

Risk Measurement in Wealth Management

VALUE AT RISK AS THE STANDARD FOR RISK MEASUREMENT

For an adequate assessment of an investment's success it is vital to take the underlying risk in addition to the performance into account.

Risk measurement according to the Value at Risk (VaR) method has established itself as the standard in the financial sector. VaR is the possible loss that, with a pre-defined probability (confidence level), is not going to be exceeded within a given holding period (horizon). In other words, VaR quantifies an amount of money or a loss. For instance, a VaR of -1,000 at a confidence level of 95% and a holding period of one day means that a daily loss exceeding 1,000 only occurs on average on 12.5 days (5% of 250 days) within a time horizon of 250 days.

For determining the prognostic quantity of VaR, backtesting retrospectively verifies how frequently the predicted level of loss was exceeded. If too many breaches are detected, the model parameters are subsequently adjusted.

VaR in e-AMIS. Different analytical and simulation methods are applied to calculate the VaR. Both the variance-covariance approach according to the delta-normal method (hereinafter referred to as 'delta method') and historical simulation are available in e-AMIS.

Delta Method. The delta method assumes that the portfolio value responds linearly to risk factor changes and is therefore suitable for the risk calculation of portfolios with symmetric financial instruments. In comparison to other risk measurement methods, the delta method has the significant advantage of being able to deliver a particularly quick and easy risk assessment. The drawback is that this model is based on a number of assumptions that do not, in reality, necessarily materialise. The theory of normally distributed returns is one of the assumptions that typically draws the most criticism.

Historical Simulation. Historical simulation disregards analytical examination of the risk factors and makes no distributional assumptions. It is based on simulated scenarios derived from actual historical market fluctuations. The challenge is to define an optimal time frame: if the selected period in history is too brief, the statistical error of estimation increases. If the chosen period is too long, the relevance of older observations for the current risk measurement becomes questionable.

Risk Figure Calculation in e-AMIS. The risk figure calculation can be broken down into the following three sub-processes: parameter estimation, risk measurement and risk presentation.

1. Parameter estimation is required for the calculation of risk ratios in which the applied risk measurement process is based on a particular distribution assumption, usually the assumption of normally distributed log returns. These parameters are generally derived from historical time series data. This process comprises the following sub-steps:

- Elimination of price effects on raw data, particularly those resulting from corporate actions (e.g. dividend payments and splits)
- Imputation of missing price data or mapping to suitable benchmarks
- Calculation of yield curves, log returns and distribution parameters

2. When calculating risks, the results of the parameter estimation are used to either calculate the delta vector or the scenario values, depending on the selected risk measurement process.

3. The results are displayed via the user interface and/or as a report. The risk figures can be presented to the desired granularity based on the results of the preceding two sub-processes.

Variable System Parameters. The risk figures to be calculated can be flexibly customised using parameters. A distinction is made between general parameters required for parameter estimation and parameters specific to key figures. The system parameters imputation procedure, volatility estimation and sample sizing are adjustable for the parameter estimation.

Parameters specific to key figures can be defined when calling a report or ad-hoc in the e-AMIS view 'VAR'. They include:

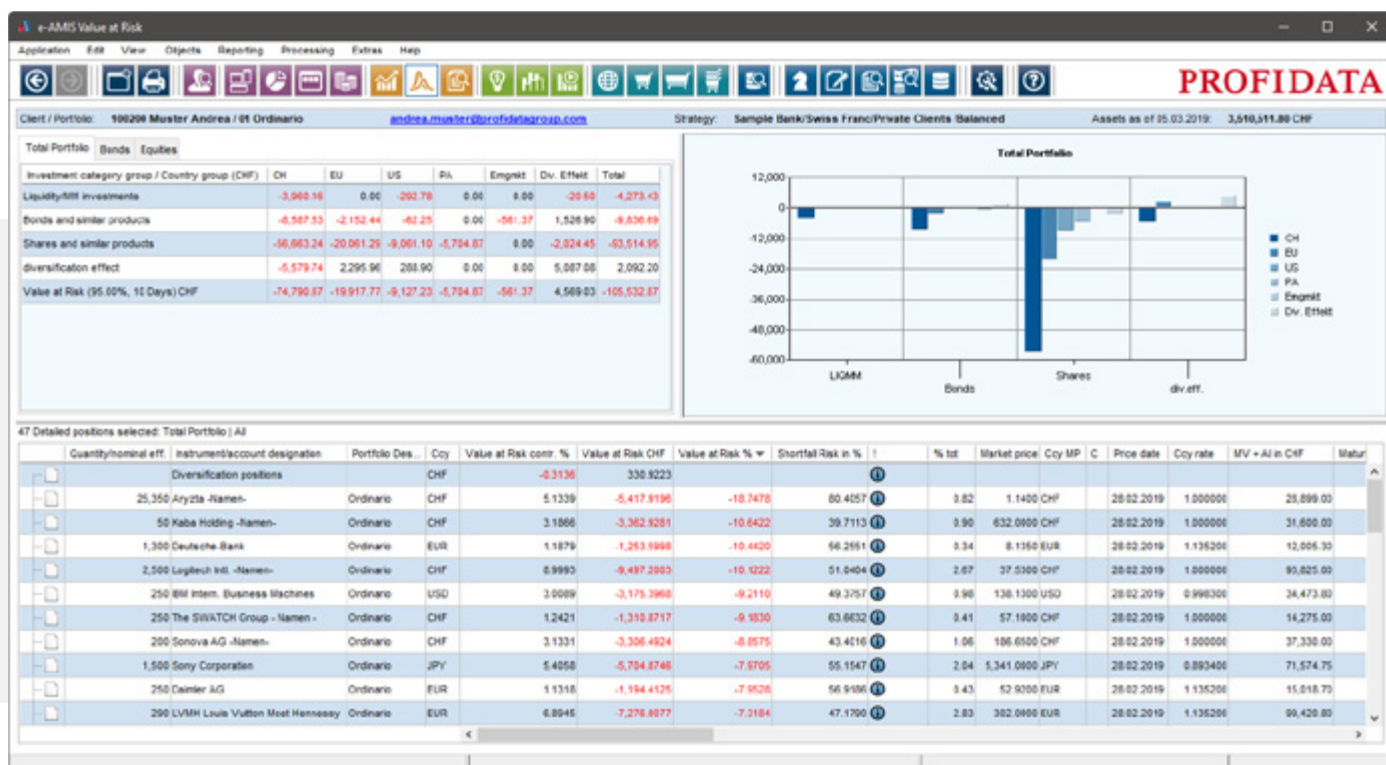
- Risk measurement procedure: delta method or historical simulation
- Number of simulation runs for the historical simulation
- Horizon
- Confidence level (VaR) or target performance (shortfall risk)

Consequently, the user can switch quickly between the two risk measurement procedures and is thus able to immediately analyse and compare the effects that changes to horizon, confidence level or number of simulation runs have on the risk figures.

Risk Presentation via the User Interface (Fig. 1) and Reporting (Fig. 2). The 'VaR' and 'shortfall risk' ratios are calculated at individual position, sector and portfolio (single and consolidated portfolio) level, whereby a sector is understood to be a grouped position quantity determined by instrument criteria such as asset class and group of asset classes, country and group of countries, currency and group of currencies, or sector and group of sectors. Whilst the risk aggregation is determined by covariances in the delta method, different procedures are applied for historical simulation. The portfolio approach, also adopted by e-AMIS, has become generally accepted.

Fig. 1 : Risk Presentation via the User Interface

Taking different risk factors into account, a revaluation of the entire portfolio with the individual risk factor is performed on a date in the past rather than linking the worst value



for a given probability to the worst value of another risk factor. The individual calculation steps can be traced due to user-friendly logging.

The VaR is either expressed as an absolute value (loss in reporting currency) or a relative value (% of the market value or % of the full portfolio VaR). The key figures can be displayed in both, tabular and graphic form. Risk bearing sectors in particular can be determined quickly in the graphic form. It is also immediately evident to the user in which sector the highest risk reduction through diversification can be expected.

VaR and shortfall risk can be summarised or set out in detail. The summary is restricted to the VaR and/or shortfall risk of the full portfolio thus showing, under the defined conditions, the potential maximum loss and/or the probability of a particular target performance being missing for the portfolio. The risk key figures are displayed per position in the detailed format. The view is also supplemented by the worst-case performance, thus enabling the identification of the highest possible loss.

Backtesting as a Quality Assurance. Frequent backtesting is required in order to verify the forecasting quality of the applied risk model. Both standard methods (clean and dirty) for backtesting can be applied in e-AMIS: clean backtesting involves the comparison of portfolio profits or losses of unchanged portfolio holdings over the relevant holding period with the calculated VaR. Dirty backtesting compares real profits or losses of a portfolio based on possibly modified portfolio holdings with the calculated VaR.

Like VaR calculation, backtesting can be performed at individual position, sector and portfolio level (single and consolidated portfolio). Both backtesting period and parameters specific to key figures can be modified ad hoc and the corresponding results can be checked immediately. A graphical analysis displays the actual profits and losses as bars and the projected VaR values as mirrored lines. Points where VaR has been breached are represented by the intersections of bars and lines (**Fig. 3**).

Value at Risk as of 31.12.2018

Ccy	Number / Nominal Balance (pending)	Designation ISIN / Instrument Account / Safeguarding account	Market value inc. Accrued interest	Share in % of the net a.	Implicit (in-ante) Volatility	Absolute VaR 95.00% 1 day	Absolute VaR 95.00% 10 days	Relative VaR 95.00% 1 day	Relative VaR 95.00% 10 days	worst case perf. 1 day	worst case perf. 10 days
Shares and similar products Swiss Franc											
CHF	500	Salice-Holding Namens-Akt, CH032429517 / 1240251	66,645.93	6.63%	2.09%	-491.58	-1,545.29	-0.74%	-2.32%	-3.20%	-3.71%
CHF	700	Nestle Namens (akt Split per 1:07:00) CH0325583352 / 3538335	49,637.89	4.93%	2.28%	-405.80	-1,783.90	-1.22%	-3.59%	-2.51%	-5.87%
Total Shares and similar products Swiss Franc											
			116,283.82	11.68%	1.84%	-897.38	-3,329.19	-0.74%	-2.62%	-2.10%	-3.77%
Shares and similar products Euro block											
EUR	1,500	Total First SEF PRO000120271 / 124773	69,270.00	6.96%	2.91%	-1,183.87	-3,629.76	-1.71%	-5.24%	-3.25%	-7.98%
EUR	300	L'Oréal Paris PRO000120321 / 502305	60,360.00	6.06%	2.92%	-986.26	-2,989.83	-1.63%	-4.95%	-4.20%	-11.67%
EUR	5,000	Orange SA (ex France Telecom) PRO000133508 / 720120	70,775.00	7.11%	2.22%	-889.24	-2,829.14	-1.23%	-4.00%	-2.74%	-6.20%
Total Shares and similar products Euro block											
			200,405.00	20.13%	2.19%	-2,199.37	-8,548.73	-1.69%	-4.73%	-2.50%	-5.91%
Shares and similar products GBP and remaining Europe											
GBP	24,000	BAE Systems (ex British Aerospace) GB0002814946 / 174077	322,952.35	32.31%	3.31%	-2,172.26	-10,332.56	-1.77%	-6.43%	-5.68%	-13.78%
Total Shares and similar products GBP and remaining Europe											
			122,332.35	12.31%	3.31%	-2,172.26	-10,332.56	-1.77%	-6.43%	-5.68%	-13.78%

Fig. 2: Risk Presentation via Reporting

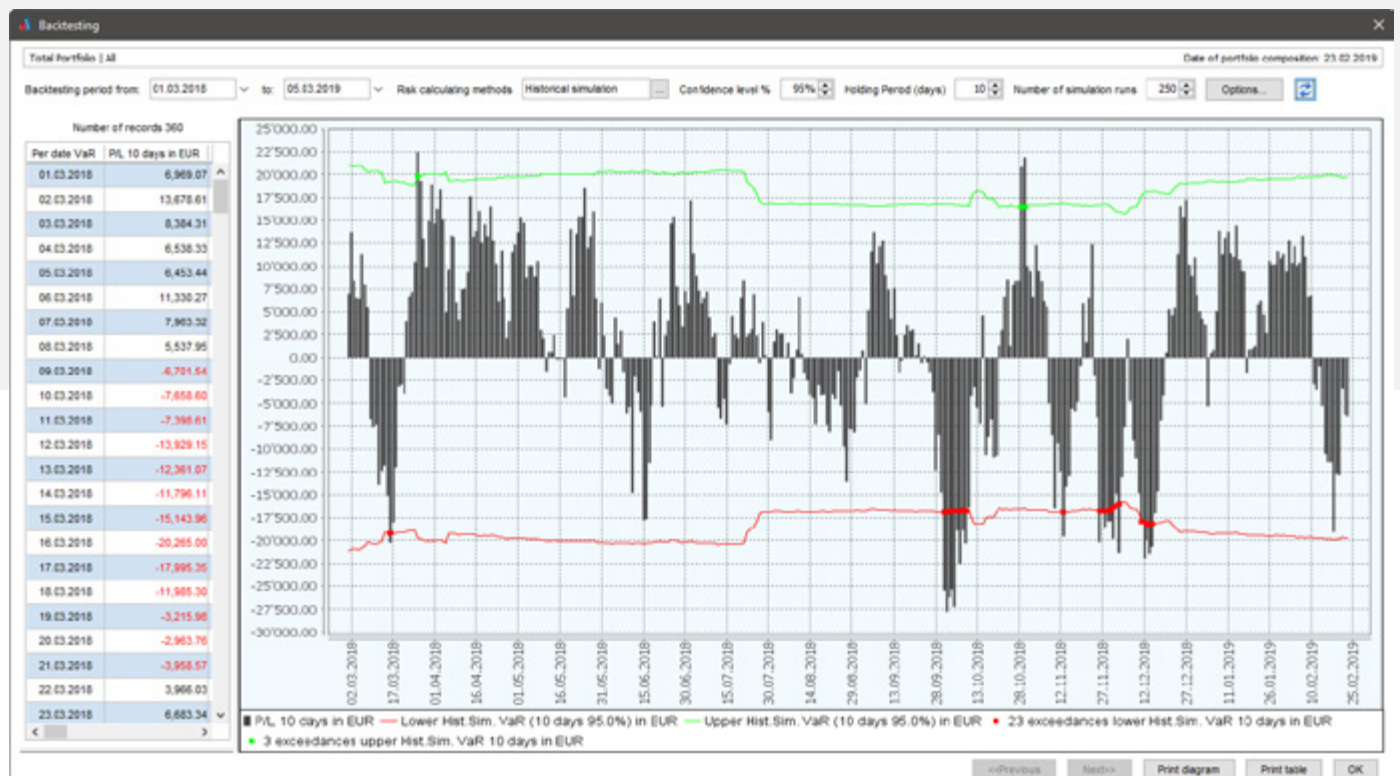


Fig. 3: Backtesting

CONCLUSION

With the VaR and shortfall risk figures, the e-AMIS Risk module offers two risk ratios that provide a realistic presentation of the investors' risk perception insofar that only the unfavourable deviations from a reference value are classified as risk. Both key figures are intuitive and easy to use and complement the reporting, not only for institutional but also increasingly for private investors.

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