

COVID-19 Effects on Risk Minimising Portfolio of Transportation and Logistics Assets

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Introduction

The global COVID-19 pandemic has significantly impacted Malaysia's stock market in almost every sector. Transportation and logistics assets are some of the major industries that have been affected by the outbreak. This study considers portfolios of investment that contain transportation and logistics assets in Malaysia, where the aim is to minimise the risk of these portfolios by using the mean-CVaR optimisation model (see [1] for model construction). We also compare the risk behaviours of these portfolios in two different time frames: 1. Before- and 2. During the COVID-19 outbreak with conditional value at risk (CVaR) as a risk measure. Thus, we implement mean-CVaR_{0.05} on the transportation and logistics assets for: (a) before COVID-19 (B-portfolios); and (b) during COVID-19 (D-portfolios).

The randomness of return distributions for each asset is obtained by simulating the monthly scenario returns of 18 transportation and logistics companies listed in Bursa Malaysia from January 2009 until December 2020. Ten optimal (in-sample) portfolios are obtained by minimising the risk using the mean-CVaR optimisation model with three target returns of 0.1%, 0.5%, and 1%, representing low, medium, and high returns, respectively. The risk behaviours of these portfolios are validated by using the out-of-samples analysis.

Results

The in-sample portfolio optimisation shows the following two essential findings:

1. The mean-CVaR optimisation model minimises the risk (in terms of both standard deviation and CVaR) for low and medium target returns. Table 1 shows the results for the first three in-sample portfolios. It can be seen that the standard deviations for both B-portfolios and D-portfolios (for low (0.1%) and medium (0.05%) targets) are maintained below the (Bursa Malaysia Top 30) index benchmark of 3.5%. Likewise, the CVaR_{0.05} levels for the same cases also show lower values than the index CVaR_{0.05} of 6.5%. The risk levels are higher than the index benchmarks for a high target return (of 1%), consistent with the nature of the risk-return trade-off in finance.

Table 1: The risk level in terms of standard deviation and CVaR_{0.05} for the first three in-sample portfolios.

In-sample	Target return	Standard deviation		CVaR 5%	
		B	D	B	D
1	0.10%	2.65%	2.87%	3.83%	4.42%
	0.50%	3.09%	3.28%	4.66%	5.43%
	1%	4.41%	7.50%	6.64%	11.30%
2	0.10%	2.57%	2.98%	3.89%	4.41%
	0.50%	3.19%	3.41%	4.73%	5.11%
	1%	4.58%	4.64%	6.71%	7.48%
3	0.10%	2.57%	3.01%	3.83%	4.62%
	0.50%	3.18%	3.44%	4.68%	5.08%
	1%	4.85%	5.25%	7.05%	7.95%



2. The risk of D-portfolios consistently shows a higher level of risk (in terms of both standard deviation and CVaR) for all the ten in-sample portfolios obtained. Furthermore, the values of the first three portfolios are shown by the same Table 1. Thus we conclude that the portfolio of transportation and logistics assets are riskier during the COVID-19 pandemic.

These in-sample results are validated using an out-of-samples analysis. Table 2 shows the example of this analysis by simulating the realised returns of the second in-sample portfolio (in-sample 2). We can conclude here that the in-sample results are well-validated here in terms of risk-return trade-off.

Table 2: Example of simulated realised returns (in %) for in-sample portfolio 2.

Target return		low (0.1%)		medium (0.5%)		high (1%)	
Portfolio		B	D	B	D	B	D
Scenarios (130)	1	2.96	1.89	2.19	1.84	1.19	1.24
	2	-0.79	-1.42	1.39	2.34	8.42	6.82

$E(R_x)$		0.09	0.27	0.47	0.60	1.05	1.08
Std. Dev.		3.15	3.93	3.58	4.22	5.22	5.65
$CVaR_{0.05}$		6.15	7.32	6.53	7.50	8.73	8.37

Conclusion

This study concludes the following three main contributions: 1. The mean-CVaR optimisation model effectively minimises the risk for portfolios of transportation and logistics assets; 2. The minimised risk outperforms the risk of the benchmarking (Bursa Malaysia Top 30) index for medium and low targets; 3. The risk levels in terms of standard deviation and CVaR is higher during the Covid-19 pandemic for any target returns specified.

References

[1] Maasar, M. A., Roman, D., & Date, P. (2020). Risk minimisation using options and risky assets. *Operational Research*, 1-22.