A Crisis-Adjusted Valuation Model for Financial Firms: Empirical Evidence from Mexico during COVID-19

Un modelo de valoración de empresas financieras ajustado para crisis: datos empíricos de México durante COVID-19

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Abstract

This study proposes an adjusted valuation model for systemic health crisis contexts to more accurately estimate the intrinsic value of Mexican financial firms during the COVID-19 pandemic. A quantitative approach is applied using two methods: a free cash flow to equity (FCFE) model with specific adjustments to projected cash flows and discount rates, and an asset-based valuation as a conservative benchmark. The sample includes eight firms listed on Mexico's Índice de Precios y Cotizaciones (IPC)—Price and Quotation Index. Intrinsic values are compared to market prices at two key moments: March 2020 and March 2022. The findings reveal a general undervaluation trend in 2020 and an overvaluation trend in 2022, consistent with behavioral finance theories regarding investor reactions to uncertainty. The adjusted model effectively captures the economic impact of health crises, offering a replicable tool for financial valuation in non-standard environments. This research contributes to the literature by demonstrating how valuation frameworks can be adapted to account for exogenous shocks in emerging markets.

Keywords: *firm valuation, financial crisis, COVID-19, behavioral finance.*
JEL Classification: *G01, G12, G14, G41.*

Resumen

Este estudio propone un modelo de valuación ajustado para contextos de crisis sanitarias sistémicas, con el fin de estimar de manera más precisa el valor intrínseco de las empresas financieras mexicanas durante la pandemia por COVID-19. Utilizando un enfoque cuantitativo, se aplican dos métodos: el modelo de flujo de efectivo libre al capital (FCFE) con ajustes específicos en los flujos y la tasa de descuento, y el modelo basado en activos como referencia conservadora. La muestra está compuesta por ocho empresas listadas en el IPC (Índice de Precios y Cotizaciones) de la Bolsa Mexicana de Valores. Se comparan los resultados obtenidos en marzo de 2020 y marzo de 2022 para observar la evolución de la relación entre valor intrínseco y precio de mercado. Los resultados muestran una tendencia general a la subvaluación en 2020 y a la sobrevaluación en 2022, lo cual se interpreta como reflejo del comportamiento de los inversionistas ante la incertidumbre. El modelo demuestra ser útil para capturar el impacto económico de crisis sanitarias en la valoración financiera.

Palabras clave: *valuación de empresas, crisis financiera, COVID-19, finanzas conductuales.*
Clasificación JEL: *G01, G12, G14, G41.*

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1. Introduction

The valuation of firms is a fundamental tool in financial decision-making, particularly in contexts of high volatility and uncertainty. During periods of crisis, such as the COVID-19 pandemic, the traditional assumptions of stable growth, constant rates, and rational investor behavior may lose validity, leading to distortions between a company's intrinsic value and its market price.

In March 2020, the emergence of COVID-19 triggered an unprecedented disruption in global financial markets. In Mexico, the financial sector experienced sharp declines in stock prices, despite many institutions maintaining solid fundamentals. This phenomenon underscores the need for valuation frameworks that encompass not only traditional financial variables, but also extraordinary exogenous factors that impact market expectations and risk perception.

This study proposes an adjusted valuation model for systemic health crisis contexts, aiming to more accurately estimate the intrinsic value of Mexican financial firms during the pandemic and evaluate whether significant discrepancies exist between estimated values and observed market prices. The model is based on the free cash flow to equity (FCFE) approach. However, it integrates specific adjustments drawn from the historical analysis of pandemics and financial crises, specifically a reduction in projected cash flows during the early crisis years and an adjusted discount rate that incorporates a complementary risk premium.

Additionally, an asset-based valuation model is employed as a conservative benchmark. Both valuation outputs are compared with market prices at two key points in time: March 2020 and March 2022. This dual comparison enables a test of whether the adjusted model reveals systematic differences, thereby allowing for the empirical validation of the proposed hypothesis and providing insights into investor behavior throughout the pandemic cycle.

2. Methodology

This study adopts a quantitative approach with a non-experimental, longitudinal design, focused on a comparative analysis of financial valuations at two key moments: March 2020, at the onset of the COVID-19 pandemic in Mexico, and March 2022, when health and economic conditions had largely stabilized. The study

applies financial valuation models to determine the intrinsic value of companies in the Mexican financial sector during a systemic health crisis. Two valuation methods are used: a discounted cash flow (DCF) model adjusted for crisis conditions, and an asset-based valuation model.

The primary objective of this study is to determine whether the application of a valuation model adjusted for systemic health crises enables the identification of significant differences between the intrinsic value and the market price of financial companies listed in Mexico during the COVID-19 pandemic.

The hypotheses proposed are as follows:

Null hypothesis: There is no significant difference between the market value and the intrinsic value of Mexican financial firms when using a valuation model adjusted for health crises.

Alternative hypothesis: There is a significant difference between the market value and the intrinsic value of Mexican financial firms when using a valuation model adjusted for health crises.

The sample consists of eight companies from the Mexican financial sector, included in the Índice de Precios y Cotizaciones —Price and Quotations Index— (IPC) of the Bolsa Mexicana de Valores —Mexican Stock Exchange— (BMV), selected based on the availability of financial and market data. The information was obtained from official sources, including companies' quarterly reports, the BMV, the Bank of Mexico, and the World Bank.

This research contributes to the financial literature by offering a methodological alternative that is adaptable to crisis environments, with particular relevance for emerging markets such as Mexico. It also provides empirical evidence of systematic discrepancies between intrinsic value and market price in high-uncertainty contexts.

3. Theoretical Framework

Pandemics are large-scale outbreaks of infectious diseases that can significantly increase illness and death rates across broad geographic areas, while also causing major economic, social, and political disruptions. The likelihood of pandemics has been rising over the past century due to factors such as the growth of international travel, global integration, urbanization, changes in land use, and the increasing exploitation of natural resources (Jones et al., 2008).

Regarding the economic impact they can generate, the SARS (severe acute respiratory syndrome) pandemic led to a -12.8% drop in the S&P 500 index between January and March 2003, while the MERS (Middle East respiratory syndrome) pandemic caused a -7.3% decline in the same index from September to November 2012. During the SARS outbreak, the financial sector and the communication services sector were hit the hardest between January and March 2003, showing losses of -16.3% and -26.7%, respectively (Li, 2020).

Regarding the COVID-19 pandemic, in the first quarter of 2020, Mexico's financial sector experienced a decline in several key indicators compared to the end of 2019. Return on equity fell by 1.4%, the capitalization index dropped by 0.4%, and the non-performing loan ratio increased by 0.1%. Another noteworthy point is that, compared to the same month the previous year, March 2020 showed a 31.9% decrease in the net income of multiple banking institutions (Méndez & Cigala, 2020).

This period (2020) also saw a downward trend in the market prices of equities listed on the Mexican Stock Exchange (BMV). However, this decline was not always aligned with the intrinsic value of these assets, but rather reflected investor behavior in response to the broader economic outlook. Regarding concepts of price and value, a company's value can differ depending on the perspective of each buyer and seller. In contrast, the price is simply the amount both parties agree upon in a transaction. In a sale, valuation helps the buyer determine the maximum they should be willing to pay, and the seller the minimum they should be willing to accept.

The uncertainty and risk that inevitably accompanied this crisis period encouraged herd behavior, as market participants operated with highly imperfect information. As a result, their decisions often followed the crowd, amplifying both moments of excessive optimism and waves of panic-driven selloffs, such as the sharp market swings seen in 2020 (Torres, 2012).

Many studies have examined investor overreaction, for example, Zakamulin's (2024) research, which confirms the presence of an overreaction effect in the stock market. She identified specific price patterns that emerge during both bull and bear markets. Another strong example is the study by Said et al. (2021), which concludes that stock returns display patterns consistent with investor overreaction in Pakistan's stock market.

Investor concerns about COVID-19 had a negative impact on financial markets, according to findings by Cevik et al. (2022). They concluded that negative investor sentiment increases market volatility, while positive sentiment helps to reduce it.

Similarly, Loang (2022) found a correlation between market sentiment, investor sentiment, and stock returns during the COVID-19 period.

As a result, investor behavior in 2020 can be seen as a case of overreaction contagion. Additionally, the empirical findings of Yuan et al. (2022) confirmed the existence of pandemic-driven financial contagion, illustrating that the Indian and Australian markets were significantly affected by COVID-19. These markets were notably susceptible to spreading financial contagion to others and played a crucial role in the pandemic-driven contagion network.

3.1 Valuation Model Structure

The discounted cash flow valuation was carried out using the formula provided by Aznar et al. (2016, p. 110):

$$PV = \sum_{i=1}^{n} \frac{CF_i}{(1+K)^i} + \frac{RV}{(1+K)^{n+i}}$$

Where:

PV = present value

CF_i = cash flow for the period

K = discount rate or required return

RV = residual or terminal value

Following Gnap and Pitera (2023), the Free Cash Flow to Equity (FCFE) was used as the amount to be discounted in the model. The FCFE was calculated as follows:

FCFE = CFO – FCInv + Net borrowing

Where:

FCFE = free cash flow to equity

CFO = cash flow from operating activities

FCInv = capital expenditures

Net borrowing = net debt issued

To estimate the growth rate used to project the firms' cash flows, the approach proposed by Masilo (2013) was followed. The author notes: "As for the long-term growth rate, it is understood that few companies can grow faster than the economy on average." (Masilo, 2013, p. 141)

To approximate the average economic growth, the annual real Gross Domestic Product (GDP) growth rate over the ten years prior to the valuation period was used as a proxy in Table 1 (see Table 1).

Table 1. Real GDP Growth (Annual %) in Mexico

Year	Growth
2010	4.97
2011	3.44
2012	3.55
2013	0.85
2014	2.50
2015	2.70
2016	1.77
2017	1.87
2018	1.97
2019	-0.28
Average	***2.34***

Source: Prepared by the author based on World Bank (2024).

Based on the information gathered, the growth rate used for projecting cash flows was set at 2.5%, and the calculated result was rounded.

Similarly, Sharpe (1964) states that the required rate of return (or discount rate) should be determined using the Capital Asset Pricing Model (CAPM).

$$r = Rf + \beta i[E(Rmkt) - Rf]$$

Where:

r = required rate of return

Rf = risk-free rate

βi = beta of the asset

E(Rmkt) = expected market return

In the formula proposed by Aznar et al. (2016), a terminal value (also referred to as residual value) is included in the final cash flow. Likewise, Damodaran (2012, 302–303) explains that a perpetuity can be used in place of a liquidation value, as the firms analyzed can be assumed to have an indefinite life cycle with constant growth. Both authors suggest the following formula:

Terminal Value = Cash Flow / (required rate – constant growth rate)

Regarding the projection horizon used in the model, McKinsey & Company Inc. et al. (1990, p. 234) recommend a period of 10 to 15 years. Therefore, a 10-year horizon was selected.

It is important to note that the observation period (first quarter of 2020) marks the onset of COVID-19 infections in Mexico. As a result, the model incorporates the impact of the pandemic on future cash flow projections.

To determine how many periods should be affected, it is essential to consider the average duration of similar events throughout history. The following Table 2 presents the duration of pandemics caused by respiratory infections since 1889 (see Table 2).

Table 2. Duration in Years of Pandemics Caused by Respiratory Infections

Period	Official Name	Pathogen	Duration
1889–1893	Russian Flu	Influenza A/H3N8	4
1918–1919	Spanish Flu	Influenza A/H1N1	1
1957–1959	Asian Flu	Influenza A/H2N2	2
1968–1970	Hong Kong Flu	Influenza A/H3N2	2
2002–2003	Severe Acute Respiratory Syndrome (SARS)	SARS-CoV	1
2009–2010	Swine Flu	Influenza A/H1N1	1
2015-2021	Middle East Respiratory Syndrome (MERS)	MERS-CoV	6
		Average	**2.4**

Source: Prepared by the author based on Piret and Boivin (2021) and WHO (2023).

Considering that a pandemic represents a period of crisis, this information was complemented with the work of Allen and Gale (2007), who analyzed the duration and impact of banking and monetary crises. The authors found that such crises last, on average, 2.3 years.

The average duration of pandemics caused by respiratory infections, along with the average duration of financial crises, supported the decision to negatively adjust the valuation of the first two years (rounding the estimated duration).

However, how were these adjustments made?

To determine how to incorporate the impact into the model, it was assumed that pandemics, as crisis events, can have economic consequences similar to those of financial crises, as can be observed in Table 3. Therefore, the observed impact of such crises on GDP was used as a reference point (see Table 3).

Table 3. Impact of Financial Crises (1973–1997) in % of GDP Loss

Currency crises	5.9
Banking crises	6.2
Average	6.1

Source: Prepared by the author based on Allen and Gale (2007).

As a result, the first two projected cash flows were adjusted downward by 6% (rounded from the estimated impact) to reflect the decline in firm growth.

Regarding the application of the CAPM model, the risk-free rate was based on the 28-day CETE (Certificado de la Tesorería de la Federación—Federal Treasury Certificate) yield as of March 26, 2020 (the closest previous date to the valuation), resulting in a rate of 6.59%.

The average economic growth rate in Mexico (2.5%) was used as a proxy for the expected market return.

As can be observed from Table 4, the required rate of 1.31% appears inconsistent with investor expectations. Therefore, it was decided to adjust the required rate by adding the average economic growth rate (2.5%) to the risk-free rate (6.59%) (see Table 4).

Table 4. Calculation of the Required Rate Using the CAPM Model for "GFNORTE O"

Beta	1.29
Risk-free rate	6.59%
Expected market return	2.50%
Required rate of return	1.31%

Source: Prepared by the author.

This adjustment is based on the rationale that investors expect at least the risk-free return when investing in fixed-income securities; however, the market under evaluation involves greater risk. Therefore, it is reasonable to expect a risk premium aligned with the average rate of economic growth.

This results in a required rate of return of 9.09%, which will be used for valuing all companies.

Regarding asset-based valuation, it is commonly used as a minimum estimate of a company's value, as it does not account for factors such as the firm's potential growth, the industry's growth, or the broader economy's growth. In this study, it is necessary to establish a minimum value for the stock prices of the firms included in the sample.

Fernández (2002) explains that the asset-based value of a company (also referred to as book value) is the difference between total assets and total liabilities. Accordingly, to calculate the per-share asset-based value, the difference between total assets and total liabilities is simply divided by the number of outstanding shares. The formula is expressed as follows:

$$V = \frac{\textit{Total assets-Total liabilities}}{\textit{Number of outstanding shares}}$$

4. Results

4.1 Valuations as of March 31, 2020

The valuations conducted as of March 31, 2020, yielded unfavorable results for the companies' stock prices, with five out of the eight firms in the sample trading below

their intrinsic value (i.e., undervalued). It is worth noting that this period coincided with a peak in uncertainty for the Mexican population, as the COVID-19 pandemic began affecting the country during that quarter.

The following Table 5 presents the values obtained through the valuation models, along with the market prices at which the stocks were traded (see Table 5).

It is essential to recognize that discounted cash flow valuations can yield a negative intrinsic value if the projected cash flows are extremely low or negative in nature. This situation often arises when a company experiences operating losses or has negative free cash flows during the year used for the valuation. Since this method values a business based on its ability to generate future cash and bring it to present value, a weak or negative starting point pulls the overall valuation down. For this research, any intrinsic value based on discounted cash flows that resulted in a negative figure (due to low or negative cash flows in the valuation year) has been reported as N/A, as such outcomes do not reflect a meaningful estimate of intrinsic value.

Table 5. Intrinsic Value of Companies in 2020

Name	Ticker	Market price as of March 31, 2020	Value based on discounted cash flows	Value based on assets
BANBAJIO	BBAJIO O	$20.48	N/A	$27.50
SANTANDER	BSMX B	$15.64	$79.07	$83.28
BMV	BOLSA A	$36.24	$17.56	$13.48
GENTERA	GENTERA *	$9.06	$44.63	$14.01
BANORTE	GFNORTE O	$65.00	$119.59	$68.49
INBURSA	GFINBUR O	$17.04	N/A	$24.57
QUALITAS	Q *	$60.93	$21.71	$38.14
BANREGIO	R A	$62.49	N/A	$62.47

Source: Prepared by the author.

Note: * Indicates a single class of shares.

The following Tables 6 and 7 illustrate the discrepancy between the intrinsic values and market prices of the companies as of March 31, 2020 (see Table 6 and Table 7).

Table 6. Mismatch between Market Price and Intrinsic Value of Companies Whose Market Price was Lower than Their Intrinsic Value

Name	Ticker	Market price as of March 31, 2020	Value based on discounted cash flows	Value based on assets	Mismatch between DCF value and market price	Mismatch between asset-based value and market price
BANBAJIO	BBAJIO O	$20.48	N/A	$27.50	N/A	$7.02
SANTANDER	BSMX B	$15.64	$79.07	$83.28	$63.43	$67.64
GENTERA	GENTERA *	$9.06	$44.63	$14.01	$35.57	$4.95
BANORTE	GFNORTE O	$65.00	$119.59	$68.49	$54.59	$3.49
INBURSA	GFINBUR O	$17.04	N/A	$24.57	N/A	$7.53

Source: Prepared by the author.

Table 7. Mismatch between Market Price and Intrinsic Value of Companies Whose Market Price was higher than their intrinsic value

Name	Ticker	Market price as of March 31, 2020	Value based on discounted cash flows	Value based on assets	Mismatch between price and DCF-based value	Mismatch between price and asset-based value
BMV	BOLSA A	$36.24	$17.56	$13.48	$18.68	$22.76
QUALITAS	Q *	$60.93	$21.71	$38.14	$39.22	$22.79
BANREGIO	R A	$62.49	N/A	$62.47	N/A	$0.02

Source: Prepared by the author.

4.2 Valuation as of March 31, 2022

For the valuation of companies as of March 31, 2022, only one adjustment was made to the discounted cash flow model: the projected cash flows were no longer reduced by 6% in the companies' growth rate. This change reflects the fact that the average two-year duration of the pandemic had already passed by that time.

By 2022, unlike in 2020, most companies were trading at prices above their intrinsic value, with seven firms classified as overvalued.

As in the presentation of the 2020 results, the following section shows the intrinsic values obtained from the valuations, along with the corresponding market prices as of March 31, 2022 (see Table 8).

Table 8. Intrinsic Value of Companies in 2022

Name	Ticker	Market price as of March 31, 2022	Value based on discounted cash flows	Value based on assets
BANBAJIO	BBAJIO O	$54.61	N/A	$33.21
SANTANDER	BSMX B	$21.09	$329.11	$98.08
BMV	BOLSA A	$42.06	$18.76	$14.52
GENTERA	GENTERA *	$16.89	N/A	$15.98
BANORTE	GFNORTE O	$149.55	$129.09	$84.65
INBURSA	GFINBUR O	$41.67	N/A	$29.27
QUALITAS	Q *	$113.99	$12.64	$52.10
BANREGIO	R A	$139.78	N/A	$65.50

Source: Prepared by the author.

The following tables 9 and 10 show the discrepancy between the market price and the intrinsic value of the companies in the sample for the year 2022 (see Table 9 and Table 10).

Table 9. Mismatch Between Market Price and Intrinsic Value of Companies Whose Market Price was Lower than Their Intrinsic Value

Name	Ticker	Market price as of March 31, 2022	Value based on discounted cash flows	Value based on assets	Mismatch between DCF-based value and price	Mismatch between asset-based value and price
SANTANDER	BSMX B	$21.09	$329.11	$98.08	$308.02	$76.99

Source: Prepared by the author.

Table 10. Mismatch Between Market Price and Intrinsic Value of Companies Whose Market Price was Higher than Their Intrinsic Value

Name	Ticker	Market price as of March 31, 2022	Value based on discounted cash flows	Value based on assets	Mismatch between price and DCF-based value	Mismatch between price and asset-based value
BANBAJIO	BBAJIO O	$54.61	N/A	$33.21	N/A	$21.40
BMV	BOLSA A	$42.06	$18.76	$14.52	$23.30	$27.54
GENTERA	GENTERA *	$16.89	N/A	$15.98	N/A	$0.91
BANORTE	GFNORTE O	$149.55	$129.09	$84.65	$20.46	$64.90
INBURSA	GFINBUR O	$41.67	N/A	$29.27	N/A	$12.40
QUALITAS	Q *	$113.99	$12.64	$52.10	$101.35	$61.89
BANREGIO	R A	$139.78	N/A	$65.50	N/A	$74.28

Source: Prepared by the author.

The following Table 11 summarizes the average and variance of the discrepancy between intrinsic value and market price across both 2020 and 2022 (see Table 11).

Table 11. Statistical Summary of Price-Value Discrepancies (2020 and 2022)

Method	Average Discrepancy	Variance
Discounted Cash Flows	$73.85	8398.19
Asset-Based Valuation	$29.78	828.15

Source: Prepared by the author.

These results show that the discounted cash flow method not only identifies larger differences from market prices on average but also shows much more variation in its outcomes. This increased volatility suggests that the model is more sensitive to changes in assumptions, such as expected cash flows and discount rates, which is especially important during uncertain times, like health crises. Because of this, the cash flow method tends to reflect market uncertainty and shifts in investor sentiment more clearly, while the asset-based method provides a more cautious and steady valuation approach.

5. Conclusions

The findings of this study support the rejection of the null hypothesis, indicating that there are indeed significant differences between the market value and the intrinsic value of Mexican financial firms when using a valuation model adjusted for health crises. The adjusted valuation model for systemic health crisis contexts proves effective in identifying relevant discrepancies between intrinsic value and market price. In particular, results from the first quarter of 2020 reveal a widespread trend of undervaluation, in contrast to the findings from 2022, where overvaluation was more prevalent.

This evolution aligns with the theoretical framework regarding investor behavior under conditions of high uncertainty. During the initial months of the COVID-19 pandemic, the lack of knowledge about the magnitude and duration of the health crisis led to an elevated perception of risk, which was reflected in falling financial asset prices, often below their fundamental values, by 2022, increased knowledge about the virus, progress in vaccination, and the economy's adaptation to a new standard significantly reduced uncertainty, triggering a price recovery that, in some cases, exceeded the value estimated by the models.

The use of an adjusted discount rate, along with the incorporation of a negative impact on projected cash flows during the first two years of the crisis, allowed for a more realistic reflection of market conditions. Additionally, the comparison with an asset-based valuation provided a conservative benchmark that complemented the discounted cash flow estimates.

From a methodological standpoint, incorporating adjustments based on historical evidence (such as the duration of past pandemics and the economic effects of previous crises) represents a valuable contribution to financial analysis in atypical environments. The proposed model offers a flexible and replicable tool that can be adapted to future systemic crises, whether health-related or otherwise.

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