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Equilibrium prices of the titles: Sharpe and the Securities Valuation Model (CAPM)

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Acceso abierto diamante

Abstract

The Capital Asset Pricing Model (CAPM) is a model used to calculate the profitability that an investor must demand when making an investment in a financial asset, depending on the risk he is assuming.

The Capital Asset Pricing Model (CAPM) is a model used to calculate the profitability that an investor must demand when making an investment in a financial asset, depending on the risk he is assuming.

Asset valuation models did not exist until before the publications of the capital asset valuation model (CAPM) by William Sharpe (1963) and John Lintner (1965). These models embodied the first principles about the nature of tastes and investment opportunities as well as clear and testable predictions of risk and return.

William Sharpe was born in 1934 in Massachusetts, studied at the University of California at Los Angeles UCLA, worked as a researcher at the RAND Corporation, was a professor at the University of Washington (Seattle), (1961-1968), at the University of California at Irvine and professor at Stanford University (since 1970).

Sharpe was awarded the Nobel Prize in Economics in 1990, shared with Harry M. Markowitz and Merton M. Miller for their pioneering work in the theory of financial economics.

Harry Markowitz and William F. Sharpe developed the Capital Asset Valuation Model (CAPM), the model is based on the proposition that any required rate of return on a stock is equal to the risk-free rate plus a risk premium, where this reflects diversification.

Initially, estimating profits through Markowitz's theory of Portfolio Selection was impractical since estimating the benefits of diversification required calculating the covariance of returns between each pair of securities. William F. Sharpe initiated the study of the valuation of securities in 1960, for this, he worked with Markowitz on portfolio analysis based on a simplified model of the relationships between securities. This analysis at Markowitz's suggestion was called by Sharp the "single index model", now known as the "one-factor model". The basic assumption of this model is that security returns are related only by their responses to a common factor. Sharpe published in the article called (A simplified model for portfolio analysis, 1963), the normative results.

In 1968, Eugene Fama, when referring to the models of Sharpe and Lintner, used the terms "capital asset pricing models", and in 1970 the first references to the acronym, CAPM, were made.

Sharpe mentions that the CAPM is constructed using an approach that is familiar to a microeconomist. First, the maximization behavior is adopted, and then, the conditions under which the market equilibrates are investigated. In 1965, Jack Treynor in his article (How to rate management of investment funds); and, in 1965, Linter in his article (Security prices, risk, and maximal gains from diversification) came to similar conclusions. In 1966, Jan Mossin published (Equilibrium in a Capital Asset Market) a version that also reaches the same relationship with a more general mode.

The proposal of Jack Treynor (1965) proposes that the evaluation of past performance is performed with a coefficient using as a measure of portfolio risk, the indicator is then designated as "beta coefficient".

Beta is the key element of CAMP. The Beta coefficient is the key element of the CAMP, it is a measure of the market risk of the stock and the degree to which the returns of a given stock move with the stock market.

Economic and financial indicators are useful tools that benefit organizations by facilitating timely and appropriate decision-making in relation to 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.

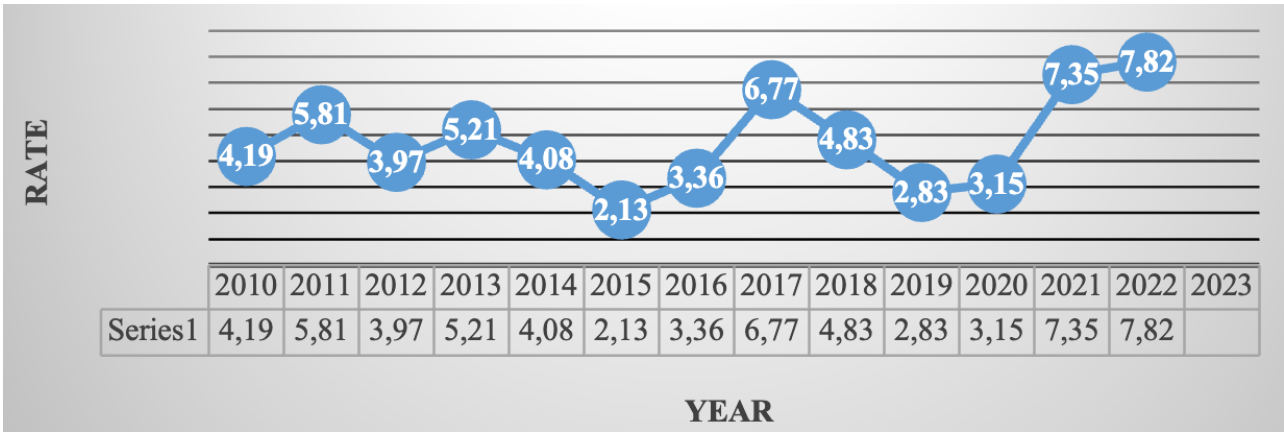
). INPC is published in the Official Gazette of the Federation on the 10th and 25th of each month. The reference period is the second half of December 2010.

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	
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	
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	
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	
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	

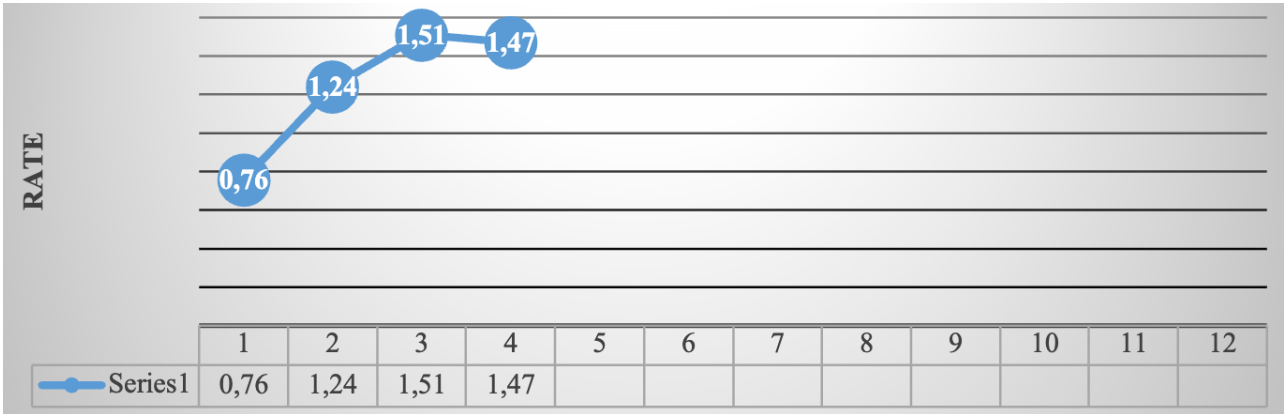
Own elaboration (INEGI, 2023). Route: Indicadores económicos de coyuntura > Índices de precios > Índice nacional de precios al consumidor. Base segunda quincena de julio de 2018=100 > Mensual > Índice > Índice general



Graph 1

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

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-April 2023)

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)

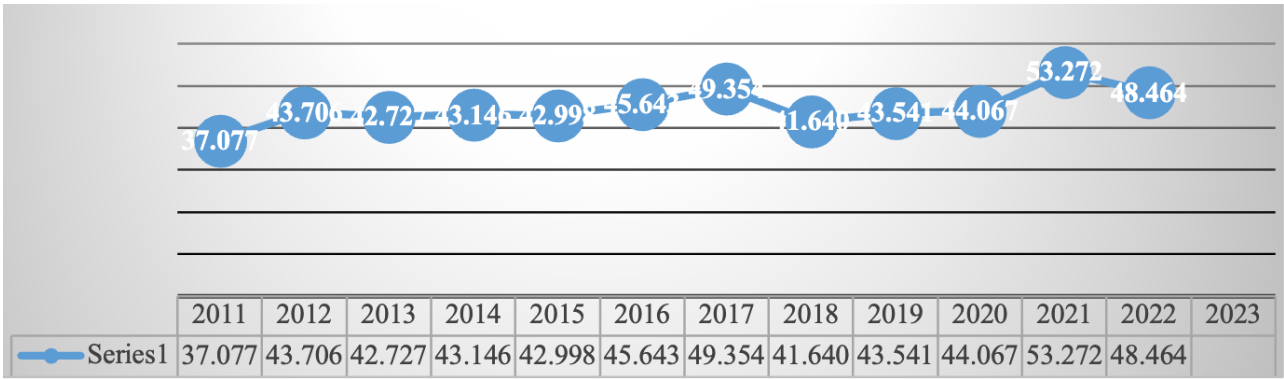
Represents the change in the values traded on the Mexican Stock Exchange concerning the previous day to determine the percentage of rising or fall of the most representative shares of the companies listed therein.

Table 2

The Price and Quotation Index of the Mexican Stock Exchange Base October 1978 078100

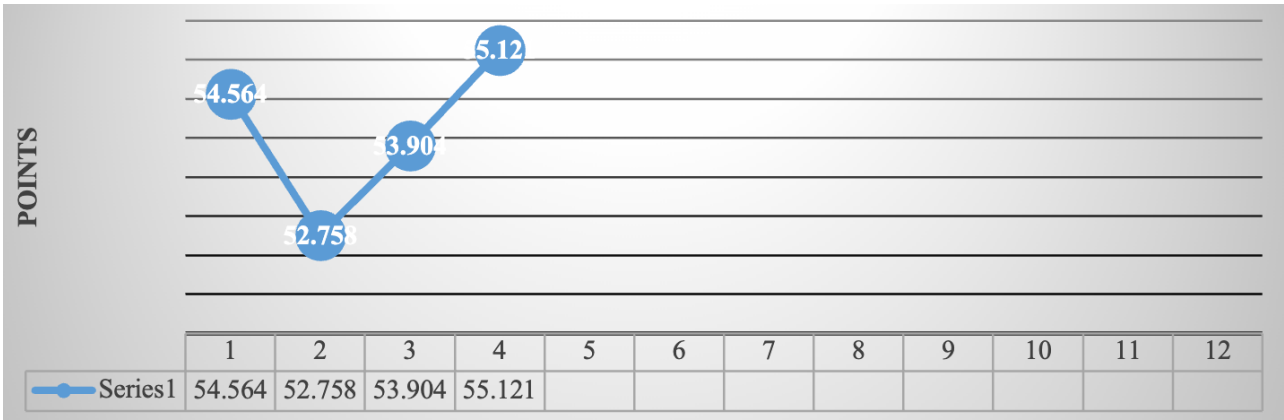
2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
36,982	37,422	45,278	40,879	40,951	43,631	47,001	50,456	43,988	44,862	42,986	51,331	54,564
37,020	37,816	44,121	38,783	44,190	43,715	46,857	47,438	42,824	41,324	44,593	53,401	52,758
37,441	39,521	44,077	40,462	43,725	45,881	48,542	46,125	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	
36,558	40,199	40,623	42,737	45,054	45,966	49,857	47,663	43,161	37,716	50,290	47,524	
35,999	40,704	40,838	43,818	44,753	46,661	51,012	49,698	40,863	37,020	50,868	48,144	
35,721	39,422	39,492	45,628	43,722	47,541	51,210	49,548	42,623	36,841	53,305	44,919	
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	

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)
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-April 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

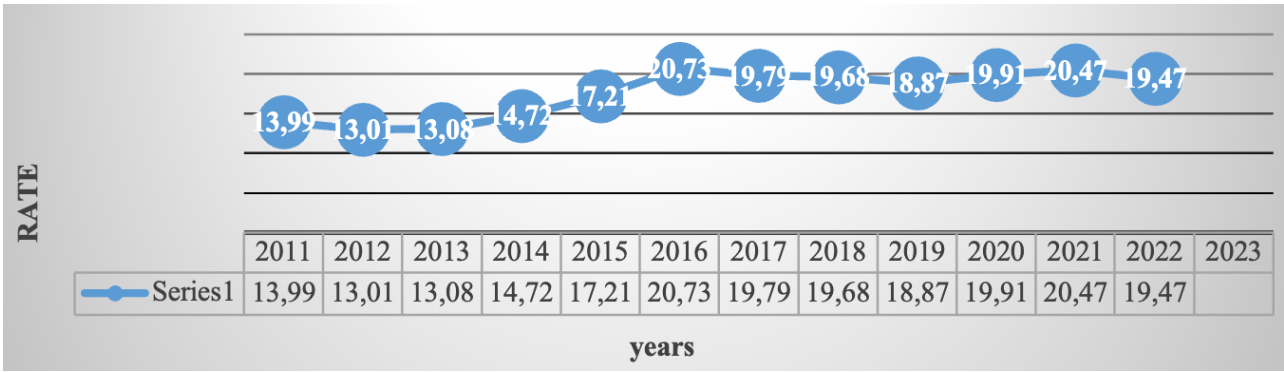
It is the value of the Mexican peso with respect to the dollar calculated with the daily average of the five most important banks in the country, which reflects the spot price (cash), negotiated between banks. It is highly related to Inflation, the interest rate, and the Mexican Stock Exchange.

Table 3

Exchange rate National currency per US dollar parity at the end of each period

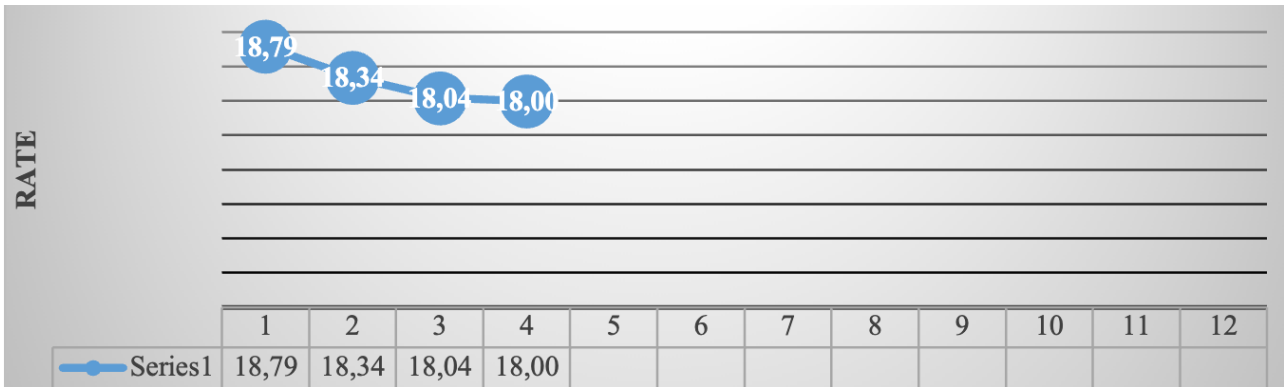
Periodo	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Enero	12.02	12.95	12.71	13.37	14.69	18.45	21.02	18.62	19.04	18.91	20.22	20.74	18.79
Febrero	12.17	12.87	12.87	13.30	14.92	18.17	19.83	18.65	19.26	19.78	20.94	20.65	18.34
Marzo	11.97	12.80	12.36	13.08	15.15	17.40	18.81	18.33	19.38	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	
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	
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	
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	
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	

Own elaboration (BANXICO, 2023). <https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=6&accion=consultarCuadro&idCuadro=CF102&locale=es>
 Exchange rate FIX by The Banco de México, used for settle obligations denominated in foreign currency. Quote at the end



Graph 5

Exchange rate (National currency per US dollar, 2011-2022, FIX parity at the end of each year)
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-April 2023, FIX parity at the end of each month)
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.

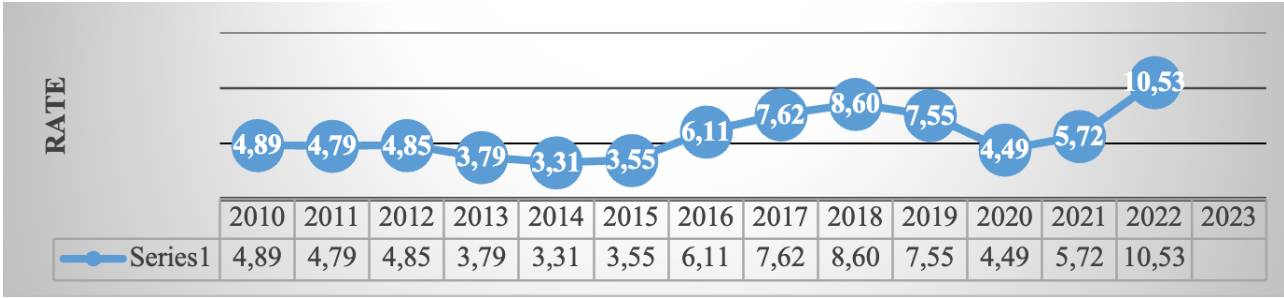
Table 4
Equilibrium interbank interest rate 28day quote

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	
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	
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	
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	
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 8. Equilibrium interbank interest rate, January-April 2023 (28-day quote)

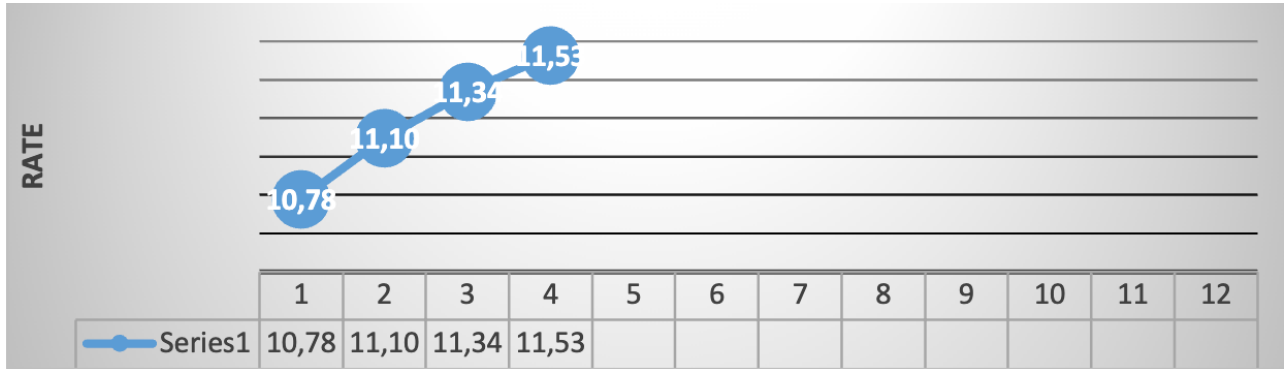
Source: Own elaboration (BANXICO, 2023). <https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es>



Graph 7.

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

<https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es>



Graph 8

Equilibrium interbank interest rate, January-April 2023 (28-day quote)

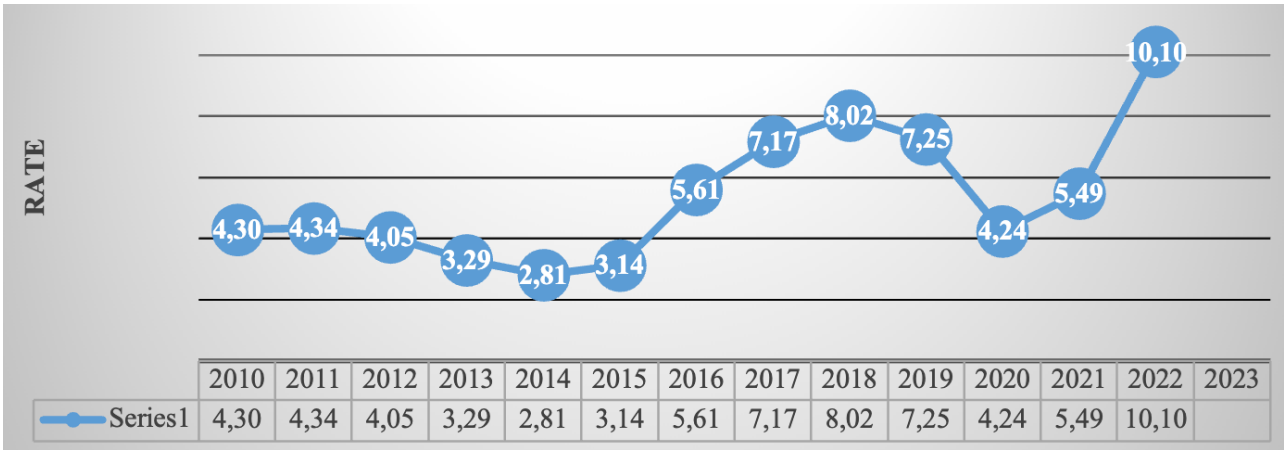
Source: Own elaboration (BANXICO, 2023). <https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=18&accion=consultarCuadro&idCuadro=CF101&locale=es>

5. CETES RATE OF RETURN

Table 5
CETES rate of return 28day

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	
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	
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	
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	
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	

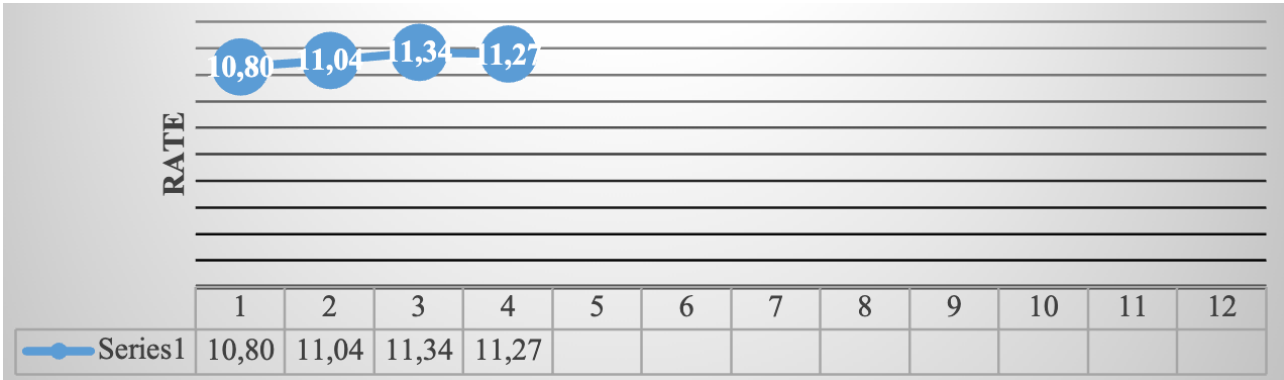
:Own elaboration (BANXICO, 2023). <https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=22&accion=consultarCuadro&idCuadro=CF107&locale=es>



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-April 2023 (at the end of each month)

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

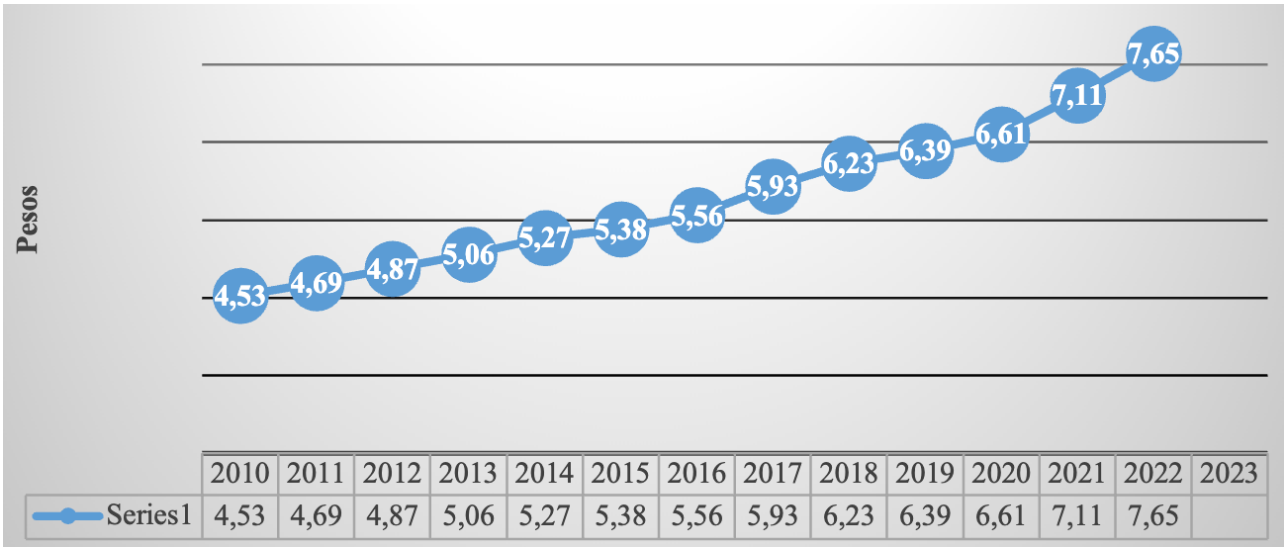
6. INVESTMENT UNITS (UDIS)

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	
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	
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	
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	
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	

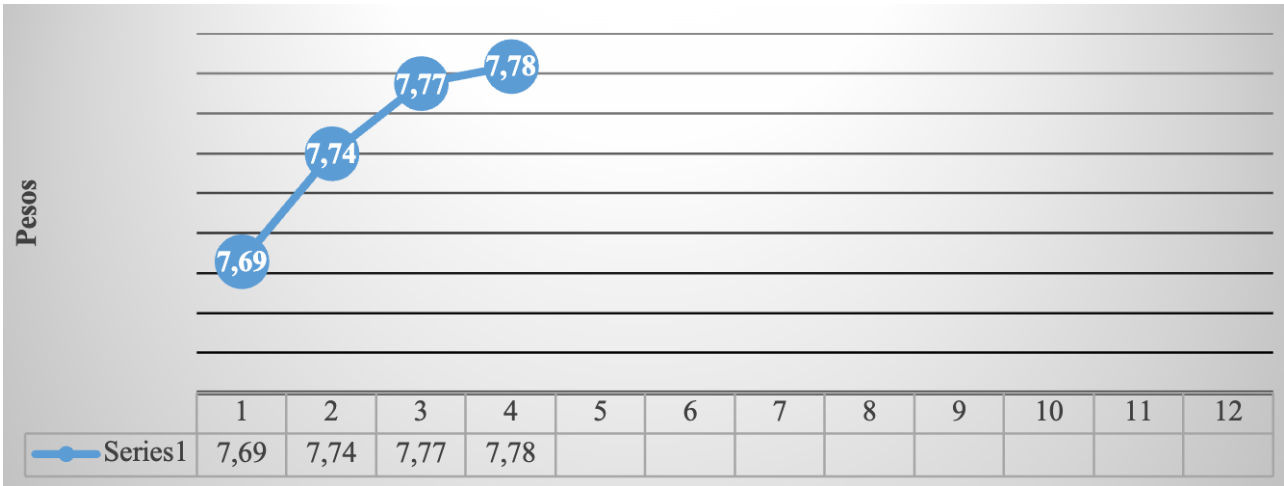
Own elaboration (BANXICO, 2023). <https://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?accion=consultarCua dro&idCuadro=CP150&locale=es>



Graph 11

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

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

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

At the 2004 symposium marking the fortieth anniversary of Sharpe's paper, Fortieth Anniversary of CAPM, André Perold notes that CAPM revolutionized modern finance, providing the first coherent framework for relating an investment's return and risk. Its diffusion is widespread, and it is a basic piece for the teaching of finance.

Six decades later, the CAPM is still widely used in estimating the cost of equity capital to firms and evaluating the performance of managed portfolios. The appeal of CAPM is its logic and simple predictions about how to measure risk and about the relationship between expected return and risk.

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Enlace alternativo

<http://mercadosynegocios.cucea.udg.mx/index.php/MYN/article/view/7705> (pdf)