

## ANEXO E-02 EVALUACIÓN ECONÓMICA

### 1. Curvas de Tasas Forward

- Tasa Forward de TIIE28

Se utilizará la curva que VALMER denomina como “FRA-SWAP”.

Instrucciones para descargar la curva “FRA-SWAP”:

1. Ingresar al sitio privado de Valmer con un usuario y clave válidos.
2. Seleccionar ‘Curvas’ > ‘Curvas Domésticas’ > ‘Derivados’ > ‘Nominal Interbancaria (FRA/SWAP)’.
3. Descargar archivo y seleccionar los datos ubicados en la columna G.

A manera de ejemplo, se presenta la Curva “FRA-SWAP” al 3 de septiembre de 2014:

Plazo (días)	Tasa Forward de TIIE 28 <sup>1</sup>
1	3.30%
360	3.82%
720	4.85%
1,080	5.70%
1,440	6.39%
1,800	6.98%
2,160	7.26%
2,520	7.86%
2,880	7.31%
3,240	7.66%
3,600	8.05%
3,960	7.72%
4,320	7.96%
4,680	8.20%
5,040	8.45%
5,400	8.69%
5,760	8.04%
6,120	8.18%
6,480	8.32%
6,840	8.45%
7,200	8.59%
7,560	8.14%
7,920	8.22%
8,280	8.30%
8,640	8.39%
9,000	8.47%
9,360	8.55%
9,720	8.64%
10,080	8.72%
10,440	8.80%
10,800	8.88%

<sup>1</sup> Esta es una tabla indicativa de la curva. Cabe señalar que existe la referencia a cualquier plazo en la curva, descargable del sitio de Internet de VALMER.

- **Tasa Forward Libor 3 Meses en Dólares**

Se utilizará la curva publicada en la plataforma Bloomberg.

Instrucciones para Cargar la Curva en Dólares en una terminal Bloomberg

1. Ticker: FWCV <GO>
2. Cambiar curva a "US Dollar Swaps (30/360, S/A) Curve"
3. Ir a la pestaña (8) Tipos a plazo implícito
4. Ajustar los parámetros:
  - Desde: T+1
  - A: 30 años
  - Plazo: 3 Meses

A manera de ejemplo, se presenta la Curva "US Dollar Swaps (30/360, S/A) Curve" al 3 de septiembre de 2014:

US Dollar Swaps (30/360, S/A) Curve <sup>2</sup>	
Fecha (dd/mm/aaaa)	Proyección
09/04/2014	0.0224%
31/12/2014	0.264%
31/12/2015	1.071%
30/12/2016	2.085%
29/12/2017	2.574%
31/12/2018	2.897%
31/12/2019	3.092%
31/12/2020	3.258%
31/12/2021	3.353%
30/12/2022	3.448%
29/12/2023	3.545%
31/12/2024	3.635%
31/12/2025	3.705%
31/12/2026	3.650%
31/12/2027	3.717%
29/12/2028	3.770%
31/12/2029	3.626%
31/12/2030	3.651%
31/12/2031	3.668%
31/12/2032	3.679%
30/12/2033	3.683%
29/12/2034	3.544%
31/12/2035	3.536%
31/12/2036	3.524%

<sup>2</sup> Esta es una tabla indicativa de la curva. Cabe señalar que la plataforma Bloomberg proyecta la tasa al plazo exacto requerido.

31/12/2037	3.509%
31/12/2038	3.492%
30/12/2039	3.453%
31/12/2040	3.431%
31/12/2041	3.407%
31/12/2042	3.382%

- **Tasa Forward Libor 3 Meses en Euros**

Se utilizará la curva publicada en la plataforma Bloomberg.

Instrucciones para Cargar la Curva en Euros en una Terminal Bloomberg

1. Ticker: FWCV <GO>
2. Cambiar curva a "Euro Swaps Curve"
3. Ir a la pestaña (8) Tipos a plazo implícito
4. Ajustar los parámetros:
  - Desde: T+1
  - A: 30 años
  - Plazo: 3 Meses

A manera de ejemplo, se presenta la Curva "Euro Swaps Curve" al 3 de septiembre de 2014:

Euro Swaps Curve <sup>3</sup>	
Fecha (dd/mm/aaaa)	Proyección
05/09/2014	0.2652%
31/12/2014	0.173%
31/12/2015	0.209%
30/12/2016	0.365%
29/12/2017	0.600%
31/12/2018	0.887%
31/12/2019	1.255%
31/12/2020	1.624%
31/12/2021	1.950%
30/12/2022	2.167%
29/12/2023	2.333%
31/12/2024	2.454%
31/12/2025	2.548%
31/12/2026	2.479%
31/12/2027	2.600%
29/12/2028	2.709%
31/12/2029	2.419%

<sup>3</sup> Esta es una tabla indicativa de la curva. Cabe señalar que la plataforma Bloomberg proyecta la tasa al plazo exacto requerido.

31/12/2030	2.481%
31/12/2031	2.537%
31/12/2032	2.587%
30/12/2033	2.632%
29/12/2034	2.360%
31/12/2035	2.382%
31/12/2036	2.400%
31/12/2037	2.416%
31/12/2038	2.429%
30/12/2039	2.287%
31/12/2040	2.292%
31/12/2041	2.295%
31/12/2042	2.296%
31/12/2043	2.297%

## 2. Curvas de Rendimientos del Gobierno Federal

- **Curva Cupón Cero en Pesos**

Se utilizará la curva que VALMER denomina como “Nominal Libre de Riesgo (Cetes con Impuestos)”.

Instrucciones para descargar la curva “Nominal Libre de Riesgo (Cetes con Impuestos)”:

1. Ingresar al sitio privado de Valmer con un usuario y clave válidos.
2. Seleccionar ‘Histórico’ > ‘Curvas’ > ‘Curvas’.
3. Seleccionar la fecha a la que se quiere descargar la información.
4. Seleccionar “Nominal Libre de Riesgo (Cetes con Impuestos)” de la lista desplegable.

A manera de ejemplo, se presenta la Curva “Nominal Libre de Riesgo (Cetes con Impuestos)” al 3 de septiembre de 2014:

Plazo (días)	Tasa Simple Anualizada Actual/360 <sup>4</sup>
1	2.76%
360	2.99%
720	3.46%
1,080	4.19%
1,440	5.01%
1,800	5.54%
2,160	6.09%
2,520	6.66%
2,880	7.21%
3,240	7.70%
3,600	8.14%

<sup>4</sup> Esta es una tabla indicativa de la curva. Cabe señalar que existe la referencia a cualquier plazo en la curva descargable del sitio de Internet de VALMER.

3,960	8.66%
4,320	9.24%
4,680	9.83%
5,040	10.51%
5,400	11.20%
5,760	11.95%
6,120	12.70%
6,480	13.37%
6,840	14.05%
7,200	14.72%
7,560	15.78%
7,920	17.23%
8,280	18.35%
8,640	19.07%
9,000	19.89%
9,360	20.85%
9,720	21.81%
10,080	22.77%
10,440	23.75%
10,800	24.77%

- **Curva Cupón Cero en Dólares**

Se utilizará la curva que VALMER denomina como “USD-UMS-SMP”.

Instrucciones para descargar la curva “USD-UMS-SMP”:

1. Ingresar al sitio privado de Valmer con un usuario y clave válidos.
2. Seleccionar ‘Histórico’ > ‘Curvas’ > ‘Curvas’.
3. Seleccionar la fecha a la que se quiere descargar la información.
4. Seleccionar “USD-UMS-SMP” de la lista desplegable.

A manera de ejemplo, se presenta la Curva “USD-UMS-SMP” al 3 de septiembre de 2014:

Plazo (días)	Tasa Simple Anualizada Actual/360 <sup>5</sup>
1	0.51%
360	0.66%
720	0.96%
1,080	1.45%
1,440	2.07%
1,800	2.58%
2,160	2.91%
2,520	3.20%
2,880	3.45%
3,240	3.79%
3,600	4.20%
3,960	4.58%
4,320	4.96%
4,680	5.34%
5,040	5.72%
5,400	6.10%

<sup>5</sup> Esta es una tabla indicativa de la curva. Cabe señalar que existe la referencia a cualquier plazo en la curva, descargable del sitio de Internet de VALMER.

5,760	6.48%
6,120	6.86%
6,480	7.24%
6,840	7.63%
7,200	8.01%
7,560	8.26%
7,920	8.44%
8,280	8.61%
8,640	8.79%
9,000	8.97%
9,360	9.17%
9,720	9.41%
10,080	9.65%
10,440	9.89%
10,800	10.14%

- **Curva Cupón Cero en Euros**

Se utilizará la curva de VALMER denominada “EUR-UMS-SMP”.

Instrucciones para descargar la curva “EUR-UMS-SMP”:

1. Ingresar al sitio privado de Valmer con un usuario y clave válidos.
2. Seleccionar ‘Histórico’ > ‘Curvas’ > ‘Curvas’.
3. Seleccionar la fecha a la que se quiere descargar la información.
4. Seleccionar “EUR-UMS-SMP” de la lista desplegable.

A manera de ejemplo, se presenta la Curva “EUR-UMS-SMP” al 3 de septiembre de 2014:

Plazo (días)	Tasa Simple Anualizada Actual/360 <sup>6</sup>
1	0.15%
360	0.20%
720	0.41%
1,080	0.63%
1,440	0.95%
1,800	1.28%
2,160	1.53%
2,520	1.77%
2,880	2.08%
3,240	2.37%
3,600	2.56%
3,960	2.76%
4,320	2.96%
4,680	3.16%
5,040	3.36%
5,400	3.56%
5,760	3.75%
6,120	3.94%
6,480	4.12%
6,840	4.30%

<sup>6</sup> Esta es una tabla indicativa de la curva. Cabe señalar que existe la referencia a cualquier plazo en la curva, descargable del sitio de Internet de VALMER.

7,200	4.47%
7,560	4.65%
7,920	4.83%
8,280	5.01%
8,640	5.18%
9,000	5.36%
9,360	5.55%
9,720	5.73%
10,080	5.92%
10,440	6.11%
10,800	6.31%

### 3. Ejemplo de la obtención del valor presente neto del crédito

El valor presente neto del crédito se calcula conforme a lo siguiente:

Para los LICITANTES que propongan un crédito con más de una fecha de desembolso:

Fórmula "A":

$$VPN_{crédito} = 95\% \left[ \sum_{t=0}^T \frac{A_t - P_t}{\left(1 + i_t \frac{d_t}{360}\right)} \right]$$

Para los LICITANTES que permitan el desembolso total del crédito el día de la firma de los instrumentos contractuales:

Fórmula "B":

$$VPN_{crédito} = \sum_{t=0}^T \frac{A_t - P_t}{\left(1 + i_t \frac{d_t}{360}\right)}$$

Donde,

$A_t$  = disposición en el periodo  $t$

$t$  = fecha de pago

$T$  = fecha del último pago

$P_t$  =

pago total requerido por la (s) institución (es) financiera (s), incluyendo capital, interés y comisiones en el periodo  $t$

$i_t$  = tasa efectiva del Gobierno Federal anualizada al plazo correspondiente con convención simple actual/360

$d_t$  = número de días transcurridos al pago

A continuación se presentan ejemplos ilustrativos para el cálculo del valor presente neto. Primero se presentan tres casos con tasa variable, dos con valor presente positivo y otro con valor presente negativo. Posteriormente se muestran otros dos ejemplos con tasa fija, con valor presente positivo y negativo, respectivamente.

## Ejemplo #1 : Valor Presente Positivo con Tasa Variable

**Monto:** 1,000,000,000.00 (MIL MILLONES DE DÓLARES).

**Tasa:** LIBOR 3M + 50pb.

**Amortizaciones:** Anuales (lineal).

**Desembolsos:** Uno (4 de septiembre de 2014).

**Pago de Intereses:** Trimestrales.

**Vencimiento:** 4 de Septiembre de 2034.

Monto Total Nominal del Crédito	1,000,000,000.00
Suma del Valor Presente	47,968,029.43
<b>Valor Presente Neto del Crédito</b>	<b>47,968,029.43</b>

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Curva Forward + Spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	$A$	$N$	$C$	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	$B$	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/09/2014	-1,000,000,000	-	-	-	1,000,000,000	-	1	1,000,000,000
04/12/2014	0	1,000,000,000	0.74%	1,878,139	-1,878,139	0.51%	0.999	-1,875,703
04/03/2015	0	1,000,000,000	0.80%	1,997,250	-1,997,250	0.51%	0.997	-1,992,108
04/06/2015	0	1,000,000,000	0.98%	2,492,178	-2,492,178	0.59%	0.996	-2,481,099
04/09/2015	50,000,000	1,000,000,000	1.19%	3,042,900	-53,042,900	0.66%	0.993	-52,688,073
04/12/2015	0	950,000,000	1.43%	3,429,904	-3,429,904	0.74%	0.991	-3,398,103
04/03/2016	0	950,000,000	1.67%	4,012,000	-4,012,000	0.81%	0.988	-3,963,020
04/06/2016	0	950,000,000	1.93%	4,674,929	-4,674,929	0.89%	0.984	-4,602,319
04/09/2016	50,000,000	950,000,000	2.18%	5,294,012	-55,294,012	0.96%	0.981	-54,232,164
04/12/2016	0	900,000,000	2.44%	5,556,688	-5,556,688	1.04%	0.977	-5,427,935
04/03/2017	0	900,000,000	2.67%	6,003,000	-6,003,000	1.16%	0.971	-5,831,726
04/06/2017	0	900,000,000	2.86%	6,569,720	-6,569,720	1.32%	0.964	-6,335,735
04/09/2017	50,000,000	900,000,000	2.92%	6,715,310	-56,715,310	1.49%	0.957	-54,255,608
04/12/2017	0	850,000,000	2.98%	6,412,960	-6,412,960	1.65%	0.948	-6,081,646
04/03/2018	0	850,000,000	3.15%	6,692,900	-6,692,900	1.81%	0.940	-6,288,366
04/06/2018	0	850,000,000	3.31%	7,193,748	-7,193,748	1.98%	0.930	-6,690,390
04/09/2018	50,000,000	850,000,000	3.29%	7,157,255	-57,157,255	2.14%	0.920	-52,583,325
04/12/2018	0	800,000,000	3.33%	6,731,573	-6,731,573	2.31%	0.910	-6,122,762
04/03/2019	0	800,000,000	3.45%	6,903,200	-6,903,200	2.47%	0.899	-6,204,799
04/06/2019	0	800,000,000	3.57%	7,303,164	-7,303,164	2.58%	0.890	-6,496,827
04/09/2019	50,000,000	800,000,000	3.53%	7,213,209	-57,213,209	2.67%	0.881	-50,378,351
04/12/2019	0	750,000,000	3.54%	6,715,042	-6,715,042	2.77%	0.871	-5,851,398
04/03/2020	0	750,000,000	3.64%	6,892,492	-6,892,492	2.87%	0.862	-5,941,743
04/06/2020	0	750,000,000	3.72%	7,139,008	-7,139,008	2.97%	0.852	-6,085,787
04/09/2020	50,000,000	750,000,000	3.69%	7,075,567	-57,075,567	3.06%	0.843	-48,099,513
04/12/2020	0	700,000,000	3.71%	6,566,408	-6,566,408	3.16%	0.833	-5,469,675
04/03/2021	0	700,000,000	3.78%	6,619,200	-6,619,200	3.23%	0.824	-5,456,457
04/06/2021	0	700,000,000	3.85%	6,892,589	-6,892,589	3.28%	0.817	-5,629,882
04/09/2021	50,000,000	700,000,000	3.81%	6,811,194	-56,811,194	3.32%	0.809	-45,974,502
04/12/2021	0	650,000,000	3.81%	6,262,178	-6,262,178	3.36%	0.802	-5,020,879
04/03/2022	0	650,000,000	3.87%	6,283,225	-6,283,225	3.40%	0.794	-4,991,327
04/06/2022	0	650,000,000	3.92%	6,513,051	-6,513,051	3.45%	0.787	-5,124,734
04/09/2022	50,000,000	650,000,000	3.92%	6,506,738	-56,506,738	3.49%	0.779	-44,035,759
04/12/2022	0	600,000,000	3.94%	5,970,813	-5,970,813	3.53%	0.772	-4,608,603
04/03/2023	0	600,000,000	3.98%	5,972,400	-5,972,400	3.57%	0.765	-4,565,937
04/06/2023	0	600,000,000	4.03%	6,173,353	-6,173,353	3.73%	0.751	-4,636,905
04/09/2023	50,000,000	600,000,000	4.01%	6,142,533	-56,142,533	3.91%	0.737	-41,374,477
04/12/2023	0	550,000,000	4.01%	5,578,768	-5,578,768	4.03%	0.726	-4,048,173
04/03/2024	0	550,000,000	4.05%	5,629,235	-5,629,235	4.12%	0.716	-4,029,779
04/06/2024	0	550,000,000	4.08%	5,741,273	-5,741,273	4.21%	0.706	-4,052,658
04/09/2024	50,000,000	550,000,000	4.10%	5,765,448	-55,765,448	4.31%	0.696	-38,809,421
04/12/2024	0	500,000,000	4.13%	5,214,679	-5,214,679	4.40%	0.686	-3,578,093
04/03/2025	0	500,000,000	4.16%	5,196,000	-5,196,000	4.49%	0.677	-3,515,298
04/06/2025	0	500,000,000	4.19%	5,348,139	-5,348,139	4.58%	0.667	-3,565,990
04/09/2025	50,000,000	500,000,000	4.18%	5,344,561	-55,344,561	4.68%	0.657	-36,365,626
04/12/2025	0	450,000,000	4.19%	4,770,106	-4,770,106	4.77%	0.648	-3,088,946

\* $d_1$  – Denota el número de días transcurridos entre el periodo actual y el anterior

\* $d_2$  – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso



Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Curva Forward + Spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	A	N	C	$I = N \times C \times \frac{d_1^+}{360}$	$F = -(A + I)$	B	$D = \frac{1}{1 + B \times \frac{d_2^+}{360}}$	$F \times D$
04/03/2026	0	450,000,000	4.22%	4,745,588	-4,745,588	4.86%	0.638	-3,028,799
04/06/2026	0	450,000,000	4.24%	4,879,105	-4,879,105	4.95%	0.629	-3,067,912
04/09/2026	50,000,000	450,000,000	4.16%	4,788,830	-54,788,830	5.05%	0.619	-33,937,816
04/12/2026	0	400,000,000	4.14%	4,182,764	-4,182,764	5.14%	0.610	-2,552,615
04/03/2027	0	400,000,000	4.15%	4,154,700	-4,154,700	5.23%	0.601	-2,498,253
04/06/2027	0	400,000,000	4.17%	4,264,916	-4,264,916	5.32%	0.592	-2,525,890
04/09/2027	50,000,000	400,000,000	4.19%	4,281,782	-54,281,782	5.42%	0.583	-31,662,355
04/12/2027	0	350,000,000	4.20%	3,719,815	-3,719,815	5.51%	0.575	-2,137,213
04/03/2028	0	350,000,000	4.22%	3,732,732	-3,732,732	5.60%	0.566	-2,112,389
04/06/2028	0	350,000,000	4.23%	3,786,899	-3,786,899	5.69%	0.557	-2,110,395
04/09/2028	50,000,000	350,000,000	4.25%	3,799,063	-53,799,063	5.79%	0.549	-29,523,987
04/12/2028	0	300,000,000	4.26%	3,230,803	-3,230,803	5.88%	0.540	-1,746,196
04/03/2029	0	300,000,000	4.27%	3,203,925	-3,203,925	5.97%	0.532	-1,705,734
04/06/2029	0	300,000,000	4.28%	3,284,247	-3,284,247	6.06%	0.524	-1,721,705
04/09/2029	50,000,000	300,000,000	4.18%	3,203,593	-53,203,593	6.16%	0.516	-27,463,309
04/12/2029	0	250,000,000	4.12%	2,604,749	-2,604,749	6.25%	0.508	-1,324,148
04/03/2030	0	250,000,000	4.13%	2,580,188	-2,580,188	6.34%	0.501	-1,291,970
04/06/2030	0	250,000,000	4.14%	2,642,061	-2,642,061	6.44%	0.493	-1,302,652
04/09/2030	50,000,000	250,000,000	4.14%	2,646,022	-52,646,022	6.53%	0.485	-25,558,607
04/12/2030	0	200,000,000	4.15%	2,096,893	-2,096,893	6.62%	0.478	-1,002,559
04/03/2031	0	200,000,000	4.15%	2,076,200	-2,076,200	6.71%	0.471	-977,783
04/06/2031	0	200,000,000	4.17%	2,133,020	-2,133,020	6.81%	0.464	-989,163
04/09/2031	50,000,000	200,000,000	4.18%	2,135,422	-52,135,422	6.90%	0.457	-23,807,432
04/12/2031	0	150,000,000	4.18%	1,585,448	-1,585,448	6.99%	0.450	-713,049
04/03/2032	0	150,000,000	4.18%	1,586,623	-1,586,623	7.08%	0.443	-702,811
04/06/2032	0	150,000,000	4.19%	1,605,247	-1,605,247	7.18%	0.436	-700,231
04/09/2032	50,000,000	150,000,000	4.19%	1,606,205	-51,606,205	7.27%	0.430	-22,169,127
04/12/2032	0	100,000,000	4.19%	1,059,695	-1,059,695	7.36%	0.423	-448,393
04/03/2033	0	100,000,000	4.19%	1,048,400	-1,048,400	7.45%	0.417	-437,041
04/06/2033	0	100,000,000	4.20%	1,072,158	-1,072,158	7.55%	0.411	-440,191
04/09/2033	50,000,000	100,000,000	4.20%	1,072,413	-51,072,413	7.64%	0.404	-20,652,467
04/12/2033	0	50,000,000	4.20%	530,467	-530,467	7.73%	0.398	-211,317
04/03/2034	0	50,000,000	4.20%	524,613	-524,613	7.82%	0.393	-205,917
04/06/2034	0	50,000,000	4.20%	536,347	-536,347	7.92%	0.387	-207,373
04/09/2034	50,000,000	50,000,000	4.11%	525,064	-50,525,064	8.01%	0.381	-19,243,553

\* $d_1$  – Denota el número de días transcurridos entre el periodo actual y el anterior

\* $d_2$  – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso



**Ejemplo #2 : Valor Presente Positivo con Tasa Variable y dos Desembolsos****Monto:** 1,000,000,000.00 (MIL MILLONES DE DÓLARES).**Tasa:** LIBOR 3M + 50pb.**Amortizaciones:** Anuales (lineal).**Desembolsos:** Dos (4 de septiembre de 2014 y 4 de marzo de 2015).**Pago de Intereses:** Trimestrales**Vencimiento:** 4 de Septiembre de 2034.

Monto Total Nominal del Crédito	1,000,000,000.00
Suma del Valor Presente	48,614,655.44
<b>Valor Presente Neto del Crédito</b>	<b>46,183,922.67</b>

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Curva Forward + Spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	<i>A</i>	<i>N</i>	<i>C</i>	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	<i>B</i>	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/09/2014	-500,000,000	-	-	-	500,000,000	-	1	500,000,000
04/12/2014	0	500,000,000	0.74%	939,069	-939,069	0.51%	0.999	-937,852
04/03/2015	-500,000,000	500,000,000	0.80%	998,625	499,001,375	0.51%	0.997	497,716,666
04/06/2015	0	1,000,000,000	0.98%	2,492,178	-2,492,178	0.59%	0.996	-2,481,099
04/09/2015	50,000,000	1,000,000,000	1.19%	3,042,900	-3,042,900	0.66%	0.993	-3,028,073
04/12/2015	0	950,000,000	1.43%	3,429,904	-3,429,904	0.74%	0.991	-3,398,103
04/03/2016	0	950,000,000	1.67%	4,012,000	-4,012,000	0.81%	0.988	-3,963,020
04/06/2016	0	950,000,000	1.93%	4,674,929	-4,674,929	0.89%	0.984	-4,602,319
04/09/2016	50,000,000	950,000,000	2.18%	5,294,012	-5,294,012	0.96%	0.981	-5,232,164
04/12/2016	0	900,000,000	2.44%	5,556,688	-5,556,688	1.04%	0.977	-5,427,935
04/03/2017	0	900,000,000	2.67%	6,003,000	-6,003,000	1.16%	0.971	-5,831,726
04/06/2017	0	900,000,000	2.86%	6,569,720	-6,569,720	1.32%	0.964	-6,335,735
04/09/2017	50,000,000	900,000,000	2.92%	6,715,310	-6,715,310	1.49%	0.957	-6,425,608
04/12/2017	0	850,000,000	2.98%	6,412,960	-6,412,960	1.65%	0.948	-6,081,646
04/03/2018	0	850,000,000	3.15%	6,692,900	-6,692,900	1.81%	0.940	-6,288,366
04/06/2018	0	850,000,000	3.31%	7,193,748	-7,193,748	1.98%	0.930	-6,690,390
04/09/2018	50,000,000	850,000,000	3.29%	7,157,255	-7,157,255	2.14%	0.920	-6,583,325
04/12/2018	0	800,000,000	3.33%	6,731,573	-6,731,573	2.31%	0.910	-6,122,762
04/03/2019	0	800,000,000	3.45%	6,903,200	-6,903,200	2.47%	0.899	-6,204,799
04/06/2019	0	800,000,000	3.57%	7,303,164	-7,303,164	2.58%	0.890	-6,496,827
04/09/2019	50,000,000	800,000,000	3.53%	7,213,209	-7,213,209	2.67%	0.881	-6,378,351
04/12/2019	0	750,000,000	3.54%	6,715,042	-6,715,042	2.77%	0.871	-5,851,398
04/03/2020	0	750,000,000	3.64%	6,892,492	-6,892,492	2.87%	0.862	-5,941,743
04/06/2020	0	750,000,000	3.72%	7,139,008	-7,139,008	2.97%	0.852	-6,085,787
04/09/2020	50,000,000	750,000,000	3.69%	7,075,567	-7,075,567	3.06%	0.843	-5,959,513
04/12/2020	0	700,000,000	3.71%	6,566,408	-6,566,408	3.16%	0.833	-5,469,675
04/03/2021	0	700,000,000	3.78%	6,619,200	-6,619,200	3.23%	0.824	-5,456,457
04/06/2021	0	700,000,000	3.85%	6,892,589	-6,892,589	3.28%	0.817	-5,629,882
04/09/2021	50,000,000	700,000,000	3.81%	6,811,194	-6,811,194	3.32%	0.809	-5,549,502
04/12/2021	0	650,000,000	3.81%	6,262,178	-6,262,178	3.36%	0.802	-5,020,879
04/03/2022	0	650,000,000	3.87%	6,283,225	-6,283,225	3.40%	0.794	-4,991,327
04/06/2022	0	650,000,000	3.92%	6,513,051	-6,513,051	3.45%	0.787	-5,124,734
04/09/2022	50,000,000	650,000,000	3.92%	6,506,738	-6,506,738	3.49%	0.779	-5,035,759
04/12/2022	0	600,000,000	3.94%	5,970,813	-5,970,813	3.53%	0.772	-4,608,603
04/03/2023	0	600,000,000	3.98%	5,972,400	-5,972,400	3.57%	0.765	-4,565,937
04/06/2023	0	600,000,000	4.03%	6,173,353	-6,173,353	3.73%	0.751	-4,636,905
04/09/2023	50,000,000	600,000,000	4.01%	6,142,533	-6,142,533	3.91%	0.737	-4,514,477
04/12/2023	0	550,000,000	4.01%	5,578,768	-5,578,768	4.03%	0.726	-4,048,173
04/03/2024	0	550,000,000	4.05%	5,629,235	-5,629,235	4.12%	0.716	-4,029,779
04/06/2024	0	550,000,000	4.08%	5,741,273	-5,741,273	4.21%	0.706	-4,052,658
04/09/2024	50,000,000	550,000,000	4.10%	5,765,448	-5,765,448	4.31%	0.696	-4,009,421
04/12/2024	0	500,000,000	4.13%	5,214,679	-5,214,679	4.40%	0.686	-3,578,093
04/03/2025	0	500,000,000	4.16%	5,196,000	-5,196,000	4.49%	0.677	-3,515,298
04/06/2025	0	500,000,000	4.19%	5,348,139	-5,348,139	4.58%	0.667	-3,565,990
04/09/2025	50,000,000	500,000,000	4.18%	5,344,561	-5,344,561	4.68%	0.657	-3,515,626
04/12/2025	0	450,000,000	4.19%	4,770,106	-4,770,106	4.77%	0.648	-3,088,946

\**d*<sub>1</sub> – Denota el número de días transcurridos entre el periodo actual y el anterior\**d*<sub>2</sub> – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Curva Forward + Spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	$A$	$N$	$C$	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	$B$	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/03/2026	0	450,000,000	4.22%	4,745,588	-4,745,588	4.86%	0.638	-3,028,799
04/06/2026	0	450,000,000	4.24%	4,879,105	-4,879,105	4.95%	0.629	-3,067,912
04/09/2026	50,000,000	450,000,000	4.16%	4,788,830	-54,788,830	5.05%	0.619	-33,937,816
04/12/2026	0	400,000,000	4.14%	4,182,764	-4,182,764	5.14%	0.610	-2,552,615
04/03/2027	0	400,000,000	4.15%	4,154,700	-4,154,700	5.23%	0.601	-2,498,253
04/06/2027	0	400,000,000	4.17%	4,264,916	-4,264,916	5.32%	0.592	-2,525,890
04/09/2027	50,000,000	400,000,000	4.19%	4,281,782	-54,281,782	5.42%	0.583	-31,662,355
04/12/2027	0	350,000,000	4.20%	3,719,815	-3,719,815	5.51%	0.575	-2,137,213
04/03/2028	0	350,000,000	4.22%	3,732,732	-3,732,732	5.60%	0.566	-2,112,389
04/06/2028	0	350,000,000	4.23%	3,786,899	-3,786,899	5.69%	0.557	-2,110,395
04/09/2028	50,000,000	350,000,000	4.25%	3,799,063	-53,799,063	5.79%	0.549	-29,523,987
04/12/2028	0	300,000,000	4.26%	3,230,803	-3,230,803	5.88%	0.540	-1,746,196
04/03/2029	0	300,000,000	4.27%	3,203,925	-3,203,925	5.97%	0.532	-1,705,734
04/06/2029	0	300,000,000	4.28%	3,284,247	-3,284,247	6.06%	0.524	-1,721,705
04/09/2029	50,000,000	300,000,000	4.18%	3,203,593	-53,203,593	6.16%	0.516	-27,463,309
04/12/2029	0	250,000,000	4.12%	2,604,749	-2,604,749	6.25%	0.508	-1,324,148
04/03/2030	0	250,000,000	4.13%	2,580,188	-2,580,188	6.34%	0.501	-1,291,970
04/06/2030	0	250,000,000	4.14%	2,642,061	-2,642,061	6.44%	0.493	-1,302,652
04/09/2030	50,000,000	250,000,000	4.14%	2,646,022	-52,646,022	6.53%	0.485	-25,558,607
04/12/2030	0	200,000,000	4.15%	2,096,893	-2,096,893	6.62%	0.478	-1,002,559
04/03/2031	0	200,000,000	4.15%	2,076,200	-2,076,200	6.71%	0.471	-977,783
04/06/2031	0	200,000,000	4.17%	2,133,020	-2,133,020	6.81%	0.464	-989,163
04/09/2031	50,000,000	200,000,000	4.18%	2,135,422	-52,135,422	6.90%	0.457	-23,807,432
04/12/2031	0	150,000,000	4.18%	1,585,448	-1,585,448	6.99%	0.450	-713,049
04/03/2032	0	150,000,000	4.18%	1,586,623	-1,586,623	7.08%	0.443	-702,811
04/06/2032	0	150,000,000	4.19%	1,605,247	-1,605,247	7.18%	0.436	-700,231
04/09/2032	50,000,000	150,000,000	4.19%	1,606,205	-51,606,205	7.27%	0.430	-22,169,127
04/12/2032	0	100,000,000	4.19%	1,059,695	-1,059,695	7.36%	0.423	-448,393
04/03/2033	0	100,000,000	4.19%	1,048,400	-1,048,400	7.45%	0.417	-437,041
04/06/2033	0	100,000,000	4.20%	1,072,158	-1,072,158	7.55%	0.411	-440,191
04/09/2033	50,000,000	100,000,000	4.20%	1,072,413	-51,072,413	7.64%	0.404	-20,652,467
04/12/2033	0	50,000,000	4.20%	530,467	-530,467	7.73%	0.398	-211,317
04/03/2034	0	50,000,000	4.20%	524,613	-524,613	7.82%	0.393	-205,917
04/06/2034	0	50,000,000	4.20%	536,347	-536,347	7.92%	0.387	-207,373
04/09/2034	50,000,000	50,000,000	4.11%	525,064	-50,525,064	8.01%	0.381	-19,243,553

\* $d_1$  – Denota el número de días transcurridos entre el periodo actual y el anterior

\* $d_2$  – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso



**Ejemplo #3: Valor Presente Negativo con Tasa Variable****Monto:** 1,000,000,000.00 (MIL MILLONES DE DÓLARES).**Tasa:** LIBOR 3M + 150pb.**Amortizaciones:** Anuales (lineal).**Desembolsos:** Uno (4 de septiembre de 2014).**Pago de Intereses:** Trimestrales.**Vencimiento:** 4 de Septiembre de 2034.

Monto Total Nominal del Crédito	1,000,000,000.00
Suma del Valor Presente	-37,748,347.05
<b>Valor Presente Neto del Crédito</b>	<b>-37,748,347.05</b>

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Curva Forward + Spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	A	N	C	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	B	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/09/2014	-1,000,000,000.00	-	-	-	1,000,000,000	-	1	1,000,000,000
04/12/2014	0	1,000,000,000	1.74%	4,405,917	-4,405,917	0.51%	0.999	-4,400,203
04/03/2015	0	1,000,000,000	1.80%	4,497,250	-4,497,250	0.51%	0.997	-4,485,672
04/06/2015	0	1,000,000,000	1.98%	5,047,733	-5,047,733	0.59%	0.996	-5,025,295
04/09/2015	50,000,000	1,000,000,000	2.19%	5,598,456	-55,598,456	0.66%	0.993	-55,226,533
04/12/2015	0	950,000,000	2.43%	5,831,293	-5,831,293	0.74%	0.991	-5,777,227
04/03/2016	0	950,000,000	2.67%	6,413,389	-6,413,389	0.81%	0.988	-6,335,091
04/06/2016	0	950,000,000	2.93%	7,102,707	-7,102,707	0.89%	0.984	-6,992,389
04/09/2016	50,000,000	950,000,000	3.18%	7,721,790	-57,721,790	0.96%	0.981	-56,613,320
04/12/2016	0	900,000,000	3.44%	7,831,688	-7,831,688	1.04%	0.977	-7,650,221
04/03/2017	0	900,000,000	3.67%	8,253,000	-8,253,000	1.16%	0.971	-8,017,531
04/06/2017	0	900,000,000	3.86%	8,869,720	-8,869,720	1.32%	0.964	-8,553,819
04/09/2017	50,000,000	900,000,000	3.92%	9,015,310	-59,015,310	1.49%	0.957	-56,455,859
04/12/2017	0	850,000,000	3.98%	8,561,571	-8,561,571	1.65%	0.948	-8,119,253
04/03/2018	0	850,000,000	4.15%	8,817,900	-8,817,900	1.81%	0.940	-8,284,926
04/06/2018	0	850,000,000	4.31%	9,365,971	-9,365,971	1.98%	0.930	-8,710,618
04/09/2018	50,000,000	850,000,000	4.29%	9,329,477	-59,329,477	2.14%	0.920	-54,581,718
04/12/2018	0	800,000,000	4.33%	8,753,796	-8,753,796	2.31%	0.910	-7,962,091
04/03/2019	0	800,000,000	4.45%	8,903,200	-8,903,200	2.47%	0.899	-8,002,458
04/06/2019	0	800,000,000	4.57%	9,347,609	-9,347,609	2.58%	0.890	-8,315,546
04/09/2019	50,000,000	800,000,000	4.53%	9,257,653	-59,257,653	2.67%	0.881	-52,178,560
04/12/2019	0	750,000,000	4.54%	8,610,875	-8,610,875	2.77%	0.871	-7,503,402
04/03/2020	0	750,000,000	4.64%	8,788,325	-8,788,325	2.87%	0.862	-7,576,065
04/06/2020	0	750,000,000	4.72%	9,055,675	-9,055,675	2.97%	0.852	-7,719,687
04/09/2020	50,000,000	750,000,000	4.69%	8,992,233	-58,992,233	3.06%	0.843	-49,714,753
04/12/2020	0	700,000,000	4.71%	8,335,853	-8,335,853	3.16%	0.833	-6,943,583
04/03/2021	0	700,000,000	4.78%	8,369,200	-8,369,200	3.23%	0.824	-6,899,048
04/06/2021	0	700,000,000	4.85%	8,681,478	-8,681,478	3.28%	0.817	-7,091,050
04/09/2021	50,000,000	700,000,000	4.81%	8,600,083	-58,600,083	3.32%	0.809	-47,422,161
04/12/2021	0	650,000,000	4.81%	7,905,233	-7,905,233	3.36%	0.802	-6,338,246
04/03/2022	0	650,000,000	4.87%	7,908,225	-7,908,225	3.40%	0.794	-6,282,209
04/06/2022	0	650,000,000	4.92%	8,174,162	-8,174,162	3.45%	0.787	-6,431,764
04/09/2022	50,000,000	650,000,000	4.92%	8,167,849	-58,167,849	3.49%	0.779	-45,330,264
04/12/2022	0	600,000,000	4.94%	7,487,480	-7,487,480	3.53%	0.772	-5,779,250
04/03/2023	0	600,000,000	4.98%	7,472,400	-7,472,400	3.57%	0.765	-5,712,696
04/06/2023	0	600,000,000	5.03%	7,706,687	-7,706,687	3.73%	0.751	-5,788,616
04/09/2023	50,000,000	600,000,000	5.01%	7,675,867	-57,675,867	3.91%	0.737	-42,504,473
04/12/2023	0	550,000,000	5.01%	6,969,045	-6,969,045	4.03%	0.726	-5,057,013
04/03/2024	0	550,000,000	5.05%	7,019,513	-7,019,513	4.12%	0.716	-5,025,032
04/06/2024	0	550,000,000	5.08%	7,146,828	-7,146,828	4.21%	0.706	-5,044,814
04/09/2024	50,000,000	550,000,000	5.10%	7,171,004	-57,171,004	4.31%	0.696	-39,787,603
04/12/2024	0	500,000,000	5.13%	6,478,568	-6,478,568	4.40%	0.686	-4,445,320
04/03/2025	0	500,000,000	5.16%	6,446,000	-6,446,000	4.49%	0.677	-4,360,973
04/06/2025	0	500,000,000	5.19%	6,625,917	-6,625,917	4.58%	0.667	-4,417,976
04/09/2025	50,000,000	500,000,000	5.18%	6,622,339	-56,622,339	4.68%	0.657	-37,205,224
04/12/2025	0	450,000,000	5.19%	5,907,606	-5,907,606	4.77%	0.648	-3,825,550

\* $d_1$  – Denota el número de días transcurridos entre el periodo actual y el anterior\* $d_2$  – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Curva Forward + Spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	<i>A</i>	<i>N</i>	<i>C</i>	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	<i>B</i>	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/03/2026	0	450,000,000	5.22%	5,870,588	-5,870,588	4.86%	0.638	-3,746,813
04/06/2026	0	450,000,000	5.24%	6,029,105	-6,029,105	4.95%	0.629	-3,791,016
04/09/2026	50,000,000	450,000,000	5.16%	5,938,830	-55,938,830	5.05%	0.619	-34,650,160
04/12/2026	0	400,000,000	5.14%	5,193,876	-5,193,876	5.14%	0.610	-3,169,666
04/03/2027	0	400,000,000	5.15%	5,154,700	-5,154,700	5.23%	0.601	-3,099,560
04/06/2027	0	400,000,000	5.17%	5,287,138	-5,287,138	5.32%	0.592	-3,131,300
04/09/2027	50,000,000	400,000,000	5.19%	5,304,004	-55,304,004	5.42%	0.583	-32,258,613
04/12/2027	0	350,000,000	5.20%	4,604,537	-4,604,537	5.51%	0.575	-2,645,529
04/03/2028	0	350,000,000	5.22%	4,617,454	-4,617,454	5.60%	0.566	-2,613,061
04/06/2028	0	350,000,000	5.23%	4,681,343	-4,681,343	5.69%	0.557	-2,608,859
04/09/2028	50,000,000	350,000,000	5.25%	4,693,508	-54,693,508	5.79%	0.549	-30,014,843
04/12/2028	0	300,000,000	5.26%	3,989,137	-3,989,137	5.88%	0.540	-2,156,063
04/03/2029	0	300,000,000	5.27%	3,953,925	-3,953,925	5.97%	0.532	-2,105,025
04/06/2029	0	300,000,000	5.28%	4,050,913	-4,050,913	6.06%	0.524	-2,123,615
04/09/2029	50,000,000	300,000,000	5.18%	3,970,260	-53,970,260	6.16%	0.516	-27,859,057
04/12/2029	0	250,000,000	5.12%	3,236,693	-3,236,693	6.25%	0.508	-1,645,403
04/03/2030	0	250,000,000	5.13%	3,205,188	-3,205,188	6.34%	0.501	-1,604,924
04/06/2030	0	250,000,000	5.14%	3,280,950	-3,280,950	6.44%	0.493	-1,617,652
04/09/2030	50,000,000	250,000,000	5.14%	3,284,911	-53,284,911	6.53%	0.485	-25,868,775
04/12/2030	0	200,000,000	5.15%	2,602,448	-2,602,448	6.62%	0.478	-1,244,274
04/03/2031	0	200,000,000	5.15%	2,576,200	-2,576,200	6.71%	0.471	-1,213,257
04/06/2031	0	200,000,000	5.17%	2,644,131	-2,644,131	6.81%	0.464	-1,226,185
04/09/2031	50,000,000	200,000,000	5.18%	2,646,533	-52,646,533	6.90%	0.457	-24,040,829
04/12/2031	0	150,000,000	5.18%	1,964,614	-1,964,614	6.99%	0.450	-883,578
04/03/2032	0	150,000,000	5.18%	1,965,790	-1,965,790	7.08%	0.443	-870,766
04/06/2032	0	150,000,000	5.19%	1,988,580	-1,988,580	7.18%	0.436	-867,447
04/09/2032	50,000,000	150,000,000	5.19%	1,989,538	-51,989,538	7.27%	0.430	-22,333,800
04/12/2032	0	100,000,000	5.19%	1,312,473	-1,312,473	7.36%	0.423	-555,352
04/03/2033	0	100,000,000	5.19%	1,298,400	-1,298,400	7.45%	0.417	-541,258
04/06/2033	0	100,000,000	5.20%	1,327,713	-1,327,713	7.55%	0.411	-545,114
04/09/2033	50,000,000	100,000,000	5.20%	1,327,969	-51,327,969	7.64%	0.404	-20,755,807
04/12/2033	0	50,000,000	5.20%	656,856	-656,856	7.73%	0.398	-261,665
04/03/2034	0	50,000,000	5.20%	649,613	-649,613	7.82%	0.393	-254,981
04/06/2034	0	50,000,000	5.20%	664,125	-664,125	7.92%	0.387	-256,777
04/09/2034	50,000,000	50,000,000	5.11%	652,842	-50,652,842	8.01%	0.381	-19,292,220

\* $d_1$  – Denota el número de días transcurridos entre el periodo actual y el anterior

\* $d_2$  – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso



**Ejemplo #4: Valor Presente Positivo con Tasa Fija**  
**Monto: 1,000,000,000.00 (MIL MILLONES DE DÓLARES).**

**Tasa:** Fija 3.17% anualizada.

**Amortizaciones:** Anuales (lineal).

**Desembolsos:** Uno (4 de septiembre de 2014).

**Pago de Intereses:** Trimestrales.

**Vencimiento:** 4 de Septiembre de 2034.

Monto Total Nominal del Crédito	1,000,000,000.00
Suma del Valor Presente	44,420,818.92
<b>Valor Presente Neto del Crédito</b>	<b>44,420,818.92</b>

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Tasa Fija CIRR	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	A	N	C	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	B	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/09/2014	-1,000,000,000.00	-	-	-	1,000,000,000	-	1	1,000,000,000
04/12/2014	0	1,000,000,000	3.17%	8,013,056	-8,013,056	0.51%	0.999	-8,002,665
04/03/2015	0	1,000,000,000	3.17%	7,925,000	-7,925,000	0.51%	0.997	-7,904,597
04/06/2015	0	1,000,000,000	3.17%	8,101,111	-8,101,111	0.59%	0.996	-8,065,100
04/09/2015	50,000,000	1,000,000,000	3.17%	8,101,111	-58,101,111	0.66%	0.993	-57,712,448
04/12/2015	0	950,000,000	3.17%	7,612,403	-7,612,403	0.74%	0.991	-7,541,823
04/03/2016	0	950,000,000	3.17%	7,612,403	-7,612,403	0.81%	0.988	-7,519,466
04/06/2016	0	950,000,000	3.17%	7,696,056	-7,696,056	0.89%	0.984	-7,576,522
04/09/2016	50,000,000	950,000,000	3.17%	7,696,056	-57,696,056	0.96%	0.981	-56,588,079
04/12/2016	0	900,000,000	3.17%	7,211,750	-7,211,750	1.04%	0.977	-7,044,648
04/03/2017	0	900,000,000	3.17%	7,132,500	-7,132,500	1.16%	0.971	-6,929,000
04/06/2017	0	900,000,000	3.17%	7,291,000	-7,291,000	1.32%	0.964	-7,031,326
04/09/2017	50,000,000	900,000,000	3.17%	7,291,000	-57,291,000	1.49%	0.957	-54,806,331
04/12/2017	0	850,000,000	3.17%	6,811,097	-6,811,097	1.65%	0.948	-6,459,214
04/03/2018	0	850,000,000	3.17%	6,736,250	-6,736,250	1.81%	0.940	-6,329,096
04/06/2018	0	850,000,000	3.17%	6,885,944	-6,885,944	1.98%	0.930	-6,404,123
04/09/2018	50,000,000	850,000,000	3.17%	6,885,944	-56,885,944	2.14%	0.920	-52,333,726
04/12/2018	0	800,000,000	3.17%	6,410,444	-6,410,444	2.31%	0.910	-5,830,676
04/03/2019	0	800,000,000	3.17%	6,340,000	-6,340,000	2.47%	0.899	-5,698,578
04/06/2019	0	800,000,000	3.17%	6,480,889	-6,480,889	2.58%	0.890	-5,765,339
04/09/2019	50,000,000	800,000,000	3.17%	6,480,889	-56,480,889	2.67%	0.881	-49,733,516
04/12/2019	0	750,000,000	3.17%	6,009,792	-6,009,792	2.77%	0.871	-5,236,853
04/03/2020	0	750,000,000	3.17%	6,009,792	-6,009,792	2.87%	0.862	-5,180,802
04/06/2020	0	750,000,000	3.17%	6,075,833	-6,075,833	2.97%	0.852	-5,179,463
04/09/2020	50,000,000	750,000,000	3.17%	6,075,833	-56,075,833	3.06%	0.843	-47,257,004
04/12/2020	0	700,000,000	3.17%	5,609,139	-5,609,139	3.16%	0.833	-4,672,290
04/03/2021	0	700,000,000	3.17%	5,547,500	-5,547,500	3.23%	0.824	-4,573,014
04/06/2021	0	700,000,000	3.17%	5,670,778	-5,670,778	3.28%	0.817	-4,631,904
04/09/2021	50,000,000	700,000,000	3.17%	5,670,778	-55,670,778	3.32%	0.809	-45,051,619
04/12/2021	0	650,000,000	3.17%	5,208,486	-5,208,486	3.36%	0.802	-4,176,052
04/03/2022	0	650,000,000	3.17%	5,151,250	-5,151,250	3.40%	0.794	-4,092,098
04/06/2022	0	650,000,000	3.17%	5,265,722	-5,265,722	3.45%	0.787	-4,143,285
04/09/2022	50,000,000	650,000,000	3.17%	5,265,722	-55,265,722	3.49%	0.779	-43,068,634
04/12/2022	0	600,000,000	3.17%	4,807,833	-4,807,833	3.53%	0.772	-3,710,951
04/03/2023	0	600,000,000	3.17%	4,755,000	-4,755,000	3.57%	0.765	-3,635,227
04/06/2023	0	600,000,000	3.17%	4,860,667	-4,860,667	3.73%	0.751	-3,650,925
04/09/2023	50,000,000	600,000,000	3.17%	4,860,667	-54,860,667	3.91%	0.737	-40,429,800
04/12/2023	0	550,000,000	3.17%	4,407,181	-4,407,181	4.03%	0.726	-3,198,023
04/03/2024	0	550,000,000	3.17%	4,407,181	-4,407,181	4.12%	0.716	-3,154,952
04/06/2024	0	550,000,000	3.17%	4,455,611	-4,455,611	4.21%	0.706	-3,145,133
04/09/2024	50,000,000	550,000,000	3.17%	4,455,611	-54,455,611	4.31%	0.696	-37,897,852
04/12/2024	0	500,000,000	3.17%	4,006,528	-4,006,528	4.40%	0.686	-2,749,110
04/03/2025	0	500,000,000	3.17%	3,962,500	-3,962,500	4.49%	0.677	-2,680,787
04/06/2025	0	500,000,000	3.17%	4,050,556	-4,050,556	4.58%	0.667	-2,700,797
04/09/2025	50,000,000	500,000,000	3.17%	4,050,556	-54,050,556	4.68%	0.657	-35,515,365
04/12/2025	0	450,000,000	3.17%	3,605,875	-3,605,875	4.77%	0.648	-2,335,033

\*d<sub>1</sub> – Denota el número de días transcurridos entre el periodo actual y el anterior

\*d<sub>2</sub> – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Tasa Fija CIRR	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	$A$	$N$	$C$	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	$B$	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/03/2026	0	450,000,000	3.17%	3,566,250	-3,566,250	4.86%	0.638	-2,276,104
04/06/2026	0	450,000,000	3.17%	3,645,500	-3,645,500	4.95%	0.629	-2,292,239
04/09/2026	50,000,000	450,000,000	3.17%	3,645,500	-53,645,500	5.05%	0.619	-33,229,603
04/12/2026	0	400,000,000	3.17%	3,205,222	-3,205,222	5.14%	0.610	-1,956,051
04/03/2027	0	400,000,000	3.17%	3,170,000	-3,170,000	5.23%	0.601	-1,906,145
04/06/2027	0	400,000,000	3.17%	3,240,444	-3,240,444	5.32%	0.592	-1,919,149
04/09/2027	50,000,000	400,000,000	3.17%	3,240,444	-53,240,444	5.42%	0.583	-31,054,946
04/12/2027	0	350,000,000	3.17%	2,804,569	-2,804,569	5.51%	0.575	-1,611,361
04/03/2028	0	350,000,000	3.17%	2,804,569	-2,804,569	5.60%	0.566	-1,587,133
04/06/2028	0	350,000,000	3.17%	2,835,389	-2,835,389	5.69%	0.557	-1,580,130
04/09/2028	50,000,000	350,000,000	3.17%	2,835,389	-52,835,389	5.79%	0.549	-28,995,139
04/12/2028	0	300,000,000	3.17%	2,403,917	-2,403,917	5.88%	0.540	-1,299,277
04/03/2029	0	300,000,000	3.17%	2,377,500	-2,377,500	5.97%	0.532	-1,265,754
04/06/2029	0	300,000,000	3.17%	2,430,333	-2,430,333	6.06%	0.524	-1,274,057
04/09/2029	50,000,000	300,000,000	3.17%	2,430,333	-52,430,333	6.16%	0.516	-27,064,158
04/12/2029	0	250,000,000	3.17%	2,003,264	-2,003,264	6.25%	0.508	-1,018,378
04/03/2030	0	250,000,000	3.17%	1,981,250	-1,981,250	6.34%	0.501	-992,065
04/06/2030	0	250,000,000	3.17%	2,025,278	-2,025,278	6.44%	0.493	-998,551
04/09/2030	50,000,000	250,000,000	3.17%	2,025,278	-52,025,278	6.53%	0.485	-25,257,248
04/12/2030	0	200,000,000	3.17%	1,602,611	-1,602,611	6.62%	0.478	-766,235
04/03/2031	0	200,000,000	3.17%	1,585,000	-1,585,000	6.71%	0.471	-746,453
04/06/2031	0	200,000,000	3.17%	1,620,222	-1,620,222	6.81%	0.464	-751,359
04/09/2031	50,000,000	200,000,000	3.17%	1,620,222	-51,620,222	6.90%	0.457	-23,572,168
04/12/2031	0	150,000,000	3.17%	1,201,958	-1,201,958	6.99%	0.450	-540,576
04/03/2032	0	150,000,000	3.17%	1,201,958	-1,201,958	7.08%	0.443	-532,420
04/06/2032	0	150,000,000	3.17%	1,215,167	-1,215,167	7.18%	0.436	-530,073
04/09/2032	50,000,000	150,000,000	3.17%	1,215,167	-51,215,167	7.27%	0.430	-22,001,144
04/12/2032	0	100,000,000	3.17%	801,306	-801,306	7.36%	0.423	-339,060
04/03/2033	0	100,000,000	3.17%	792,500	-792,500	7.45%	0.417	-330,366
04/06/2033	0	100,000,000	3.17%	810,111	-810,111	7.55%	0.411	-332,604
04/09/2033	50,000,000	100,000,000	3.17%	810,111	-50,810,111	7.64%	0.404	-20,546,398
04/12/2033	0	50,000,000	3.17%	400,653	-400,653	7.73%	0.398	-159,604
04/03/2034	0	50,000,000	3.17%	396,250	-396,250	7.82%	0.393	-155,533
04/06/2034	0	50,000,000	3.17%	405,056	-405,056	7.92%	0.387	-156,611
04/09/2034	50,000,000	50,000,000	3.17%	405,056	-50,405,056	8.01%	0.381	-19,197,845

\* $d_1$  – Denota el número de días transcurridos entre el periodo actual y el anterior

\* $d_2$  – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso



**Ejemplo #5: Valor Presente Negativo con Tasa Fija**  
**Monto: 1,000,000,000.00 (MIL MILLONES DE DÓLARES).**  
**Tasa: Fija 4.17% anualizada.**  
**Amortizaciones: Anuales (lineal).**  
**Desembolsos: Uno (4 de septiembre de 2014).**  
**Pago de Intereses: Trimestrales.**  
**Vencimiento: 4 de Septiembre de 2034.**

Monto Total Nominal del Crédito	1,000,000,000.00
Suma del Valor Presente	-41,295,557.56
<b>Valor Presente Neto del Crédito</b>	<b>-41,295,557.56</b>

Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Tasa Fija CIRR + spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	A	N	C	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	B	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/09/2014	-1,000,000,000.00	-	-	-	1,000,000,000	-	1	1,000,000,000
04/12/2014	0	1,000,000,000	4.17%	10,540,833	-10,540,833	0.51%	0.999	-10,527,164
04/03/2015	0	1,000,000,000	4.17%	10,425,000	-10,425,000	0.51%	0.997	-10,398,160
04/06/2015	0	1,000,000,000	4.17%	10,656,667	-10,656,667	0.59%	0.996	-10,609,295
04/09/2015	50,000,000	1,000,000,000	4.17%	10,656,667	-60,656,667	0.66%	0.993	-60,250,908
04/12/2015	0	950,000,000	4.17%	10,013,792	-10,013,792	0.74%	0.991	-9,920,948
04/03/2016	0	950,000,000	4.17%	10,013,792	-10,013,792	0.81%	0.988	-9,891,538
04/06/2016	0	950,000,000	4.17%	10,123,833	-10,123,833	0.89%	0.984	-9,966,592
04/09/2016	50,000,000	950,000,000	4.17%	10,123,833	-60,123,833	0.96%	0.981	-58,969,235
04/12/2016	0	900,000,000	4.17%	9,486,750	-9,486,750	1.04%	0.977	-9,266,935
04/03/2017	0	900,000,000	4.17%	9,382,500	-9,382,500	1.16%	0.971	-9,114,805
04/06/2017	0	900,000,000	4.17%	9,591,000	-9,591,000	1.32%	0.964	-9,249,411
04/09/2017	50,000,000	900,000,000	4.17%	9,591,000	-59,591,000	1.49%	0.957	-57,006,581
04/12/2017	0	850,000,000	4.17%	8,959,708	-8,959,708	1.65%	0.948	-8,496,821
04/03/2018	0	850,000,000	4.17%	8,861,250	-8,861,250	1.81%	0.940	-8,325,656
04/06/2018	0	850,000,000	4.17%	9,058,167	-9,058,167	1.98%	0.930	-8,424,352
04/09/2018	50,000,000	850,000,000	4.17%	9,058,167	-59,058,167	2.14%	0.920	-54,332,119
04/12/2018	0	800,000,000	4.17%	8,432,667	-8,432,667	2.31%	0.910	-7,670,006
04/03/2019	0	800,000,000	4.17%	8,340,000	-8,340,000	2.47%	0.899	-7,496,237
04/06/2019	0	800,000,000	4.17%	8,525,333	-8,525,333	2.58%	0.890	-7,584,058
04/09/2019	50,000,000	800,000,000	4.17%	8,525,333	-58,525,333	2.67%	0.881	-51,533,725
04/12/2019	0	750,000,000	4.17%	7,905,625	-7,905,625	2.77%	0.871	-6,888,857
04/03/2020	0	750,000,000	4.17%	7,905,625	-7,905,625	2.87%	0.862	-6,815,124
04/06/2020	0	750,000,000	4.17%	7,992,500	-7,992,500	2.97%	0.852	-6,813,363
04/09/2020	50,000,000	750,000,000	4.17%	7,992,500	-57,992,500	3.06%	0.843	-48,872,244
04/12/2020	0	700,000,000	4.17%	7,378,583	-7,378,583	3.16%	0.833	-6,146,199
04/03/2021	0	700,000,000	4.17%	7,297,500	-7,297,500	3.23%	0.824	-6,015,605
04/06/2021	0	700,000,000	4.17%	7,459,667	-7,459,667	3.28%	0.817	-6,093,072
04/09/2021	50,000,000	700,000,000	4.17%	7,459,667	-57,459,667	3.32%	0.809	-46,499,278
04/12/2021	0	650,000,000	4.17%	6,851,542	-6,851,542	3.36%	0.802	-5,493,419
04/03/2022	0	650,000,000	4.17%	6,776,250	-6,776,250	3.40%	0.794	-5,382,981
04/06/2022	0	650,000,000	4.17%	6,926,833	-6,926,833	3.45%	0.787	-5,450,315
04/09/2022	50,000,000	650,000,000	4.17%	6,926,833	-56,926,833	3.49%	0.779	-44,363,139
04/12/2022	0	600,000,000	4.17%	6,324,500	-6,324,500	3.53%	0.772	-4,881,598
04/03/2023	0	600,000,000	4.17%	6,255,000	-6,255,000	3.57%	0.765	-4,781,986
04/06/2023	0	600,000,000	4.17%	6,394,000	-6,394,000	3.73%	0.751	-4,802,636
04/09/2023	50,000,000	600,000,000	4.17%	6,394,000	-56,394,000	3.91%	0.737	-41,559,796
04/12/2023	0	550,000,000	4.17%	5,797,458	-5,797,458	4.03%	0.726	-4,206,863
04/03/2024	0	550,000,000	4.17%	5,797,458	-5,797,458	4.12%	0.716	-4,150,205
04/06/2024	0	550,000,000	4.17%	5,861,167	-5,861,167	4.21%	0.706	-4,137,289
04/09/2024	50,000,000	550,000,000	4.17%	5,861,167	-55,861,167	4.31%	0.696	-38,876,035
04/12/2024	0	500,000,000	4.17%	5,270,417	-5,270,417	4.40%	0.686	-3,616,337
04/03/2025	0	500,000,000	4.17%	5,212,500	-5,212,500	4.49%	0.677	-3,526,461
04/06/2025	0	500,000,000	4.17%	5,328,333	-5,328,333	4.58%	0.667	-3,552,784
04/09/2025	50,000,000	500,000,000	4.17%	5,328,333	-55,328,333	4.68%	0.657	-36,354,963
04/12/2025	0	450,000,000	4.17%	4,743,375	-4,743,375	4.77%	0.648	-3,071,636

\* $d_1$  – Denota el número de días transcurridos entre el periodo actual y el anterior

\* $d_2$  – Denota el número de días transcurridos desde el inicio del contrato hasta el periodo actual

Desembolso



Fecha de Pago (dd/mm/aaaa)	Amortizaciones	Nocional	Tasa Fija CIRR + spread	Intereses	Flujo	Curva Cupón Cero	Factor de Descuento	VP
	A	N	C	$I = N \times C \times \frac{d_1^*}{360}$	$F = -(A + I)$	B	$D = \frac{1}{1 + B \times \frac{d_2^*}{360}}$	$F \times D$
04/03/2026	0	450,000,000	4.17%	4,691,250	-4,691,250	4.86%	0.638	-2,994,118
04/06/2026	0	450,000,000	4.17%	4,795,500	-4,795,500	4.95%	0.629	-3,015,342
04/09/2026	50,000,000	450,000,000	4.17%	4,795,500	-54,795,500	5.05%	0.619	-33,941,947
04/12/2026	0	400,000,000	4.17%	4,216,333	-4,216,333	5.14%	0.610	-2,573,101
04/03/2027	0	400,000,000	4.17%	4,170,000	-4,170,000	5.23%	0.601	-2,507,453
04/06/2027	0	400,000,000	4.17%	4,262,667	-4,262,667	5.32%	0.592	-2,524,558
04/09/2027	50,000,000	400,000,000	4.17%	4,262,667	-54,262,667	5.42%	0.583	-31,651,205
04/12/2027	0	350,000,000	4.17%	3,689,292	-3,689,292	5.51%	0.575	-2,119,677
04/03/2028	0	350,000,000	4.17%	3,689,292	-3,689,292	5.60%	0.566	-2,087,806
04/06/2028	0	350,000,000	4.17%	3,729,833	-3,729,833	5.69%	0.557	-2,078,593
04/09/2028	50,000,000	350,000,000	4.17%	3,729,833	-53,729,833	5.79%	0.549	-29,485,995
04/12/2028	0	300,000,000	4.17%	3,162,250	-3,162,250	5.88%	0.540	-1,709,144
04/03/2029	0	300,000,000	4.17%	3,127,500	-3,127,500	5.97%	0.532	-1,665,046
04/06/2029	0	300,000,000	4.17%	3,197,000	-3,197,000	6.06%	0.524	-1,675,967
04/09/2029	50,000,000	300,000,000	4.17%	3,197,000	-53,197,000	6.16%	0.516	-27,459,906
04/12/2029	0	250,000,000	4.17%	2,635,208	-2,635,208	6.25%	0.508	-1,339,632
04/03/2030	0	250,000,000	4.17%	2,606,250	-2,606,250	6.34%	0.501	-1,305,020
04/06/2030	0	250,000,000	4.17%	2,664,167	-2,664,167	6.44%	0.493	-1,313,551
04/09/2030	50,000,000	250,000,000	4.17%	2,664,167	-52,664,167	6.53%	0.485	-25,567,415
04/12/2030	0	200,000,000	4.17%	2,108,167	-2,108,167	6.62%	0.478	-1,007,949
04/03/2031	0	200,000,000	4.17%	2,085,000	-2,085,000	6.71%	0.471	-981,927
04/06/2031	0	200,000,000	4.17%	2,131,333	-2,131,333	6.81%	0.464	-988,381
04/09/2031	50,000,000	200,000,000	4.17%	2,131,333	-52,131,333	6.90%	0.457	-23,805,565
04/12/2031	0	150,000,000	4.17%	1,581,125	-1,581,125	6.99%	0.450	-711,105
04/03/2032	0	150,000,000	4.17%	1,581,125	-1,581,125	7.08%	0.443	-700,375
04/06/2032	0	150,000,000	4.17%	1,598,500	-1,598,500	7.18%	0.436	-697,288
04/09/2032	50,000,000	150,000,000	4.17%	1,598,500	-51,598,500	7.27%	0.430	-22,165,817
04/12/2032	0	100,000,000	4.17%	1,054,083	-1,054,083	7.36%	0.423	-446,019
04/03/2033	0	100,000,000	4.17%	1,042,500	-1,042,500	7.45%	0.417	-434,582
04/06/2033	0	100,000,000	4.17%	1,065,667	-1,065,667	7.55%	0.411	-437,526
04/09/2033	50,000,000	100,000,000	4.17%	1,065,667	-51,065,667	7.64%	0.404	-20,649,739
04/12/2033	0	50,000,000	4.17%	527,042	-527,042	7.73%	0.398	-209,952
04/03/2034	0	50,000,000	4.17%	521,250	-521,250	7.82%	0.393	-204,597
04/06/2034	0	50,000,000	4.17%	532,833	-532,833	7.92%	0.387	-206,015
04/09/2034	50,000,000	50,000,000	4.17%	532,833	-50,532,833	8.01%	0.381	-19,246,512

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Desembolso

