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Shlonchak Vasyl
PhD in Economics, Senior Financial Analyst
EcoDigital AG
ORCID: https://orcid.org/0009-0002-6867-627X

Шльончак В.В.
кандидат економічних наук,
Старший фінансовий аналітик в компанії EcoDigital AG

THE ENERGY INVESTMENT MODEL AS A TOOL FOR ENHANCING EFFICIENCY OF INVESTMENT BANKING

Summary. In light of growing financial volatility and macroeconomic uncertainty, this study explores ways to enhance the efficiency of banks' investment activity through integrated strategies. It focuses on the development of an energy investment model that leverages synergies between energy infrastructure and IT assets, particularly data centers. Using structural-functional and systems analysis, the research introduces an original definition of investment efficiency as a multi-dimensional indicator. The proposed model treats data centers as hybrid energy-financial assets, incorporating crypto market participation to ensure flexibility and responsiveness to market volatility. The study addresses gaps in existing literature by offering a risk-sensitive, income-oriented approach to investment and highlights the role of strategic investor engagement in maximizing efficiency.

Keywords: bank investment activity, investment efficiency, energy investment model, data center, crypto assets, energy market, strategic planning, diversification.

Introduction and problem statement. Considering growing macroeconomic turbulence and increasing financial market volatility, enhancing the efficiency of banks' investment activity has become a priority. Conventional portfolio management approaches often lack sufficient adaptability to external instability and thus require conceptual revision. A key area of focus is the development of models that combine strategic planning, profitability, and operational flexibility.

A promising direction involves the implementation of combined investment strategies targeting interdependent sectors particularly energy and information technology. In this context, the proposed energy investment model, which utilizes a data center as an energy asset, offers substantial advantages over traditional real-sector investments.

Key features of the model include:

1. Participation in the crypto asset market, which enables banks to tap into new, high-yield income streams driven by price volatility.
2. Operational flexibility of crypto-focused data centers, allowing dynamic reallocation of resources based on market conditions.
3. Strategic engagement with the energy market, wherein data centers can adjust energy consumption or sales based on favorable pricing, thus optimizing cost-efficiency.

The model's dual responsiveness to fluctuations in both energy and crypto asset markets leads to a combined investment effect, enhancing both portfolio performance and resilience. This dual-market adaptability facilitates income diversification and risk mitigation, aligning with the evolving needs of modern banking institutions.

In our opinion, the conceptual development and practical implementation of such an energy investment model are fully justified. Creating a specialized toolkit to operationalize this model is essential for ensuring sustainable investment profitability amid volatile market conditions.

Analysis of recent research and publications. The issue of evaluating the effectiveness of investment banking has been widely explored in both domestic and international research. Practical aspects of IB have been addressed by foreign researchers like Nicholas Apergis [1], A. Damodaran [4], Arthur H. Gilbert [2], Estelle Brack [3], Ramona Jimborean [3], David Wheelock [8], Loretta J. Mester [9] and Fred H. Hays [2]. Domestic scholars, including Andriychuk V. [5], Krykliy A. [6], Bezrodna O. [7] and Maslak N. [6], have contributed to the development of theoretical foundations for IB, provided practical recommendations for its effective implementation, and proposed strategies for managing investment risks. Although the investment activity of banks has received substantial scholarly attention, several critical dimensions remain underexplored. Specifically, further investigation is warranted in the following areas:

1. The development of combined investment strategies that incorporate the realities of heightened market volatility.
2. The integration of crypto assets and energy resources into a unified and coherent investment mechanism.
3. The flexible management of data centers as investment assets that generate synergistic effects at the confluence of financial, energy, and digital markets.

In response to these research gaps, the present study introduces the concept of an energy investment model, which explicitly incorporates price volatility across relevant markets and proposes an innovative framework for optimizing the investment activity of banks.

This research is positioned to contribute to the refinement of methodological approaches in financial strategy and to the advancement of practical instruments for managing investment efficiency in the banking sector.

Objectives of the article. The study aims to substantiate, on a theoretical level, and develop applied approaches for improving the efficiency of banks' investment activity by introducing combined investment strategies. Particular attention is given to the energy investment model, which integrates the capabilities of energy infrastructure and IT assets.

To achieve this objective, the following research tasks are outlined:

1. Identification of key determinants influencing the efficiency of investment activity (IA) in contemporary economic conditions.
2. Justification of the benefits of combined investment strategies involving interrelated sectors namely, energy and information technology compared to conventional investments in the real economy.
3. Development of a conceptual framework for an energy investment model that incorporates the operational flexibility of data centers and their responsiveness to volatility in both energy and crypto asset markets.
4. Assessment of the potential for realizing a combined investment effect through asset management optimization and risk mitigation.

This study contributes to the advancement of modern investment management methodologies by proposing an integrative model tailored to the dynamic requirements of the financial environment.

Results of the study. Although extensive theoretical research exists in the domain of financial management, academic literature remains fragmented in defining the concept of bank performance efficiency. A review of English-language sources reveals a diversity of terminology used by international scholars and practitioners, which considerably affects methodological approaches to evaluating bank efficiency.

To address this inconsistency, we propose a refined definition of efficiency of investment activity of a bank, conceptualized as a composite indicator that captures:

• both quantitative and qualitative dimensions of portfolio formation and management;

• the bank's ability to integrate assets under conditions of consistency and standardized comparability;

• the degree of asset interchangeability, enabling portfolio optimization in line with the current market performance of constituent assets.

Based on a synthesis of the literature, we identify two core requirements for effective investment activity [1, 2, 3]:

1. A high level of flexibility and adaptability to economic volatility.
2. The generation of stable returns alongside the enhancement of the bank's financial resilience.

We believe that IA should be strategically planned in parallel with credit activity, as both are executed continuously and interactively. Consequently, investment decisions should not follow a residual logic, but instead be informed by a comparative assessment of the expected profitability of investment versus credit operations.

The efficiency of a bank's IA is closely tied to the profitability and risk structure of the investment portfolio. Since various combinations of assets exhibit different levels of multicollinearity, covariance, and diversification, portfolio configuration becomes a decisive factor [5, 6, 7]. Hence, improving methodologies for portfolio design, structural optimization, and performance maximization is particularly relevant under conditions of elevated market volatility.

Results of foreign scientific research [2, 3, 8, 9] confirm that a benchmarking-based approach provides a valid reference point for measuring IA efficiency. This involves comparing the bank's performance either with a recognized market indicator (KPI) or with a representative peer group of investment banks. In practice, major indices such as the S&P 500 are widely accepted for this purpose, serving as proxies for market return, risk, and investor expectations.

However, investments in market indices generally yield moderate returns (8.0-10.0% annually), which may be inadequate for banks targeting above-average profitability. As a result, there is a clear rationale for investing in high-yield securities.

Empirical evidence indicates that such assets are typically represented by equities of companies that:

• possess high-growth business models, driven by increasing demand for their products or services;

• exhibit resilient and adaptable operations, reducing exposure to market shocks and price volatility;

• employ advanced production technologies, thus supporting innovation and industry development;

• operate across multiple sectors, which decreases their overall correlation with market-wide risks.

This set of conditions offers a framework for identifying investment opportunities that enhance portfolio efficiency while aligning with the bank's strategic objectives.

The research emphasizes that the most effective investment strategies are those generating a combined investment effect (hereinafter "Combined Investments"), which involves capital allocation to companies operating in interconnected and interdependent economic sectors. These sectors can be:

1. Unilaterally interdependent, where one sector stimulates growth in another.
2. Bilaterally interdependent, where each sector mutually reinforces the other's development.
3. Diversification-enhancing, sharing common growth drivers but also possessing distinct sector-specific catalysts.

Empirical findings highlight the energy and IT sectors as an optimal interdependent pair capable of delivering a strong combined investment effect. In particular, data centers, whose operational efficiency is heavily reliant on energy consumption, represent a core link between these two sectors. Their operational flexibility allows dynamic energy strategy adjustments, improving both internal performance and return on investment.

Data centers specializing in cryptocurrency mining are identified as the most flexible operational model, rapidly adapting to market conditions and energy pricing dynamics. This enables them to serve as efficient conduits for achieving combined investment returns.

The combined investment strategy offers the following strategic benefits:

• Increases in cryptocurrency prices stimulate mining, thereby driving energy consumption and promoting technological development in both IT and energy sectors;

• Advances in data center technologies enhance mining efficiency and support crypto asset price growth, while also spurring further energy demand;

• Lower energy prices improve mining margins and positively affect crypto valuations;

• Operational flexibility permits switching between grid balancing, crypto mining, and thermal energy generation, depending on profitability and market conditions.

The study advocates the development of an energy investment model, which integrates energy and IT sector investments, particularly data centers with crypto-mining specialization. This model requires an accompanying energy strategy that optimizes energy utilization and enhances the profitability of data center operations.

A key proposition is treating the data center as an energy asset capable of operating simultaneously on the energy and crypto markets. The proposed model incorporates a cogeneration unit as a backup energy source, increasing flexibility in energy distribution and operational reliability.

Core advantages of the model include:

• Use of data centers as grid-balancing infrastructure and suppliers of thermal energy;

• Classification of mining as a secondary or derivative activity, triggered by favorable energy or heat utilization scenarios;

• Implementation of speculative strategies across energy and crypto markets to optimize operational decisions based on profitability comparisons between:

• Grid balancing,

• Thermal energy generation,

• Crypto mining.

In conclusion, this investment architecture provides a multidimensional tool for banks seeking to enhance investment efficiency through sectoral synergy, dynamic asset management, and adaptive operational strategies.

A common cost component across the aforementioned types of operational activity is the cost of electricity supply, which serves as one of the key indicators used in optimizing the energy strategy of the data center. Additionally, to increase the profitability of cryptocurrency mining, a HODL strategy is employed. This approach allows the accumulated crypto assets to grow in value over time, positively influencing the overall efficiency of the energy investment model and the bank's investment activity.

The optimization of energy resource usage and profitability assessment of operations is conducted on two levels:

• Level 1: Grid balancing vs. (Cryptocurrency mining + Heat generation and recovery);

• Level 2: (Cryptocurrency mining + Heat generation and recovery) vs. (Operational expenses of the cogeneration unit + Heat generation and recovery).

The findings of the study confirm that the highest level of efficiency from combined investments can be achieved when the investor participates in the operational planning of the company. Accordingly, several implementation pathways for the energy investment model are identified, classified into direct (e.g., establishing an operating company and engaging in direct operational management) and indirect participation (e.g., investing in issuers' securities):

1. Combined investment in securities of energy companies and crypto miners.
2. Combined investment in securities of energy companies plus crypto asset investment via a subsidiary operating company.
3. Combined investment in securities of energy companies and an energy investment model implemented through a subsidiary operating company.
4. Independent development of a comprehensive energy investment model with a full range of services and energy assets via a subsidiary operating company.

Each of these pathways represents a distinct model, offering varying degrees of bank participation in capital and control over energy assets. These structural differences directly impact the effectiveness of the bank's investment activity.

As a result of this research, the feasibility and strategic importance of applying combined investment strategies have been substantiated for enhancing bank investment efficiency amid contemporary economic turbulence. The energy investment model, based on the interaction between the energy and IT sectors, is proposed as a tool for achieving a synergistic effect through flexible asset management, optimized energy consumption, and improved profitability.

The theoretical generalization and statistical analysis carried out in this study have led to the formulation of practical guidelines for banks on strategic portfolio formation. The proposed approach is adaptable to the specificities of the financial environment and has been empirically validated in terms of its effectiveness for maximizing returns and minimizing risks.

Conclusions. The research examined key approaches to enhancing the efficiency of banks' investment activity in the context of financial market volatility. Special emphasis was placed on identifying innovative mechanisms that integrate strategic planning, asset diversification, and flexible resource management.

The study establishes that the efficiency of a bank's investment activity should be understood as an integral indicator, encompassing both quantitative and qualitative aspects of portfolio formation and management. This interpretation reflects the importance of adaptability to market conditions, the interchangeability of assets, and alignment with benchmarking standards.

Strategic planning is crucial and must be embedded in the early stages of developing the bank's credit and investment policy. Effective planning requires a clear orientation toward market benchmarks, such as the S&P 500 index, which serve as minimum reference points for ensuring acceptable levels of profitability and competitiveness.

The research finds that the highest investment efficiency is typically achieved through combined investment strategies, particularly those operating within interdependent sectors such as energy and information technology. This approach facilitates risk diversification, enhances technological responsiveness, and provides a robust framework for capital allocation.

An energy investment model was developed and tested within the study, using a data center as a hybrid asset. Its effectiveness stems from the operational flexibility to balance electricity grids, recover and utilize waste heat, and support the mining of crypto assets. This multifunctional role significantly contributes to achieving a synergistic investment effect.

Lastly, the active involvement of investors in strategic asset management is identified as a key factor in optimizing investment outcomes. Whether participation is direct or indirect, the degree of investor control influences both the risk profile and profitability of the investment structure and must be considered in scenario planning and portfolio modeling.

A promising direction for further scientific inquiry is the deepening of the theoretical and methodological foundations for implementing the energy investment model, taking into account the specific features of risk management, the digitalization of financial processes, and the evaluation of investment activity efficiency under conditions of high volatility. Subsequent research will focus on the quantitative analysis of variability in combined investment models and the assessment of their impact on the profitability and stability indicators of banking capital.

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ІНВЕСТИЦІЙНА ЕНЕРГЕТИЧНА МОДЕЛЬ ЯК ІНСТРУМЕНТ ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ БАНКІВСЬКИХ ІНВЕСТИЦІЙ

Анотація. В умовах зростаючої волатильності фінансових ринків та нестабільності макроекономічного середовища підвищення ефективності інвестиційної діяльності банків постає як ключовий пріоритет для забезпечення стабільного розвитку фінансової системи. Існуючі підходи до управління інвестиційними портфелями потребують адаптації до сучасних викликів, зокрема через обмеженість традиційних моделей у врахуванні динаміки зовнішніх ризиків. Особливе значення має розробка інноваційних стратегій, орієнтованих на диверсифікацію активів, стратегічне планування та адаптивне ресурсне управління. Метою дослідження є теоретичне обґрунтування та розробка прикладних підходів до підвищення ефективності інвестиційної діяльності банків шляхом впровадження комбінованих стратегій, зокрема інвестиційної енергетичної моделі, яка поєднує потенціал енергетичних та ІТ-активів. У процесі дослідження використано структурно-функціональний, порівняльний, системний та сценарний аналіз. Теоретичною базою слугували праці провідних зарубіжних (E. Brack, A. Damodaran, N. Apergis, D. Wheelock) та вітчизняних науковців (В. Андрійчук, Н. Маслак, О. Безродна), а також результати емпіричних досліджень у сфері інвестиційного банкінгу та фінансових інновацій. У дослідженні сформульовано авторське визначення ефективності інвестиційної діяльності банку як інтегрального показника, що враховує якісні й кількісні параметри управління інвестиційним портфелем. Запропоновано концепцію інвестиційної енергетичної моделі, що базується на використанні датацентру як енергетичного активу та передбачає активність на ринку криптоактивів. Обґрунтовано, що поєднання гнучкості операційної діяльності датацентру з можливістю реагування на цінову волатильність енергетичного та криптовалютного ринків дозволяє досягти комбінованого інвестиційного ефекту. Визначено, що участь інвестора у стратегічному управлінні активами є ключовою умовою максимізації ефективності інвестицій. Отримані результати засвідчили недостатню розробленість у науковій літературі питань щодо використання комбінованих інвестицій у взаємозалежні сектори економіки. Практично не досліджено потенціал датацентрів як гнучких інвестиційних інструментів. Запропонована модель дозволяє банкам адаптуватися до ринкових змін, підвищити дохідність інвестицій та зменшити ризики шляхом оптимального управління ресурсами. Дослідження формує наукове підґрунтя для подальшої розробки інструментів управління ефективною інвестиційною діяльністю банків.

Ключові слова: інвестиційна діяльність банку, ефективність, інвестиційна енергетична модель, датацентр, криптоактиви, енергетичний ринок, стратегічне планування, диверсифікація.