

## **“Using Hedging as One of the Applications of Financial Engineering to Limit the Increase in Prices of Imported Basic Commodities to Reduce Expenditure in the Public Budget - The Ration Card in Iraq as a Model”**

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### **Abstract**

*The research aims to demonstrate the impact of financial engineering tools on government expenditure (governing Expenditures), along with highlighting the effect of hedging against fluctuations in prices of essential commodities in achieving food security and addressing the problem related to the strategic stockpile of essential commodities (such as wheat, rice, sugar, and oil) due to insufficient local production to meet actual needs. The research community included the Iraqi Ministry of Finance, relying on actual financial data from the research sample, which is the Accounting Department, for the period from 2015 to 2022, in addition to other data obtained practically from the Ministry of Commerce and the two public companies for food and grain trade. The research employed an inductive and analytical descriptive approach and utilized financial engineering methods, ideas, and tools to find solutions to the financial problems of government financial institutions, represented by reducing governing expenses, which are part of operating expenses in the Public state budget, and managing their financial risks effectively. The research concluded that the use of financial engineering applications, such as hedging against the increase in prices of essential commodities through options contracts/American options, contributed to reducing the prices of imported essential commodities, which in turn reflects on providing larger quantities of these commodities and thus achieving food security.*

**Keywords:** *Public state budget, financial engineering, options contracts, hedging.*

### **Introduction**

First: Research methodology.

1- Research problem :

The problem of food security is one of the problems that arouses the concern of countries in general, especially countries whose local production is not sufficient to meet the actual needs of their citizens, including Iraq, due to weather conditions such as drought, desertification, or climate change and the accompanying fluctuations in the prices of basic commodities (wheat, rice, sugar, and oil). As a result of supply and demand for these goods, the research problem can be determined by the following questions:

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A - What is the effect of financial engineering tools on reducing the ruling expenditures in the state's public budget?

B- What is the impact of financial engineering tools in achieving food security?

2- Research objectives

A- Explaining the impact of financial engineering tools on government expenditure (government expenditures).

B- Explaining the impact of hedging against commodity price fluctuations in achieving food security.

3- The importance of research

The research gained its importance through an attempt to rationalize expenditure in the public budget and reduce the effects of fluctuations in the prices of basic commodities (wheat, rice, sugar, and oil) imported by the Ministry of Commerce for the ration card in the public distribution system and managing budget risks in a way that leads to reducing expenditure in general.

4-Research hypotheses

A - Financial engineering tools contribute to rationalizing government expenditure in the state's public budget.

B- Financial engineering tools have an effective role in achieving food security.

5- Spatial and temporal boundaries:

The Republic of Iraq, the study population is the Ministry of Finance, the sample is the Accounting Department, the Ministry of Commerce, and the sample is the Public Company for Foodstuff Trade and the Public Company for Grain Trade. For the period from 2015-2023

Second : The theoretical framework of the research

1- Concept of Financial Engineering

(A). Financial Engineering: It is the design, innovation, implementation, and development of financial tools and processes, as well as finding creative solutions to the problems faced by institutions. Innovation, accompanied by creativity, achieved by financial engineering, is not limited to new products offered but extends to attempts to adapt old tools and ideas to serve the goals of those institutions (4). Financial engineering tools can be divided into traditional financial tools, which include stocks and bonds, and innovative financial tools, which include four main types: options contracts, futures contracts, forwards contracts, and swaps contracts. They are also referred to as financial engineering instruments, financial derivatives, or financial derivative contracts, which include a range of financial derivatives that differ in nature, risks, maturities, and degrees of complexity (5). In this research paper, we will focus on options contracts.

(B). Options Contracts: There are two main types as follows (6):

Call Option: A contract between an option seller (writer) and an option buyer (holder) that allows the buyer to purchase a specific asset at or before the execution date at a predetermined price, with the right to execute the contract if desired, in exchange for a premium paid to the option seller who is obligated to execute the contract if the buyer wishes to do so.

Sale option: A contract between a seller (grantor) of the option and a buyer (holder) of the option, whereby the holder of the option has the right to sell a specified asset on or before the execution date at a predetermined price, with the right to execute the contract at the discretion of the holder in exchange for a premium paid to the option grantor, who is obligated to execute the contract if the buyer wishes to do so.

(C). Options contracts based on the execution date are divided into four types as follows (7):

- American option: Gives the holder of the option the right to buy or sell a specific asset at a pre-agreed price, with the ability to execute the contract at any time, even before the option contract's execution date.
- European option: Gives the holder of the option the right to buy or sell a specific asset at a predetermined price agreed upon in advance, with the contract being executed on the execution date.
- Asian option: In these contracts, the average price throughout the contract period is considered, as these contracts calculate their cash flows based on the average price of the underlying asset at the contract's location. This is calculated over the smallest part of the option's duration.
- Bermuda options: Bermuda contracts combine the features of American and European options, relating to the execution dates, as these contracts have different execution dates, which may be before or at the maturity dates.

Here it is necessary to understand the concept of the (Broker), who guarantees the completion of the transaction and is associated with the execution of options contracts. The broker is known as the person who represents a registered brokerage institution in various markets, often hedge funds affiliated with a bank or a group of banks. They charge a fee and arrange transactions involving the purchase and sale of various commodities and guarantee the completion of the transaction (8).

## 2- The Public Budget

The concept of the budget: The budget is considered one of the most important financial planning tools that determine the goals of the executive authority, represented by the government, through the policies and programs it follows in the optimal utilization and redistribution of available resources to achieve comprehensive economic development. It is defined as "an expression of the government's public policy and a financial plan that indicates the amounts to be spent for various purposes, and the budget appropriations cannot be generally exceeded without following the necessary legal procedures (9).

Researchers believe that the budget is a document issued by the legislative authority through a law that includes a plan for a set of programs and activities expressed in estimated figures for expenses and revenues for one year. These estimates are based on actual facts that have occurred in the past. The purpose is to achieve a set of pre-planned economic and social objectives, leading to comprehensive development in all sectors adopted by the state.

Third : Hedging against the increase in prices of basic food commodities using options contracts, such as a call option or American option.

Hedging against the increase in prices of basic food commodities related to food security through available crops that rely on climatic conditions. This reflects on the basic food chain and its derivatives, which are used as a basis in the food industry. Consequently, it affects government expenditures directed towards the agricultural sector, which generates food security. This means directing government expenditures (governing expenditures) towards strengthening and supporting food security, thereby ensuring the achievement of revenues that contribute to long-term reduction in governing expenditures. A significant portion of these expenditures is allocated to supporting the ration card, which includes basic commodities needed by the Iraqi citizen, such as wheat, rice, sugar, and oil. These are considered among the most important agricultural crops in the world due to their primary use in human food, the average production of wheat and local rice in Iraq

reached 3,280,204 and 122,599 tons respectively annually during the study period from 2015 to 2022(10).

Due to the low local production of these commodities, it is necessary to turn to imports to compensate for the shortage in local production. Purchasing these commodities from the global market is considered one of the most important strategies for managing import risks in any country. Each country has its own specific methods and tools for purchasing and selecting a range of different methods to follow. Given the recent increases in international price volatility for crops in the future due to climate change, such as rising temperatures, decreased rainfall, and desertification, it is important to monitor and analyze the fundamentals of local and global markets for basic commodities in order to understand and determine prices and the risks surrounding supplies. Strategies should be developed to mitigate the risks associated with importing these commodities in order to improve the ability to forecast and have a better understanding of short-term and long-term import needs for these goods. One of the methods that can help achieve this is the effective use of hedging contracts to hedge against price increases in these commodities.

Researchers see that the Ministry of Commerce can use engineering tools by entering as a buyer for these goods through contracts (call option / American option) to hedge against the risks of increasing prices of basic commodities that affect the quantity supplied in the global markets, which requires higher financial allocations than expected allocations. The Iraqi government provides allocations called "governing expenditures" in the budget to provide basic foodstuffs (rice, wheat, oil, sugar) as one of the items of the ration card in the public distribution system, thus securing these materials as a strategic reserve and hedging against price increases and achieving food security.

Fourth: Analysis of the actual data of the public budget public expenditures

#### 1.Public Expenditures:

Public expenditures in the budget are divided into current expenditures and investment expenditures, as shown in Table (1).

Table (1) The total public expenditures, both current and investment, for the years from 2015 to 2022 (in million Iraqi dinars).

| Year | (1)Current Expenditure in the Budget | (2) Capital expenditure in the Budget | (3) Total Public Expenditure in the Budget (1+2) |
|------|--------------------------------------|---------------------------------------|--|
| 2015 | 53,600,323                           | 27,925,040                            | 81,525,363                                       |
| 2016 | 51,173,425                           | 15,894,008                            | 67,067,433                                       |
| 2017 | 59,025,654                           | 16,464,461                            | 75,490,115                                       |
| 2018 | 67,052,856                           | 13,820,332                            | 80,873,188                                       |
| 2019 | 87,300,932                           | 24,422,590                            | 111,723,522                                      |
| 2020 | 72,873,537                           | 3,208,905                             | 76,082,442                                       |
| 2021 | 89,526,686                           | 13,322,973                            | 102,849,659                                      |
| 2022 | 104,941,090                          | 12,018,491                            | 116,959,581                                      |

The table is prepared by researchers based on data from the Ministry of Finance/Accounting Department/Consolidation Division 2022, Annex (1).

From table number (1), it can be observed that the public expenditures in the budget during the study period (2015-2022) amounted to 81,525,363 million IQD in 2015, decreased to 67,067,433 million IQD in 2016, and then increased again during the years 2017, 2018, 2019, 2021, and 2022 with amounts of 75,490,115, 111,723,522, 80,873,188, 102,849,659, and 116,959,581 million IQD respectively, except for the year 2020 where the amount decreased to 76,082,442 million IQD.

## 2. Governing Expenditures:

Includes operational expenses, which can be described expenditures related to the basic necessities of life for society, as it is associated with expenditures on food, medicine, and energy

Table number (3) shows a comparison between the planned governing expenditures in the budget related to the ration card and the total actual expenditures for basic commodities (wheat, rice, sugar, oil) for the years 2015-2022.

Table (3) Governing Expenditures - Ration Card (Public Distribution System) for the years 2015-2022 (in million dinars).

| Year | : Allocated Governing Expenditures / Ration Card. | 10. Actual Expenditure on Basic Commodities (Wheat, Rice, Sugar, Oil) |
|------|---|---|
| 2015 | 2,500,000   | 122623635   |
| 2016 | 2,470,000   | 1839226212  |
| 2017 | 1,693,000   | 1423166653  |
| 2018 | 1,500,000   | 1466759021  |
| 2019 | 1,500,000   | 2451872912  |
| 2020 | * *   | 2447121430  |
| 2021 | 794,923   | 1731643687  |
| 2022 | * *   | 721201000   |

The table prepares researchers based on the Ministry of Finance data/budget laws from 2015 to 2022/ See appendix (1).

\* Ministry of Commerce data the Public Company for Foodstuff Trade and the Public Company for Grain Trade / Appendix (2).

\*\* The budgets for 2020 and 2022 were not approved.

It is observed from table number (3) that the allocations for the governing expenses of the ration card in the public distribution system in the budget have been continuously decreasing during the study period from 2015 to 2022, reaching (2,500,000, 2,470,000, 1,693,000, 1,500,000, 1,500,000, 794,923) million Iraqi dinars respectively, except for the years 2020 and 2022 due to the non-approval of the budget law.

Meanwhile, the actual expenditures for basic commodities for the same period from 2015 to 2022 amounted to (122623635, 1839226212, 1423166653, 1466759021, 2451872912, 2447121430, 1731643687, 721201000) million Iraqi dinars respectively.

Based on the above, it becomes clear that:

1. The total public expenditures in the budget have been continuously increasing during the study period from 2015 to 2022.
2. The expenditures was directed towards operational expenses at the expense of investment expenses, and the impact of this was reflected in the revenues that contribute to the budget due to the limited
3. Due to the lack of directed allocations towards the investment tunnels that generate revenues to support the budget, the translation of the governing expenditure allocations for the ration card in the public distribution system in the budget is continuously decreasing and does not meet the requirements of providing the essential items of the ration card (wheat, rice, sugar, and oil) and distributing them to citizens for a period of (12) months during the study period from 2015-2022.

In the researchers' opinion, the government should focus on increasing investment expenses within Iraq towards strategic projects, which, if properly directed, could generate good revenues for the public treasury of the state. We also believe that resorting to hedging as one of the applications of financial engineering to provide essential goods at lower prices in exchange for a premium borne by the government, such as 10% of the available governing allocations within the budget for this item, and not relying solely on tenders, direct invitations, or participation contracts adopted by the Ministry of Commerce.

Fifth : Using hedging as one of the applications of financial engineering to reduce the prices of basic commodities.

To hedge against the rise in prices of imported basic materials in the public distribution system of the ration card, it is necessary to know the quantities of local production in achieving self-sufficiency for the items of the ration card. Table (1) illustrates the quantities of wheat and rice for the years from 2015-2022.

Table. (1) Quantities of local wheat and rice for the years from 2015-2022.

| Years | Wheat (Local) Quantity in Tons | Rise (Shlab) Quantity in Tons |
|-------|--------------------------------|-------------------------------|
| 2015  | 3218950                        | 191064                        |
| 2016  | 2993933                        | 201993                        |
| 2017  | 2379466                        | 54453                         |
| 2018  | 2306180                        | 43057                         |
| 2019  | 4747292                        | 104698                        |
| 2020  | 5024892                        | 3041                          |
| 2021  | 3356101                        | 259889                        |
| 2022  | 2214814                        | No data                       |
| Total | 26241628 Ton                   | 858195 Ton                    |

The table prepares researchers based on Ministry of Commerce / the Public Company for Grain Traders / 2022 / Annex (2).

From table (1) the following is noted:

The average locally produced quantity of the commodity = Total quantity produced during the study period ÷ Number of years.

The average locally produced quantity of wheat = 26,241,628 tons ÷ 8 years = 3,280,204 tons.

The average locally produced quantity of rice = 858,195 tons ÷ 7 years = 122,599 tons.

This means that the average annual production of locally produced wheat and rice in Iraq reached 3,280,204 tons and 122,599 tons respectively.

Since these quantities of basic commodities are not sufficient to meet the actual need for supplying the ration card items, additional quantities are imported to cover the shortage, as shown in table (2).

Table (2): Imported quantities (wheat, rice, sugar, oil) for the years from 2015 to 2022.

| Year  | Wheat (Imported)*<br>Quantity in Tons                             | Rice (Imported) *<br>Quantity in Tons  | Sugar (Imported)**<br>Quantity in Tons                                     | Oil<br>(Imported)**<br>Quantity in<br>Tons                                 |
|-------|---|--|--|--|
| 2015  | 353885  | 696351   | 327500   | 161000   |
| 2016  | 152500  | 366061   | 604916   | 63000  |
| 2017  | 257206  | 307546   | 553000   | 100000   |
| 2018  | 1548586   | 798563   | 525000   | 271196   |
| 2019  | 419416  | 759619   | 631124   | 287468   |
| 2020  | 0<br>There is no import due to the availability of local produce. | 0<br>No data available due to lack of imports caused by the COVID-19 pandemic. | 282840   | 123126   |
| 2021  | 157000  | 120000   | 240560   | 82000  |
| 2022  | 102257  | No data available due to converting ration card vocabulary into contracts.     | No data available due to converting ration card vocabulary into contracts. | No data available due to converting ration card vocabulary into contracts. |
| Total | 2990850 Ton   | 3048140 Ton  | Ton  | 1087790 Ton  |

The table prepares researchers based on data from the Ministry of Commerce / the Public Company for Grain Traders / Import Department / 2022.

\*\*Ministry of Commerce / the Public Company for Food Trade / Import Department / 2022 / Annex (2).

From table (2) the following is noted:

The average imported quantity of the commodity = Total imported quantity during the study period ÷ Number of years.

The average imported quantity of wheat = 2,990,850 tons ÷ 8 years = 373,856 tons annually.

The average quantity of imported rice = 3048140 ÷ 6 years = 508023 tons annually.

The average quantity of imported sugar = 3164940 ÷ 6 years = 527490 tons annually.

The average quantity of imported oil = 1087790 ÷ 6 years = 181298 tons annually.

Therefore, Iraq's production of local wheat reached 26241628 tons during the study period with an annual average of 3280204 tons. The import during the same period was 3750000 tons with an annual average of 535714 tons. The production of local rice was 858195 tons with an annual average of 122599 tons. The import of rice during the same period was 3048140 tons with an annual average of 508023 tons. As for sugar, Iraq had a small portion of local production in 2015 and used to import raw material from other sources such as Bahrain, the UAE, and Iran. However, from 2016 to 2022, most of the production was domestic through a contract with a local company (Al-Ittihad), which imports the raw material from international sources like Brazil and Thailand. It is then processed in the company's factories according to Iraqi standards to become local

production. The Iraqi government contracts through intermediaries (local investment companies) to encourage investment, most of which are exempted from taxes and customs duties for a period of 15 years under Investment Law No. 13 of 2006. Despite the existence of giant factories owned by the state, most of them have been shut down since 2003, such as the sugar factory in Maysan and the sugar beet factory in Nineveh.

Regarding the oil material, most of the local production is through contracts with the aforementioned companies, which import crude oil from Ukraine and other sources. Imports of this material during the study period amounted to (1,087,790) tons, with an annual average of (181,298) tons. Therefore, most of the raw material for sugar and oil production is imported by government factories or private sector factories (12).

Since local production is not sufficient to meet the needs of citizens and secure the food basket represented by the ration card items, due to weather conditions such as high temperatures, water scarcity, drought, and resulting desertification, it is necessary to change or diversify the mechanism adopted by the Ministry of Commerce, which includes tenders, direct invitations, or participation contracts, towards entering into contracts through financial engineering derivatives represented by options contracts (call options) to hedge against the risks of rising prices of basic commodities, in order to reduce the losses resulting from importing ration card materials and also to get rid of poor quality. Entering into future commitments to supply quantities of basic commodities for the ration card system at known prices through a financial intermediary (broker) operating in the global derivatives market (a parallel market to the commodity exchange) mostly with hedging funds belonging to a bank or a group of banks, as we have explained in the theoretical aspect. Therefore, we will consider practical cases for the ration card items (wheat, rice, sugar, and oil)(13)

We will choose sugar and wheat for the agricultural season 2021/2022 to demonstrate the new mechanism through contracts (purchase option / American option) to hedge against the risks of price increases and reduce the losses resulting from imports instead of the current mechanism followed by the Ministry of Commerce. Whenever the price of wheat and sugar decreases, there will be a benefit to the budget by reducing that expenditure, and vice versa.

1-The first commodity: Sugar Since Iraq needs an average quantity of sugar of (527,490) tons annually based on the results of table number (2), we will compare the prices of one ton of imported sugar contracted by the Public Company for Food Trade through tenders with the prices of sugar in the global market for the same period during the 2021/2022 season. Due to the unavailability of contract dates from the company on a daily basis, the accuracy of price differentials would be closer if obtained. We will take a practical case as follows:

The Public Company for Foodstuff Trade is required to study the prices prior to a period of reflection on the price trend, whether it is increasing or decreasing. The price of sugar was less than \$500 at the end of 2021, and at the beginning of 2022, specifically on 4/1/2022, it was \$495. It then started fluctuating between highs and lows, then returned to an increase of \$522 on 3/3/2022. Through this reflection, we find that during the study of prices in the first quarter of 2022, prices are trending upwards and in a worrisome manner.

Here, the company is contracting to purchase a call option contract on 3/3/2022 when the price started rising, reaching \$522 per ton. The contract is for a term of 9 months, until 2/12/2022, which means the company has the right to exercise the option to buy or not to buy, in exchange for paying a premium during that period. We calculate the premium amount and the break-even point as follows:

$\$522 \text{ per ton} \times 10\% \text{ option price} = \$52.2 \text{ premium amount for the option}$



$\$522 + \$52.2 = \$574.2$  per ton, which represents the break-even point using hedging procedures.

1. In case the prices fall below the execution level, the company does not execute the option, and the maximum loss that the company can bear is the premium amount of \$52.2 per ton only.

2. In case the prices rise above the breakeven point, the company will execute the option, and the return it will achieve is unspecified, and there are several strategies for executing the right to purchase option, including the following:

a-If the company wishes to execute the option on 15/7/2022, when the price of sugar per ton was \$598.

\$574.2 represents the breakeven point for purchasing the call option.

\$598 is the execution price.

$\$598 - \$574.2 = \$23.8$  profit per ton from executing the call option contract.

$\$23.8 \times 527,490$  tons = \$12,554,262 annually.

This is the amount that the company reduces and saves, which is equivalent to approximately 18,203,679,900 Iraqi dinars.

To calculate the difference between the two methods and verify it, it is as follows:

$527,490$  tons  $\times 598 = \$315,439,020$  purchasing without hedging procedures

$527,490$  tons  $\times 574.2 = \$302,884,490$  purchasing with hedging procedures

$315,439,020 - 302,884,490 = \$12,554,262$  annually.

This is the same amount that would be reduced and saved if the contract were based on this strategy, equivalent to approximately 18,203,679,900 Iraqi dinars annually.

b. If the company wishes to exercise the option right on 15/9/2022, when the price per ton of sugar was \$622.

574.2 \$ represents the breakeven point for buying the purchase option

\$622 exercise price on 15/9/2022

$\$622 - \$574.2 = \$47.8$  profit per ton from executing the purchase option contract

$47.8 \times 527,490$  tons = \$25,214,022 annually

This is the amount that is reduced and saved by the company, equivalent to approximately 36,560,331,900 Iraqi dinars annually.

To calculate the difference between the two methods and verify it, the following is done as follows:

$527,490$  tons  $\times 622 = \$328,098,780$ : Purchase without applying hedging procedures.

$527,490$  tons  $\times 574.2 = \$302,884,490$ : Purchase with applying hedging procedures.

$328,098,780 - 302,884,490 = \$25,214,022$  annually.

This is the same amount that would have been reduced and saved if the contract had been based on this strategy, which is equivalent to approximately 36,560,331,900 Iraqi dinars.

## 2- Second Commodity: Wheat

Iraq needs an average of 373,856 tons of wheat annually. As shown in Table 19, we will compare the prices per ton of imported wheat contracted by the Public Company for Grain Trade through tenders with the prices of wheat in the global market for the same

period. The price of wheat for the first half of the agricultural season 2021/2022 was less than \$700, then started to rise in the third quarter of 2021 to reach \$725 on 9/1/2021.

Here, the company contracts to purchase a call option contract on 9/1/2021 when the price of wheat started to rise and reached \$725 per ton. The contract is for a term of 9 months until 6/1/2022, which means the company can exercise the right to buy the option or not execute it in exchange for a premium during that period. We calculate the premium amount and the break-even point as follows:

$$725\$ \text{ Price per ton} \times 10\% \text{ Option price} = 72.5\$ \text{ Option premium amount}$$

$$725 + 72.5 = 797.5\$ \text{ Price per ton, which represents the Break Even point using hedging measures.}$$

a. In case prices drop below the execution level, the company does not execute the option and the maximum loss the company can bear is only the premium amount of 72.5\$ per ton.

b. In case prices rise above the Break Even point, the company will execute the option and the return it will achieve is undefined. The company will have several strategies to execute the right to a call option, including the following:

A. If the company wishes to execute the option on 1/3/2022, when the price per ton of wheat was 1006\$.

797.5\$ represents the Break Even point for buying a call option.

1006\$ Execution price for buying.

$$1006\$ - 797.5\$ = 208.5\$ \text{ Profit per ton from executing a call option contract.}$$

$$208.5\$ \times 373856 \text{ tons} = 77,948,976\$ \text{ annually.}$$

This is the amount that the company reduces and saves, which is equivalent to approximately 113,026,015,200 Iraqi dinars.

To calculate the difference between the two methods and verify it as follows:

$$373,856 \text{ tons} \times \$1006 = \$376,099,136 - \text{Purchasing without hedging measures}$$

$$373,856 \text{ tons} \times \$797.5 = \$298,150,160 - \text{Purchasing with hedging measures}$$

$$315,439,020 - 302,884,490 = \$77,948,976 \text{ per year.}$$

This is the same amount that would be reduced and saved if the contract were signed according to this strategy, equivalent to approximately 113,026,015,200 Iraqi dinars.

B - If the company wishes to exercise the option right on 1/4/2022, when the price of wheat per ton was \$1055.

\$797.5 represents the breakeven point for purchasing the call option.

\$1055 is the exercise price for the purchase option.

$$\$1055 - \$797.5 = \$257.5 - \text{Profit per ton from executing a purchase option contract.}$$

$$\$257.5 \times 373,856 \text{ tons} = \$96,267,920 \text{ per year.}$$

This is the amount that is reduced and saved by the company, equivalent to approximately 139,588,484,000 Iraqi dinars per year.

To calculate the difference between the two methods and verify it as follows:

$$373,856 \text{ tons} \times \$1055 = \$394,418,080 - \text{Purchasing without hedging measures}$$

$$373,856 \text{ tons} \times \$797.5 = \$298,150,160 - \text{Purchasing with hedging measures}$$

$$328,098,780 - 302,884,490 = \$96,267,920 \text{ per year.}$$

This is the same amount that would be reduced and saved if the contract were signed according to this strategy, equivalent to approximately 139,588,484,000 Iraqi dinars per year.

From the foregoing, we conclude:

The Ministry of Commerce resorts to importing basic commodities (wheat, rice, sugar, and oil) through the Public Company for Grain Trade and the Public Company for Food Trade to supply the ration card items. This is due to the insufficiency of local production in meeting the demand resulting from weather conditions such as high temperatures, water scarcity, drought, and desertification. The average annual production of wheat and rice locally amounted to 3,280,204 tons and 122,599 tons, respectively. As for the imported quantities, they amounted to 37,385 tons, 508,023 tons, 527,490 tons, and 527,490 tons, respectively, on an annual basis.

The Ministry of Commerce contracts through intermediaries (local investment companies) to supply it with ration card items in order to encourage investment. Most of these companies are exempt from taxes and customs duties for a period of 15 years under Investment Law No. 13 of 2006.

Most of the raw materials, such as sugar and oil, are imported by private sector companies from Ukraine and Brazil, rather than being domestically produced. As a result, these companies benefit from the exemptions provided by Investment Law No. 13 of 2006, as well as the commissions they receive through contracts with the Ministry of Commerce.

The neglect of giant state-owned factories that ceased operations after 2003, such as the sugar factory in Maysan and the sugar beet factory in Nineveh, contributed increase expenditures on imported goods stocks, and it was preferable to rehabilitate them and return them to operation through the renewal and development of their production lines, which contribute to reducing expenditures, as well as eliminating the costs of intermediaries' commissions.

Relying on the method of tenders, direct invitations, or partnership contracts has led to an increase in the prices of imported goods from the ration card items and the Public Company for Grain Trade has incurred significant losses, in addition to the added intermediation costs and poor quality, resulting in a significant waste of money and failure to rationalize or reduce expenditures.

The amount saved and reduced according to the new mechanism through hedging against the increase in import prices of basic materials for sugar and wheat, in case the options contracts are implemented, amounted to \$12,554,262 annually and \$77,948,976 annually, respectively, at the implementation price of the first model (A), and amounted to \$25,214,022 annually and \$96,267,920 annually, respectively, at the implementation price of the second model (B).

And therefore, hedging against the fluctuations in the increase of prices of imported basic food items for the ration card (wheat, rice, sugar, and oil) using financial engineering tools contributed to reducing expenditure, which is evidence of the research hypotheses.

## **Conclusions:**

1. Using financial engineering applications such as hedging against the increase in prices of basic commodities through (options contracts/American options) contributed to reducing the prices of imported basic commodities, which in turn reflects on providing larger quantities of these commodities and thus achieving food security.

2. The total public expenditures in the budget are continuously increasing during the study period, and the volume of expenditure was directed towards operational expenditures at the expense of investment expenditures during the period from 2015 to 2022.
3. The allocations of governing expenditures for the ration card in the Public distribution system in the budget are continuously decreasing and do not meet the requirements of providing the basic items of the ration card (wheat, rice, sugar, and oil) and distributing them to citizens for a period of (12) months.
4. The Ministry of Commerce resorts to importing basic commodities (wheat, rice, sugar, and oil) for the preparation of the food ration card due to insufficient local production. The quantities imported annually were 37,385, 508,023, 527,490, and 527,490 tons respectively.
5. The neglect of giant factories owned by the state and stopped after 2003, such as the sugar factory in Maysan and the sugar beet factory in Nineveh, contributed to the increase in expenditures on imported goods.
6. The reliance on bidding methods, direct invitations, or participation contracts has led to an increase in the prices of imported goods for the food ration card. This has resulted in significant losses for the Public Company for Grain Trade and the Public Company for Food Trade, in addition to the added intermediation costs and poor quality, thus leading to a significant waste of money and a failure to rationalize or reduce expenditures.:
7. The amount saved and reduced and according to the new mechanism through hedging against the increase in import prices of basic materials for sugar and wheat, if the options contracts are executed, amounted to \$12,554,262 annually and \$77,948,976 annually, respectively, at the execution price of the first model (A). It amounted to \$25,214,022 annually and \$96,267,920 annually, respectively, at the execution price of the second model (B).

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