0.248 (0.023)
Panel B: 7-year estimation interval				
Period 1 Beta	0.353 (0.001)		0.204 (0.035)	

there is significant correlation between portfolio betas in the various periods. However, these portfolio betas had a lower degree of stability compared to betas of individual securities. These findings are inconsistent with those of Blume (1971) and Levy (1971) whose data were based on developed markets.

This inconsistency could be due to the use of Fowler-Rorke betas adjusted for thinness of trading in this study instead of Ordinary Least

TABLE 7
Product-Moment and Rank-Order Correlation of Portfolio Betas
(Prob > R under Ho: ≤ = 0, N = 7 portfolios)

Panel A: 5-year estimation interval				
	Rank-Order Correlation		Product-Moment Correlation	
	Period 2 Beta	Period 3 Beta	Period 2 Beta	Period 3 Beta
Period 1 Beta	0.286 (0.001)	0.357 (0.001)	0.084 (0.072)	0.096 (0.068)
Period 2 Beta		0.035 (0.261)		0.359 (0.011)
Panel B: 7-year estimation interval				
	Period 2 Beta		Period 2 Beta	
Period 1 Beta	0.081 (0.069)		0.178 (0.05)	

Squares (OLS) betas, as the OLS portfolio betas (not shown in the text) showed a higher degree of stability than those of individual securities. This is to be expected since portfolio betas encountered less serious non-synchronous trading problems (Annuar and Shamsher, 1991).

Porter and Ezzell (1975) and Alexander and Chervang (1980) provide evidence that the method of portfolio formation and level of diversification affect the stability of portfolio betas. In view of this evidence, portfolios consisting of 5, 10, 15 and 20 stocks were formed both randomly and by a ranking procedure based on securities beta coefficients over the five and seven-year estimation intervals. For the ranked portfolio formation, individual stocks were ranked in ascending order of their beta coefficients, and sequentially n number of portfolios were formed. The portfolio beta coefficients were calculated as the average of the betas of stocks in the portfolios. After determining the portfolio's beta coefficients for the succeeding 5 and 7-year periods, the product-moment correlation, rank-order correlation and mean absolute deviations were computed.

Table 8 presents the descriptive summary of the 5 year (Panel A) and 7 year (Panel B) sets of portfolio betas. The findings show that the standard deviation (SD) of the randomly formed portfolio beta coefficients in Panel A and Panel B decrease in value as the number of securities in the portfolio increases. A similar observation for the ranked portfolios is not as apparent. The decrease in SD is most noticeable when the portfolio size increases to 15 securities in Panel A and 10 securities in Panel B with relatively little improvement thereafter. These findings imply that the beta stability of random portfolios increases with the increase in the number of securities, although the rate of increase decreases after 15 (10) securities for the 5 (7) year estmation intervals. This shows that shorter term portfolio betas are more stationary with a larger number of securities in the portfolio.

Table 9 presents the correlation and mean absolute deviation values of portfolio betas from alternative measures of portfolio formation for the three 5-year periods (Panel A) and the two 7-year periods (Panel B). The findings in Panel A and B show that both the rank-order (RO) and product-moment (PM) correlations increase as the portfolio size is increased for the ranked portfolios, suggesting greater beta stability for more diversified portfolios. The alternative measure of beta stability, mean absolute deviation, suggests a decrease in value as the size of portfolios is increased for both the ranked and random portfolios, consistent with the findings in developed markets (Porter and Ezzel 1975, and Blume 1975).

TABLE 8
Descriptive summary of beta coefficients
Panel A: 5-year interval

Estimation interval	Number of securities	Number of portfolios	Random portfolios Mean	Random portfolios SD	Ranked portfolios Mean	Ranked portfolios SD
1975-1979	5	29	0.973	0.311	1.102	0.743
	10	14	0.874	0.232	1.071	0.700
	15	9	1.128	0.200	1.115	0.679
	20	7	1.153	0.192	1.071	0.713
1980-1984	5	29	0.530	0.338	0.491	0.326
	10	14	0.387	0.114	0.500	0.213
	15	9	0.444	0.089	0.493	0.166
	20	7	0.495	0.166	0.500	0.164
1985-1989	5	29	0.429	0.281	0.632	0.297
	10	14	0.825	0.186	0.642	0.234
	15	9	0.500	0.163	0.613	0.217
	20	7	0.647	0.129	0.641	0.216
Panel B: 7-year estimation interval						
1976-1982	5	29	0.902	0.311	1.105	0.743
	10	14	0.758	0.232	1.071	0.701
	15	9	0.914	0.211	1.115	0.679
	20	7	0.036	0.201	1.071	0.715
1983-1989	5	29	0.454	0.287	0.441	0.367
	10	14	0.536	0.164	0.413	0.237
	15	9	0.257	0.153	0.427	0.218
	20	7	0.465	0.132	0.423	0.135

TABLE 9
Stability of portfolio betas

Panel A: 5-year estimation interval

Estimation interval	portfolio formation method	number of securities in portfolio	correlation RO	correlation PM	mean absolute deviation
1975/1979 to 1980/1984	Ranked	5	0.193	0.000	0.917
		10	0.129	0.032	0.889
		15	0.317	0.057	0.874
		20	0.393	0.067	0.829
	Random	5	0.454	0.238	0.564
		10	0.604	0.629	0.487
		15	0.251	0.417	0.683
		20	0.287	0.084	0.458

Table 9 (*continued*)

1975/1979 to 1985/1989	Ranked	5	0.415	0.384	0.769
		10	0.490	0.491	0.786
		15	0.667	0.778	0.753
		20	0.643	0.526	0.669
	Random	5	0.549	0.525	0.575
		10	0.112	0.192	0.274
		15	0.783	0.813	0.629
		20	0.357	0.096	0.406
1980/1984 to 1985/1989	Ranked	5	0.631	0.461	0.292
		10	0.719	0.586	0.278
		15	0.817	0.764	0.244
		20	0.893	0.800	0.235
	Random	5	0.127	0.189	0.303
		10	0.068	0.181	0.439
		15	0.183	0.264	0.161
		20	0.036	0.359	0.257
Panel B: 7-year estimation interval					
1976/1982 to 1983/1989	Ranked	5	0.267	0.049	0.790
		10	0.490	0.364	0.720
		15	0.450	0.299	0.731
		20	0.643	0.684	0.662
	Random	5	0.589	0.233	0.511
		10	0.442	0.308	0.269
		15	0.300	0.096	0.657
		20	0.081	0.178	0.501

CONCLUSION

For a sample of 148 securities traded on the Kuala Lumpur Stock Exchange (KLSE), the findings of this study indicate that the beta coefficients as a measure of systematic risk are relatively stationary over time. For example, there is stability of beta coefficients over the 5 and 7 year estimation periods in the low risk class membership of individual securities. The risk class membership of portfolios is relatively more stable than individual securities when this measure of stability is applied.

When standard deviation of beta coefficients is used as a measure of stability the results show that the beta stability of randomly formed portfolios increases with increase in the number of securities, although the rates of increase decrease after 15 securities for 5-year betas and 10 securities for the 7-year betas.

Using alternative measures of beta stability such as product-moment and rank order correlations the results indicate that beta coefficients of ranked portfolios are relatively more stable and are related to the number of securities in the portfolio and the converse is true for randomly selected portfolios. On average, there is substantial stability between betas of individual securities for the three 5-year and two 7-year periods. However, there is a lower degree of stability for portfolio betas. The use of correlation coefficient as a measure of beta stability masks the possibility of decrease in the magnitude of intertemporal changes in portfolio beta coefficients as the number of securities in the portfolio increases, regardless of the method of portfolio formation.

Therefore, the mean absolute deviation statistic can be used to measure time stability of beta coefficients. The results show that time stability of portfolio beta coefficients are directly related to the number of securities in the portfolio and are significantly stable for portfolios of 15 or more securities, irrespective of the method of portfolio formation.

Overall, the results indicate that the individual securities and portfolio betas are relatively stable and can be reliably used for portfolio selection and investment decisions.

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