M.M.WARBURG & CO
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ECONOMIC SITUATION AND STRATEGY

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What role does chance play in successful portfolio management?

We start today's *Economic Situation and Strategy* with a somewhat provocative thought experiment. Let us assume that on the capital markets everything depended only on chance and there were 1,000 portfolio managers in the world. After a year, one would expect about 500 of the portfolio managers would have beaten the market. After two years, there would still be about 250 portfolio managers that had successively beaten the market, while only 125 would be ahead of the game after three years. After five years, the number of apparently "eternally" successful portfolio managers would still stand at about 30. By this time, if not sooner, these portfolio managers would enjoy the status of nearly infallible gurus in the media and with investors, since they had managed to beat the broad market repeatedly five years in a row. However, what looks like a minor miracle was in fact nothing but chance. But does this thought experiment actually describe reality? How much of asset managers' performance is due to chance?

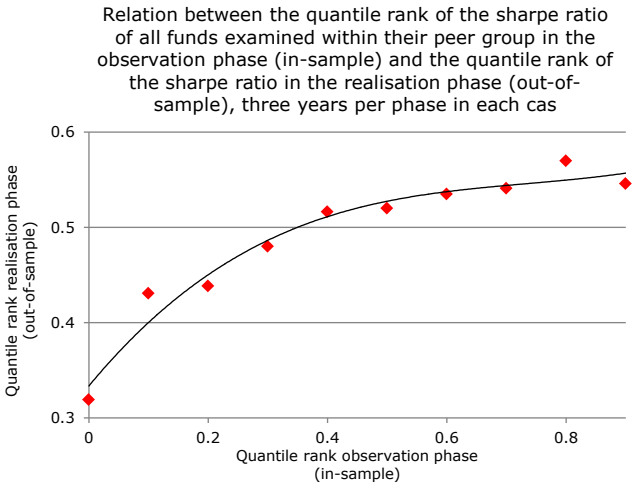
In the end, it will never be possible to answer this question satisfactorily. That markets are comparatively efficient and hence price in new information almost in real time speaks in favor of chance. That makes it extremely difficult to beat the market systematically such that the chance element does not play a non-discountable role in explaining performance. But can we at least heuristically determine what shares chance and skill have in explaining performance?

To answer this empirically, we have devised a kind of experimental setup. The basic idea is that if a fund or asset manager's performance does not depend solely on chance but also on above-average skill, the historical performance of portfolio managers must have a certain degree of influence on future performance. However, if there should be no connection at all, that would be a strong indication of chance-driven performance.

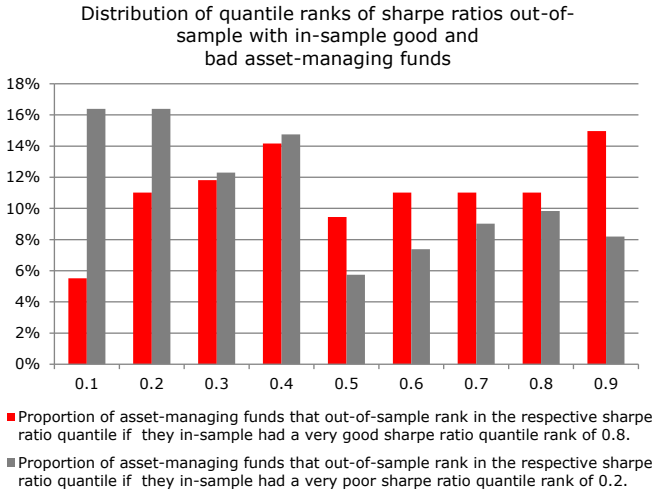
To approach the question empirically, we have analyzed the development of fund data for a relatively large number of Morningstar peer groups. Our question was to what extent a historical Sharpe ratio (as parameter for risk-adjusted performance) can explain a future Sharpe ratio. However, since broad market development also influences a fund's Sharpe ratio at a given time, we have not tested the persistence of Sharpe ratios, strictly speaking, but rather the persistence of quantile scores of Sharpe ratios of funds in their respective peer group. We have thus analyzed how well or poorly a fund has done relative to its peer group as a function of how well or poorly it had performed before compared with its peer group. We have chosen in each case historical periods of over three years as the "test phase" for determining the quantile score of the Sharpe ratio (in-sample analysis) and then compared these results with the respective quantile scores of the Sharpe ratios for the subsequent three years (out-of-sample analysis). We have performed these calculations for European stock funds, US stock funds, global stock funds, global asset management funds, and global corporate bond funds, so the data basis consists of many thousands of time series and the parameters connected with them.

What we find is an undeniable connection between historical and future performance. That rules out pure chance in the results, which incidentally shows that active asset managers should be chosen partly based on

their historical achievements. A clear pattern emerges. Funds that have historically exhibited good (relative, risk-adjusted) performance also tend to show slightly above-average subsequent performance. But one should be cautious about funds that have done especially poorly historically, since they are very likely to perform below average in the future as well.



We can explain the results using the chart above to illustrate. The funds that have historically achieved especially poor quantile scores between 0 and 0.2 within their respective peer group also exhibit only significantly below-average risk-adjusted performance in the phase thereafter. This is reflected in the low quantile scores subsequently observed on average in a range between 0.3 and 0.45. Concretely, this means that the previously "bad" funds also perform so poorly (relatively and risk-adjusted) following this observation that between 65% and 55% of all funds in the respective peer group will do better. But we should clearly note here that historically good (poor) performance is never a guarantee of good (poor) future performance. What seems clear on average may turn out completely different in individual cases. That is also reflected in another important key statistic that describes the quality of the connection between the two datasets. That is the coefficient of determination, which describes what part of the distribution of one parameter (in this case, the quantile scores of the Sharpe ratios in the out-of-sample phase) can be explained by the other parameter (the quantile scores in the in-sample phase). Depending on the peer group studied, the determination coefficients range between 2% and 10%. Those are comparatively low values, which again statistically confirm how noisy the results are. But the determination coefficients are again so high that they definitely rule out the pure chance hypothesis. For those less versed in statistics, we may also describe how extensively the results are distributed by reference to a chart. Here, we depict the distribution of the quantile scores in the subsequent three years for the funds that have done well (with a quantile score of 0.8) or poorly (with a quantile score of 0.2) in the observation phase. We see, for example, that the probability of the originally good asset management funds' doing extremely poorly in the subsequent years is 5%, and that of their doing extremely well only 15%.



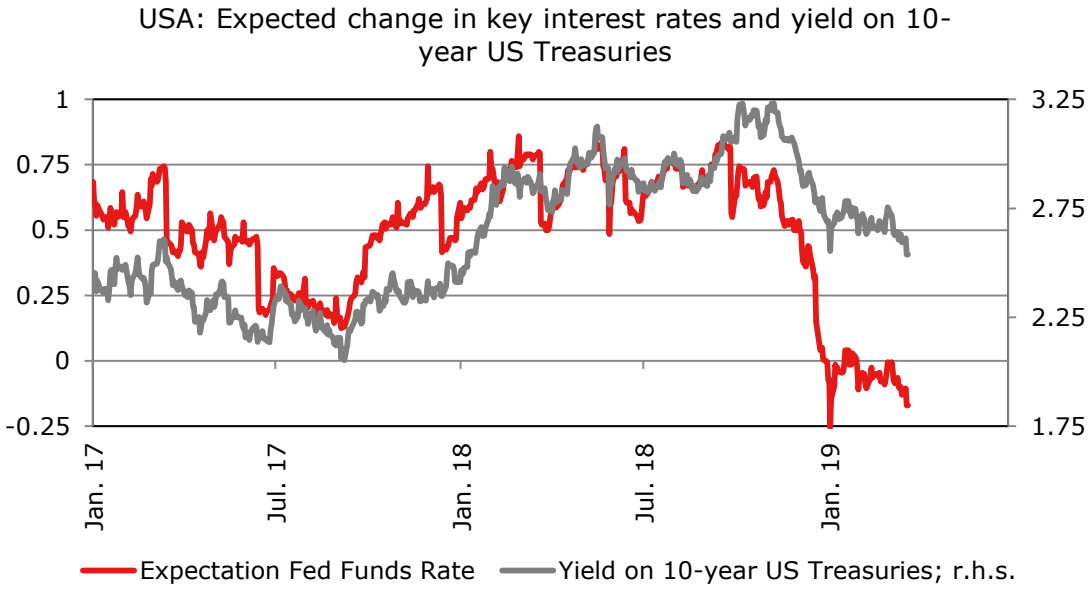
In conclusion, these insights suggest that good results in asset management are not achieved by chance in the long term, but short-term disturbances are normal and one should not read too much into them. The longer the observation period is, the more clearly skill should eclipse chance. As in real life, patience is also sometimes the most important attribute in asset management.

Weekly Outlook for March 25-29, 2019

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Release
DE: Ifo business climate index	102.2	101.1	99.3	98.5	98.7		March 25
DE: Ifo business expectations	98.7	97.3	94.3	93.8	94.0		March 25
DE: Ifo current conditions	105.8	105	104.5	103.4	103.6		March 25
DE: GfK consumer climate	10.6	10.4	10.5	10.8	10.8	10.9	March 26
DE: Inflation rate, m/m – flash	-0.7%	0.0%	-0.8%	0.4%	0.2%		March 28
DE: Inflation rate, y/y – flash	2.1%	1.6%	1.4%	1.5%	1.1%		March 28
DE: Import prices, m/m	-1.0%	-1.3%	-0.2%	0.2%			March 29
DE: Retail sales, m/m	1.6%	-4.3%	3.3%	0.4%			March 29
DE: Unemployed, change in 000s	-16	-15	-4	-21	-14		March 29
DE: Unemployment rate	5.0%	5.0%	5.0%	5.0%	4.9%		March 29
EUR19: M3 money supply, y/y	3.7%	4.1%	3.8%	3.9%			March 28
EUR19: Business climate	1.04	0.86	0.69	0.69	0.71		March 28
EUR19: Economic confidence	109.5	107.4	106.3	106.1	106.3		March 28
EUR19: Consumer confidence – final	-6.6	-8.3	-7.9	-7.4	-7.3		March 28
EUR19: Industrial confidence	4.4	2.3	0.6	-0.4	-0.1		March 28

MMWB estimates in red

Chart of the Week: Fed slams on the brakes, inverse yield curve nearer



The US central bank has put on the monetary policy brakes in a very short time. Just last December, the Fed raised its policy interest rate by 25 basis points and said it would take at least two more rate steps this year. However, market participants did not give that announcement much credence even then in view of weaker economic data and the stock market sell-off. Now, the Fed is following market expectations. The majority of FOMC members now foresee a pause in raising interest rates this year and at most one increase in 2020. On the other hand, the markets are again already a step ahead. They believe it is highly probable that the next interest rate move will not be an increase, but rather a decrease. That is positive news for emerging market countries, which benefit from falling US interest rates and a weaker US dollar. Further capital inflows into those regions are therefore likely. The news is not so good for the United States, though, since it will probably not be much longer until the yield curve between 10 years and 3 months becomes inverse. In the past, that has been a very accurate indication of an imminent recession.

Market Data Overview

Stock marktes	As of 25.03.2019 10:09	Change versus 18.03.2019 -1 week	22.02.2019 -1 month	21.12.2018 -3 months	22.03.2018 -1 year	31.12.2018 YTD
Dow Jones	25502	-1.6%	-2.0%	13.6%	6.4%	9.3%
S&P 500	2801	-1.1%	0.3%	15.9%	5.9%	11.7%
Nasdaq	7643	-0.9%	1.5%	20.7%	6.6%	15.2%
DAX	11372	-2.4%	-0.8%	6.9%	-6.0%	7.7%
MDAX	24605	-2.4%	1.0%	13.9%	-3.1%	14.0%
TecDAX	2633	-1.1%	0.7%	8.3%	2.0%	7.5%
EuroStoxx 50	3288	-3.0%	0.5%	9.6%	-1.8%	9.5%
Stoxx 50	3059	-2.0%	1.3%	10.9%	3.9%	10.8%
SMI (Swiss Market Index)	9264	-2.5%	-0.9%	10.1%	7.2%	9.9%
Nikkei 225	20977	-2.8%	-2.1%	4.0%	-2.8%	4.8%
Brasilien BOVESPA	93735	-6.3%	-4.2%	9.4%	10.6%	6.7%
Russland RTS	1220	0.5%	1.8%	13.2%	-3.1%	14.4%
Indien BSE 30	37708	-1.0%	5.1%	5.5%	14.2%	4.5%
China Shanghai Composite	3043	-1.7%	8.5%	20.9%	-6.8%	22.0%
MSCI Welt (in €)	2095	-0.8%	0.4%	15.1%	10.0%	12.5%
MSCI Emerging Markets (in €)	1060	-0.6%	0.2%	11.6%	-3.6%	11.0%
Bond markets						
Bund-Future	165.74	147	-88	238	678	220
Bobl-Future	132.76	33	-39	40	174	24
Schatz-Future	111.89	6	0	-1	-7	-5
3 Monats Euribor	-0.31	0	0	0	2	0
3M Euribor Future, Dec 2017	-0.29	-1	-3	-6	-33	0
3 Monats $ Libor	2.61	-2	-4	-21	32	-20
Fed Funds Future, Dec 2017	2.22	-11	-15	-31	-30	0
10 year US Treasuries	2.47	-14	-19	-33	-37	-22
10 year Bunds	0.00	-8	-10	-25	-53	-25
10 year JGB	-0.08	-5	-4	-12	-10	-8
10 year Swiss Government	-0.42	-2	-7	-19	-40	-18
US Treas 10Y Performance	597.16	1.3%	2.0%	4.2%	6.2%	2.8%
Bund 10Y Performance	647.37	1.0%	1.2%	3.3%	7.0%	3.2%
REX Performance Index	491.14	0.3%	0.3%	0.8%	2.3%	0.7%
US mortgage rate	0.00	0	0	0	0	0
IBOXX AA, €	0.49	-8	-13	-39	-27	-39
IBOXX BBB, €	1.49	-5	-23	-57	10	-57
ML US High Yield	6.75	-3	-11	-128	15	-126
JPM EMBI+, Index	837	0.2%	1.0%	5.9%	2.9%	5.7%
Convertible Bonds, Exane 25	7157	0.0%	1.2%	4.0%	-1.8%	3.8%
Commodities						
CRB Spot Index	424.35	1.0%	2.3%	3.1%	-3.4%	3.7%
MG Base Metal Index	316.01	-0.4%	-0.3%	5.8%	-7.9%	7.2%
Crude oil Brent	66.74	-1.0%	-0.8%	23.2%	-3.6%	25.6%
Gold	1316.83	0.9%	-1.0%	4.5%	-0.8%	2.8%
Silver	15.42	0.4%	-3.3%	5.1%	-6.0%	-0.6%
Aluminium	1876.75	-1.2%	-0.7%	-1.6%	-8.6%	0.8%
Copper	6314.50	-2.2%	-3.1%	5.8%	-5.1%	6.1%
Iron ore	85.89	-0.5%	-2.6%	24.5%	21.0%	24.1%
Freight rates Baltic Dry Index	690	-4.3%	8.8%	-46.1%	-38.2%	-45.7%
Currencies						
EUR/ USD	1.1317	-0.3%	-0.1%	-0.8%	-8.1%	-1.2%
EUR/ GBP	0.8566	-0.1%	-1.4%	-4.9%	-1.9%	-4.6%
EUR/ JPY	124.71	-1.4%	-0.7%	-1.8%	-3.9%	-0.9%
EUR/ CHF	1.1248	-1.0%	-0.9%	-0.6%	-3.6%	-0.2%
USD/ CNY	6.7082	-0.1%	-0.1%	-2.9%	5.9%	-2.4%
USD/ JPY	109.93	-1.3%	-0.7%	-1.2%	4.4%	0.3%
USD/ GBP	0.76	0.1%	-1.1%	-4.0%	6.7%	-3.6%

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