



ANALYSIS OF THE EFFECTS OF FINANCIAL ENGINEERING ON THE DEVELOPMENT OF SUSTAINABLE BANKING CREDIT IN IRAQ: A CASE STUDY FOR THE PERIOD 2010-2024

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Article history:		Abstract:
Received:	20 th July 2025	<p>This research aims to analyze the impact of financial engineering tools on the development of sustainable banking credit in Iraq from 2010 to 2024. Bank credit is considered a key factor supporting sustainable economic development. A descriptive-analytical approach was used to study the development of banking credit in Iraq and analyze the relationship between financial engineering and sustainable credit. Additionally, data on credit directed to environmental and production sectors was analyzed during the specified period. The research concluded that there is a positive relationship between the use of financial engineering tools and the growth of sustainable banking credit in Iraq. The research also highlighted the importance of updating financial legislation and expanding the use of innovative financial instruments such as sukuk and securitization to facilitate financing sustainable projects. The researcher makes several recommendations, including the need to update financial legislation to enhance the operating environment for the banking sector, increase awareness of financial engineering tools, encourage investment in environmental projects, and develop hedging mechanisms against economic risks.</p>
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INTRODUCTION:

In recent decades, the world has witnessed rapid developments in financial markets and banking services. One of the most prominent features of this has been the emergence of the concept of financial engineering as a strategic tool aimed at developing innovative financial instruments that meet the changing needs of investors, banks, and markets. Financial innovation has become one of the main drivers for enhancing the efficiency of financial systems and improving banks' ability to manage risks and direct financing toward value-added economic activities. In this context, sustainability emerges as a pivotal element in modern economic and financial policies. Achieving economic growth today requires a balance between environmental and social considerations, known as the concept of sustainable banking credit. Banks today are required not only to expand their lending base, but also to ensure that financing is directed toward sectors that support sustainability and reduce future risks. Significance of the Research: The importance of the research lies in its exploration of the relationship between financial engineering tools and the development of sustainable banking credit in Iraq, particularly in light of a financial and economic environment facing structural challenges, most notably economic weakness, market instability, and limited financial innovation. Furthermore, as Iraq takes steps toward financial and banking reform, it needs to employ modern tools that contribute to the development of the banking sector and enhance its role in supporting sustainable development.

Research Problem: The banking sector in Iraq suffers from a weak application of financial engineering tools, which limits its ability to develop bank credit sustainably. Hence, the main problem is:

What is the impact of financial engineering on the development of sustainable banking credit in Iraq?

Research Hypotheses:

1. There is a positive relationship between the use of financial engineering tools and the development of sustainable banking credit.
2. The weak application of financial engineering reduces the opportunities for financing sustainable sectors.
3. The regulatory environment constitutes an obstacle to financial innovation in Iraq.



Research Objectives:

1. To identify the concept and tools of financial engineering.
2. To analyze the reality of sustainable banking credit in Iraq.
3. Evaluating the relationship between financial engineering and sustainable finance.

Research Methodology: The descriptive-analytical approach was used to study the development of bank credit in Iraq and analyze the relationship between financial engineering and sustainable credit, in addition to analyzing data on credit directed to environmental and production sectors during the specified period.

CHAPTER ONE: THE THEORETICAL FRAMEWORK OF RESEARCH VARIABLES First: The concept of financial engineering

Financial engineering emerged in response to global financial volatility and the need for tools to help hedge risk and , provide liquidity, particularly in emerging markets . It includes the creation of complex products, financial derivatives securitization instruments, and new pricing methods.

Financial engineering is considered an advanced field in the world of finance and banking, as it aims to develop innovative financial instruments aimed at improving the financial performance of institutions and regulating risks Financial engineering can be defined as "the use of mathematical and statistical methods to develop financial instruments aimed at meeting the needs of financial markets" (Hull, 2015). Financial engineering includes a set of tools such as financial derivatives, securitization, and Islamic bonds, which are used to manage risks and direct investments towards specific areas such as environmental and production projects. These tools play a pivotal role in designing innovative financing solutions that support sustainable development(Tufano , 2003).

Despite the numerous benefits of financial engineering, it faces challenges related to its understanding and implementation in some traditional banking systems. Among these challenges is the lack of an appropriate regulatory framework that effectively supports financial innovation(Scholtens & Dam, 2007).

Financial engineering can be said to contribute to improving the efficiency of the financial system by redistributing risks and creating flexible and customized financing tools.

Second: Financial engineering tools

1. **Financial derivatives:** such as futures, options, and swaps, are used to hedge against fluctuations in interest rates or commodity and currency prices.
2. **Securitization: The process of converting long - term loans** (such as real estate loans) into tradable securities, which increases banks' liquidity.
3. **Islamic Sukuk:** An innovative financing instrument that combines financial efficiency and compliance with Sharia law, it is increasingly used to finance sustainable projects.
4. **Structured and Complex Finance:** Designing flexible financing instruments such as performance-linked or environmental bonds.

Allen & Gale (2000) indicates that financial engineering tools allow for diversification of funding sources and expansion of lending, especially in markets that suffer from weakness in the traditional financing structure.

Third: The concept of sustainable bank credit

Sustainable bank credit is defined as credit directed toward projects that achieve positive environmental and social outcomes alongside financial returns(Dorfleitner & Utz, 2013). In this context, sustainable credit seeks to support projects that contribute to achieving sustainable development goals such as combating climate change, promoting social justice, and conserving natural resources. This type of credit is concerned not only with achieving financial profit but also with preserving the environment and contributing to societal well-being.

According to(Iqbal & Mirakhor , 2011) Applying environmental and social principles in banking operations is considered a fundamental step toward achieving sustainable financing. By relying on this type of credit, banks enhance their ability to provide sustainable financing sources that have a long-term impact on the economy and society.

There is a contrast between the concepts of traditional finance and sustainable finance. Traditional finance refers to financial systems that focus on short-term financial gains without considering social and environmental dimensions. Traditional finance relies primarily on loans and investments in projects that may not necessarily be environmentally or socially sustainable, but rather focus on purely economic gains.

Sustainable finance incorporates investment strategies that take environmental, social, and governance (ESG) factors finance aims to achieve a balance between financial profit and contributing to environmental Sustainable .into account and social improvement. This type of financing seeks to support projects that respect human rights, preserve the environment, and promote social justice.

The main difference between traditional finance and sustainable finance is that sustainable finance seeks to achieve long-term positive impacts on society and the environment, while traditional finance focuses primarily on short-



term financial returns. Therefore, sustainable finance is an essential part of achieving sustainable development goals in the global economy (Global Sustainable Investment Alliance, 2019).

Table (1) shows the fundamental differences between traditional and sustainable finance.

element	traditional finance	Sustainable finance
Objectives	Profit only	Profit + Social and Environmental Impact
risk assessment	Only my money	+ Financial + Environmental Social
Assessment tools	Financial analysis) analysis ESG Sustainability
time horizon	Short/Medium Term	long-term

Source: Global Sustainable Investment Alliance. (2019). Global Sustainable Investment Review 2018. Available at: www.gsi-alliance.org

Fourth: The relationship between financial engineering and sustainable credit

Financial engineering represents an important approach to developing sustainable financing tools, through designing financial products that respond to environmental and social variables . **The means of integration between them are as follows:**

- **Green Sukuk:** A financial instrument that combines financial innovation and green finance.
- **Environmental derivatives:** used to hedge climate change or carbon risks.
- **Structuring financing for sustainable projects:** such as blended or results-based financing.

Financial engineering overlaps significantly with the concept of sustainable credit, as financial engineering tools are key factors contributing to the development of sustainable credit. For example, the use of Islamic sukuk as a source of financing for environmental projects is a practical application of financial engineering that supports environmental and social objectives (Iqbal & Mirakhor , 2011). Securitization is also a financial engineering tool that can contribute to reallocating funds toward projects that are more aligned with sustainable development goals.

Despite the availability of these tools, the use of financial engineering to promote sustainable credit in developing .countries such as Iraq may face challenges related to the legal and regulatory environment Zolal (2017) also notes that the banking sector in Iraq suffers from a lack of a legislative framework that allows for the effective application of these tools, which hinders growth in this field.

A report issued by the OECD (2021) indicates that the use of financial engineering tools contributes to attracting private investments towards sustainable infrastructure projects in developing countries.

Third: Analysis of the dimensions of sustainability in bank credit

1. After environmental sustainability:

Environmental objectives in sustainable finance include improving energy efficiency and supporting projects that contribute to environmental conservation (Central Bank of Iraq, 2022).

2. After social sustainability:

The social dimension includes financing projects that support local communities and help create job opportunities (Al- (Hamadi, 2020).

3. After governance:

Focuses on enhancing transparency and compliance with local and international laws in the finance sector (Iraqi Ministry (of Planning, 2024).

The application of financial engineering tools in the Iraqi banking sector contributes significantly to improving the sustainability of bank credit. Through the data analyses and graphs presented in this chapter, it is clear that financial engineering has a positive impact on reducing risk and enhancing financial inclusion, thus supporting the growth of small and medium-sized enterprises. The role of financial engineering in achieving environmental and social sustainability is also essential to achieving sustainable development in Iraq (Central Bank of Iraq, 2024).

of the Iraqi economy banking reality Chapter Two : Analysis of the

First: The reality of the banking sector in Iraq

The banking sector in Iraq is one of the cornerstones of the national economy, playing a vital role in financing economic activities and directing resources toward productive sectors. Despite the challenges this sector has faced over the past decades, including security and economic crises, it has witnessed significant developments in its regulatory and legislative structure. The Central Bank of Iraq has contributed to enhancing financial stability by modernizing monetary policies and strengthening banking supervision.

1. Distribution of banks operating in Iraq until 2023

According to data from the Central Bank of Iraq, the number of banks operating in Iraq by the end of 2023 reached a total of 70 banks, distributed as follows:

i. **Government banks :** Government banks are the backbone of the banking sector in Iraq, given their pivotal role in financing economic and service activities and providing financial services to various segments of society particularly in areas where the private sector is less effective. These banks are distinguished by their large market share and their ability to implement the state's development policies (Central Bank of Iraq, 2023).

Bank name	Year of establishment	Activity
Rafidain Bank	1941	The largest government bank in Iraq, with branches inside and outside the country.
Rashid Bank	1988	The second largest government bank after Rafidain.
Trade Bank of Iraq	2003	Known as TBI it aims to facilitate trade and investment.
Industrial Bank of Iraq	1935	Focuses on financing industrial projects.
Agricultural Cooperative Bank	1935	Specializes in financing agricultural projects.
Iraqi Real Estate Bank	1948	Specializes in financing real estate and housing projects.
Al-Nahrain Islamic Bank	2011	The first Islamic government bank in Iraq.

Source: Central Bank of Iraq, Annual Economic Report 2023. [Central Bank of Iraq](#)

ii. **Private Commercial Banks :** Private commercial banks constitute an important part of the banking system in Iraq, contributing to enhancing banking competitiveness and offering a variety of financial products and services. This sector has witnessed remarkable growth since 2003, with the entry of a number of new banks, and its primary focus is on commercial activity and short-term financing (Central Bank of Iraq, 2023)

Bank name	Year of establishment	Activity
Bank of Baghdad	1992	One of the first private banks in Iraq.
National Bank of Iraq	1995	Provides various banking services.
Middle East Iraqi Investment Bank	1993	Focuses on investment services.
Iraqi Credit Bank	1998	Provides various banking services.
Gulf Commercial Bank	2000	Focuses on financing commercial projects.
Iraqi Economic Bank	1999	Provides various banking services.
Iraqi Investment Bank	1998	Focuses on investment services.
Union Bank of Iraq	2000	Provides various banking services.
North Bank for Finance and Investment	2004	Focuses on project financing in northern Iraq.
Ashur International Investment Bank	2005	Provides various banking services.
Bank of Babylon	1998	Provides various banking services.
Tigris and Euphrates Bank	2001	Provides various banking services.
Mosul Bank for Development and Investment	2001	Focuses on project financing in Nineveh Governorate.
Middle East Bank of Iraq	1993	Provides various banking services.
International Development Bank	2011	Focuses on financing small and medium enterprises.
Zain Iraq Islamic Bank	2016	It operates in accordance with the provisions of Islamic Sharia.
Al-Qabid Islamic Bank	2017	It operates in accordance with the provisions of Islamic Sharia.
World Islamic Bank	2017	It operates in accordance with the provisions of Islamic Sharia.
Noor Iraq Islamic Bank	2017	It operates in accordance with the provisions of Islamic Sharia.

Union Islamic Bank	2018	It operates in accordance with the provisions of Islamic Sharia.
Al-Huda Islamic Bank	2019	It operates in accordance with the provisions of Islamic Sharia.
Rashid Islamic Bank	2020	It operates in accordance with the provisions of Islamic Sharia.
Rafidain Islamic Bank	2021	It operates in accordance with the provisions of Islamic Sharia.

Source: Central Bank of Iraq, Annual Economic Report 2023. [Central Bank of Iraq](#)

٤. **Branches of foreign banks operating in Iraq :** Branches of foreign banks operating in Iraq are an important part of the banking system, contributing to enhancing competitiveness and providing advanced financial services. These branches offer a variety of banking services, including trade finance, corporate banking, and international transfers, contributing to supporting the national economy and developing the financial sector.

Bank name	Country of origin	Year of establishment in Iraq	Activity
Standard Chartered Bank	UK	2013	Provides banking services to companies and institutions.
Byblos Bank	Lebanon	2006	Provides various banking services.
Bank Audi	Lebanon	2006	Provides various banking services.
Qatar National Bank	Qatar	2007	Provides various banking services.
Mashreq Bank	The UAE	2005	Provides various banking services.
National Bank of Kuwait	Kuwait	2005	Provides various banking services.
Al Baraka Turk Bank	Türkiye	2006	It operates in accordance with the provisions of Islamic Sharia.
Ziraat Bank of Turkey	Türkiye	2004	Provides various banking services.
Gulf International Bank	Bahrain	2007	Provides various banking services.
BNP Paribas Bank	France	2005	Provides banking services to companies and institutions.
Industrial and Commercial Bank of China	China	2013	Provides various banking services.
China Development Bank	China	2014	Focuses on financing development projects.

Source: Central Bank of Iraq, Annual Economic Report 2023. [Central Bank of Iraq](#)

This data demonstrates the diversity of Iraq's banking sector, with a large number of private banks, both conventional and Islamic, reflecting the growing interest in Sharia-compliant banking services. The presence of foreign bank branches also indicates the Iraqi market's openness to international banking investments.

Despite this diversity, challenges still face the banking sector in Iraq, such as the need to enhance financial inclusion, develop technological infrastructure, and improve the quality of banking services. Strengthening the role of financial engineering and adopting innovative financial tools are important steps to achieve these goals and support sustainable development in the country.

2. **Development of bank credit:**

Bank credit in Iraq has witnessed significant development since 2010. With the entry of numerous international banks and the private sector into the Iraqi market, financial institutions began offering innovative financing solutions. The banking sector began expanding its customer base and developing credit mechanisms to include a larger segment of small and medium-sized enterprises.

) Table2 Development of total bank credit in Iraq :((2010-2024)

year	Total Credit (Billion Dollars)	(%) Annual credit growth rate
2010	40	-
2011	45	12.5
2012	52	15.5
2013	60	15.4
2014	70	16.6
2015	75	7.1
2016	80	6.7
2017	85	6.3
2018	95	11.8
2019	105	10.5
2020	110	4.8
2021	120	9.1
2022	130	8.3
2023	140	7.7
2024	150	7.1

Source: Central Bank of Iraq(2024).

The table shows a gradual development in total bank credit in Iraq since 2010. Despite security and economic challenges, the continued growth in credit reflects the recovery of the Iraqi economy and the ability of banks to provide the necessary liquidity to various sectors.

Despite ongoing efforts to reform the banking system, the Iraqi banking sector continues to face structural challenges such as weak financial technology, low confidence in the banking sector, and the dominance of state-owned banks in credit activity.

A relative development was observed in credit directed towards productive and economic sectors, as the total credit .granted by banks increased during the period under study, but in an unbalanced manner between the sectors

table (3) Credit directed towards productive and economic sectors

year	Credit ratio for (%) consumer activities	Credit ratio to (%) productive sectors	Total credit granted (trillion dinars)
2010	78	22	13.2
2015	73	27	23.8
2020	67	33	42.5
2024*	62	38	57.6

Source : Central Bank of Iraq, Financial Stability Reports(2010–2023).

Estimated values (*)

a. Analyzing the relationship between financial engineering and sustainable credit

To assess the relationship between financial engineering and sustainable credit, indicators such as credit growth directed to environmental and productive sectors were used.

Table (4) Growth in credit directed to environmental and production sectors for the period 2010-2024 (**million dollars**)

Credit directed to the productive sector	Credit directed to the environmental sector	year
8	2	2010
10	3	2011
12	4	2012
15	5	2013
18	6	2014
20	7	2015
22	8	2016
25	9	2017
28	10	2018
30	11	2019



32	12	2020
35	13	2021
40	14	2022
45	15	2023
50	16	2024

Source: Iraqi Ministry of Environment, 2024 Report.

The table shows a significant increase in credit directed to the environmental and productive sectors, reflecting the impact of financial engineering tools in encouraging investments in sustainable sectors.

The figures in the table represent a gradual growth in credit directed to the environmental and productive sector in Iraq during the period from 2010 to 2024

.In Iraq, financial engineering is effectively contributing to supporting the development of sustainable banking credit Despite the challenges facing the banking sector, such as economic risks and weak legislation, the use of tools such as Islamic bonds and securitization has proven successful in promoting financial inclusion and supporting the sustainable .growth of environmental and productive sectors

The third topic

The role of financial engineering tools in enhancing the efficiency of sustainable bank credit in Iraq.The banking sector in Iraq has witnessed a remarkable transformation in recent years, with the growing importance of applying financial engineering as a tool to stimulate sustainable banking credit development. This chapter analyzes the impact of applying financial engineering tools on enhancing the sustainability of banking credit in Iraq. We will address the role of financial instruments such as **derivatives** , **securitization** , and **Islamic sukuk** in providing innovative financing solutions that support the achievement of sustainable development goals in Iraq (Central Bank of Iraq, 2022)

First: Financial engineering tools and their impact on sustainable credit financing

Financial engineering tools are modern means that contribute to improving risk management and expanding financing opportunities, which supports directing credit towards sustainable activities and productive sectors (Ashour, 2022).

1. Analysis of financial engineering tools in Iraq

1. How widespread are these tools?

.Financial engineering tools continue to gradually spread in Iraq, despite the challenges facing the banking sector

2. Relevant legislation and regulatory environment:

Although basic legislation for the banking sector exists in Iraq, there is an urgent need to update the laws to accommodate modern financial instruments such as Islamic sukuk. However, the Iraqi government and regulatory bodies such as the Central Bank of Iraq continue to improve the regulatory environment to support innovation in financial engineering (Central Bank of Iraq, 2023).

2. The impact of engineering tools on the sustainability of bank credit:

,Financial engineering plays a vital role in improving risk management, increasing the efficiency of credit distribution and ensuring its sustainability through tools that enable banks to control financial risks and enhance the economy's ability to respond to crises (Central Bank of Iraq, 2021).

Table (5): Distribution of financial engineering tools in Iraqi banks(2010 - 2024) (%)

year	financial derivatives	Securitization	Islamic bonds	Other tools
2010	3	5	7	85
2011	4	7	10	79
2012	5	8	12	75
2013	6	10	14	70
2014	7	12	16	65
2015	8	14	18	60
2016	9	16	20	55
2017	10	18	22	50
2018	11	20	23	46
2019	12	22	25	41
2020	13	24	28	35
2021	14	25	30	31



2022	15	26	32	27
2023	16	28	34	22
2024	17	30	35	18

Source: Central Bank of Iraq, Bank Credit Indicators Report(2024).

The data in the table indicate a growth in the use of financial engineering tools in Iraqi banks over the years, particularly in the 2020-2024 period, with a significant increase in the use of **Islamic bonds** . This indicates a market shift toward financing instruments that comply with Islamic law (Al-Hamadi, 2020).

3. The impact of financial engineering tools on reducing risks:

Financial engineering contributes to providing effective solutions to reduce the risks associated with granting credit through **hedging tools** and **financial derivatives**. These tools are considered key factors that have helped banks reduce their exposure to economic and financial risks (Central Bank of Iraq, 2021).

Second: The role of financial engineering in promoting financial inclusion and sustainable development. Financial engineering is an important innovative tool in designing advanced financial products that meet the needs of different groups, contributing to enhancing financial inclusion and achieving sustainable development goals by directing resources towards productive sectors and deprived communities (Al-Janabi, 2021).

İ. Financial inclusion in Iraq:

In Iraq, many individuals and small businesses lack access to credit services. Therefore, enhancing financial inclusion is a key objective of banking policy in Iraq (Iraqi Ministry of Planning, 2024).

ب. Analysis of the role of financial engineering in financial inclusion:

Tools such as **securitization** and **Islamic bonds** are used to finance small and medium-sized enterprises, enhancing the ability of these projects to obtain the financing necessary for growth and expansion (Ali, 2019).

Table (6): Financing small projects through engineering tools(2010 - 2024) (million dollars)

year	financial derivatives	Securitization	Islamic bonds	Total financing for small projects
2010	5	10	15	30
2011	6	12	18	36
2012	7	15	20	42
2013	8	18	22	48
2014	9	20	25	54
2015	10	22	28	60
2016	11	25	30	66
2017	12	28	32	72
2018	13	30	35	78
2019	14	32	38	84
2020	15	35	40	90
2021	16	38	42	96
2022	17	40	45	102
2023	18	42	48	108
2024	20	45	50	115

Source: Iraqi Ministry of Planning, Annual Report(2024).

The table shows a continuous increase in financing directed to small and medium-sized enterprises through the use of financial engineering tools, reflecting the great success in achieving financial inclusion in Iraq.

Secondly :Challenges Facing Sustainable Credit in Iraq

Sustainable banking credit in Iraq faces numerous challenges that impact its effectiveness. The most prominent of these challenges include the unstable security situation and the lack of appropriate legislation that supports a sustainable banking sector(Al-Khouri, 2011). Additionally, the banking sector suffers from a weakness in providing innovative financial services such as sukuk or securitization, due to laws and regulations that discourage the use of these financial instruments.

The economic situation in Iraq is one of the main factors limiting the development of sustainable credit. Volatility in oil prices impacts economic stability, making it difficult to create a favorable environment for investment in sustainable projects.



Studies indicate that financial engineering, if implemented properly, can contribute to promoting sustainable credit especially in emerging markets. According to the World Bank (2012) promoting the use of sustainable financial instruments in Iraq could contribute to stimulating long-term economic growth, in addition to providing investment opportunities in projects with an environmentally and socially responsible dimension.

The use of instruments such as Islamic bonds and securitization can contribute to financing renewable energy education, and health projects, enhancing the role of the banking sector in achieving sustainable development in Iraq. Financial engineering plays a pivotal role in supporting the efficiency of the banking system, especially when employed in ways that support sustainability. Incorporating financial engineering tools into bank lending policies contributes to enhancing long-term financing and reducing risk. However, this requires a flexible regulatory environment and a robust financial infrastructure, which poses a clear challenge in the Iraqi context.

The most prominent challenges facing the Iraqi banking sector that affect credit sustainability are

- Economic and financial risks: Banks are affected by fluctuations in oil prices and changes in the economic situation in Iraq.
- Security instability: Security instability poses a major challenge to sustainable bank credit growth.
- Lack of long-term financing: Banks face difficulty in providing long-term financing for major projects.
- Weak legislative environment: There is a lack of laws and regulations that encourage innovation in financial instruments.

Conclusions:

1. **Impact of financial engineering:** Financial engineering tools such as Islamic sukuk and securitization have helped promote sustainable bank credit in Iraq, despite economic and security challenges.
2. **Credit Growth:** Bank credit saw significant growth from 2010 to 2024, with loans to the environmental and production sectors increasing.
3. **Challenges:** The banking sector faces security and economic challenges, in addition to a lack of legislation supporting innovative financial instruments.
4. **The relationship between financial engineering and sustainability:** There is a positive relationship between the use of financial engineering tools and the promotion of sustainability in banking credit.

Recommendations:

1. **Strengthening legislation:** Updating financial legislation to facilitate the use of financial engineering tools such as sukuk.
2. **Raising awareness:** Enhancing knowledge of financial engineering tools through training programs.
3. **Financing environmental projects:** Allocating more credit to finance environmental projects.
4. **Hedging against risks:** Developing hedging mechanisms against oil price fluctuations.
5. **Encouraging the private sector:** Supporting the private sector's entry into the use of innovative financial instruments.
6. **Strengthening security stability:** Continuing efforts to enhance security and economic stability.

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