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# FINANCIAL AND ECONOMIC INDICATORS

*The Monte Carlo method of random simulation samples*

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The Monte Carlo method is one of the most powerful mathematical techniques that, through calculation, analyzes risk and allows solving physical and mathematical problems through computer programs, Using historical data, creates and predicts models of possible future results by substituting a range of values, calculating results over and over again, using a different group of random values of the probability functions to predict the possible results of some uncertain event related to problems of all kinds.

Monte Carlo simulations offer a clearer picture than a deterministic forecast. The model has a wide range of applications that offer the probability of possible outcomes in various sectors that handle multiple random variables such as business, investment, engineering, biology, meteorology, astronomy, particle physics, etc. Among the practical applications in business, finance, and economics, we can mention the following problems:

a) Stocks: The Monte Carlo model estimates the possible behavior of the future value and profitability of an individual stock or a group of stocks. The prediction of the probability of the movement and future value of the shares is carried out taking into consideration that in reality, it is not possible to predict it accurately.
b) Investment projects: They are used to estimate the probability of implementing large projects based on their profitability, avoiding cost overruns and time overruns in schedules.
c) Investment Portfolios: Create, value, and analyze the financial products that comprise it to generate a positive return.
d) Evaluate complex financial products such as those derived from financial options.
e) Risk management: identifies, analyzes, and evaluates risks, as well as their mitigation and supervision. Risk identification is the process of identifying and evaluating threats to an organization, its operations, and its administrative processes.

f) Creation of risk management models: Processes for measuring and quantifying the probabilities of adverse effects on the markets in financial investments or new projects.

The development of the Monte Carlo method began in 1946 by the mathematician and physicist Stanislaw Ulam (1909–1984), who was involved in the Manhattan Project whose objective was to develop the first atomic bomb. The idea of statistical simulation arose after asking the following question: What is the possibility of successfully solving a Canfield solitaire with 52 cards? The method was built thinking about problems such as neutron diffusion in mathematical physics. and in how to change the processes by differential equations as a succession of random operations. This idea was shared with John Von Neumann, and together they began to plan the actual calculations. (Ulam, 1983).

In the Journal of the American Statistical Association, in 1949 a seminal article was published where Nicholas Metropolis and Stanislaw Ulam presented the technique: The Monte Carlo method. The name Monte Carlo to designate the statistical simulation technique was proposed by Metropolis, inspired by the interest that Stanislaw Ulam had in the game of poker, (Metropolis and Stanislaw, 1949).



The Monte Carlo method is a numerical resolution method where the relationships and interactions of different objects and their environment are modeled, through the random generation of these interactions. The greater the repetition of tests, the result that converges to a value with greater precision. (Vargas & Cruz-Carpio, 2020)

In Monte Carlo methods the properties of the distributions of random variables are investigated by simulating random numbers. These methods are like the usual statistical methods in which random samples are used to make inferences about source populations. In its statistical application, a model is used to simulate a phenomenon that contains some random component. In Monte Carlo methods, the object of investigation is a model itself, and random or pseudo-random events are used to study it (Gentle, 2006).

In all types of research where an observation or measurement experiment is carried out, and data from different variables are obtained; It is essential to make a dependency relationship between the variables to make predictions or forecasts of future events.

The difference between a simulation and a statistical analysis is that in the Monte Carlo simulation, the results or output variables previously obtained in the statistical analysis are used as input variables (Eppen, 2000).

At present, the Monte Carlo model methodology has not been applied in armed conflicts, its use has been oriented towards solving problems to obtain a social benefit. The great

importance of the Monte Carlo method is based on the attention to problems that are difficult to solve by analytical or numerical methods, which depend on random factors or are associated with a deterministic model, identifying, and offering optimal solutions.

Economic and financial indicators are useful tools that benefit organizations by facilitating timely and appropriate decision-making about their corporate and financial strategies.

Next, the evolution of some economic and financial indicators of the Mexican environment is described and shown to facilitate decision-making related to personal and business strategies in an integral manner.

1. National Consumer Price Index (INPC, Spanish)
2. The Price and Quotation Index of the Mexican Stock Exchange (IPC, Spanish)
3. Exchange rate
4. Equilibrium interbank interest rate (TIIE, Spanish)
5. CETES rate of return
6. Investment units (UDIS, Spanish)

## 1. NATIONAL CONSUMER PRICE INDEX (INPC)

Born in 1995 and reflecting changes in consumer prices, measures the general increase in prices in the country. It is calculated fortnightly by the Bank of Mexico and INEGI (2021). INPC is published in the Official Gazette of the Federation on the 10th and 25th of each month. The reference period is the second half of December 2010.

**Table 1**

**Accumulated inflation in the year (Base: 2nd. Fortnight of December 2010 = 100 with data provided by *Banco de México*)**

| Periodo | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Enero | 1.48 | 0.77 | 0.98 | 0.79 | 0.90 | -0.09 | 0.38 | 1.70 | 0.53 | 0.09 | 0.48 | 0.86 | 0.59 | 0.76 |
| Febrero | 2.15 | 1.42 | 1.47 | 1.46 | 1.15 | 0.09 | 0.82 | 2.29 | 0.91 | 0.06 | 0.90 | 1.50 | 1.43 | 1.24 |
| Marzo | 2.52 | 1.84 | 1.55 | 1.99 | 1.43 | 0.51 | 0.97 | 2.92 | 1.24 | 0.44 | 0.85 | 2.34 | 2.43 | 1.51 |
| Abril | 1.98 | 0.72 | 0.69 | 1.81 | 1.24 | 0.25 | 0.65 | 3.04 | 0.90 | 0.50 | -0.17 | 2.67 | 2.98 | 1.47 |
| Mayo | 0.60 | -0.70 | -0.65 | 0.95 | 0.91 | -0.26 | 0.20 | 2.92 | 0.73 | 0.21 | 0.22 | 2.88 | 3.17 | 1.27 |
| Junio | 0.49 | -0.41 | -0.41 | 1.12 | 1.09 | -0.09 | 0.31 | 3.18 | 1.12 | 0.27 | 0.76 | 3.43 | 4.04 | 1.37 |
| Julio | 0.56 | -0.04 | 0.32 | 1.14 | 1.42 | 0.06 | 0.57 | 3.57 | 1.66 | 0.65 | 1.43 | 4.04 | 4.81 | 1.86 |
| Agosto | 0.91 | 0.30 | 0.92 | 1.31 | 1.73 | 0.27 | 0.86 | 4.08 | 2.26 | 0.63 | 1.82 | 4.24 | 5.54 | 2.42 |
| Septiembre | 1.27 | 0.73 | 1.12 | 1.61 | 2.18 | 0.27 | 1.47 | 4.41 | 2.69 | 0.89 | 2.06 | 4.88 | 6.19 | |
| Octubre | 2.35 | 2.33 | 2.12 | 2.77 | 2.74 | 1.16 | 2.09 | 5.06 | 3.22 | 1.44 | 2.68 | 5.76 | 6.79 | |
| Noviembre | 3.89 | 4.87 | 3.86 | 4.57 | 3.57 | 1.71 | 2.89 | 6.15 | 4.10 | 2.26 | 2.76 | 6.97 | 7.41 | |
| Diciembre | 4.19 | 5.81 | 3.97 | 5.21 | 4.08 | 2.13 | 3.36 | 6.77 | 4.83 | 2.83 | 3.15 | 7.35 | 7.82 | |

Source: Own elaboration (INEGI, 2023). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general

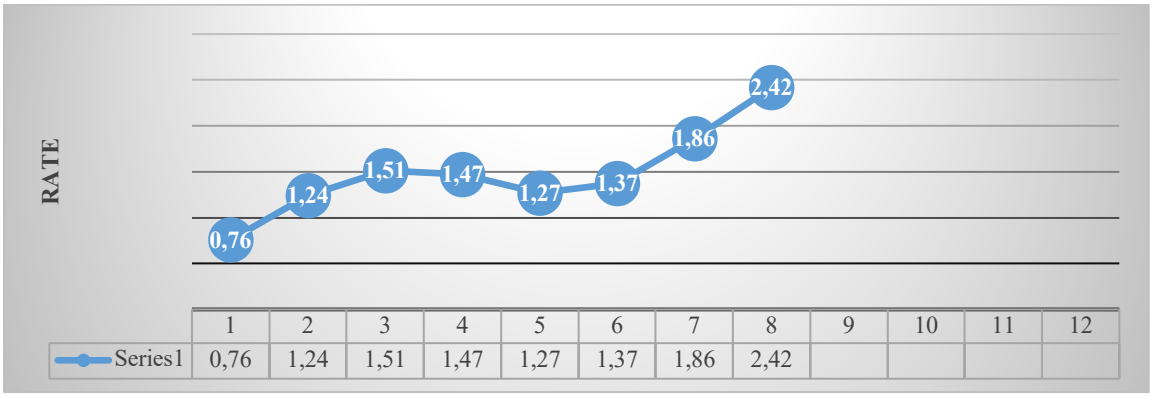
**Graph 1**

**Inflation in Mexico (2010-2022 accumulated at the end of the year)**


Source: Own elaboration (INEGI, 2023). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general

**Graph 2**

**Inflation in Mexico (accumulated January-August 2023)**




Source: Own elaboration (INEGI, 2023). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general

## 2. THE PRICE AND QUOTATION INDEX OF THE MEXICAN STOCK EXCHANGE (IPC)

Represents the change in the values traded on the Mexican Stock Exchange concerning the previous day to determine the percentage of rising or falling of the most representative shares of the companies listed therein.



**Table 2**

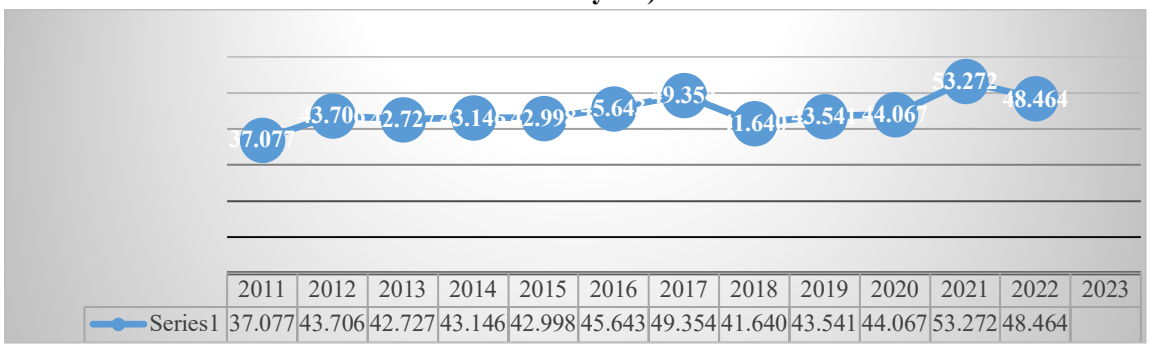
**The Price and Quotation Index of the Mexican Stock Exchange (Base: October 1978, 0.78=100)**

| 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36,982 | 37,422 | 45,278 | 40,879 | 40,951 | 43,631 | 47,001 | 50,456 | 43,988 | 44,862 | 42,986 | 51,331 | 54,564 |
| 37,020 | 37,816 | 44,121 | 38,783 | 44,190 | 43,715 | 46,857 | 47,438 | 42,824 | 41,324 | 44,593 | 53,401 | 52,758 |
| 37,441 | 39,521 | 44,077 | 40,462 | 43,725 | 45,881 | 48,542 | 46,125 | 43,281 | 34,554 | 47,246 | 56,537 | 53,904 |
| 36,963 | 39,461 | 42,263 | 40,712 | 44,582 | 45,785 | 49,261 | 48,354 | 44,597 | 36,470 | 48,010 | 51,418 | 55,121 |
| 35,833 | 37,872 | 41,588 | 41,363 | 44,704 | 45,459 | 48,788 | 44,663 | 42,749 | 36,122 | 50,886 | 51,753 | 52.736 |
| 36,558 | 40,199 | 40,623 | 42,737 | 45,054 | 45,966 | 49,857 | 47,663 | 43,161 | 37,716 | 50,290 | 47,524 | 53.526 |
| 35,999 | 40,704 | 40,838 | 43,818 | 44,753 | 46,661 | 51,012 | 49,698 | 40,863 | 37,020 | 50,868 | 48,144 | 54.819 |
| 35,721 | 39,422 | 39,492 | 45,628 | 43,722 | 47,541 | 51,210 | 49,548 | 42,623 | 36,841 | 53,305 | 44,919 | 53.021 |
| 33,503 | 40,867 | 40,185 | 44,986 | 42,633 | 47,246 | 50,346 | 49,504 | 43,011 | 37,459 | 51,386 | 44,627 | |
| 36,160 | 41,620 | 41,039 | 45,028 | 44,543 | 48,009 | 48,626 | 43,943 | 43,337 | 36,988 | 51,310 | 49,922 | |
| 36,829 | 41,834 | 42,499 | 44,190 | 43,419 | 45,286 | 47,092 | 41,733 | 42,820 | 41,779 | 49,699 | 51,685 | |
| 37,077 | 43,706 | 42,727 | 43,146 | 42,998 | 45,643 | 49,354 | 41,640 | 43,541 | 44,067 | 53,272 | 48,464 | |

Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=7&accion=consultarCuadro&idCuadro=CF57&locale=es

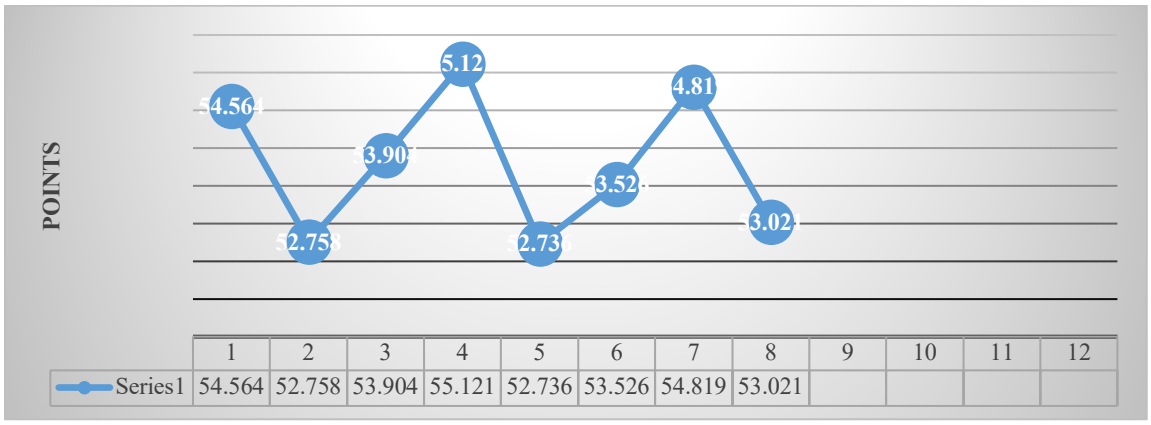
**Graph 3**

**The Price and Quotation Index of the Mexican Stock Exchange, 2011 - 2022 (Score at the end of each year)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=7&accion=consultarCuadro&idCuadro=CF57&locale=es

**Graph 4**
**The Price and Quotation Index of the Mexican Stock Exchange, January-August 2023 (Score at the end of each month**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=7&accion=consultarCuadro&idCuadro=CF57&locale=es

## 3. EXCHANGE RATE

It is the value of the Mexican peso concerning the dollar calculated with the daily average of the five most important banks in the country, which reflects the spot price (cash), negotiated between banks. It is highly related to Inflation, the interest rate, and the Mexican Stock Exchange.

**Table 3**
**Exchange rate (National currency per US dollar, parity at the end of each period)**

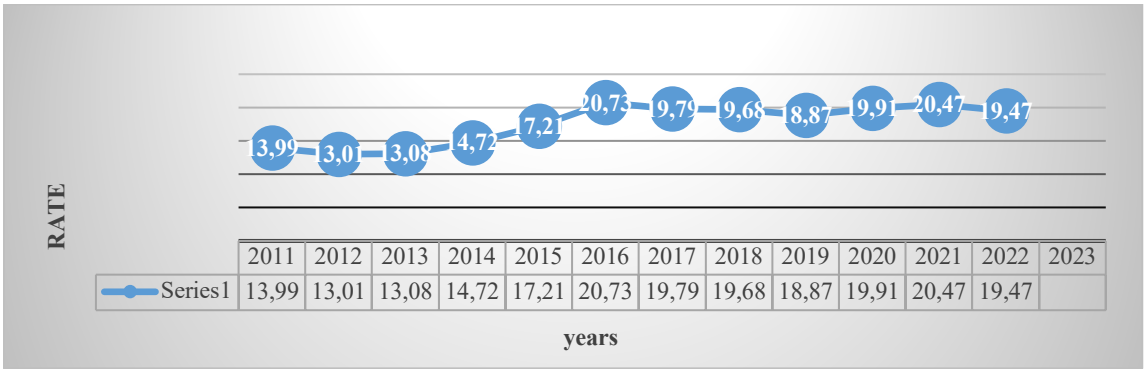
| Periodo | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Enero** | 12.02 | 12.95 | 12.71 | 13.37 | 14.69 | 18.45 | 21.02 | 18.62 | 19.04 | 18.91 | 20.22 | 20.74 | 18.79 |
| **Febrero** | 12.17 | 12.87 | 12.87 | 13.30 | 14.92 | 18.17 | 19.83 | 18.65 | 19.26 | 19.78 | 20.94 | 20.65 | 18.34 |
| **Marzo** | 11.97 | 12.80 | 12.36 | 13.08 | 15.15 | 17.40 | 18.81 | 18.33 | 19.38 | 23.48 | 20.44 | 19.99 | 18.04 |
| **Abril** | 11.59 | 13.20 | 12.16 | 13.14 | 15.22 | 19.40 | 19.11 | 18.86 | 19.01 | 23.93 | 20.18 | 20.57 | 18.00 |
| **Mayo** | 11.63 | 13.91 | 12.63 | 12.87 | 15.36 | 18.45 | 18.51 | 19.75 | 19.64 | 22.18 | 19.92 | 19.69 | 17.74 |
| **Junio** | 11.84 | 13.66 | 13.19 | 13.03 | 15.57 | 18.91 | 17.90 | 20.06 | 19.21 | 23.09 | 19.91 | 20.13 | 17.07 |
| **Julio** | 11.65 | 13.28 | 12.73 | 13.06 | 16.21 | 18.86 | 17.69 | 18.55 | 19.99 | 22.20 | 19.85 | 20.34 | 16.73 |
| **Agosto** | 12.41 | 13.27 | 13.25 | 13.08 | 16.89 | 18.58 | 17.88 | 19.07 | 20.07 | 21.89 | 20.06 | 20.09 | 16.92 |
| **Septiembre** | 13.42 | 12.92 | 13.01 | 13.45 | 17.01 | 19.50 | 18.13 | 18.90 | 19.68 | 22.14 | 20.56 | 20.09 | |
| **Octubre** | 13.20 | 13.09 | 12.89 | 13.42 | 16.45 | 18.84 | 19.15 | 19.80 | 19.16 | 21.25 | 20.53 | 19.82 | |
| **Noviembre** | 14.03 | 13.04 | 13.09 | 13.72 | 16.55 | 20.55 | 18.58 | 20.41 | 19.61 | 20.14 | 21.45 | 19.40 | |
| **Diciembre** | 13.99 | 13.01 | 13.08 | 14.72 | 17.21 | 20.73 | 19.79 | 19.68 | 18.87 | 19.91 | 20.47 | 19.47 | |

NOTE: Exchange rate FIX by The Banco de México, used for settle obligations denominated in foreign currency. Quote at the end

Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CF102&locale=es

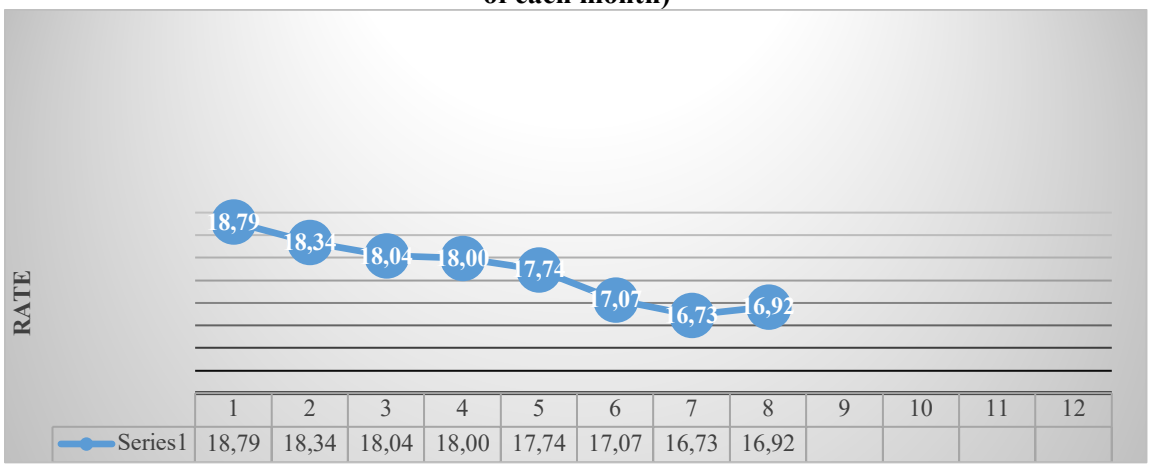


**Graph 5**
**Exchange rate (National currency per US dollar, 2011-2022, FIX parity at the end of each year)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CF102&locale=es

**Graph 6**
**Exchange rate (National currency per US dollar, January-August 2023, FIX parity at the end of each month)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CF102&locale=es

## 4. EQUILIBRIUM INTERBANK INTEREST RATE (TIIE)



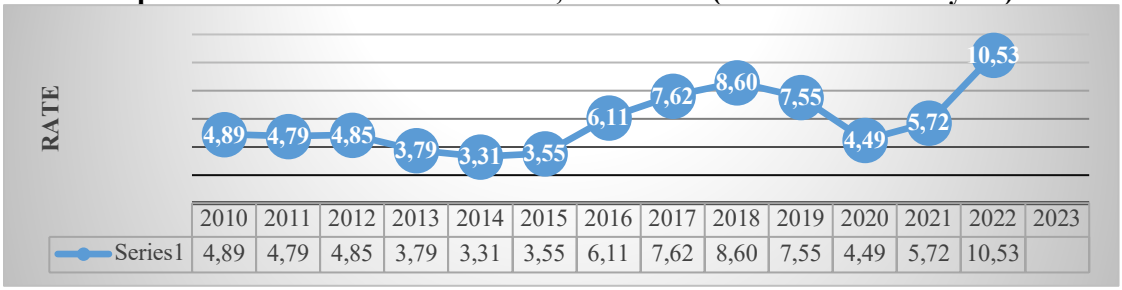
On March 23, 1995, the Bank of Mexico, to establish an interbank interest rate that better reflects market conditions, released the Interbank Equilibrium Interest Rate through the Official Gazette of the Federation.

**Table 4**
**Equilibrium interbank interest rate (28-day quote)**

| Periodo | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Enero** | 4.91 | 4.86 | 4.79 | 4.84 | 3.78 | 3.29 | 3.56 | 6.15 | 7.66 | 8.59 | 7.50 | 4.47 | 5.72 | 10.78 |
| **Febrero** | 4.92 | 4.84 | 4.78 | 4.80 | 3.79 | 3.29 | 4.05 | 6.61 | 7.83 | 8.54 | 7.29 | 4.36 | 6.02 | 11.10 |
| **Marzo** | 4.92 | 4.84 | 4.77 | 4.35 | 3.81 | 3.30 | 4.07 | 6.68 | 7.85 | 8.51 | 6.74 | 4.28 | 6.33 | 11.34 |
| **Abril** | 4.94 | 4.85 | 4.75 | 4.33 | 3.80 | 3.30 | 4.07 | 6.89 | 7.85 | 8.50 | 6.25 | 4.28 | 6.73 | 11.53 |
| **Mayo** | 4.94 | 4.85 | 4.76 | 4.30 | 3.79 | 3.30 | 4.10 | 7.15 | 7.86 | 8.51 | 5.74 | 4.29 | 7.01 | 11.54 |
| **Junio** | 4.94 | 4.85 | 4.77 | 4.31 | 3.31 | 3.30 | 4.11 | 7.36 | 8.10 | 8.49 | 5.28 | 4.32 | 7.42 | 11.50 |
| **Julio** | 4.92 | 4.82 | 4.78 | 4.32 | 3.31 | 3.31 | 4.59 | 7.38 | 8.11 | 8.47 | 5.19 | 4.52 | 8.04 | 11.50 |
| **Agosto** | 4.90 | 4.81 | 4.79 | 4.30 | 3.30 | 3.33 | 4.60 | 7.38 | 8.10 | 8.26 | 4.76 | 4.65 | 8.50 | 11.50 |
| **Septiembre** | 4.90 | 4.78 | 4.81 | 4.03 | 3.29 | 3.33 | 4.67 | 7.38 | 8.12 | 8.04 | 4.55 | 4.75 | 8.89 | |
| **Octubre** | 4.87 | 4.79 | 4.83 | 3.78 | 3.28 | 3.30 | 5.11 | 7.38 | 8.15 | 7.97 | 4.51 | 4.98 | 9.56 | |
| **Noviembre** | 4.87 | 4.80 | 4.85 | 3.80 | 3.31 | 3.32 | 5.57 | 7.39 | 8.34 | 7.78 | 4.48 | 5.13 | 10.00 | |
| **Diciembre** | 4.89 | 4.79 | 4.85 | 3.79 | 3.31 | 3.55 | 6.11 | 7.62 | 8.60 | 7.55 | 4.49 | 5.72 | 10.53 | |

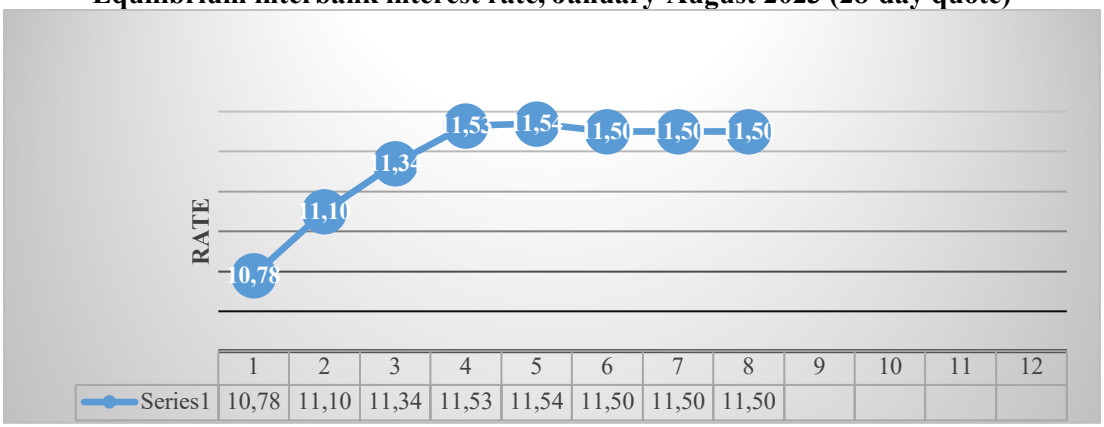
Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es

**Graph 7**
**Equilibrium interbank interest rate, 2010- 2022 (at the end of each year)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es

**Graph 8**
**Equilibrium interbank interest rate, January-August 2023 (28-day quote)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es

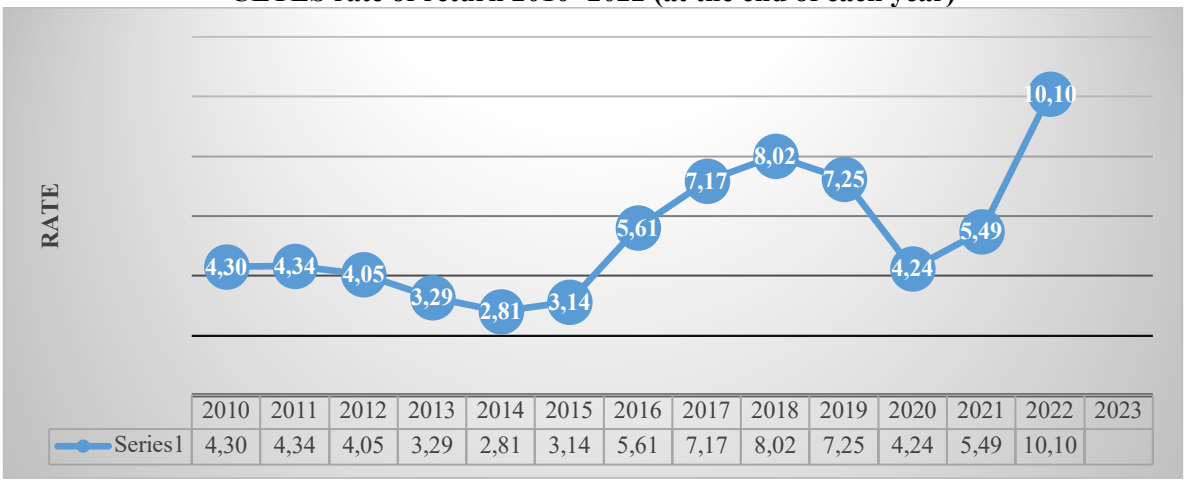
## 5. CETES RATE OF RETURN

**Table 5.**
**CETES rate of return (28-day)**

| Periodo | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Enero** | 4.49 | 4.14 | 4.27 | 4.15 | 3.14 | 2.67 | 3.08 | 5.83 | 7.25 | 7.95 | 7.04 | 4.22 | 5.50 | 10.80 |
| **Febrero** | 4.49 | 4.04 | 4.32 | 4.19 | 3.16 | 2.81 | 3.36 | 6.06 | 7.40 | 7.93 | 6.91 | 4.02 | 5.94 | 11.04 |
| **Marzo** | 4.45 | 4.27 | 4.24 | 3.98 | 3.17 | 3.04 | 3.80 | 6.32 | 7.47 | 8.02 | 6.59 | 4.08 | 6.52 | 11.34 |
| **Abril** | 4.44 | 4.28 | 4.29 | 3.82 | 3.23 | 2.97 | 3.74 | 6.50 | 7.46 | 7.78 | 5.84 | 4.06 | 6.68 | 11.27 |
| **Mayo** | 4.52 | 4.31 | 4.39 | 3.72 | 3.28 | 2.98 | 3.81 | 6.56 | 7.51 | 8.07 | 5.38 | 4.07 | 6.90 | 11.25 |
| **Junio** | 4.59 | 4.37 | 4.34 | 3.78 | 3.02 | 2.96 | 3.81 | 6.82 | 7.64 | 8.18 | 4.85 | 4.03 | 7.56 | 11.02 |
| **Julio** | 4.60 | 4.14 | 4.15 | 3.85 | 2.83 | 2.99 | 4.21 | 6.99 | 7.73 | 8.15 | 4.63 | 4.35 | 8.05 | 11.09 |
| **Agosto** | 4.52 | 4.05 | 4.13 | 3.84 | 2.77 | 3.04 | 4.24 | 6.94 | 7.73 | 7.87 | 4.50 | 4.49 | 8.35 | 11.07 |
| **Sep.** | 4.43 | 4.23 | 4.17 | 3.64 | 2.83 | 3.10 | 4.28 | 6.99 | 7.69 | 7.61 | 4.25 | 4.69 | 9.25 | |
| **Oct.** | 4.03 | 4.36 | 4.21 | 3.39 | 2.90 | 3.02 | 4.69 | 7.03 | 7.69 | 7.62 | 4.22 | 4.93 | 9.00 | |
| **Nov.** | 3.97 | 4.35 | 4.23 | 3.39 | 2.85 | 3.02 | 5.15 | 7.02 | 7.83 | 7.46 | 4.28 | 5.05 | 9.70 | |
| **Dic.** | 4.30 | 4.34 | 4.05 | 3.29 | 2.81 | 3.14 | 5.61 | 7.17 | 8.02 | 7.25 | 4.24 | 5.49 | 10.10 | |

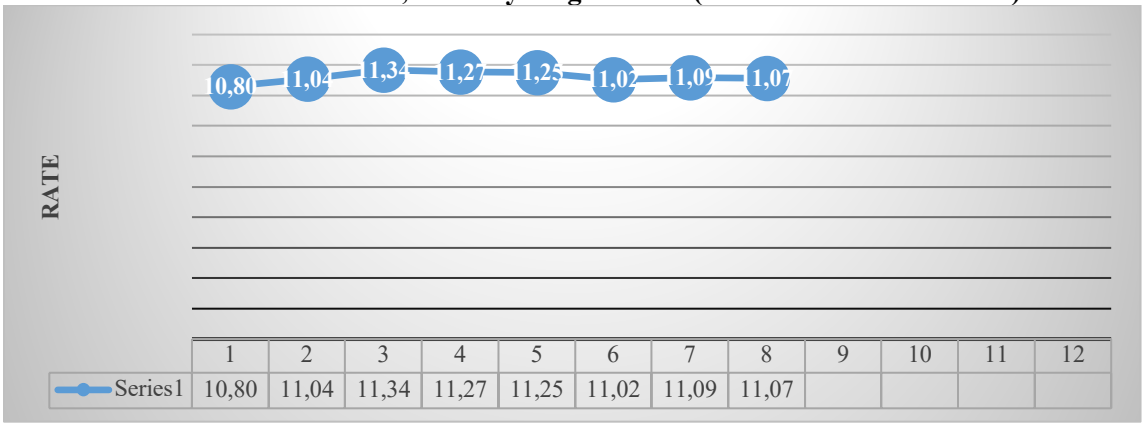
Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es

**Graph 9**
**CETES rate of return 2010- 2022 (at the end of each year)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es

**Graph 10**
**CETES rate of return, January-August 2023 (at the end of each month)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es

## 6. INVESTMENT UNITS (UDIS)

The UDI is a unit of account of constant real value to denominate credit titles. It does not apply to checks, commercial contracts, or other acts of commerce.

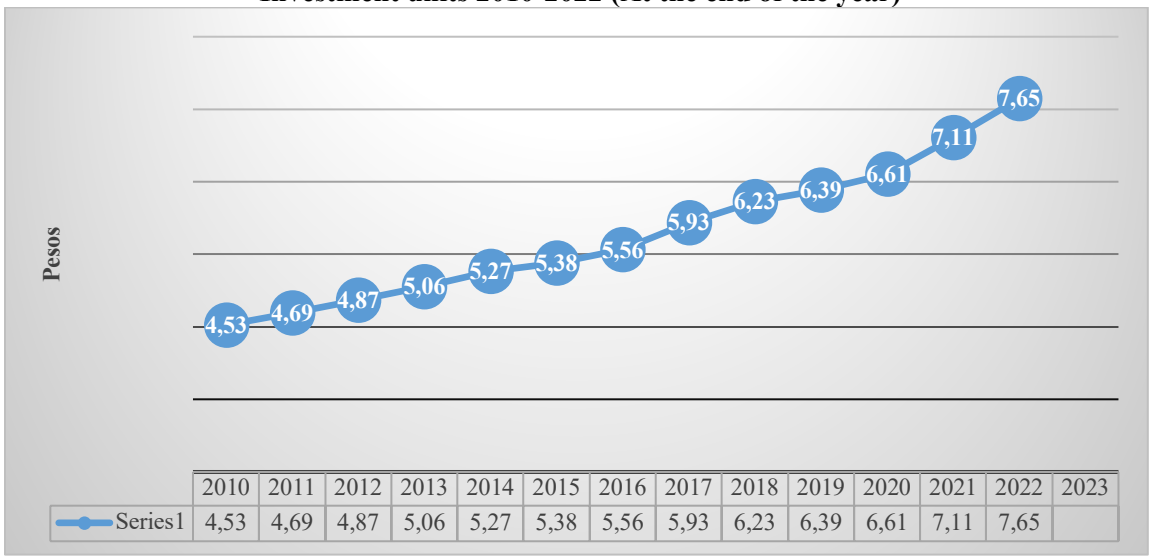


**Table 6**
**Investment units (value concerning pesos)**

| Periodo | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Enero** | 4.37 | 4.56 | 4.73 | 4.89 | 5.10 | 5.29 | 5.41 | 5.62 | 5.97 | 6.25 | 6.44 | 6.64 | 7.12 | 7.69 |
| **Febrero** | 4.41 | 4.57 | 4.75 | 4.92 | 5.13 | 5.29 | 5.43 | 5.69 | 6.00 | 6.25 | 6.46 | 6.70 | 7.18 | 7.74 |
| **Marzo** | 4.44 | 4.59 | 4.75 | 4.94 | 5.15 | 5.30 | 5.44 | 5.71 | 6.02 | 6.26 | 6.49 | 6.75 | 7.24 | 7.77 |
| **Abril** | 4.46 | 4.59 | 4.75 | 4.97 | 5.15 | 5.32 | 5.45 | 5.75 | 6.03 | 6.28 | 6.43 | 6.79 | 7.31 | 7.78 |
| **Mayo** | 4.43 | 4.58 | 4.71 | 4.96 | 5.13 | 5.29 | 5.42 | 5.75 | 6.01 | 6.27 | 6.42 | 6.81 | 7.33 | 7,78 |
| **Junio** | 4.41 | 4.55 | 4.74 | 4.95 | 5.13 | 5.28 | 5.42 | 5.75 | 6.01 | 6.26 | 6.44 | 6.83 | 7.36 | 7.77 |
| **Julio** | 4.42 | 4.57 | 4.77 | 4.95 | 5.14 | 5.28 | 5.42 | 5.76 | 6.04 | 6.27 | 6.49 | 6.87 | 7.43 | 7.79 |
| **Agosto** | 4.43 | 4.58 | 4.78 | 4.95 | 5.16 | 5.29 | 5.44 | 5.79 | 6.07 | 6.29 | 6.52 | 6.90 | 7.47 | 7.83 |
| **Septiembre** | 4.44 | 4.59 | 4.80 | 4.97 | 5.18 | 5.31 | 5.45 | 5.82 | 6.11 | 6.29 | 6.55 | 6.92 | 7.53 | |
| **Octubre** | 4.47 | 4.61 | 4.83 | 4.99 | 5.20 | 5.33 | 5.49 | 5.84 | 6.13 | 6.31 | 6.57 | 6.97 | 7.57 | |
| **Noviembre** | 4.50 | 4.64 | 4.85 | 5.02 | 5.23 | 5.36 | 5.53 | 5.89 | 6.17 | 6.35 | 6.60 | 7.04 | 7.62 | |
| **Diciembre** | 4.53 | 4.69 | 4.87 | 5.06 | 5.27 | 5.38 | 5.56 | 5.93 | 6.23 | 6.39 | 6.61 | 7.11 | 7.65 | |

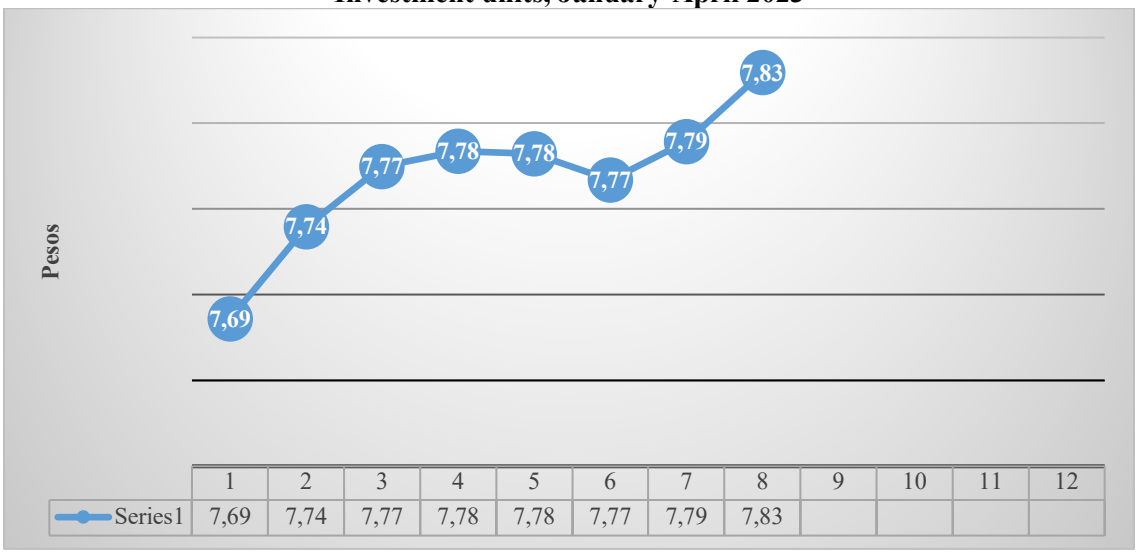
Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CP150&locale=es

**Graph 11**
**Investment units 2010-2022 (At the end of the year)**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CP150&locale=es

**Graph 12**
**Investment units, January-April 2023**




Source: Own elaboration (BANXICO, 2023).
https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCuadro&idCuadro=CP150&locale=es



In these uncertain times, it is very important to apply the best mathematical models to carry out the appropriate analyzes that offer us the necessary information to make business decisions related, among others, to investment, opportunity costs, market share, sales forecasts, plans business, business valuation or risk assessment.

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