

# 1 Introduction

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Dynamic portfolio choice problems consider the optimal portfolio construction over time. These have a general solution in the absence of market frictions. When frictions are introduced, the problem becomes significantly more realistic, as investors face costs when trading assets. However, this increased realism comes at a tradeoff of increased complexity in the problem, as the optimal portfolio construction is no longer trivial to find. In Dynamic Portfolio choice dynamic programming (DP) schemes have been implemented to solve these problems numerically, but the computational complexity of these schemes suffer from the curse of dimensionality in a multitude of ways using multiple grid-based methods. In this regard the work of Gaegauf, Scheidegger and Trojani (2023) is of particular interest, as they develop a computational framework which reduces the need for grid-based methods. While much work has been put to developing a computational framework which reduces the need for grid-based methods, this has not been applied to a broader set of portfolio choice models, and we therefore only have a limited idea of the scope of applicability of these methods.

I therefore extend the framework of Gaegauf, Scheidegger and Trojani (2023), to new asset types and new cost functions, to broaden the scope of models which can be solved using this framework, and to provide a broader understanding of the class of dynamic portfolio choice problems. I analyse the impact of introducing various transaction costs types, such as fixed costs, and asset specific costs, including the proportional transaction costs often seen in the literature. Furthermore i broaden the investment universe to include multiple asset types, such as stocks, bonds and vanilla options. This paper therefore aims to provide a broader understanding of the class of dynamic portfolio choice problems, utilizing the newest insights in computational methods seen in the literature.

Furthermore a novel extension to the computational framework is provided, which aims to reduce the computational burden in higher dimensions. The framework suffers in higher dimensions, as the number of grid points increase, but also because the function approximation which leverages Gaussian process (GP) becomes more complex. I introduce Structured Kernel Interpolation for Products (SKIP), which has been shown to increase the efficiency of the GP when dimensionality is increased.

I implement this framework on parametrization analyzed earlier in the literature, and compare the results to the existing literature. Following this i extend the framework to include options, as seen in Cai, Judd and Xu (2020), and new cost functions, as seen in Dybvig and Pezzo (2020).

## References

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