Synthesis of Inter-Industrial Balance and Production Function as an Instrument of Regional Sustainable Development

Aleksandras Vytautas Rutkauskas
Jelena Stankeviciene

Vilnius Gediminas Technical University, Lithuania
Profit, Riskness and Reliability – Three-Dimensional Base for Investment Decisions Management
Multi-criteria Valuation of Investment Possibilities

- Even though in perception of investment decisions possible outcomes a high pragmatism is present, here a need for possibilities’ multicriteria valuation is formed, if the possibilities are measured in investment return.

- Here are the main attributes of non-unique conception of return possibility:
  - The size of return possibility;
  - The guarantee of possibility;
  - The extent of loss related to random realization of possibility.

- It is common to think that for quantitative description of investment possibilities it is always possible to invoke a certain probability distribution $P\{\xi<x\}$ of these possibilities, which makes assumptions also for quantitative description of the attributes mentioned above.
H. Markowitz Portfolio

- Our selected investment decisions management means is investment portfolio, decision search logics of which in case of modern portfolio is presented below.
Transition to adequate portfolio

Modern (Markowitz) portfolio

Reliability

Riskness

Profitability

Adequate portfolio
Formation of adequate portfolio

Markowitz or “mean-standard deviation” set of portfolios

Bunch of “quintiles – standard deviation” portfolios

The confidence zone of adequate portfolio

Three-dimensional view of the investment portfolio
Formation of three-dimensional view
The intersection of indifference curve family and efficiency line

- indifference curves family with decreasing \( u_j < u_i \)
- utility level

- efficiency line
Possibilities set of invested portfolios and utility function of return, placed on profitability, risk and reliability system of axes
The concept of isoguarantee

- Isoguarantee of investment portfolio is a curve in “portfolio risk – portfolio profitability possibilities” surface, connecting possibility values of the same guarantee under changing risk level.
- In probability theory and mathematical statistics terminology, isoguarantee should indicate a line, connecting q-level quintiles

\[ \xi_q^s : \left( P \{ \xi^s \geq \xi_q^s \} = q \right) \]

of the set of values \( \xi^s \), when portfolio riskness (s – standard deviation) is changing (increasing).
The anatomy of isoguarantee
Conclusions and suggestions

- Utility, riskness and reliability are three main attributes that ought to be used integrally when investment decision is under preparation.
- Adequate investment portfolio seems to be theoretically sound and practically effective instrument for investment decision making in global capital and exchange markets.
- Thus, in order to have an operative mean of such decision, that is necessary for the application of adequate portfolio for decision making, it falls to use imitative technologies, which are almost the only mean of information supply for the quick decision management process.
P.S.

- **New means and methods:**
  - Isoguarantees;
  - Three-dimensional utility function;
  - Efficiency zone;
  - Expert systems;
  - Imitative technologies.

- **Fields of application:**
  - Portfolio decisions;
  - Integrated assets and liabilities management decisions;
  - Portfolio management;
  - Formation and management of portfolios of strategies.
The main goal

- To reveal the content of the so-called “double trump” decision management model in the global currency and stock exchange markets and to present the possibilities and results of its practical application.
- This model is developed on the basis of the earlier proposed model of adequate investment decision evaluation portfolio.
- The investigation was carried out using real FOREX and capital markets data for the period from 2007.01.01 – 2009.04.07.
Double trump portfolio decision management in currency market model

If EUR >> USD
then

If EUR << USD
then

EUR | GBP | CHF | CAD | AUD | JPY | USD
Scheme of portfolio solutions (trading strategies) and taken actions

1. Stage of determination of aims and principles of the system of the main portfolio decisions in currency and capital markets
   - Preparation of an adequate currency rates and stock prices possible changes forecasting system
   - Adaptation of the prepared forecasting system for non-portfolio decisions and information, necessary for portfolio decisions, generation

2. Stage of grounding the idea of portfolio decisions realization and stage of decisions informational supply
   - Determination of criteria set of elective portfolio decisions (trading strategies)
   - Determination of possible solutions using a chosen set of criteria

3. Stage of search and efficiency evaluation of portfolio solutions (trading strategies)
   - Monitoring of historical trajectories developmental possibilities interaction
   - Estimation of achievement of the purpose of portfolio decisions (trading strategies)
Pseudo-scenario of investment portfolio management in FOREX market

- Change of invested capital in USD and in EUR

**Time period:** 2008.12.07 – 2009.04.07

**Trump pair of currencies:** USD and EUR

**Objective:** to maximize the value of invested USD

**Currencies for diversification:** EUR, GBP, CHF, CAD, AUD and JPY
Pseudo-scenario of investment portfolio management in FOREX market
Time period: 2007.01.02 iki 2009.05.09. EUR USD

Growth of currency rates

Growth of invested capital

Growth of currency rates
USD EUR

Growth of invested capital

Growth of currency rates
EUR GBP

Growth of invested capital

Growth of currency rates
USD GBP

Growth of invested capital

Growth of currency rates
GBP USD

Growth of invested capital

Growth of currency rates
Evidence from Capital Markets

- This model is analogically used in capital market.
- Here the role of the first trump is performed by the selected stocks, and the role of the second trump – by the currency of the country in the stocks of which we invest.
- If forecasting system indicates future possibility to select a profitable portfolio structure – then the appropriate structure is selected.
- If forecasting system indicates about the absence of profitable possibilities – then we retain certain amount of cash.
Change of stock prices in portfolio and change of invested capital (France)
Change of stock prices in portfolio and change of invested capital (France)
Change of invested capital (NYSE)

Change of invested capital (Sweden)
Conclusions

- Performed experiments in capital and exchange markets allow to make a conclusion that separate investors could incur considerably lower loss than the general market recession.
- The use of double trump model, tested with historical data and with real-time demo versions in the real time probably could be an assumption for success in the real investment process.
The scheme of analysis of efficiency, riskness and reliability interaction for management of multi-industrial balance and production functions of the general model.
Simplified multi-industrial balance and production functions general model version

Let us have the following two-industries constraints system:

\[
\begin{align*}
  y_1 &= (1-a_{11})x_1 - a_{12}x_1 - z_1(x_1) \\
  y_2 &= -a_{12}x_1 + (1-a_{22})x_2 - z_2(x_2) \\
  x_1 + x_2 &= C
\end{align*}
\]

- here \(x_1, x_2\) – the volume of gross domestic product production in respective industries of activity;
- \(z_1(x_1), z_2(x_2)\) – the volume of capital investments which is required for 1st and 2nd industries. These are the decisions of production functions with respect to invested capital.
- \(a_{ij}\) – coefficients showing the interaction of the analysed industries of activity in the production process, \(i, j = 1, 2\).
First problem:

We have to find the probability distribution \( y = y_1 + y_2 \) if in the 1\(^{st}\) system \( a_{ij} \), as well as \( z_1, z_2 \) functions are stochastic variables.
Output 2
Output 3
Second problem:

- We should generate information allowing to select the most advantageous decision with respect to efficiency, riskness and reliability, $x_1$ and $x_2$ combination.
Quartiles
Percentiles
Thank you for your attention!