



Financing meat, dairy and feed production

Bank of America, Citigroup, and JP
Morgan Chase face financial risks

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About this report

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Summary, Key Takeaways, and Recommendations

Key Takeaways

- In the near term (to 2030), 31 meat, dairy, and feed corporations reviewed for this report (see Appendix 1) could face US\$ 116 billion in losses, putting US\$ 0.43 billion to US\$ 1.12 billion of the banks' loans and investments in the 31 corporations at risk.
- In the long term (to 2050), the 31 meat, dairy, and feed corporations face total climate-related financial risk in the range of US\$ 536 billion to US\$ 5,415 billion.
 - At the low end, total financial risk comprises a major part of the 31 companies' US\$ 725 billion in equity value and US\$ 932 billion in enterprise value.
 - At the high end, potential losses could exceed the 31 corporations' equity value by 7.5X and enterprise value by 5.8X.
- In the long term, Bank of America (BofA), Citigroup (Citi) and JP Morgan Chase (JPMC), the "Big Three", face much higher financial risks, ranging from US\$ 2.5 billion to US\$9.3 billion of their US\$10.4 billion outstanding financing to the 31 companiesⁱ.
- Even in scenarios where the 31 corporations' revenues increase by 16%-25%, the costs of carbon could outstrip gains and negatively impact the corporations' EBITDA and/or value, putting 24% - 91% of the Big Three's loans and investments at riskⁱⁱ.
- For the Big Three, ending financing to the 31 corporations in the near-term (as soon as current loans are redeemed), would reduce climate-related financing risk by 83% to 95%.

Summary

This report evaluates the climate-related financial risks that Bank of America, Citigroup, and JP Morgan Chase face in financing companies active in meat, dairy and feed (MDF) production.

In their April 2024 report *Bull in the Climate Shop: Industrial livestock financing sabotages major U.S. banks' climate commitments*, Friends of the Earth US. and Profundo analyzed the emissions from and U.S. bank financing of the world's largest 56 corporations involved in meat, dairy, and animal feed production.¹ Of these 56, a group of 31 companies (see Appendix 1) received US\$ 74 billion of loans and underwriting services from Bank of America (BofA), Citigroup (Citi) and JP Morgan Chase (JPMC), the "Big Three", during the period 2016-2023. Of this, US\$ 7.1 billion was still outstanding end of 2022; the rest has been repaid or sold.

At that date, the three banks had US\$ 3.2 billion in shares in the 31 companies, and US\$ 0.12 billion in outstanding bonds. The total enterprise value of these 31 companies was US\$ 932 billion (end 2022). The 31 companies had net revenues of US\$ 1,072 billion (2022), and EBITDA (Earnings Before Interest, Tax payments, Depreciation, and Amortisation) of US\$ 88 billion.

The three banks face climate-related financial risks as the 31 companies face six categories of risks. The financial risks that the 31 MDF companies are facing are due to stranded assets, market access/declining markets, higher feed costs, the introduction of climate costs through carbon pricing, higher interest rates on loans, and loss of reputation. All these risks affect the value of an enterprise: the value of shares, and the value of debt, including loans and bonds. The current report calculated the size of the risks based on four scenarios (A1, A2, B1, B2), including different market expectations, different carbon costs, and different interest rates:

- Scenario A1: Declining demand, low CO₂e prices and interest rates raised by 0.25%,
- Scenario A2: Declining demand, high CO₂e prices and interest rates raised by 1%,

ⁱ Total value (US\$ 10.4B) of lending and investments as of 12/31/22.

ⁱⁱ Total value (US\$ 10.4B) of lending and investments as of 12/31/22.

- Scenario B1: Increasing demand, low CO_{2e} prices and interest rates raised by 0.25%,
- Scenario B2: Increasing demand, high CO_{2e} prices and interest rates raised by 1%.

The risks have been calculated for the medium term – the risk for existing debt. The medium-term risk lies in a deterioration of the EBITDA (Earnings Before Interest, Depreciation and Amortisation) through a change in volume and rising feed costs following climate change. MDF companies with a declining EBITDA might get into problems in paying interest and repaying the existing debt when its ratio net-debt/EBITDA deteriorates to more than five times (Net-debt/EBITDA ratio >5X). Therefore, this report focused on the development of this ratio. In the period that a loan is outstanding, banks might be confronted with a deferral of payments on debt. The 'medium term' risks are applicable for a period of 5 years.

The long-term risks are broader and potentially larger. In addition to higher feed costs and volume changes, MDF companies might be confronted with carbon costs, higher interest rates, and reputation loss. These will affect the value of shares and might affect the value of debt. The 'long term' risks apply for the 2030-2050 period.

In the medium term, the 31 MDF companies could face a US\$ 116 billion financial risk. In other words, 44% of loans could be at risk. In the scenarios with declining volumes (scenarios A1 and A2), the existing net-debt/EBITDA ratio would deteriorate from 2.2x (existing situation) to 4.2x for the whole group. While an average ratio of 4.2x for the group could suggest a situation without financial risk, several individual companies show a much higher net-debt/EBITDA ratio and could therefore face a more severe impact.

In the scenarios where meat and dairy volumes continue to rise (B1 and B2), the net-debt/EBITDA ratio could improve slightly from 2.2x (existing situation) to 2.1x (pro forma): the higher EBITDA from market growth would exceed the negative EBITDA impact from higher feed costs.

In the long term, the 31 MDF companies face a total climate-related financial risk in the range of US\$ 536 billion to US\$ 5,415 billion. These risks form a major part of, and even exceed the US\$ 725 billion equity value of the 31 companies as well as the enterprise value of US\$ 932 billion. So, macro-wisely, the financial impact for the 31 companies could be a major risk to equity value (shareholders bear the most risks) and for debt. The risk range of US\$ 536 billion (scenario B1) to US\$ 5,415 billion (scenario B2) is between 2.0% and 19.8% of USA's 2023 GDP (Gross Domestic Product of US\$ 27.4 trillion). While 19.8% of 2023 USA's GDP seems relatively high, it needs to be considered that the losses might occur in a period of more than one year.

In three of the four scenarios, climate damage costs are a dominant contributor to the total financial risks (>84%). The financing risk is a relatively small element in each scenario, contributing only 0.7% to 1.8% to total financial risks. Climate-related market access risk contributes to the total risk in the scenarios with declining demand (A1, A2). This market risk does not exist in the scenarios with continuing growing demand (B1, B2).

A very interesting outcome of the long-term scenario analysis is that in scenario B2 (further market growth with high CO_{2e} prices), the total financial risk is higher than in scenario A2 (market decline with high carbon prices). This means that the sweetness for the 31 companies' financiers of growing meat and dairy volumes will be outweighed by the **bitterness of the costs of climate damage and climate-related financial risks.**

The next step in the analysis is to translate the 31 MDF companies' financial risks into the risks associated with the outstanding financing by the three banks.

The medium-term financial risk for the three banks together is in the range of US\$ 0.43 billion to US\$ 1.12 billion. In scenarios A1 and A2, Bank of America face risks on 21.5% of its loans to the MDF companies. Citigroup sees a risk for 6.6% of its loan portfolio to MDF companies, and JP Morgan Chase 5.3%. ***Versus the global outstanding portfolios (including financing to other sectors), the percentual medium-term risks of MDF loans are below 0.05% for each bank and each scenario.***

In the medium term, the financial risks in scenarios B1 and B2 are much lower for each bank. For medium-term risks, shares have not been included.

In the long term, the three banks face much higher financial risks. These risks are in the range of US\$ 2.5 billion to US\$ 9.3 billion of their US\$ 10.3 billion outstanding financing to the 31 companies. This is 24% to 91% of their total financing to this group of companies. The percentual financial risk at Bank of America reaches the highest level (29% to 95%). **Compared to their global portfolios, the financial risks represent 0.05% to 0.36% in the various scenarios for each of the three financial institutions.**

It would pay off to end financing of the relevant sectors in the medium term, as this would reduce risk by 83% to 95%. The long-term risks for each bank are significantly higher than the medium-term risks. The total long-term risk of financing MDF companies by the three banks is in the range of US\$ 2.5 – 9.3 billion in the four scenarios, versus a medium-term risk of US\$ 0.43 – 1.12 billion. **Therefore, by ending the financing as soon as loans are redeemed, the three banks would be able to reduce risks significantly. For the three banks in total, the risk reduction is between 83% and 95% in the four scenarios.** For each of the individual banks, the risk reduction would be material and in the range of 75.1% and 98.2% in the various scenarios.

This report has not calculated the financial risks related to biodiversity loss, the impact of meat and dairy production and consumption on human health, and the impact on human rights. These financial damages and risks would further escalate the total financial risks.

Recommendations

The data is clear: climate risk is financial risk. By significantly curtailing or ending financing to a small number of high-emitting companies in the agricultural sector, the Big Three and any other lenders or investors in the sector can limit exposure to climate-related losses and make significant progress on their net zero commitments.

Importantly however, climate-related risks are not the end of the story. Corporations involved in meat, dairy and/or feed production face additional regulatory, reputational, and operational risks associated with other negative environmental and social impacts.² These include:

- Deforestation and biodiversity loss
- Air, land and water pollution
- Freshwater depletion
- Antimicrobial resistance
- Infectious diseases, including zoonotic pandemics
- Food insecurity
- Human rights violations, including against Indigenous communities
- Animal cruelty

Calculating the financial risks associated with these impacts is beyond the scope of this report. However, all such risks should factor into a comprehensive analysis of potential losses to financiers of corporations involved in meat, dairy, and feed production. The negative environmental and social impacts of meat, dairy and feed production are already being scrutinized by regulators, investors, and consumers. Such scrutiny will only increase – and combine with intensifying physical risks – as the polycrisis³ worsens.

Financiers of meat, dairy and feed corporations are already facing pressure from investors⁴ and civil society⁵ to address their role in the global expansion of industrial, extractive agricultural practices based on the incompatibility of this expansion with public and private sector sustainability goals.

While continued support for meat, dairy and feed production involves financial risks for the Big Three, the reality is that U.S. banks' support for the continued expansion of meat, dairy and feed

extends well beyond portfolio returns and enterprise value to the broader climate system, the stability of financial markets, and the long-term portfolio returns on which global economic growth ultimately relies.

Given the fierce urgency of the climate crisis, it is incumbent on all financial actors – who themselves rely on a sustainable and relatively stable global economy – to acknowledge the role of meat, dairy and feed production in warming the planet and driving concurrent market-disrupting environmental and social disasters.

Beginning now, the Big Three must take swift and meaningful action to reduce – and ultimately eliminate – financed and facilitated emissions from corporations involved in meat, dairy, and/or feed production. Taking action on a tiny portion of their portfolios will have an outsized impact on the banks' ability to honor their net zero commitments, comply with existing and forthcoming climate and sustainability-related regulations, and align their lending and investment activities with the Paris Agreement, Global Methane Pledge, and international initiatives supporting sustainable and resilient agriculture.⁶

Abbreviations

Abbreviation	Description
EBITDA	Earnings before interest, tax, depreciation, amortisation
EBITDA margin	EBITDA as percentage of revenues
Enterprise value	Equity value + net-debt + minorities
Equity value	= market capitalisation
Fixed assets	Non-current assets like property, plant, equipment
Gross-debt	Total of loans and bonds
Market capitalisation	Number of shares X share price
Net-debt	Gross-debt minus cash

Introduction

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At that date, the three banks had US\$ 3.2 billion in shares in the 31 companies, and US\$ 0.12 billion in outstanding bonds. The total enterprise value of these 31 companies was US\$ 932 billion (end 2022).

The 31 companies had total 2022 revenues of US\$ 1,072 billion and profits (EBITDA) of US\$ 88 billion. The total market capitalisation (or equity value) was US\$ 725 billion, and the enterprise value US\$ 932 billion. The enterprise value includes, among others, the equity value and gross-debt of US\$ 264 billion.

Table 1 The 31 Meat, Dairy and Feed companies

US\$ billion	2022
Revenues	1,072.2
EBITDA	87.9
Fixed assets	380.0
Gross-debt	263.5
Cash	69.8
Market capitalisation	725.2
Enterprise value	932.0

Source: Profundo; see the list of companies in the appendix. Privately owned companies have no market capitalisation. Consequently, they are pro forma calculated through valuation multiples in line with companies active in the same sector.

On 31 December 2022, the three banks had an outstanding financial exposure of US\$ 10,395 million (= US\$ 10.4 billion) to the 31 meat, dairy and feed (MDF) companies. Of the total outstanding financing to MDF, 68% is in loans, 31% in shares, and 1% in bonds. JPMorgan Chase had the largest financing, US\$ 4.6 billion, or 45% of the total, of which US\$ 2.6 billion in shareholdings and US\$ 1.9 billion in loans. In the total portfolios of the three banks, the MDF financing was 0.3-0.4% of the total outstanding financing.

Table 2 Three bank's outstanding financing of Meat, Dairy and Feed production

US\$ million	Bank of America	Citigroup	JPMorgan Chase	Total	As % of total
Outstanding loans	2,889.9	2,277.1	1,908.1	7,075.1	68.1%

US\$ million	Bank of America	Citigroup	JPMorgan Chase	Total	As % of total
Shares	469.2	110.2	2,617.0	3,196.4	30.8%
Bonds	0.4	0.0	122.9	123.3	1.2%
Total	3,359.5	2,387.3	4,648.0	10,394.8	100.0%
As % of total	32.3%	23.0%	44.7%	100.0%	
Total in US\$ billion	3.4	2.4	4.6	10.4	
Total portfolio (US\$ billion)	1,045.7	640.2	1,135.6	2,821.6	
Meat, Dairy and Feed as % of the total portfolio	0.3%	0.4%	0.4%	0.4%	

Source: Profundo

The current report is focused on making the risk case to financiers against MDF investments. It builds on a FAIRR analysis⁸ and the outcomes of parts 1 and 2. The value of risks related to external and societal costs due to climate change will be calculated. The sum of these risks is calculated in absolute and relative terms in the context of the portfolios of the three financiers: Bank of America, Citigroup, and JPMorgan Chase.

1

Financial risks: description and methodologies

This section describes the climate change-related financial risks that financial institutions can face when financing companies active in meat, dairy and feed (MDF) production. These risks relate to stranded assets, market access, regulation, operations and input costs, financing, reputation, and climate damage.

1.1 Introduction

This report distinguishes between financial risks for operating companies and financial risks for financiers.

- The operating companies in the various meat and soy-sourcing/dairy markets will face financial risks from changing market conditions due to climate change.
- The financial institutions will face different climate change-related impacts on the various financial instruments such as loans, bonds, and shareholdings.

The focus of the analysis is to show the financial risks of financiers who have provided financing to meat, dairy and feed companies (MDF companies). The analysis is based on the anticipated impact on all elements of the profit & loss account and the balance sheet of the operating companies that can be affected by climate change or reactions to climate change, including changing demand patterns. The calculations have been made on an annual basis (2022 as a base year), and on a Discounted Cash Flow (DCF) basis. The choice for the DCF basis is logical as DCF makes comparison with invested value easier.

The analysis will include the valuation of risks related to climate change, as well as changing demand patterns.

1.1.1 Impact of climate change on operating companies

A FAIRR analysis indicates that in a 2°C 'Business as Usual' (BAU) scenario, 40 livestock companies would suffer in 2030 a 7% reduction in profit margins on average compared to 2020 levels, representing US\$ 23.7 billion overall. Potential hits to profits are driven largely by an increase in climate-related costs which are forecast to rise by over 9% on average. Climate change will impact agricultural production, contributing to higher feed prices which account for 5% of the cost rise, with expected carbon taxes on emissions from livestock production making up 4%.

At the regional level, North American companies would be the hardest hit – seeing profit margins fall by 11% on average in 2030 compared to 2020 levels amongst the 6 companies analysed, driven by a 15% average cost increase. Rising feed prices would be the biggest contributor as market- and climate-related impacts on feed crops in the region bite, accounting for 14% of the cost rise on average.

Following this 2°C BAU scenario through to 2050, sector profits are forecast to fall by US\$ 38 billion (10% fall in profit margins on average) compared to 2020 as carbon taxes overtake feed price rises as the most significant driver of cost increases. Modelling reveals an average projected

cost rise of 14% across the group of 40 companies – including an 8% increase due to carbon taxes, and 5% costs from feed price rises.⁹

1.1.2 Changing demand patterns, impacting operating companies

In addition to climate change effects, the sector will be hurt by changing demand, which has a volume impact. Increasing knowledge and civil society campaigning, in addition to new product development in alternative meats and dairy, are expected to affect the industry. These demand changes are the consequence of public attention to climate change and the escalating attention to animal welfare and health concerns.

Parts 1 and 2 of the meat, dairy and feed production campaign by FoE have delivered financial flows of three financial institutions to the meat/dairy industry as well as their financed emissions related to meat/dairy. The current report will apply a value to these emission outcomes.

1.1.3 The financial risks: seven different risk elements for operating companies

The total number of financial risks in the current study is larger than the risks quoted by FAIRR. In this report, the risks consist of stranded assets, market access, regulation, operational, financing, climate damage, and reputation risks. These will affect the value of the loans and investments and consequently affect financial institutions.

Section 1.2 to section 1.8 describe the financial risks that the various financial products (loans, bonds, and shares) linked to MDF companies face when MDF markets are confronted with the impacts of a 2°C BAU scenario.

1.1.4 Financial risks for financial institutions

Financial institutions, like banks, can lend money through loans and bonds with a maturity date. As investors, financial institutions can also own shares, whose values can be affected by a change in future cash flow expectations.

In the section 1.9, the distinction in risks between loans and bonds on the one hand, and shares on the other hand will be explained.

1.2 Stranded assets: assets written off at operating companies

Companies experience stranded assets when they are not able to use a certain part of their assets anymore because of changed demand by customers and/or regulation changes. As a consequence, assets could become idle and might lose their value. This is a stranded asset risk.

Assets that are not used anymore and face an accelerated depreciation and/or amortisation do negatively impact the balance sheet and the balance sheet ratios such as equity versus debt. However, as these assets have already been acquired earlier, there is often no additional cash outflow. In that sense, stranded assets do not affect the calculation of the discounted cash flow (DCF).

Companies active in the MDF industries might be faced with stranded assets:

- Meat companies which are faced with a reduction in meat demand will need to reduce their slaughter capacity and distribution infrastructure, including trucks. The closure of slaughterhouses and the sale of trucks might create a residual value that could lead to a positive cash flow. As with these asset sales, also the number of personnel will have to be reduced, leading to cash lay-off costs, no estimates of the balance of residual value and lay-off costs have been made in this study.
- Soy-sourcing companies like dairy manufacturers might face a reduction in demand for their products. Like meat companies, assets might need to be reduced: cheese-making facilities,

milk, yoghurt factories, and distribution infrastructure. Like meat companies, the balance of residual value and lay-off costs has not been made in this study.

- A reduction in sales might also lead to a decrease in inventory, and potentially, receivables (current assets) might lose their value as clients go bankrupt. As the reduction in revenues through a decline in market volume will probably occur gradually, all companies can prepare for such a development and cash losses might be limited. Therefore, in this study, losses on current assets have not been included.

Consequently, the stranded asset risk will be calculated as a percentage reduction of property, plant and equipment (PPE). The percentages will be the same as used in the section 1.3, as the assumption is that when 15% of volumes are lost, 15% of the PPE will not be used anymore and can be written off.

1.3 Market access risk, revenue risk, and regulation risk

A reduction in market demand leads to a reduction in volumes and revenues (assuming stable prices). A decrease in volume and revenues leads to the same reduction in variable input volumes. For instance, lower volumes in beef sales lead to fewer cows needed for slaughter. This means that a company will not be able to benefit from the profit margin between the costs of a cow and the sales price of the meat packaged for supermarkets and fast-food restaurants or wholesalers.

For the profit margin, the EBITDA as a percentage of revenues (the EBITDA margin) will be applied. This is because EBITDA numbers are available for the companies investigated.

To calculate an annual impact from lower volumes, two scenarios for each group of companies (meat, dairy, traders) will be applied with a range of changes in volume.

To calculate a value number, a discounted cash flow (DCF) calculation is made.

1.4 Stranded assets and revenue risk: the assumptions

1.4.1 Introduction

This section compares various studies on the anticipated demand volume effects in the meat and dairy market. A 2°C scenario will impact the volume development in the MDF sector, and the investigated companies will be affected. Based on these studies, input is created for scenarios that calculate the financial impact of stranded assets and revenue risk.

1.4.2 Various expectations for future meat production and consumption

Meat-replacing products, as well as cultured meat, could grow significantly in the coming decades and might replace conventional meat in the global market. An AT Kearney report estimates that in 2040, only 40% of all 'meat' consumption will come from traditional meat.¹⁰ In value terms, from 2025's 90% market share and USD 1,080 billion value, conventional meat might face a decline to a 40% market share and USD 720 billion in value in 2040. This projection means that the global traditional market of meat will decline between 2025 and 2040 by 33% in value, an annual decline of 2.7%.

Table 3 2025-2040 global meat development

	2025	2030	2035	2040	Total change (%)	CAGR 2025-2040	Total growth 2025-2040
Global share (%)							
Conventional meat	90%	72%	55%	40%			
Meat replacement	10%	18%	23%	25%			
Cultured meat	0%	10%	22%	35%			
Total	100%	100%	100%	100%			
Value (USD billion)							
Conventional meat	1,080	1,008	880	720	-33.3%	-2.7%	-33.3%
Meat replacement	120	252	368	450	275.0%	9.2%	275.0%
Cultured meat	0	140	352	630	n.a.	n.a.	n.a.
Total value	1,200	1,400	1,600	1,800	50%	2.7%	50.0%

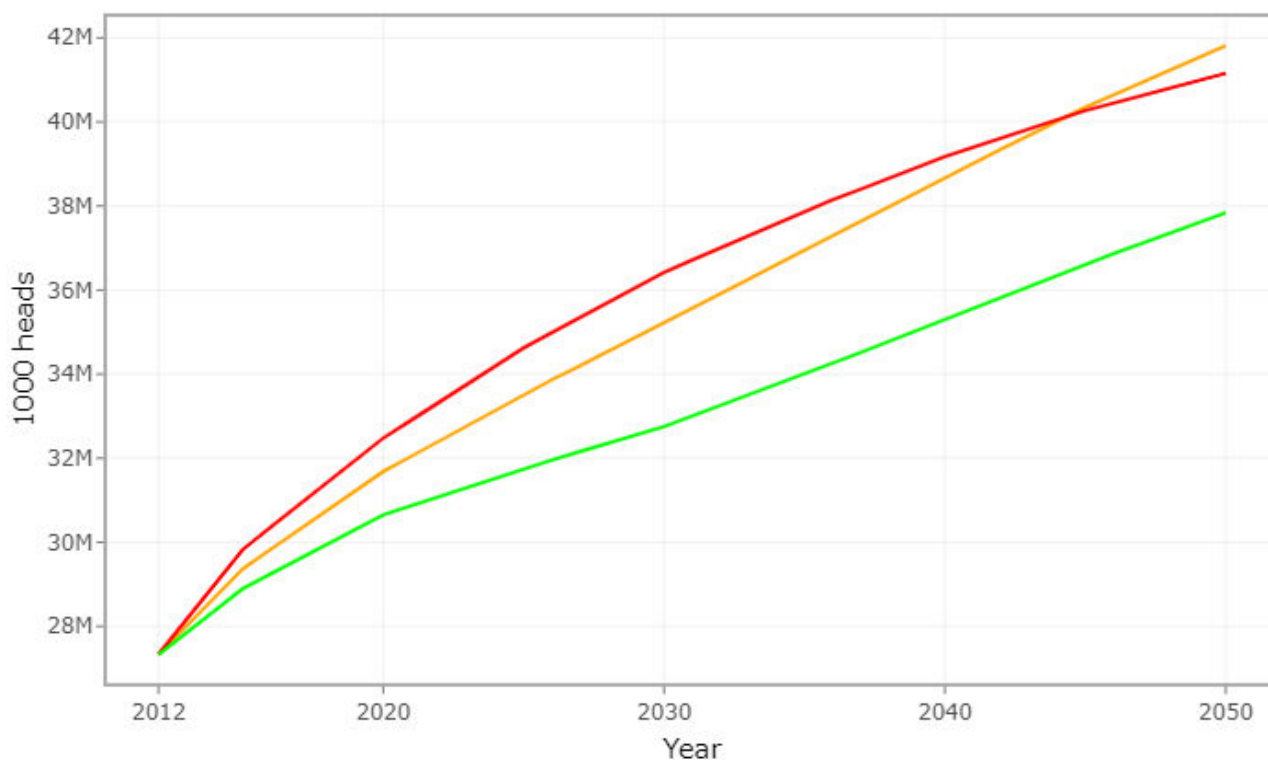
Source: AT Kearney (2019), "How will cultured meat and meat alternatives disrupt the agricultural and food industry ?", online: <https://www.futuretimeline.net/data-trends/pdfs/kearney-cultured-meat.pdf>, viewed June 2022.

These AT Kearney estimates are supported by an analysis by Vivid Economics (since 2021, a subsidiary of McKinsey) and PRI (Principles for Responsible Investments).¹¹ This analysis is based on the inevitable policy response (IPR) approach, which describes the impact of new regulations required by governments to reach the Paris 2015 GHG reduction targets. Also, because of changes in consumer preference and innovations, Vivid/PRI foresee peak meat consumption in 2030, after which meat consumption will decline by 30% between 2030 and 2050. In poultry, there will be a relatively smaller decline as emissions per kilogram are relatively low. In Vivid/PRI's scenario, alternative meat consumption will reach a market share of 28% in 2050.¹²

These outcomes contradict the FAO's estimates. In a business-as-usual and sustainable scenario, the FAO continues to see a growth in livestock sizes until 2050.¹³

Figure 1 FAO forecasts of livestock sizes

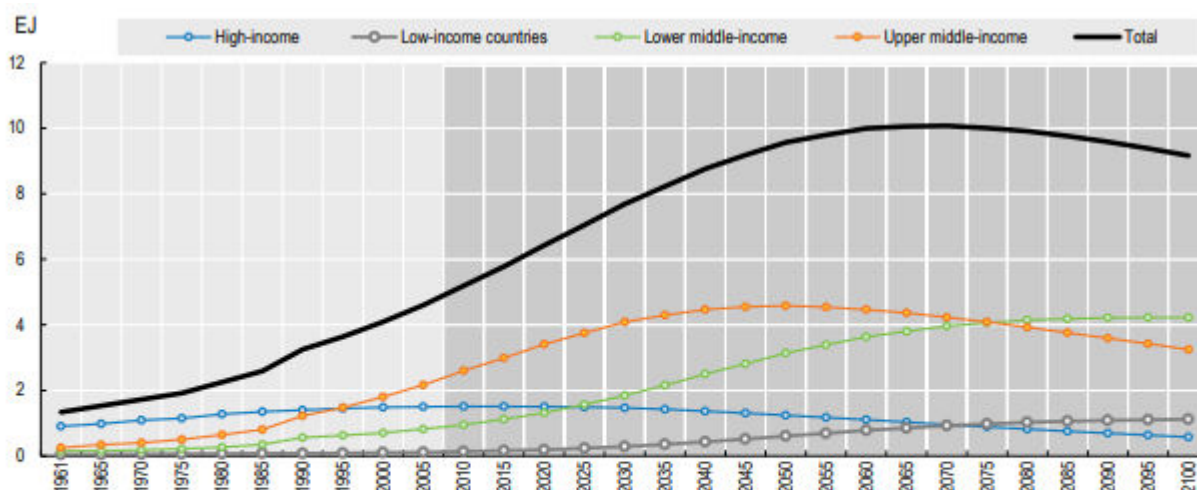
FOFAO 2050 data for Herd sizes



Source: FAO, "Global Perspectives Studies", online: <https://www.fao.org/global-perspectives-studies/food-agriculture-projections-to-2050/en/>; Red = Business-as-usual; yellow = stratified societies; green = towards sustainability

In a more recent publication (2023), FAO's worldwide projection for growth in poultry, pigmeat, beef, and sheep meat consumption is 15%, 11%, 10%, and 15%, respectively, by 2032 (versus 2023). On a per capita basis, global meat consumption is set to rise by 2%. FAO admits that globally there is a growing trend among consumers to become increasingly sensitive to animal welfare, environmental and health concerns. This leads to a shift to poultry which has the least carbon footprint. Looking beyond the medium term into the longer term (after 2032), FAO sees negative impacts on meat consumption and production from demographic trends, human health, animal welfare, and environmental concerns, and from efforts to reduce food loss and waste. Due to rising volumes in lower middle-income countries, the FAO sees markets to grow until 2075.¹⁴

Figure 2 FAO forecasts animal-based food energy projections per region



Notes: The Intergovernmental Panel developed the four Special Report on Emissions Scenarios on Climate Change (IPCC). The graph shows the B2 middle-of-the-road emissions scenario, which has a balanced approach of slow economic growth, modest population growth, some technological advances, and social and environmental sustainability.

EJ (Exajoule) is an energy unit. It's equivalent to 1 EJ = 10¹⁸ Joules per year

Source: Bodirsky B.L., S. Rolinski, A. Biewald, I. Weindl, A. Popp, H. Lotze-Campen (2015), "Global Food Demand Scenarios for the 21st Century", *PLoS ONE*, Vol.10 (11): e0139201, <https://doi.org/10.1371/journal.pone.0139201>.

For dairy products and world milk production, OECD-FAO expects 1.5% annual growth from 2023 to 2032. OECD-FAO admits that environmental legislation could have a strong impact on the future development of dairy production but does not put a number on this.¹⁵

Boston Consulting Group foresees in a base case that alternative proteins will very likely account for 11% of the protein market in 2035. This would mean that while alternative proteins will face a 646% total growth from 2020 to 2035, conventional proteins still grow by more than 30%. The base case conservatively assumes a consistent pattern of consumer acceptance, regulatory support, and technological change.

Table 4 BCG: global consumption of protein products

million ton	2020	2025	2030	2035	Growth 2020-2035	CAGR
Nonaddressable conventional proteins	93	109	118	131	41%	2.3%
Addressable conventional proteins	481	555	590	644	34%	2.0%
Alternative proteins	13	24	65	97	646%	14.3%
Total	587	688	773	872	49%	2.7%

Source: Profundo, based on Boston Consulting Group

In the first upside scenario, further efforts on the part of scientists, startups, incumbents, and investors to accelerate further: technological step changes, including large improvements in metabolic efficiency due to better conditions for microorganism fermentation or animal-cell cultures. This would lead to better texture and smell. This could lead to 16% of the market in 2035 (instead of 11%).

The next upside scenario requires an additional push from regulators: more supportive policies and regulations, such as widespread taxation of GHG emissions or reallocation of agricultural subsidies to support the transition to alternative proteins. This would push penetration to 22%.¹⁶

This still would mean that in BCGs most aggressive alternative protein scenario the conventional tons still grow by 18% between 2020 and 2035.

Table 5 BCG: conventional meat scenarios

million ton	Scenario 1	Scenario 2	Scenario 3
Market 2020	587	587	587
Conventional meat 2020	574	574	574
Market 2035	872	872	872
Share alternative 2035	11%	16%	22%
Share conventional 2035	89%	84%	78%
Conventional meat 2035	776	732	680
Growth of conventional meat 2020-2035	35%	28%	18%

Source: Profundo, based on Boston Consulting Group

1.4.3 Input for further analysis and estimates

For the reduction in meat demand volume, the current report will apply a range between AT Kearney's (-33%), Vivid/PRI's scenario (-30%) and BCGs scenario 3 (+18%) on the one side, and the FAO scenario on the other side (+25%). ***In the current report, the range is -15% to +25% (2040/50).***

1.5 Operational risk, higher input costs and feed costs

1.5.1 Introduction

Due to the 2D scenario, feed and input costs are expected to increase.

This report follows the outcomes of the FAIRR analysis. This indicates that in a 2°C scenario, livestock companies would face an average 7% reduction in profit margins in 2030 compared to 2020. A part of this margin decline is due to the impact of climate change on agricultural production, leading to lower harvests in feed-based grains, which will add to higher feed prices. For 2050, the margin decline is estimated to be 10%.

1.5.2 Higher feed prices

Meat companies and dairy companies will face higher feed prices. They will only be able to pass a part to the customers, which is implicitly in the FAIRR analysis that the margins will decline. FAIRR indicated that more than half of the cost increase was due to higher feed costs. Carbon costs also contribute strongly, but for carbon costs the FAIRR methodology is extended with Profundo's methodology on societal costs.

FAIRR indicated the feed cost increases for 2030 and 2050 as follows:

- 2030: 5% higher feed prices (compared to 2020) contribute to 9% higher costs in 2030. Therefore, the contribution of the 5% higher feed costs to the 7%-point margin decline is 4%-point ($= 5/9 \times 7\%$). Carbon costs increase by 4%, so their contribution is 3%-point ($4/9 \times 7\%$).
- 2050: 5% higher feed prices (compared to 2020) contribute to 14% higher costs in 2050. Therefore, the contribution of the 5% higher feed costs to the 10%-point margin decline is 3%-point ($= 5/14 \times 10\%$). Carbon costs increase by 8%, so their contribution is 6%-point ($8/14 \times 10\%$).

For scenarios A1 and A2 in this report, the assumption is that an EBITDA margin could face a hit of 4%-point due to higher feed costs for both 2030 and 2050. For scenarios B1 and B2, the assumption is that the margin declines by 2%-point due to higher feed costs. This more mitigated impact is based on the assumption that in a still-growing market (the B scenarios), the companies can pass on higher costs more easily despite increasing worries about climate change.

Traders in animal feed products will face higher input prices (grain, soy), but this report assumes that traders' relatively low margins will not be affected. They can pass on higher soy, barley, and other grain costs to feed manufacturers.

1.6 Carbon costs and climate costs

1.6.1 Introduction

In the FAIRR analysis, rising carbon costs for industries contribute to a profit margin decline in 2030 and 2050. For 2030, the cost increase is 8% and for 2050, 8%, leading to a profit margin impact of respectively 3%-point and 6%-point.

The current report deviates from the FAIRR analysis as most Scope 3 emissions for the MDF companies financed by the financial institutions (FIs) are available and offer the opportunity to calculate the carbon costs per company. Additionally, alternative price scenarios on carbon costs (per ton CO₂e) can be introduced.

Although in various jurisdictions carbon rights need to be bought by selected industries on emission trading systems, the agricultural sector is often not included in this mechanism in any country. In Canada, however, the carbon tax that is also applied to farmers is leading to higher costs and lower incomes as they cannot pass the tax to customers.¹⁷ Also, often, carbon tax only refers to Scope 1 and 2 emissions but neglects the crucial Scope 3 emissions, which are often dominant in a supply chain.

1.6.2 Carbon tax or carbon costs per ton and societal costs

The development of methodologies to value climate damage is still underway and there has yet to be an internationally accepted standard. The International Monetary Fund (IMF) has adopted the approach that carbon dioxide pricing per ton is an excellent proxy to value the climate damage or the Social Costs of Carbon (SCC). The IMF states that, based on the development in literature, the SCC is a measure conditional on the level of CO₂ in the atmosphere. The higher that level, the more powerful the greenhouse effect and, therefore, the higher the expected physical damages. For simplicity reasons, a constant SCC (or carbon price) per ton was assumed in their analysis, as the real growth in costs every year (3%) would be nearly 'neutralised' by the need to use a discount rateⁱⁱⁱ to calculate a present value of future costs.¹⁸ The carbon dioxide price as a proxy for damage has also been used in various other studies.¹⁹

The US jurisdiction, which is the focus of the current report, does not apply a carbon dioxide cost system for Scope 1, 2, and 3. Many parts of the world need to pay more attention to pricing a significant part of emissions, particularly Scope 3 emissions.

The World Bank's Carbon Pricing Dashboard²⁰ shows that various US jurisdictions have implemented, scheduled, or are considering various forms of carbon pricing. These average US\$34.05 per ton CO₂-eq, which will be used in scenario 1 (see below).

ⁱⁱⁱ A discount rate is used to calculate the Net Present Value (NPV) of a business or activity as part of a Discounted Cash Flow (DCF) analysis. The principal thought is that 1 Euro in year 2 is seen as less valuable than 1 Euro in year 1.

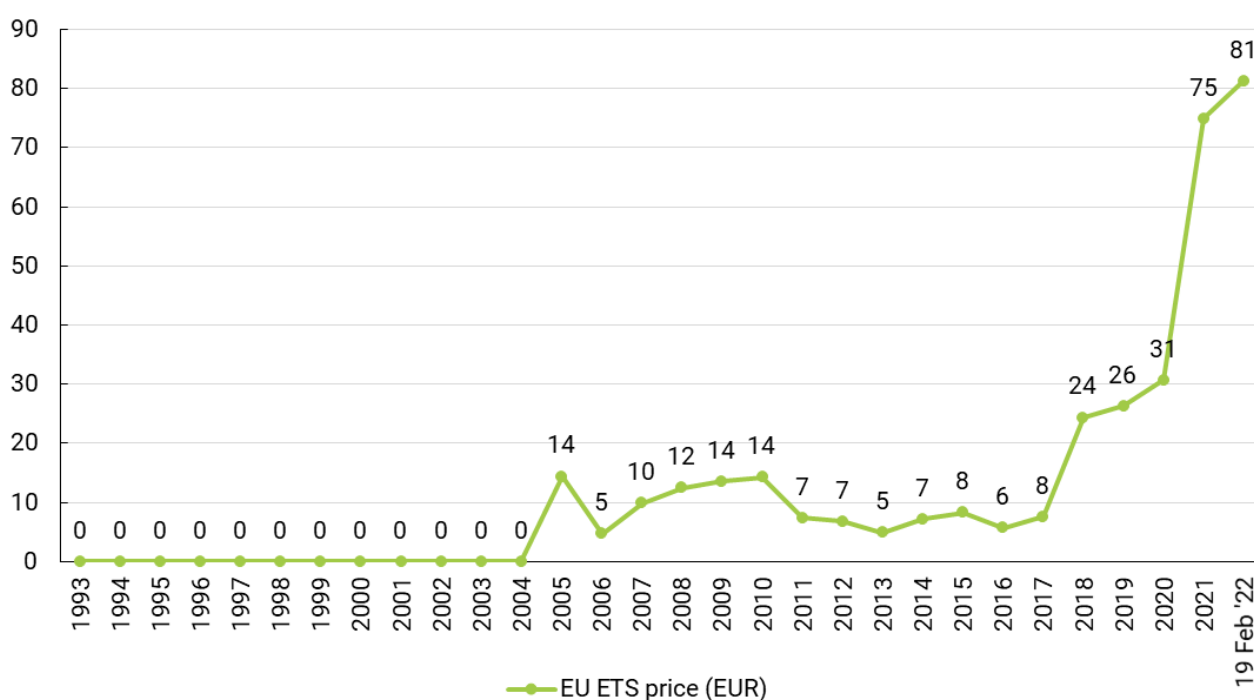
Table 6 Carbon pricing initiatives US and Canada

7/8/23	US\$/ton CO ₂ -eq
Massachusetts	12.05
RGGI (Regional Greenhouse Gas Initiative)	15.39
Alberta	48.03
California	29.84
New Brunswick	48.03
Newfoundland and Labrador	48.03
Northwest Territories	48.03
Nova Scotia	20.87
Ontario	48.03
Washington	22.20
Average	34.05

Source: World Bank's Carbon Pricing Dashboard, Profundo.

In the meantime, the EU ETS (Emission Trading System) price per ton CO₂e has shown an upward-moving trend in the last 18 years (no price before 2004). This EU system is established for specific high-emission industries and excludes Scope 3. It is a trading platform for emission rights and, in this way, establishes a proxy for climate damage per ton CO₂-eq. The EU ETS price on 31 March 2023 was US\$ 96 per ton, roughly in line with what we have seen in recent years.

Figure 3 EU ETS end-of-year prices (In Euro/€)



Source: Transport & Environment (2022, 25 April), *European Big Oil – Big Liability in Carbon, Pollution and Health Care Costs*, based on Bloomberg, European Climate Exchange OTC 1st year CO₂ Emission EU ETS Px.

One could say that the EU price per ton CO₂-eq is relatively high due to the competition for emissions rights in a 'crowded' continent. However, an EU ETS price, or prices based on other policy recommendations as a proxy for societal costs, continue to be a relatively conservative concept:

- Firstly, policymakers' estimates are often relatively low as a global average price on CO₂-eq emissions is used, with many jurisdictions still not applying CO₂-eq costs for scope 1, 2 and 3.
- Secondly, policymakers often underestimate the (economic) impacts by using a high discount rate assumption for future damages. When applying a high discount rate, a future value is calculated to present into a low value. Consequently, the future costs seem low in a Discounted Cash Flow calculation. Companies often use this methodology to compare current investments and expenses in year zero with future profits from these investments in the years after that. However, is the loss of one litre of water in year 10 less valuable than in year 0?

Conservative societal cost models focus on short-term damage, assuming that climate change has no lasting effect on economic growth despite growing evidence to the contrary.

Societal costs: however, extreme events like droughts, fires, heatwaves, and storms are likely to cause long-term economic harm because of their impact on health, savings, labour productivity, agriculture, and social disruption. Expert groups of economists and climate scientists calculated US\$ 171 and US\$ 310 per ton respectively. Recent calculations for economic damage have increased further due to the inclusion of higher damages in the Global South.²¹ These latest societal costs of carbon dioxide (SCCO₂) have a more forward-looking component based on the projected cost to society of releasing an additional ton of CO₂, including climate damage costs and economic damages (economic feedback). One study shows that by 2100, global GDP could be 37% lower than it would be without the impacts of global warming when taking the effects of climate change on economic growth into account (without accounting for lasting damages - excluded from most estimates - GDP would be around 6% lower). This means that in a 'wider' societal cost concept, the impacts on growth may increase the economic costs of climate change by a factor of six. When taking more robust climate science and updated models into account, one study suggests that the economic damage could, in fact, be over US\$ 3,000 per ton of CO₂.²²

A 2023 Environmental Protection Agency (EPA) study on the social costs of GHGs (SC-GHG) presented new estimates.²³ These reflect recent advances in the scientific literature on climate change and its economic impacts. The SC-GHG is a comprehensive metric including changes to net agricultural productivity, human health effects, property damage from increased flood risk, changes in the frequency and severity of natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. The report includes social costs for CO₂, CH₄ and N₂O, rising prices for years further ahead, and different prices for various discount rates (from 2.5% to 1.5%). For simplicity, the current report will use an SC-GHG of US\$ 270 for 2040 (discount rate of 2%).

Two prices are applied. The first price (US\$ 34.05) is based on the average in various North American jurisdictions, and the second price is based on the EPA 2040 SC-CO₂ price of US\$ 270 at discount rate of 2.0%. The assumption is that one-third of these costs per ton will be borne by the producers, and that two-thirds will be borne by other partners in the chain. Therefore, the price per ton is multiplied by 33%, to reflect the producers' share only.

1.7 Financing risks

As financiers become more reluctant to invest in MDF companies, these companies might face higher funding costs for loans and bonds, while share issuances might become more difficult.

When the focus is on the impact on the cost of gross debt, the difference between sustainable and unsustainable borrowing costs is still small at this moment.

However, in the coming years, investors' increased focus on sustainable financing might lead to significantly higher funding costs for 'dirty' industries. This will affect the interest charges of MDF companies, leading to lower pre-tax profits and lower net profits, which will negatively affect their valuation.

Although the current proof of extra borrowing costs for 'dirty' industries is meagre,²⁴ the scenarios applied in this report contain assumptions for future years when climate change and the impact of dietary choices on climate change will get higher on the agenda. Sustainability-linked loans offer lower interest rates when a company is able to meet ESG targets.²⁵

In this report the assumption is that in the coming years MDF companies might face 0.25%-point (low impact scenarios A1 and A2) to 1%-point higher interest rates on their gross debt. The assumption is that there is no impact on interest on cash. These financing cost increases have been calculated for 27 years (assuming financing continues until 2050).

1.8 Reputation risk

On top of the specific risks mentioned in the preceding sections, MDF companies might be confronted with a reduction in their reputation value. For publicly listed companies, this may culminate in an impact on the share price. Moreover, companies could be confronted with a lower reputation in the eagerness of employees to work for this kind of industry. Also, the products might get a less prominent place in supermarkets; advertisements for meat and dairy products might face limitations, for instance, no billboards close to schools or no ads in sports arenas.

The difference between having a good reputation and a bad reputation can be significant. A good reputation can support valuation by 20%, while a consistent bad reputation can reduce value by 30%.²⁶ **In this report a 15% reduction in reputation is applied for shareholdings.** This is because several elements of reputation value reduction are difficult to distinguish from the risk factors mentioned in the preceding sections. Therefore, 15% is applied in order to take into account the potential overlap and to avoid double-counting of the effects.

1.9 Impact on financial institutions

The above-mentioned financial risks for operating companies will impact the financial institutions that have lent money through loans and bonds or own shares in the operating companies in meat, soy-sourcing (dairy), and traders.

1.9.1 Risks for shareholders

Shareholders will be confronted with all the risk elements described in the sections above. Market access risk, regulation risk, higher feed costs, higher debt costs, and reputation risk will impact the future cash flows of an operating company. A change in the future cash flows will impact the value of the shares as this value should be equal to the discounted cash flow (DCF). Thus, the sum of the values attached to the market access, regulation, operational, financing and reputation risk will impact the value of the shares.

1.9.2 Risks for lenders

Loans and bonds will be repaid after a certain period. If market conditions change significantly, repayment might not occur or with a discount or restructuring. First, the shareholders are hurt; in the second instance, the lenders. For the lenders, two scenarios are introduced:

Scenario 1: long-term risk

This scenario assumes that the lending by the relevant financial institutions will occur until 2050, at the same level as 2016-2023. It is impossible to integrate future changes in behaviour by the three financial institutions, such as 'not renewing a loan to JBS in 2025' (as an example) or 'ending meat financing in 2037'.

Scenario 2: medium-term risk

In the medium term, a change in market conditions might impact operating companies' ability to pay interest costs and repay debt. However, as financial institutions often ask for collateral when giving loans, the financial risk is often relatively limited except for operating companies that are 'highly leveraged'.

According to one definition a 'highly-leveraged' company is a company with a higher than average level of debt.²⁷ Another definition says that a 'highly leveraged' company has more debt than equity.²⁸ In the current analysis, it is important that the company can continue to pay its interest and repay and renew its debt. The ratio net-debt/EBITDA is an often-used methodology to evaluate or assess the financial strength of a company to service and repay its debt. **Generally, a net-debt to EBITDA ratio above 5X is considered 'high' and is seen as a red flag that causes concern for rating agencies, investors, creditors, and analysts.**²⁹

The mentioned risk level of >5X net-debt EBITDA also follows from the specific margin structure in the meat, dairy, and trading/feed industries. A decline in volumes and a decreasing EBITDA margin lead to a lower EBITDA. This has a substantial impact on cash generation and thus in servicing debt (see Table 7). In this example, incorporating the 15% market decline and the 4% margin decline, a net-debt/EBITDA of 4.7x mirrors a situation of a negative free cash flow in a meat/dairy/trading market margin environment. While it differs from meat to dairy and trading sector, a company might need to postpone the payment of its interests. Banks or debtors might ask for the bankruptcy of a company. Subsequently, debt will be restructured, and a discount of value might occur.

Table 7 Example: Net-debt/EBITDA of 5x

€ million	Year-1	Year-5	Change
Revenue	600.0	510.0	-15%
EBITDA	49.2	21.4	
EBITDA margin (%)	8.2%	4.2%	-4% points
Depreciation, and Amortization	19.2	19.2	
EBIT	30.0	2.2	
EBIT margin (%)	5.0%	0.4%	
Interest costs	5.0	5.0	
Interest rate	5.0%	5.0%	
Pre-tax profit	25.0	-2.8	
Tax rate (%)	25%	25%	
Tax payment	6.3	-0.7	
Net profit	18.8	-2.1	
Investments	19.2	19.2	
Free Cash flow	18.8	-2.1	
Net-debt	100.0	100.0	
Net-debt/EBITDA	2.0	4.7	

Source: Profundo

To calculate the medium-term risk, an indication of the **annual EBITDA impact of changing demand and higher feed costs is deducted from the existing EBITDA. Subsequently, the new EBITDA is calculated in the formula 'net-debt/EBITDA'. A level above 5X is considered as high. In the medium term, the financing risks, the carbon costs, and the reputation risk are not taken into account:**

- As this report works with the 'net-debt/EBITDA>5' criteria for risk, 'financing risk' is already covered. 'Financing risk' can refer to so-called 'covenants', and if they are based on financial results/ratios, which are not met by the company, the conditions of the loan(s) can be renegotiated, including the interest rates.
- The introduction of a carbon cost system for scope 3 emissions will probably not occur in the coming five to 10 years. This is a threat to the companies in the long-term scenarios.
- Although reputation risk is a long-term as well as a short-term threat, its short-term impact will be on the value of the shares, and only in the longer term will a company's cash flow be materially affected.

2

Scenarios for medium and long term

This section elaborates on the scenarios that will be calculated. Four scenarios include all the risks introduced and described in the preceding chapter and assume that financial institutions will continue to finance meat, dairy and feed (MDF) companies until 2030 or 2050. The fifth scenario is calculated for medium-term risk, relevant for lending activities by financial institutions to 'highly leveraged' companies.

2.1 The four long-term scenarios and their assumptions

This section lists various assumptions for meat and dairy (product) demand. Due to the range in market development and thus in GHG emissions until 2050, the application of two GHG prices (US\$ 34.05 and US\$ 270 per ton) and the assumption of two different interest rate additions for MDF companies (0.25%- and 1.0%-point), this report works with four scenarios. The different assumptions are listed below:

- A volume decline in meat, dairy and trading markets would mean that companies and their financiers will be confronted with stranded assets, market access risk, but a reduction in climate damage costs.
- A further increase in volumes in both markets does not lead to stranded assets, while the market access risk is not a negative number but a positive one. Higher volumes lead to higher emissions and, thus, higher climate damage costs and liability for 2023-2040/50.
- In both scenarios A and B, operational costs from rising feed costs will be present. In scenarios A1 and A2, the decline in EBITDA margin through higher feed costs is 4%-point, while in scenarios B1 and B2, the margin decline is 2%-points. However, it is assumed that trading companies are able to pass on the higher costs, unlike meat and dairy companies.
- Concerning emissions, they are assumed to decline towards 2050 in scenarios A1 and A2, in line with the volume decline. This means that the emissions per company are calculated for 28 years (2023-2050) multiplied by the average emissions between 2022/23 and 2050, based on a linear decline.
- The report works with two CO₂e prices. The scenarios with declining consumption (scenarios A1 and A2) and those with further rising consumption (scenarios B1 and B2) will be calculated for both prices.
- The GWP20 sub-scenarios (Scenario A2 and Scenario B2) are monetized by the US\$ 270 SC-GHG price as this is the most relevant scenario towards 2050. When stakeholders like to rely on the weaker scenarios of GWP100 (Scenario A1 and Scenario B1), the lower US\$ 34.05 GHG price is applied.
- The assumption is that the meat, dairy, and trading companies absorb one-third (33%) of the climate costs and that the rest is absorbed by other companies and stakeholders in the chain.
- In all scenarios, the financing risks with higher interest costs will be present: 0.25% (assuming financial institutions continue the financing) in A1/B1, and 1.0%-point in A2/B2.
- Furthermore, the reputation risk is calculated on the enterprise value, or on market value.
- When these separate risks have been calculated, the total risk is an addition of all estimates. The stranded asset risk is not included as this is a non-cash risk: the money has already been invested in earlier years.

- The assumption is that the first tranche of risk is absorbed by shareholders. Their value will be affected first before the value of the creditors will be affected. Therefore, of the total value risk, the equity value is deducted first. The remaining part is the value-at-risk for creditors. Regarding creditors, the focus of this report is on the risks of outstanding loans. The risk for underwriting services is difficult to calculate: the services for 2016-2023 have already been executed and paid for, while the risks until 2050 are difficult to calculate as there is no methodology for how much of services will be given by the three banks to the 31 companies. Bondholders' risk is not considered as the outstanding total is relatively small.
- Each FI exposure to every MDF company's enterprise value is calculated as a percentage. Example: **Bank A has a US\$ 10 million outstanding loan to company B and US\$ 2 million in shares in company B.** Company B has a US\$ 100 million enterprise value, of which US\$ 50 million equity value. The total long-term risk of company B is valued at US\$ 75 million. Therefore, the US\$ 75 million risk will completely destroy the equity value, and US\$ 25 million of risk will be left. This US\$ 25 million impact will harm half of the US\$ 50 million net-debt. **For Bank A this means that it will lose 100% of the equity value invested in A (US\$ 2 million, and half of the credit, or US\$ 5 million, will be affected.**

Table 8 Assumptions of four long-term scenarios

	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%
Stranded assets risk				
Livestock companies	-15%	-15%	0%	0%
Dairy companies	-15%	-15%	0%	0%
Traders	-15%	-15%	0%	0%
Total value risk = value of PPE x percentage given	TBC	TBC	0.0	0.0
Market access risk*				
Trend/period	Linear to 2050	Linear to 2050	Linear to 2050	Linear to 2050
Livestock companies	-15%	-15%	25%	25%
Dairy companies**	-15%	-15%	16%	16%
Traders***	-15%	-15%	21%	21%
EBITDA margin x turnover x percentage given	TBC	TBC	TBC	TBC
x DCF factor (x)****	14.24	14.24	15.68	15.68
= Total value of risk until 2050	TBC	TBC	TBC	TBC
Operational risk: higher feed costs/ EBITDA margin impact (%-points)*****				
Trend/period	From year 1	From year 1	From year 1	From year 1

	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Livestock companies	-4%	-4%	-2%	-2%
Dairy companies	-4%	-4%	-2%	-2%
Traders	0%	0%	0%	0%
EBITDA change (%-point impact x revenues)	TBC	TBC	TBC	TBC
x DCF factor (x)	14.83	14.83	14.83	14.83
= Total value of risk until 2050	TBC	TBC	TBC	TBC
Climate damage costs/liability				
Trend/period	Linear to 2050	Linear to 2050	Linear to 2050	Linear to 2050
GWP 20/100	GWP 100	GWP20	GWP 100	GWP 20
CO ₂ e price (US \$)	34.05	270.00	34.05	270.00
Total emissions 2023-2050 = 28 years X average 2022-2050 emissions	TBC	TBC	TBC	TBC
x Absorption share in supply chain (33%)	0.33	0.33	0.33	0.33
x DCF factor (x)	Not relevant	Not relevant	Not relevant	Not relevant
= Total value of risk until 2050: total emissions x price	TBC	TBC	TBC	TBC
Financing risk				
Trend/period	27 years	27 years	27 years	27 years
Change in interest rate debt (% point)	0.25%	1.00%	0.25%	1.00%
x DCF factor (x)	14.83	14.83	14.83	14.83
= Total value of risk until 2050	TBC	TBC	TBC	TBC
Reputation risk*****				
All companies	15% of value	15% of value	15% of value	15% of value
= Total value of risk until 2050	TBC	TBC	TBC	TBC
Translation to Financial Institutions				
For creditors outstanding 31 December 2022	TBC	TBC	TBC	TBC
For investors data March 2023	TBC	TBC	TBC	TBC

Source: Profundo, based on various studies; *) market access and market opportunity; **) 16% in dairy market access scenarios B1 and B2 based on OECD report; ***) Traders growth is average of meat and dairy companies as they source both indirectly; ****) DCF factor (x) is based on 7% discount rate and 0% terminal growth after 2050, with tax rate of 25%; *****) From year 1 as for calculation reasons more easy; *****) on enterprise value, otherwise equity value

2.2 The medium-term scenario

In the medium-term scenario, the existing EBITDA of the MDF companies has been reduced by the annual EBITDA effects from 1) the market change and 2) higher feed costs, based on the same assumptions as in Table 8. The financing risk and carbon costs are assumed to have no

(additional) impact in the medium-term (see section 1.9.2) as loans have already been provided, and the introduction of a Scope 3 emissions trading system takes time. Also, reputation value is not an annual cost item.

Subsequently, the proforma EBITDA is applied in the formula net-debt/EBITDA. If this ratio is higher than 5X, the assumption is that the investment is at risk. Below 5X, the assumption is 'no risk'. Scenarios A1, A2, B1, and B2 have been calculated for the targeted financial institutions.

3

Calculation of the risks

Out of a selection of 56 companies, 31 received financing from three selected financial institutions in the investigated period 2016-2023 (see Appendix 1). In focus are Bank of America, Citigroup, and JPMorgan Chase. This section calculates the climate change-related financial risk for the 31 companies. Subsequently, the risks for the three banks have been calculated.

3.1 Introduction

This chapter starts with the medium-term risks for the outstanding financing to the group of 31 companies, based on the assumptions outlined in chapter 2. These outcomes differentiate between the four scenarios and the various risk categories. Subsequently, the section 3.3 shows the long-term risks regarding the outstanding financing to the 31 companies. Section 3.4 translates the macro medium-term financial risks of the 31 companies to the risks for the three banks in focus. Finally, section 3.5 concludes about the differences between medium-term and long-term risks.

3.2 Medium-term financial risks for the 31 companies

The focus is on the risks from market access and higher feed costs (margin pressure) on the EBITDA and, consequently, on the net-debt/EBITDA ratio. As elaborated in the section 1.9.2, a net-debt/EBITDA ratio above 5X might lead to problems and a debt restructuring. In a medium-term perspective, this could lead to losses for financiers.

In scenarios A1 and A2, the existing net-debt/EBITDA ratio would change from 2.2x to 4.2x for the whole group (weighted average). **For the group, 4.2x would mean no problem. However, several individual companies would face a more severe impact. Consequently, the total creditors at risk would be US\$ 116.0 billion, or 44.0% of the outstanding gross-debt. It should be noted that in the existing situation, US\$ 59.7 billion, or 22.7% of gross-debt, was already at risk. Therefore, an additional 21.4% is at risk due to the impacts of higher feed costs and lower volumes.**

In scenarios B1 and B2, the net-debt/EBITDA even improves from 2.2x (existing) to 2.1x (pro forma). For the group as a whole, the higher EBITDA from market growth would exceed the negative EBITDA impact from higher feed costs. Consider that the impact of higher feed costs on the margin is more mitigated in scenarios B1 and B2 than in scenarios A1 and A2 (-2%-point versus -4%-point). Overall, in scenarios B1 and B2, many companies in the meat and dairy group face a slight deterioration in net-debt/EBITDA, but this does not lead to an additional number of companies with a net-debt/EBITDA ratio above five times.

Table 9 Medium-term financial risk for the 31 companies

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description	Declining demand, EBITDA margin impact high*	Declining demand, EBITDA margin impact high*	Increasing demand, EBITDA margin impact low*	Increasing demand, EBITDA margin impact low*
Existing				
Gross-debt	263.5	263.5	263.5	263.5
Net-debt	193.8	193.8	193.8	193.8
EBITDA 2022	87.9	87.9	87.9	87.9
Net-debt/EBITDA (x)	2.2	2.2	2.2	2.2
Value at risk in existing situation	59.7	59.7	59.7	59.7
Additional risk				
Annualized impact market access risk	-13.2	-13.2	18.5	18.5
Annualized impact operational risk	-28.6	-28.6	-14.3	-14.3
Pro forma				
EBITDA, including risks	46.1	46.1	92.1	92.1
Net-debt/EBITDA (x)	4.2	4.2	2.1	2.1
Value at risk	116.0	116.0	62.0	62.0
% of gross-debt	44.0%	44.0%	23.5%	23.5%
Additional risk	56.3	56.3	2.3	2.3
% of gross-debt	21.4%	21.4%	0.9%	0.9%

Source: Profundo: The focus of further analysis is on the outcome 'excluding stranded assets' as this value affects companies' cash flows. 'Stranded assets' do not affect future cash flows as the investments have already been spent in earlier years and decades; *) no EBITDA margin impacts at traders/feed companies (see Chapter 2).

3.3 Long-term financial risks for the 31 companies

By applying the input data from Table 8, the total financial risks for the 31 companies amount to US\$ 1,150 billion in scenario A1, US\$ 5,221 billion in scenario A2, US\$ 536 billion in scenario B1, and US\$ 5,415 billion in scenario B2 (see Table 10). **A very interesting outcome is that the total risk in case of further market growth with high CO₂e prices (scenario B2) is higher than in case of a market decline with high carbon prices (scenario A2). This is due to the higher climate damage costs.**

3.3.1 Stranded assets

In the scenarios A1 and A2, stranded assets amount to US\$ 57 billion for the total of 31 companies (see Table 10). Meat companies face US\$ 28.5 billion at risk, dairy companies US\$ 18.5 billion, and Traders/feed companies US\$ 10.0 billion.

As mentioned earlier, while these assets have a high chance of being written off in a scenario of declining demand for meat, dairy, and/or feed, they do not affect a company's cash flows.

In scenarios B1 and B2, stranded assets do not exist as the market continues to grow.

3.3.2 Market access risk

The scenarios A1 and A2 lead to a reduction in volumes. With no EBITDA margin change (the feed cost increase impact is calculated in section 3.3.3), this results in a reduction of annual EBITDA. The total value of this reduction in profits and cash flows is calculated through a DCF calculation.

For the 31 companies, an annual EBITDA of US\$ 13.2 billion will be lost in case of a 15% decline in volumes. The total DCF value of this event is US\$ 188.2 billion.

In scenarios B1 and B2, the 31 companies are confronted with further volume growth and higher EBITDA. This leads to a US\$ 290.4 billion 'positive' risk impact in DCF value terms (see Table 10).

3.3.3 Operational risk

The operational risk consists of the impact of higher feed prices on the margin. This occurs in the context of the scenarios A1 and A2 as well as B1 and B2.

The 4%-point negative impact on the EBITDA margin has a material impact in scenario A1, as the US\$ 425 billion negative impact contributes 36.9% to the total value at risk (US\$ 1,150 billion excluding stranded assets, see Table 11).

In scenarios B1 and B2, the EBITDA margin reduction is only half, -2%-point.

3.3.4 Climate damage costs and value

As the climate damage values in scenario A1 are based on relatively low carbon costs per ton CO_{2e}, the contribution to the total risks is 33.7%, or US\$ 387 billion. The nearly eight-fold higher costs per ton in scenario A2, lead to a much higher outcome (US\$ 4,429 billion), which is 84.8% of the total value at risk.

In scenarios B1 and B2, the volumes have continued to increase, and the emissions have increased in line with this. As a consequence, the negative climate damage value risks in scenarios B1 and B2 are larger than in scenarios A1 and A2, respectively (Table 10). Climate damage risk is the risk category with the highest relative contribution in both scenarios B1 and B2 (Table 11).

3.3.5 Financing risk

In all scenarios, two interest rate assumptions have been applied. However, the financing risk value is a minor contributor to the totals of all risk scenarios. This is attributable to the level of interest rate increases assumed (+0.25%-point and +1.0%-point).

3.3.6 Reputation value risk

In all scenarios, a 15% reputation risk is applied to the value of the companies. The MDF companies will be confronted with a negative reputation value impact, also when the demand for their products continues to grow. This is similar to what happens in the oil and gas industry: annual increases in demand and production, go hand-in-hand with a weak reputation and a low reputation value.

3.3.7 Summary of the total financial risk for the 31 companies

The following table summarizes the four scenarios and the total financial risk faced by all financiers.

Table 10 Summary of financial risks for the 31 companies

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%
Stranded assets risk	-57.0	-57.0	0.0	0.0
Market access risk	-188.2	-188.2	290.4	290.4
Operational risk: higher feed costs	-424.7	-424.7	-212.4	-212.4
Climate damage costs/liability	-387.1	-4,429.3	-464.6	-5,314.0
Financing risk	-9.8	-39.1	-9.8	-39.1
Reputation risk	-139.8	-139.8	-139.8	-139.8
Total risk including stranded assets**	-1,206.6	-5,278.1	-535.8	-5,414.8
Total risks excluding stranded assets**	-1,149.6	-5,221.1	-535.8	-5,414.8

Source: Profundo: *) In addition to the description of the distinguishing characteristics, every scenario included 15% reputation risk on market values of the companies, and scenarios A1 and A2 included an EBITDA margin impact of -4%-points, scenarios B1 and B2 -2%-points; **) the focus of further analysis is on the outcome of 'excluding stranded assets' as this value affects the cash flows of companies. 'Stranded assets' do not affect future cash flows as the investments have already been spend in earlier years and decades.

In three of the four scenarios, the climate damage costs are a dominant contributor to the total financial risks (>84%). The financing risk is a relatively small risk in each scenario, contributing only 0.7% to 1.8%. While market access risk contributes to risk in scenarios A1 and A2, in scenarios B1 and B2 the market risk outcome is a negative number as the companies benefit from further market growth.

Table 11 Summary of financial risks for the 31 companies: contribution (%)

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%
Market access risk	16.4%	3.6%	-54.2%	-5.4%
Operational risk: higher feed costs	36.9%	8.1%	39.6%	3.9%
Climate damage costs/liability	33.7%	84.8%	86.7%	98.1%
Financing risk	0.8%	0.7%	1.8%	0.7%
Reputation risk	12.2%	2.7%	26.1%	2.6%
Total risks excluding stranded assets	100.0%	100.0%	100.0%	100.0%

Source: Profundo, based on Table 10; *) In addition to the description of the distinguishing characteristics, every scenario included 15% reputation risk on market values of the companies, and scenarios A1 and A2 included an EBITDA margin impact of -4%-points, scenarios B1 and B2 -2%-points.

3.4 The risks for the financial institutions

3.4.1 The total risk for all financiers

In the four scenarios, the total value at risk for the 31 companies is in the range of US\$ 536 billion to US\$ 5,415 billion. The lower figure (US\$ 536 billion) is significant, and the higher figure (US\$ 5,415 billion) even exceeds the US\$ 725 billion equity value of the 31 companies and the enterprise value of US\$ 932 billion (see Table 12). So, macro-wisely, the financial risk for the 31 companies could be a major risk to equity value in first instance (shareholders bear the most risks), and for debt. **Or, put it in another way, the 31 companies create a material risk for the financial system. The mentioned risk range of US\$ 536 billion (scenario B1) to US\$ 5,415 billion (scenario B2) is between 2.0% and 19.8% of the USA's 2023 GDP (Gross Domestic Product of US\$ 27.4 trillion³⁰). It needs to be considered that the losses might occur in a period of more than one year.**

In scenario A1, shareholders face US\$ 564 billion of financial risks, below the total equity value of US\$ 725 billion (see Table 12). In scenario A1, 78% of equity value might be at risk. Some companies, like Nestlé, face relatively minor financial risks relative to their equity value. This is because Nestlé has a relatively high equity value relative to its revenues and earnings, linked to the strength of its brands.

In scenario A1, the risk for creditors of US\$ 585 billion needs an explanation. This amount is higher than the gross debt of US\$ 264 billion. However, loans from several companies can still be repaid. For instance, loans to Nestlé will face no risk. However, for other companies the remaining financial risk, after the equity value has been absorbed by the financial risks, is much higher than the value of gross-debt.

Scenario B1 seems to generate the lowest risks for shareholders (40%) and for holders of debt (93%).

Table 12 Long-term value risk for 31 companies

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%
Total financial risk, excluding stranded asset risk	-1,149.6	-5,221.1	-535.8	-5,414.8
Valuation data				
Enterprise value	932.0	932.0	932.0	932.0
Gross-debt	263.5	263.5	263.5	263.5
Equity value	725.2	725.2	725.2	725.2
Risk for:				
Shareholders	-564.3	-670.8	-291.1	-535.4
Creditors	-585.3	-4,550.4	-244.7	-4,879.4
Risk as % of equity	78%	92%	40%	74%
Risk as % of creditors	222%	1727%	93%	1852%

Source: Profundo; *) In addition to describing the distinguishing characteristics, every scenario included a 15% reputation risk on the companies' market values. Scenarios A1 and A2 included an EBITDA margin impact of -4% points, and scenarios B1 and B2 -2% points.

3.4.2 Financial risk for the three banks in focus: medium-term risk

To evaluate the medium-term risk for the three banks, the EBITDA of the 31 MDF companies has been confronted with rising feed costs and a change in volumes. The four scenarios lead to changes in EBITDA, which will impact the ability of several of the 31 companies to service their debt. The servicing of debt (paying interest and redemption) is seen as riskier when the ratio net-debt/EBITDA is higher than five times (see section 1.9.2).

The three banks have the following outstanding financing in MDF companies (MDFs) and in the total portfolio (Table 13). This data is applied as a basis in various other tables in this report.

Table 13 Long-term value risk for 31 companies

US\$ billion	Total outstanding in MDFs	Total portfolio
Bank of America	3.36	1,045.7
Citigroup	2.39	640.2
JPMorgan Chase	4.53	1,135.6
Total	10.27	2,821.6

Source: Profundo

When applying the net-debt/EBITDA >5X formula to each outstanding loans from each of the three banks in focus, the total medium-term risk is in a range of US\$ 0.43 billion to US\$ 1.12 billion for the three banks together. In scenarios A1 and A2, Bank of America faces risk on 21.5% of its loans to the MDF companies. Citigroup sees a risk for 6.6% of its loan portfolio to MDFCs. Versus the global outstanding portfolio in loans and shares, the percentual medium-term risks of MDF companies' loans is below 0.1% for each bank and each scenario.

Table 14 Three banks: medium-term risk in loans to the 31 companies

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description	Declining demand, EBITDA margin -4%-points	Declining demand, EBITDA margin -4%-points	Increasing demand, EBITDA margin -2%-points	Increasing demand, EBITDA margin -2%-points
Bank of America	0.72	0.72	0.24	0.24
Citigroup	0.16	0.16	0.04	0.04
JPMorgan Chase	0.24	0.24	0.15	0.15
Total	1.12	1.12	0.43	0.43
% of the loan portfolio to MDF companies				
Bank of America	21.5%	21.5%	7.2%	7.2%
Citigroup	6.6%	6.6%	1.5%	1.5%
JPMorgan Chase	5.3%	5.3%	3.3%	3.3%
Total	10.9%	10.9%	4.2%	4.2%
% of the total portfolio				
Bank of America	0.07%	0.07%	0.02%	0.02%
Citigroup	0.02%	0.02%	0.01%	0.01%
JPMorgan Chase	0.02%	0.02%	0.01%	0.01%
Total	0.04%	0.04%	0.02%	0.02%

Source: Profundo; MDF companies = Meat, dairy and feed companies

3.4.3 Financial risk for the three banks in focus: long-term risk

The long-term risk is higher than the medium-term risk. While in the medium-term risk assessment, only the impact of higher feed costs and volume changes are included in the scenarios, the long-term risk assessment also includes the other categories: carbon costs, financing costs, and reputation value loss.

In section 3.3, the long-term value risks for the 31 companies were calculated, with outcomes between US\$ 536 billion (scenario B1) and US\$ 5,415 billion (scenario B2). The objective of this section is to translate these risks to the portfolios of the three banks in focus.

The financial risks for the three banks' exposure (shares, loans) are in the range of US\$ 2.5 billion to US\$ 9.3 billion (Table 15), based on the four scenarios.

Table 15 Three banks: long-term risk to the 31 companies

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2	Total outstanding in MDF Cs
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%	
Bank of America	3.11	3.20	0.97	3.20	3.36
of which shares	0.47	0.47	0.37	0.47	0.47
of which loans	2.64	2.73	0.60	2.73	2.89
Citigroup	1.87	2.02	0.32	2.01	2.39
of which shares	0.11	0.11	0.09	0.11	0.11
of which loans	1.76	1.91	0.23	1.90	2.28
JPMorgan Chase	3.55	4.12	1.17	3.52	4.53
of which shares	1.90	2.37	0.78	1.77	2.62
of which loans	1.65	1.75	0.39	1.75	1.91
Three banks' total	8.52	9.34	2.46	8.73	10.27
of which shares	2.48	2.95	1.23	2.35	3.20
of which loans	6.04	6.39	1.23	6.38	7.08

Source: Profundo; MDF Cs = Meat, Dairy and Feed companies; *) In addition to describing the distinguishing characteristics, every scenario included a 15% reputation risk on the companies' market values. Scenarios A1 and A2 included an EBITDA margin impact of -4% points, and scenarios B1 and B2 -2% points.

In percentage terms of the MDF portfolios, long-term financing of MDF companies could lead to financial risks (>77%) in three scenarios for all three banks. Only scenario B1, characterized by further market growth and relatively low carbon costs per ton, shows relatively low percentual risks for the three banks of between 13.4% (Citigroup) and 29.0% (Bank of America). In each scenario, the percentual financial risk at Bank of America reaches the highest level.

Table 16 Three banks: long-term risk of MDF loans as % of the portfolio

%	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%
% of the portfolio in MDF companies				
Bank of America	92.4%	95.3%	29.0%	95.3%
Citigroup	78.2%	84.6%	13.4%	84.3%

%	Scenario A1	Scenario A2	Scenario B1	Scenario B2
JPMorgan Chase	78.4%	91.1%	25.8%	77.8%
Total	82.9%	91.0%	24.0%	85.0%
% of the total portfolio				
Bank of America	0.30%	0.31%	0.09%	0.31%
Citigroup	0.29%	0.32%	0.05%	0.31%
JPMorgan Chase	0.31%	0.36%	0.10%	0.31%
Total	0.30%	0.33%	0.09%	0.31%

Source: Profundo; MDF companies = Meat, Dairy and Feed companies; *) In addition to describing the distinguishing characteristics, every scenario included a 15% reputation risk on the companies' market values. Scenarios A1 and A2 included an EBITDA margin impact of -4% points, and scenarios B1 and B2 -2% points.

The absolute risks in the value of shares and loans and the percentual risks vary by bank. For Bank of America, the highest nominal risk is in loans (between US\$ 0.6 – 2.7 billion) and the highest percentage risk in shares in all scenarios (Table 17).

Table 17 Bank of America: long-term risk in shares and loans

	Scenario A1	Scenario A2	Scenario B1	Scenario B2	Total outstanding in MDF Cs
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%	
Nominal risk (in US\$ billion)					
Total	3.11	3.20	0.97	3.20	3.36
of which shares	0.47	0.47	0.37	0.47	0.47
of which loans	2.64	2.73	0.60	2.73	2.89
% risk in shares and loans					
in shares	100.0%	100.0%	78.9%	100.0%	
in loans	91.2%	94.5%	20.9%	94.5%	

Source: Profundo; MDF Cs = Meat, Dairy and Feed companies; risk in shares and loans to 31 companies; *) In addition to describing the distinguishing characteristics, every scenario included a 15% reputation risk on the companies' market values. Scenarios A1 and A2 included an EBITDA margin impact of -4% points, and scenarios B1 and B2 -2% points.

For Citigroup, the highest nominal risk is in loans (US\$ 0.2 – 1.9 billion), and the highest percentage risk is in shares, in all scenarios (Table 18).

Table 18 Citigroup: long-term risk in shares and loans

	Scenario A1	Scenario A2	Scenario B1	Scenario B2	Total outstanding in MDF Cs
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%	
Nominal risk (in US\$ billion)					
Total	1.87	2.02	0.32	2.01	2.39
of which shares	0.11	0.11	0.09	0.11	0.11
of which loans	1.76	1.91	0.23	1.90	2.28
% financial risk in shares and loans					
in shares	99.6%	99.9%	78.0%	99.6%	
in loans	77.2%	83.8%	10.3%	83.6%	

Source: Profundo; MDF Cs = Meat, Dairy and Feed companies; risk in shares and loans to 31 companies; *) In addition to describing the distinguishing characteristics, every scenario included a 15% reputation risk on the companies' market values. Scenarios A1 and A2 included an EBITDA margin impact of -4% points, and scenarios B1 and B2 -2% points.

For JP Morgan Chase (Table 19) the highest nominal risk is in shares (between US\$ 0.8 – 2.4 billion), and in three of the four scenarios, the highest percentage risk is in loans.

Table 19 JPMorgan Chase: long-term risk in shares and loans

	Scenario A1	Scenario A2	Scenario B1	Scenario B2	Total outstanding in MDF Cs
Description*	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%	
Nominal risk (in US\$ billion)					
Total	3.55	4.12	1.17	3.52	4.53
of which shares	1.90	2.37	0.78	1.77	2.62
of which loans	1.65	1.75	0.39	1.75	1.91
% financial risk in shares and loans					
in shares	72.5%	90.7%	29.8%	67.8%	
in loans	86.4%	91.7%	20.3%	91.5%	

Source: Profundo; MDF Cs = Meat, Dairy and Feed companies; risk in shares and loans to 31 companies; *) In addition to describing the distinguishing characteristics, every scenario included a 15% reputation risk on the companies' market values. Scenarios A1 and A2 included an EBITDA margin impact of -4% points, and scenarios B1 and B2 -2% points.

3.5 Conclusions on medium-term and long-term financial risks

The long-term risks for each bank are significantly higher than the medium-term risks (see Table 20). In the four scenarios, the three banks' total long-term risk of financing MDF companies is between US\$ 2.46 and 9.34 billion, and their medium-term risk is between US\$ 0.43 and 1.12 billion.

Therefore, by ending financing as soon as loans are redeemed, the three banks are able to reduce risks significantly. In the four scenarios, the risk reduction for the three banks in total is between 82.5% and 95.1%. Besides, the risk reduction for each of the individual banks would be material. The differences between the three banks are relatively small.

Table 20 Three banks: long-term risk versus medium-term risk of MDF financing

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Description***	Declining demand, low CO ₂ e prices and interest rates raised by 0.25%	Declining demand, high CO ₂ e prices and interest rates raised by 1%	Increasing demand, low CO ₂ e prices and interest rates raised by 0.25%	Increasing demand, high CO ₂ e prices and interest rates raised by 1%
Long-term risk				
Bank of America	3.11	3.20	0.97	3.20
Citigroup	1.87	2.02	0.32	2.01
JPMorgan Chase	3.55	4.12	1.17	3.52
Total	8.52	9.34	2.46	8.73
Medium-term risk				
Bank of America	0.72	0.72	0.24	0.24
Citigroup	0.16	0.16	0.04	0.04
JPMorgan Chase	0.24	0.24	0.15	0.15
Total	1.12	1.12	0.43	0.43
Risk reduction if getting out early (US\$ billion)*				
Bank of America	2.38	2.48	0.73	2.96
Citigroup	1.71	1.86	0.28	1.98
JPMorgan Chase	3.31	3.88	1.02	3.37
Total	7.40	8.22	2.03	8.30
Risk reduction if getting out early** (%)				
Bank of America	76.7%	77.4%	75.1%	92.4%
Citigroup	91.6%	92.2%	88.7%	98.2%
JPMorgan Chase	93.2%	94.2%	87.1%	95.7%

US\$ billion	Scenario A1	Scenario A2	Scenario B1	Scenario B2
Total	86.9%	88.0%	82.5%	95.1%

Source: Profundo; MDF Cs = Meat, Dairy and Feed companies; *) Long-term loss minus medium-term loss; **) The difference between long-term and medium-term loss, divided by long-term loss; ***) In addition to describing the distinguishing characteristics, the calculations for every long-term scenario included a 15% reputation risk on the companies' market values. Scenarios A1 and A2 included an EBITDA margin impact of -4% points, and scenarios B1 and B2 -2% points. For the medium-term scenario calculations, only declining/increasing demand and EBITDA margin changes were included.

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Appendix 1 The 31 companies

Table 21 The 31 companies

US\$ million	Private/ listed	Revenues	EBITDA	EBITDA %	Fixed assets
Meat companies		475,199	42,486	8.9%	190,148
BRF - Brasil Foods	Listed	10,442.19	562.25	5.4%	5,049.92
Cargill	Private	165,000.00	11,500.00	7.1%	39,994.00
CP Group	Listed	17,572.28	1,175.80	6.7%	13,065.84
Fujian Sunner	Listed	2,504.28	275.56	11.0%	2,649.86
Guangdong Haid Group	Listed	15,593.44	873.18	5.6%	3,694.00
Guangdong Wens Foodstuff Group	Listed	12,467.72	1,906.10	15.3%	10,827.43
Industrias Bachoco	Listed	4,924.09	520.58	10.6%	2,392.55
JBS	Listed	72,749.17	6,662.49	9.2%	22,308.70
Marfrig	Listed	25,352.29	2,956.53	11.7%	13,141.83
Minerva	Listed	6,012.00	536.84	8.9%	1,402.94
Muyuan Foodstuff	Listed	18,587.47	4,480.76	24.1%	22,827.76
New Hope Group	Listed	21,071.27	850.56	4.0%	12,252.34
NH Foods	Listed	10,261.73	640.28	6.2%	6,171.94
Seaboard	Listed	11,243.00	892.00	7.9%	4,435.00
Tyson Foods	Listed	53,282.00	5,639.00	10.6%	18,400.00
WH Group	Listed	28,136.00	3,014.00	10.7%	11,534.00
Dairy companies		240,779.83	32,992.58	13.7%	123,226.93
Agropur	Private	8,479.00	522.00	6.2%	2,322.23
China Mengniu Dairy	Listed	13,788.31	1,204.75	8.7%	6,607.16
Danone	Listed	29,140.30	4,998.93	17.2%	17,808.22
DFA - Dairy Farmers of America	Private	24,500.00	500.00	2.0%	5,723.57
Fonterra Cooperative Group	Listed	14,762.68	987.85	6.7%	7,756.88
Inner Mongolia Yili	Listed	18,341.18	2,080.19	11.3%	8,923.30
FrieslandCampina	Private	14,833.29	496.34	3.3%	3,413.26
Glanbia	Listed	5,944.15	474.49	8.0%	1,168.80
Nestlé	Listed	98,993.91	20,779.97	21.0%	63,998.27
Saputo	Listed	11,997.01	948.08	7.9%	5,505.24

US\$ million	Private/ listed	Revenues	EBITDA	EBITDA %	Fixed assets
Trader or feed companies		356,230.89	12,434.53	3.5%	66,672.00
ADM - Archer Daniels Midland	Listed	101,556.00	5,348.00	5.3%	27,863.00
Bunge	Listed	67,232.00	2,826.00	4.2%	8,860.00
COFCO Group	Private	108,286.14	2,163.84	2.0%	23,412.30
Land O'Lakes	Private	19,225.75	446.70	2.3%	2,841.70
Louis Dreyfus Company	Private	59,931.00	1,650.00	2.8%	3,695.00
Total		1,072,209.65	87,913,04	8,2%	380,047,02

Source: Profundo

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