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EFFICIENT, DIVERSIFIED AND SECURE ELECTRICITY GENERATING PORTFOLIOS FOR SWITZERLAND

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Overview

In this study, Markowitz portfolio theory is applied to power technologies in Switzerland. A current user (rather than the investor) point of view is adopted to determine efficient frontiers of electricity generation technologies in terms of expected return and risk in 2003.

Methods

Since shocks in generation costs per kWh (the inverse of expected returns) are correlated, seemingly unrelated regression estimation (SURE) is applied to filter out the systematic components of the covariance matrix. Some of the portfolios of interest (minimum variance (risk), maximum expected return) call for a high share of one technology (e.g. *Nuclear* power), causing security of supply to become an issue. Shannon-Wiener and Herfindahl-Hirschman indices are calculated to see the trade-off between efficiency and security of supply.

Results

For a population as risk-averse as the Swiss, the minimum variance portfolio arguably is appropriate. Under this standard and with a "realistic" restriction on the shares of *Run of river*, *Storage hydro* and *Solar*, *Nuclear* power accounts for 40 percent, *Storage hydro* and *Run of river* for 32 percent and 24 percent, respectively, and *Solar* for 4 percent (assuming high external costs) of the 2003 Swiss efficient portfolio.

Conclusions

If one compares these efficient portfolios with the actual 2003 portfolio, one is led to conclude that the current mix of Swiss technologies appears to be efficient. In addition, the Shannon-Wiener Index indicates that the mix of technologies is sufficiently diverse to ensure security of supply. However, the Herfindahl-Hirschman index suggests that security can be enhanced by added diversity, notably by increasing the share of new renewable generation technologies, such as *Solar*.

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