Selecting Optimal Industrial Sectors for a Targeted State Economy

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Policy makers and prospective investors recognize a continuing need for finding strategically important or profitable industrial sectors for a targeted state. This paper discusses how to apply an optimal portfolio theory to selecting the optimal combination of industrial sectors. With information technology and analytical approach applied to the selection process, this paper provides an operational and workable framework for fulfilling the need. The framework includes capital asset pricing model, ways to find excess return to risk ratios and unsystematic risk measures. The investigative objectives of this paper are 1) to develop a heuristic framework to utilize information technology, 2) to analyze performance of industrial sectors for constructing the optimal mix of industrial sectors for a targeted state economy.

This paper supplements the optimal portfolio construction technique (Elton, Gruber, and Padberg, Journal of Portfolio Management, 1978) (henceforth, "EGP technique") for the optimization process by incorporating realistic components into the optimization process. The extension is necessary because the original EGP technique did not deal with components of forced inclusion. This paper constructs the optimal portfolios without and with the components of forced inclusion using the EGP technique. It calls the portfolio without the components of forced inclusion as "purely optimal portfolio." It calls the portfolio with the components of forced inclusion as "realistically optimal portfolio." Nawrocki (2009, http://www.math.umn.edu/~bemis/IMA/MMI2009/port_opt_heuristics.pdf) suggested to practitioners that the key to a successful portfolio allocation decision is to have very good estimates for risk and return.

The first step for determining the optimal portfolio based on the original EGP technique is to find "excess return to beta ratios" for industrial sectors under consideration; rank them from highest to lowest. Second, set a cutoff rate for including those sectors to be qualified for the optimum mix. The pure optimum mix will consist of only the sectors whose “excess return to beta" ratios are greater than the cutoff rate. This optimum cutoff rate is determined by finding the last individual component ratio which is less than its "excess return to beta" ratio in the ordered list in the first step. The individual component ratio is found by solving a mathematical objective function to maximize the tangency slope of excess return to the component's risk measure with the constraint that the sum of the proportions of individual components included in the mix equals one. Third, after finding the cutoff ratio and the components for the optimum mix, the percent of each component for the optimum portfolio is calculated.

The paper uses the following simulation data for a targeted state economy: the average industry betas, standard deviations of return based on those of individual industrial sectors using stock data within the industrial sectors as proxies. For market proxy returns, the country's stock market index data is used for the same time frame. The paper takes the following specific procedures: (1) It finds annualized statistics for the market proxy used in the model as follows: Arithmetic mean: 3.36979 %; standard deviation: 2.05526 %; variance: 4.20209 $\%^2$. (2) It finds "excess return to beta" ratio for each industrial sector. The "excess return" means the return over risk-free rate (the rate of 3-month T-bill is used as a proxy of the risk-free rate). (3) It ranks the industries based on the "excess return to beta" ratios and find the cutoff ratio. In principle, the industries, whose excess return to beta ratios are above the cut-off rate, are selected and those whose ratios are below the rate are rejected for purely optimal composition. (4) It finds the realistically optimal weight for each industry by ignoring the cutoff ratio.

The paper suggests two levels of recommendation based on the purely optimal weights and the realistically optimal weights. First, the recommendation based on the purely optimal weights would suggest expansion or contraction of the industries identified by the model. For example, the spreadsheet model suggests that the industries of Wholesale Trade (50.49%), Finance, Insurance, & Real Estate (33.69%), and Services (15.82%) constitute the purely optimal combination. Second, the recommendation based on the realistically optimal weights would suggest expansion or contraction of the industries identified by the model. For example, the realistically optimal model recommends the emphasis on three industries. That is, Transportation and Communication (27.46%), Wholesale Trade (23.96%), and Finance, Insurance, & Real Estate (16.31%) represent the most heavily weighted industries.

Comparing the current weights with the purely optimal or realistically optimal weights will generate specific recommendation guidelines: If the current weight is greater than the latter, then one would recommend a contraction of that industry (local governments or investors should avoid promoting investment in that industry). If the current weight is smaller than the latter, then one would recommend an expansion of that industry (local governments or investors should sponsor investment in that industry).

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