



*Changing How
the World Builds*



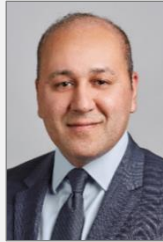
COVID-19: Rethinking Capital Investment Programs

***Using AI and Advanced Analytics to assess where we are,
where you will be and where you want to go***

May 27, 2020



Introductions



Riz Shah
(Alvarez & Marsal)

Washington D.C.

Riz has 20+ years supporting project owners / operators, improving performance by effectively leveraging technology and analytics to enhance ROI and reducing the associated risks that can occur during execution.



Carlo Sandrin
(Neuro Data)

Washington D.C.

Carlo has +15 years supporting companies to make better business decisions based on robust advanced analytics modelling, machine learning and artificial intelligence.



Mike Pappas
(CII)

Austin, TX

Associate Director with the Construction Industry Institute and Capital Project Management Consultant providing project-specific consulting and professional education related to process improvement and implementation of CII Best Practices.



Agenda

- Current 'qualitative' context
- COVID19 business response
- Applicability of AI/ML to construction businesses
- Examples of data sources
- Construction industry economic influencers 'we cannot control'
- What does the future currently look like
- Three business case studies
- How to capitalize on projected economic challenges
- Q & A discussion

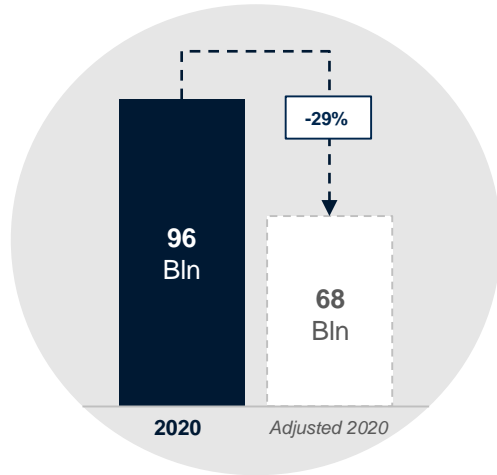


COVID-19: Unprecedented Liquidity Pressure and CapEx Reductions

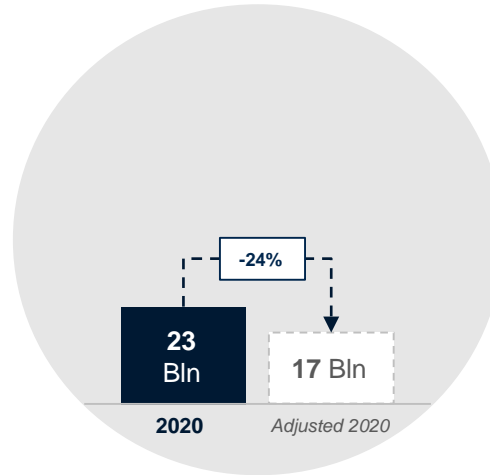
Several large players of selected sectors have been experiencing severe pressure on working capital lines and liquidity, leading to the need to reduce projects – and profitability forecasts

Example of Post-Covid Adjustment on Capital Expenditures Guidance

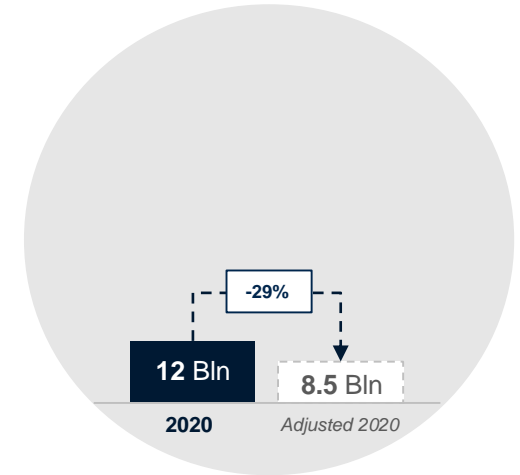
Big Oil¹



US Midstream²



US Downstream³



¹BP; Chevron; ExxonMobil; Shell (data according companies' quarterly earnings release)

²Enbridge; Energy Transfer; KinderMorgan; EPP; Williams Companies; ONEOK; Pembina (data according companies' quarterly earnings release)

³Phillips 66; Valero; HollyFrontier; Marathon Petroleum (data according companies' quarterly earnings release)



Challenges assessing direct Impacts on the Capital Projects Industry

Crisis effects can be observed at different levels across the value chain of the capital project industry, but quantifying them has always presented a challenge

Examples of qualitative impacts



Equipment & Material Vendors

Reduced visibility of demand for products and subsequent production volumes

Increasing level of change requests on currently active purchase orders

Reduced manpower productivity rates at manufacturing facilities

Increasing instability in vendor's logistics network (increasing leadtime)



Construction Contractors

Increasing layoffs and potential labor claims

Reduced productivity rates at construction sites

Liquidity shortage and constrained/expensive access to revolving credit facilities

Potential loss of corporate competence and poor knowledge management



Owners

Significant changes in business plans and project feasibility drivers

Sharp adjustment on selected **commodities prices**

Adjustment on project and corporate **financing** alternatives and premiums

Increasing amount of construction claims and contractual disputes

Anticipated quantification of these impacts is however a highly complex task

Data not at hand

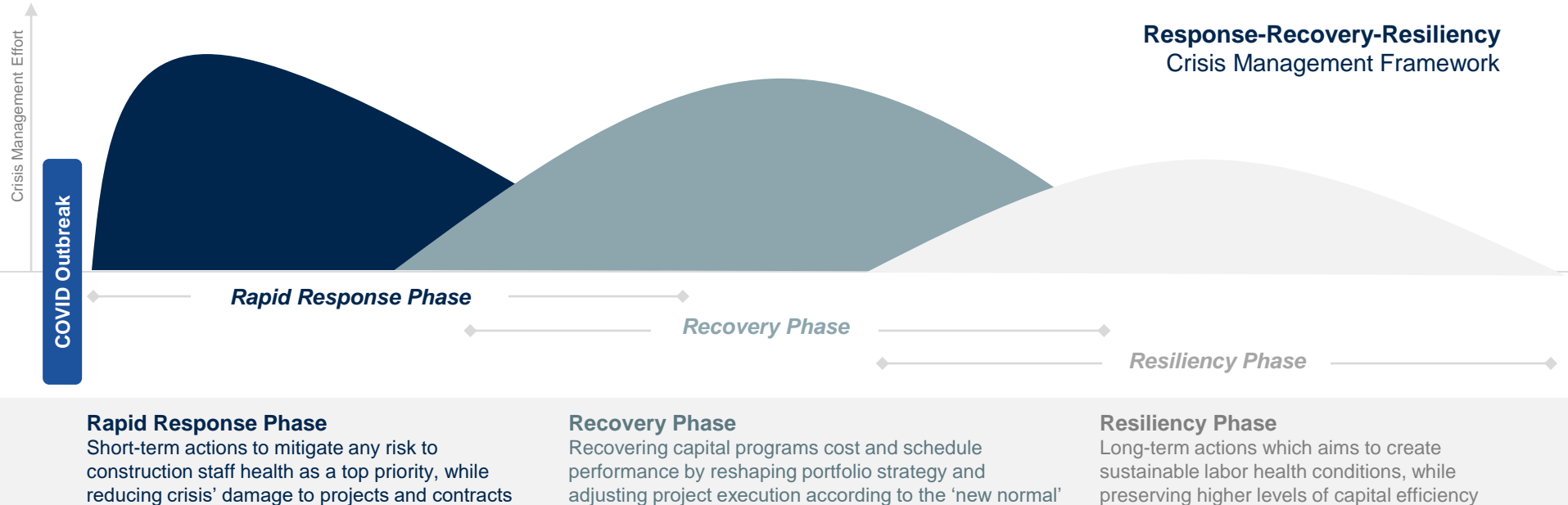
Lack of appropriate **tools**

Complexity of influence factors

Uncertainty of timing regarding restarting business

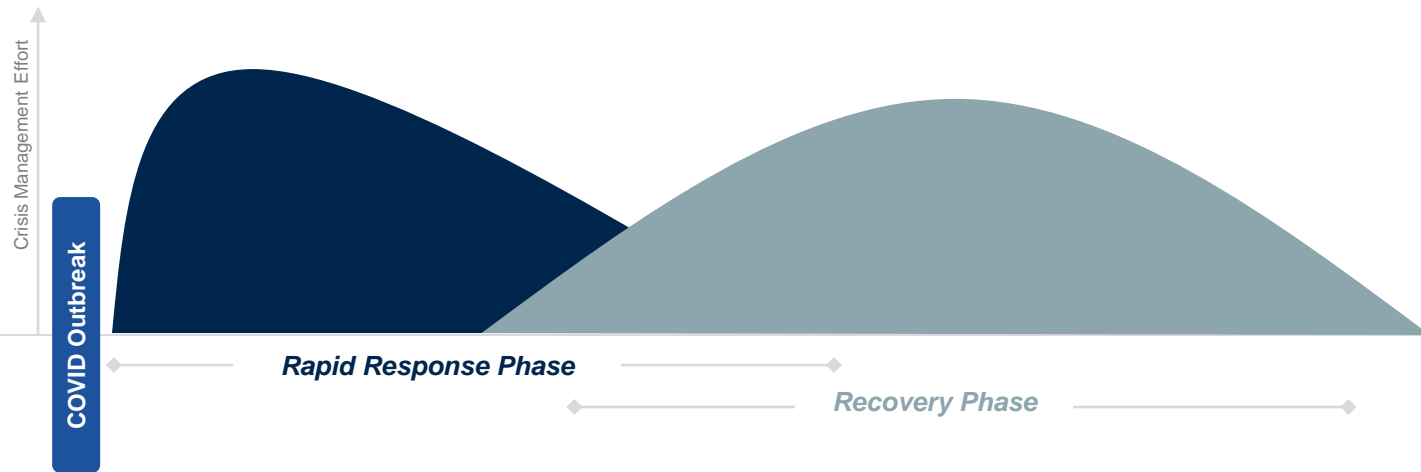
Crisis Management Framework on Capital Projects

A crisis response program shall be implemented to mitigate financial and operational impacts both at project and portfolio levels



Crisis Management Framework on Capital Projects

A crisis response program shall be implemented to mitigate financial and operational impacts both at project and portfolio levels



Rapid Response Phase

Short-term actions to mitigate any risk to construction staff health as a top priority, while reducing crisis' damage to projects and contracts

Recovery Phase

Recovering capital programs cost and schedule performance by reshaping portfolio strategy and adjusting project execution according to the 'new normal'



“Recovery”
means redefining capital spending according to the projected ‘new normal’

Artificial Intelligence

Advanced Analytics

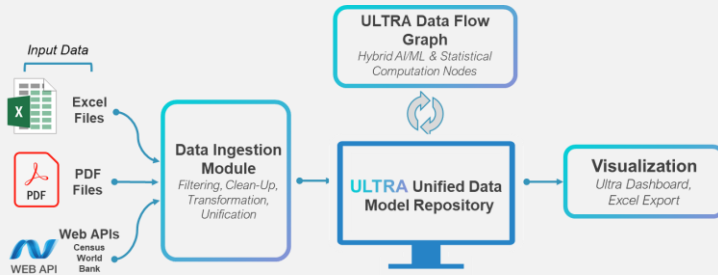
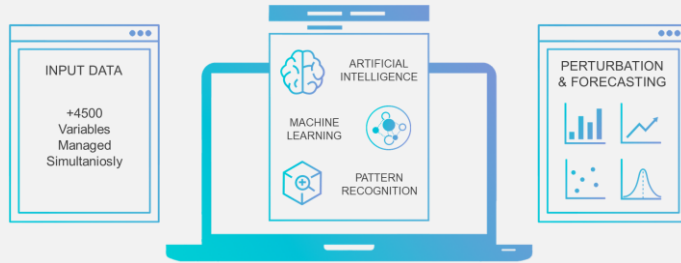
“What can we expect from the new normal?”

'Econo-physics': a game changer for the Construction Industry



How can we apply AI/ML to a business in the construction industry?

An overview of how Artificial Intelligence and Machine Learning works



Main Features

- Data can be collected from **heterogeneous sources** and transformed to uniform representation with multiple levels of granularity
- By modeling data collected against data we have in reality, we can **'learn' the patterns** that exists in thousands of data sets
- Through the application of machine learning, data models can reach **confidence levels** greater than 90%
- Through advanced data analytics and perturbation, data models can see if data is nonsensical, manipulated or has gaps (**improving the confidence level of its forecasting capabilities**)

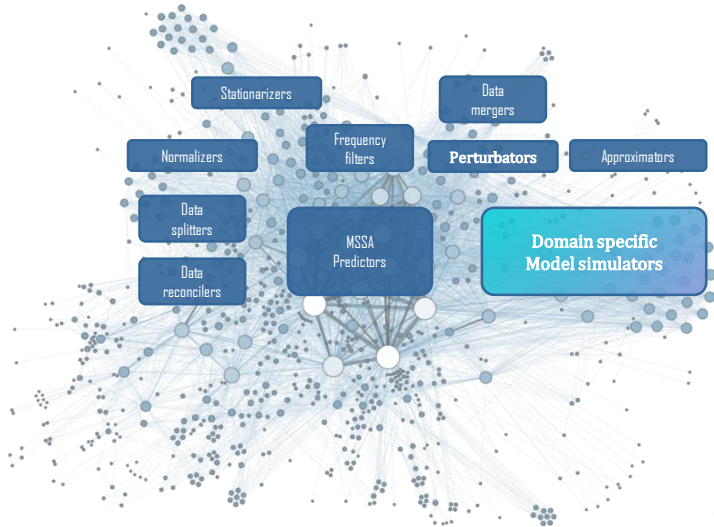


AI and Advanced Analytics driving Crisis Response Plans

Accurate forecasting and scenario planning shall be considered as the key drivers for a well-designed recovery plan

Case Study

Use of unsupervised machine learning algorithm to identify relationships between various economic indicators, detect economic cycles and provide **meaningful projections for ecosystems associated to future development of capital projects**



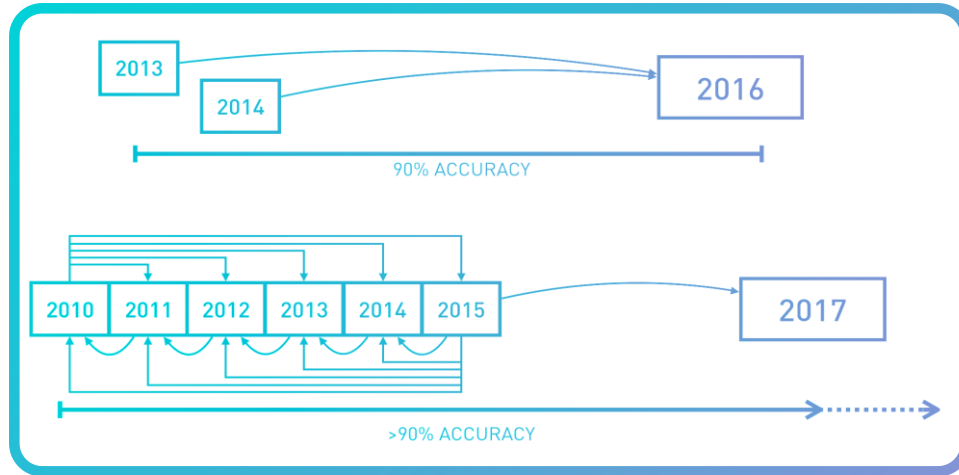
Data Modelling Stages

- 1 **Macroeconomic Outlook** – COVID-19 impact estimation on the global economy, focusing on the manufacturing sector
- 2 **Commodity Prices** – Future price estimations of major global commodities, based on the evaluation of global demand and macroeconomic conditions of major economies
- 3 **Illustrative Company Outlook** – Major financial indicators of future performance with regard to COVID-19 impact (and correlation to commodity prices and macroeconomic outlook)
- 4 **What-if Scenarios**



AI and Machine Learning-based forecasting: How do we know it works?

By putting 'blinders' on specific data sets, and comparing them to actuals, we can see previously unprecedented levels of accuracy and confidence levels for decision making



Building trust in your data



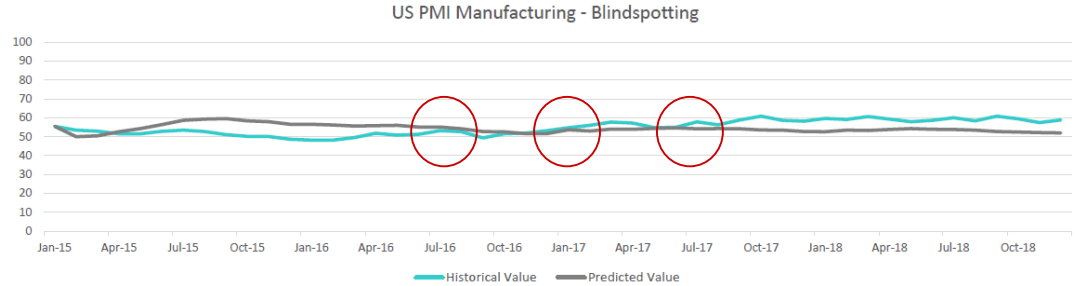
AI and Machine Learning-based forecasting: How do we know it works?

Applied to one of today's case studies:

What will demand be for product in 2018?

**The forecast...
from 2015**

**Accuracy of > 98% at 18,
24 and 30 months**

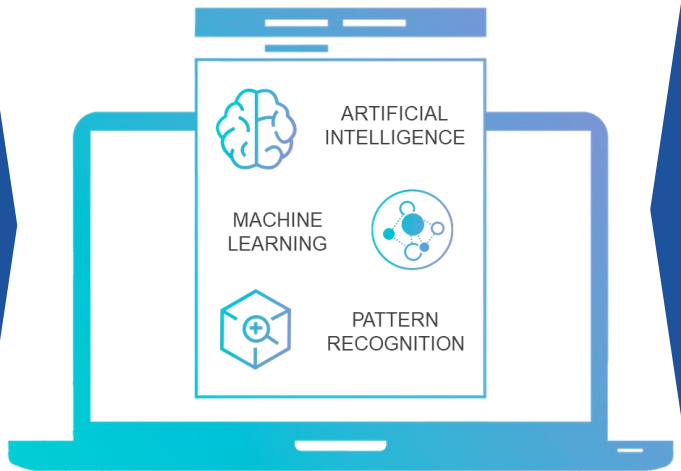
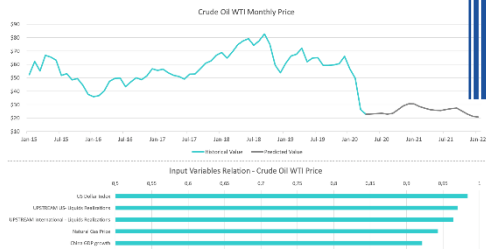


Critical to know 'what you can control' vs 'what you cannot control'

Understanding these two aspects will be critical for you to make decisions that relate to your capital projects

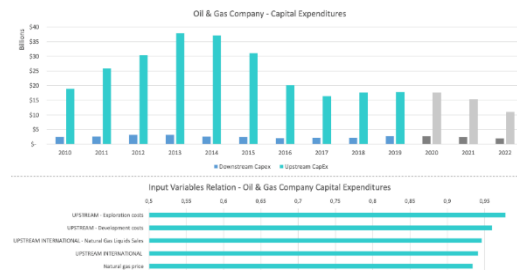
Cannot control 'Strategic'

- Manufacturing
- Commodity pricing
- Weather
- Interest rates



Can control 'Tactical'

- Capital Expenditure
- Cost of goods sold
- Labor costs
- Market share



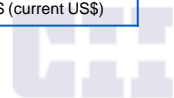
What data will you need to conduct a similar analysis yourself?

Overview of data sources utilized for today's case study analyses

• Aluminum 3Mo (AH_3)
• PMI Composite Brazil
• Tin 3Mo (SN_3)
• Confidential business information
• ge - USA - employed persons
• ge - USA - government debt
• ge - USA - building permits
• ge - USA - balance of trade
• Iron Ore 65% Fe CFR China Future Quotes (US\$)
• Treasury Yield 10 Years (^TNX)
• Confidential business information
• PMI Composite ISA
• ge - USA - food inflation
• ge - USA - labor force participation rate
• Crude oil price (Brent)
• PMI Manufacturing Brazil
• PMI Manufacturing USA
• Zinc 3Mo (ZS_3)
• Copper 3Mo (CS_3)
• Nickel 3 months
• Confidential business information
• PMI Manufacturing China

• 3-Month London Interbank Offered Rate (LIBOR)
• ge - USA - construction spending
• Dow Jones Industrial Average (^DJI)
• ge - USA - consumer price index
• CBOE Volatility Index (^VIX)
• PMI Manufacturing India
• Natural gas price
• ge - USA - employment rate
• S&P 500 (^GSPC)
• Crude oil price (WTI)
• Vanguard FTSE Developed Markets Index Fund ETF Shares (VEA)
• ge - USA - composite pmi
• NASDAQ Composite (^XIC)
• Vanguard FTSE Emerging Markets Index Fund ETF Shares (VWO)
• US Dollar/USDX - Index - Cash (DX-Y.NYB)
• ge - USA - imports
• Russell 2000 (^RUT)
• ge - USA - average weekly hours
• ge - USA - exports
• ge - USA - foreign direct investment
• ge - USA - bankruptcies
• EBITDA (million USD)

• CH FOREIGN DIRECT INVESTMENT NET INFLOWS (current US\$)
• NON-OECD LIQUID FUEL CONSUMPTION (mbpd)
• UPSTREAM INTERNATIONAL - Natural Gas Sales (MCFD)
• US GFCF (CURRENT US\$)
• GDP growth China
• Confidential business information
• UPSTREAM US- Natural Gas Realizations (USD per thousand cubic feet)
• Confidential business information
• NET REVENUE - iron ore (million USD)
• Total Petroleum and Other Liquids Product Supplied (mbpd)
• US GFCF (% GDP)
• ge - USA - gdp
• FEDFUNDS (%)
• US REFINERY OUTPUT (mbpd)
• CRUDE OIL PRODUCTION NON-OPEC (mbpd)
• CH GDP PER CAPITA (USD)
• Confidential business information
• ge - USA - gross federal debt to gdp
• Iron Ore 62% Fe CFR China Future Quotes (US\$)
• CH FOREIGN DIRECT INVESTMENT NET OUTFLOWS (current US\$)
• BR GDP (current USD)
• US FOREIGN DIRECT INVESTMENT NET INFLOWS (current US\$)



What data will you need to conduct a similar analysis yourself?

Overview of data sources utilized for today's case study analyses

• Confidential business information
• BR CRUDE STEEL PRODUCTION (k ton)
• US GDP PER CAPITA (%)
• COGS - pellets (million USD)
• SAUDI ARABIA CRUDE OIL PRODUCTION (mbpd)
• UPSTREAM - Exploration costs (millions USD)
• BR GDP PER CAPITA (USD)
• CH COAL CONSUMPTION (million ton)
• UPSTREAM net revenues Halliburton (million USD)
• Confidential business information
• UPSTREAM operating costs Halliburton (million USD)
• GDP growth India
• BR GFCF (% GDP)
• UPSTREAM US- Natural Gas Sales (MCFD)
• Confidential business information
• Confidential business information
• ge - USA - states competitiveness index
• BR COAL CONSUMPTION (million ton)
• US CPI INFLATION (%)
• CH GDP GROWTH (%)
• UPSTREAM INTERNATIONAL - Natural Gas Liquids Sales (thousands of barrels per day)

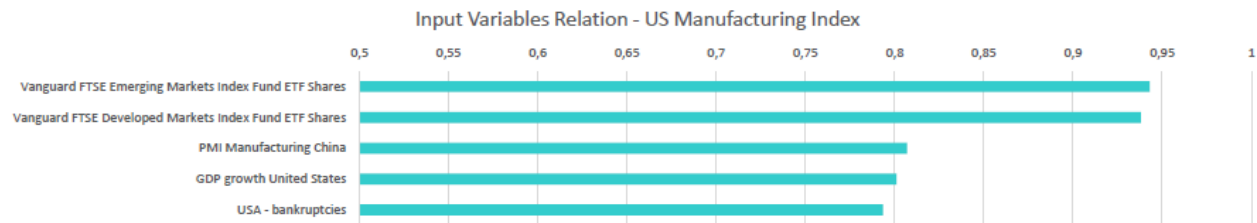
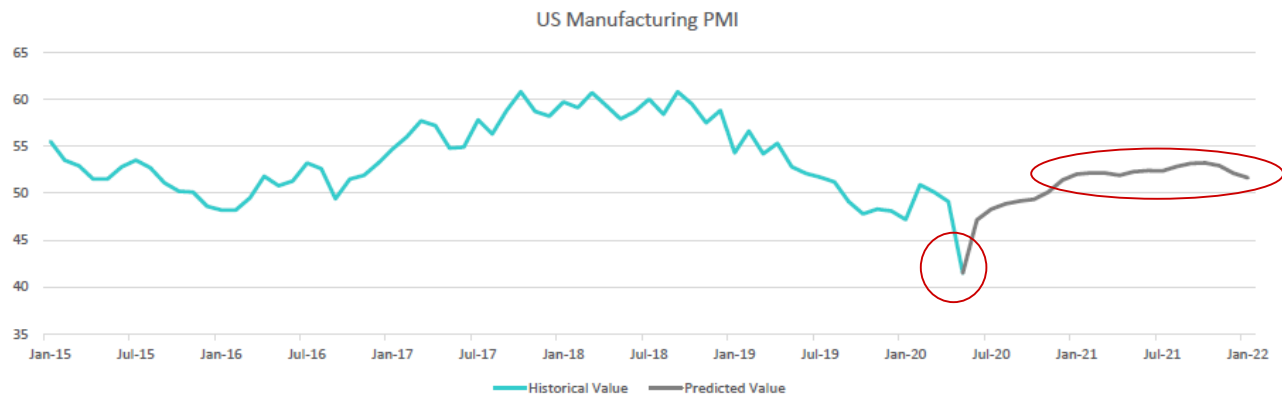
• UPSTREAM Capital and exploratory expenditures (million USD)
• CH CRUDE STEEL PRODUCTION (k ton)
• Confidential business information
• CH GFCF (% GDP)
• UPSTREAM US- Liquids Realizations (USD per barrel)
• OECD LIQUID FUEL CONSUMPTION (mbpd)
• CH GFCF (CURRENT US\$)
• UPSTREAM - Development costs (millions USD)
• BR GFCF (CURRENT US\$)
• DOWNSTREAM capex (million USD)
• CH GDP (current USD)
• US GDP (current USD)
• Confidential business information
• WTI CRUDE OIL PRICE (US\$/ barrel)
• CAPITAL EXPENDITURES - total (million USD)
• US NATURAL GAS CONSUMPTION (bmf/D)
• CRUDE OIL PRODUCTION OPEC (mbpd)
• BR FOREIGN DIRECT INVESTMENT NET OUTFLOWS (current US\$)
• DOWNSTREAM net revenues (million USD)
• UPSTREAM INTERNATIONAL - Natural Gas Realizations (USD per thousand cubic feet)
• DOWNSTREAM Capital and exploratory expenditures (million USD)

• GDP growth United States
• CH CPI INFLATION (%)
• BR GDP GROWTH (PERCENT)
• US GDP GROWTH (%)
• NET REVENUES (million USD)
• WORLD GDP (current USD)
• US FOREIGN DIRECT INVESTMENT NET OUTFLOWS (current US\$)
• ge - USA - federal corporate tax rate
• GDP growth Brazil
• UPSTREAM US - Natural Gas Liquids Sales (thousands of barrels per day)
• WORLD GDP GROWTH (%)
• SELIC (perc p.y.)
• BR IPCA INFLATION (%)
• CRUDE OIL PRODUCTION CAPACITY OPEC (mbpd)
• UPSTREAM International - Liquids Realizations (USD per barrel)
• ge - USA - competitiveness rank
• DOWNSTRAM operating income (million USD)
• DOWNSTRAM operating costs (million USD)
• BR FOREIGN DIRECT INVESTMENT NET INFLOWS (current US\$)
• COGS (million USD)
• Confidential business information



General Assessment of Crisis Global Effects

Primary forecasting on the global macroeconomic outlook, commodities pricing and output is used to support more detailed and specific scenarios generation at business unit levels

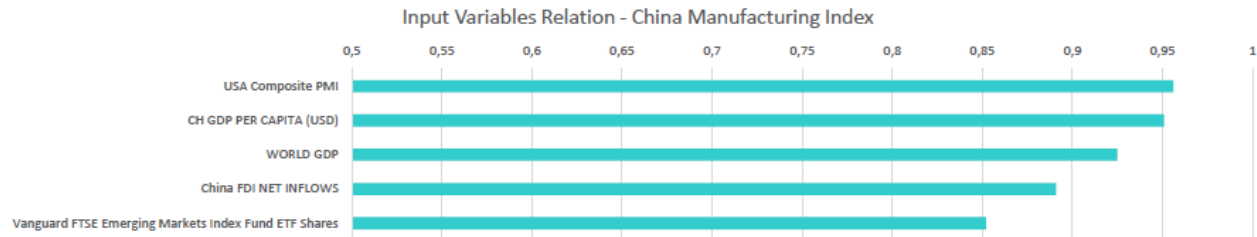
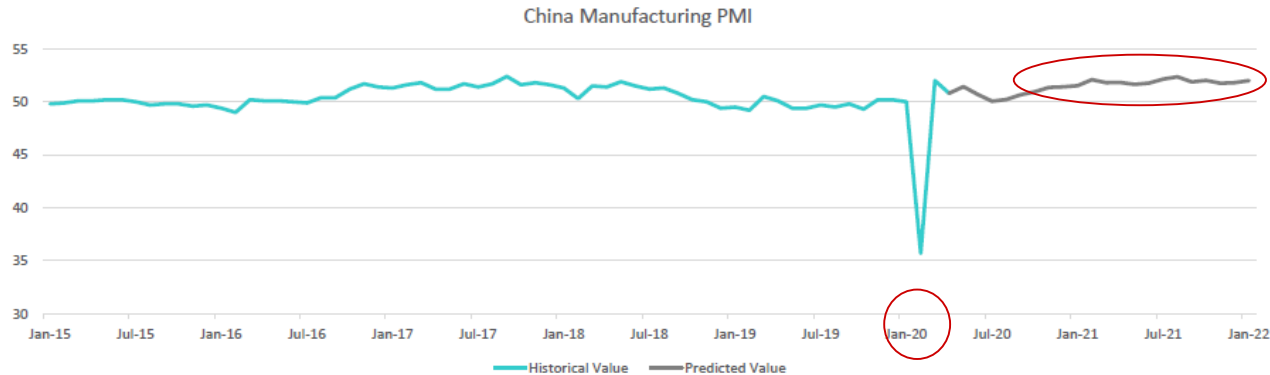


Stage 1
Macroeconomic
Outlook

US Manufacturing PMI

General Assessment of Crisis Global Effects (2)

Primary forecasting on the global macroeconomic outlook, commodities pricing and output is used to back more detailed and specific scenarios generation at business unit levels

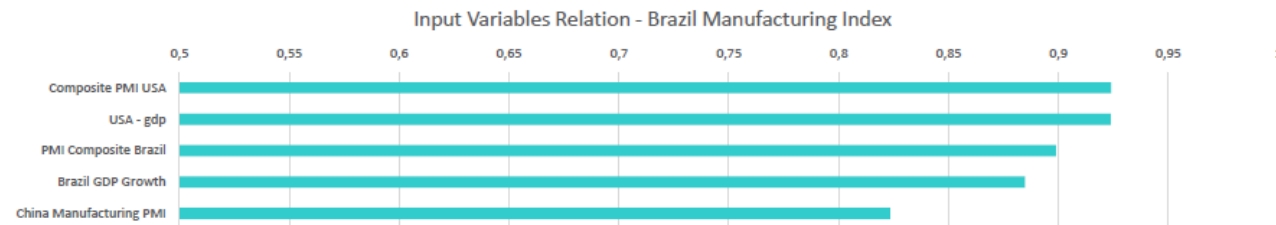
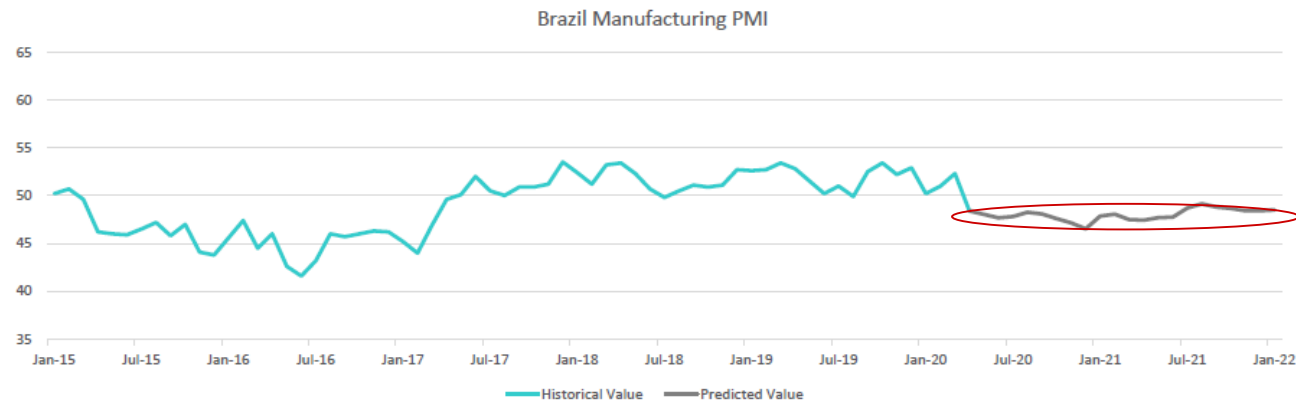


Stage 1
Macroeconomic
Outlook

China Manufacturing PMI

General Assessment of Crisis Global Effects (3)

Primary forecasting on the global macroeconomic outlook, commodities pricing and output is used to back more detailed and specific scenarios generation at business unit levels



Stage 1
Macroeconomic
Outlook

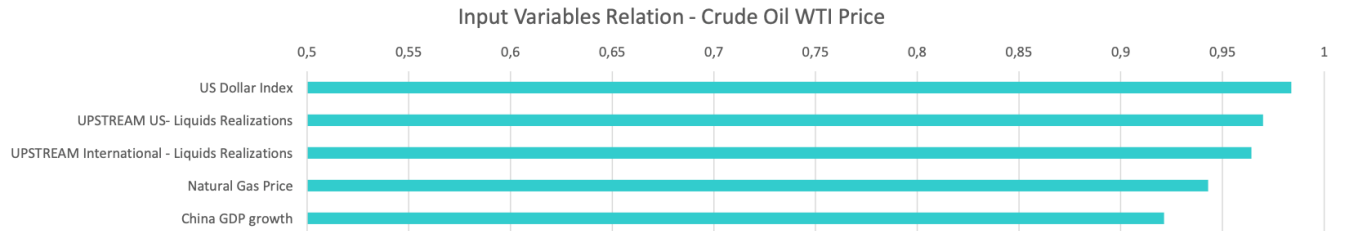
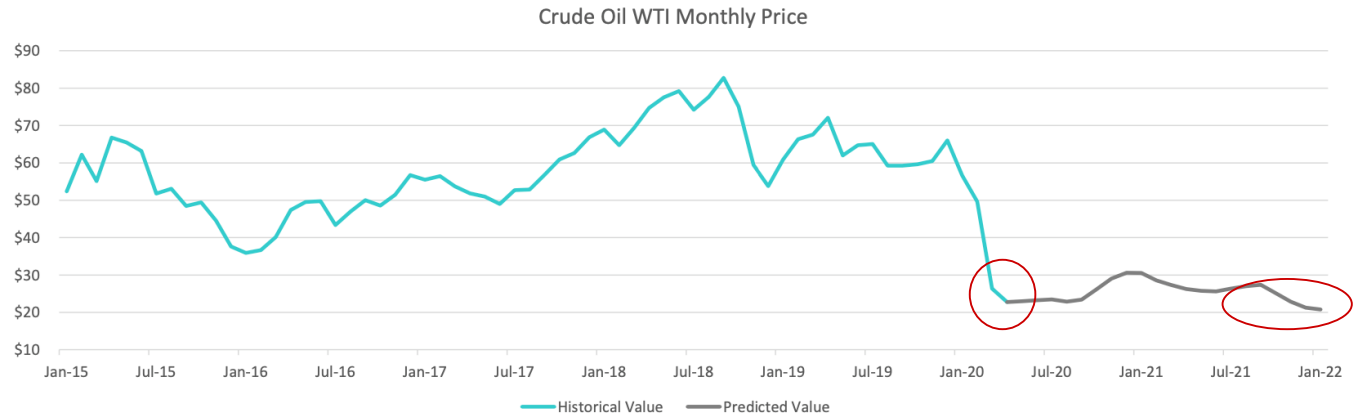
Brazil Manufacturing PMI

General Assessment of Crisis Global Effects (4)

Primary forecasting on the global macroeconomic outlook, commodities pricing and output is used to back more detailed and specific scenarios generation at business unit levels

Stage 2 Commodity Prices

Crude Oil Monthly Price

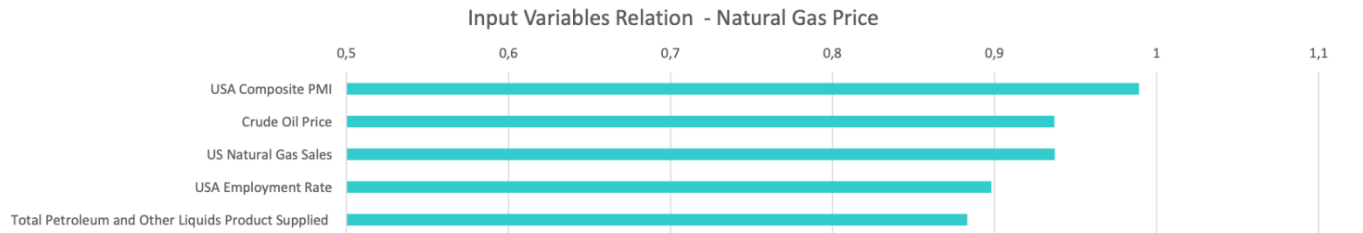
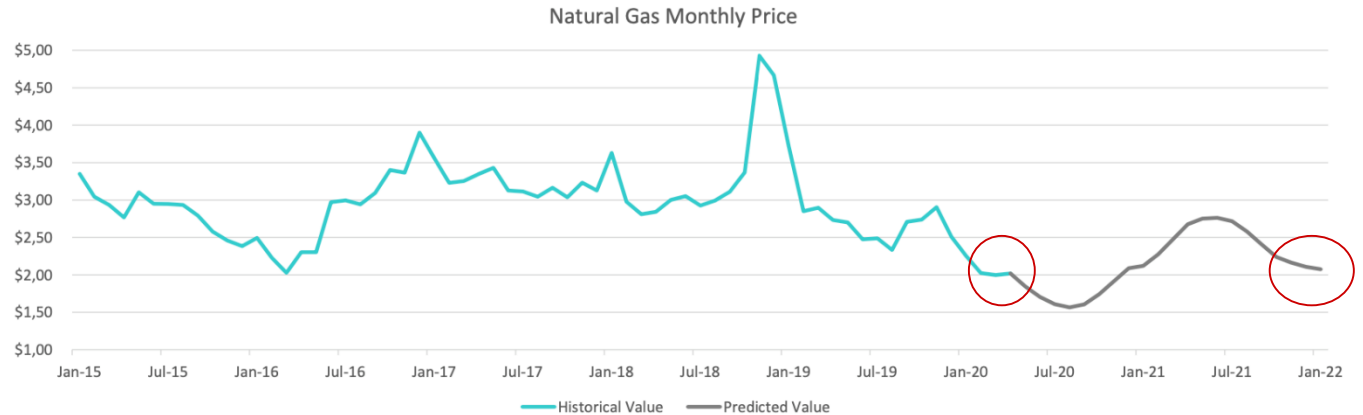


General Assessment of Crisis Global Effects (5)

Primary forecasting on the global macroeconomic outlook, commodities pricing and output is used to back more detailed and specific scenarios generation at business unit levels

Stage 2 Commodity Prices

Natural Gas Monthly Price

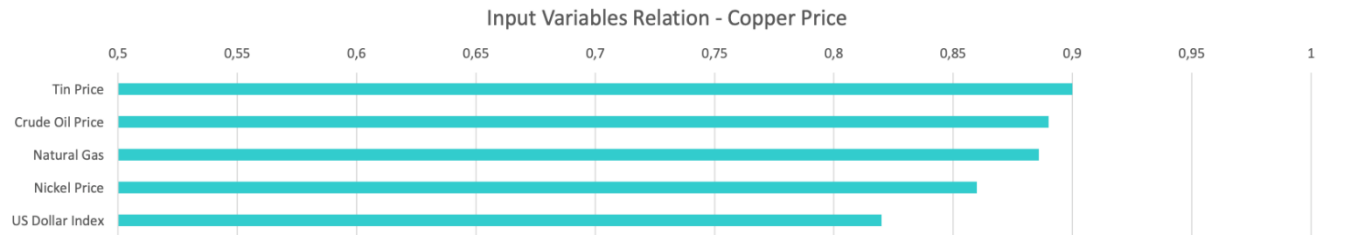
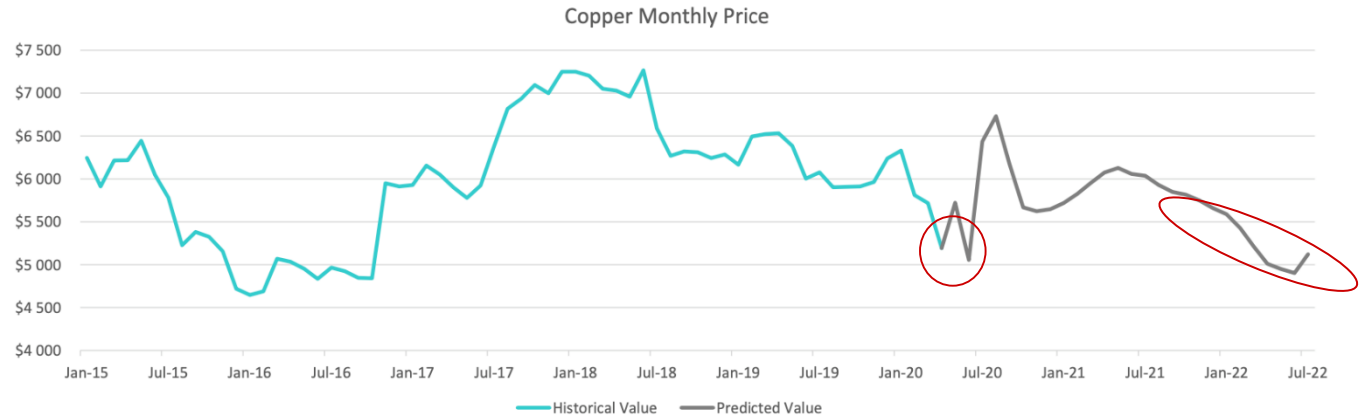


General Assessment of Crisis Global Effects (6)

Primary forecasting on the global macroeconomic outlook, commodities pricing and output is used to back more detailed and specific scenarios generation at business unit levels

Stage 2 Commodity Prices

Copper Monthly Price

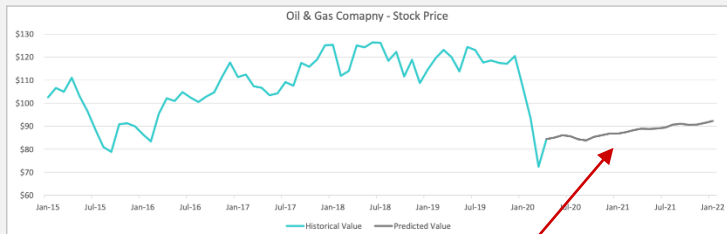


Case 1 – Oil and Gas Company

[ILLUSTRATIVE]

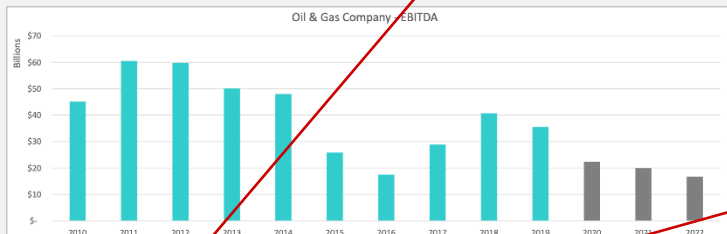
The framework aims to stress-test business units' financials and enable rapidly adjustments on capital investment decisions to preserve shareholder value in the long-term

Stock Prices

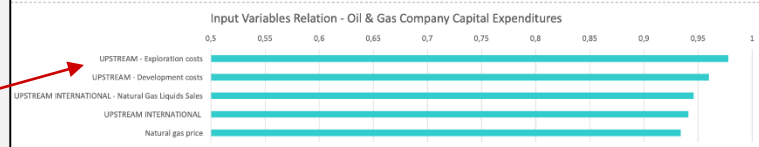
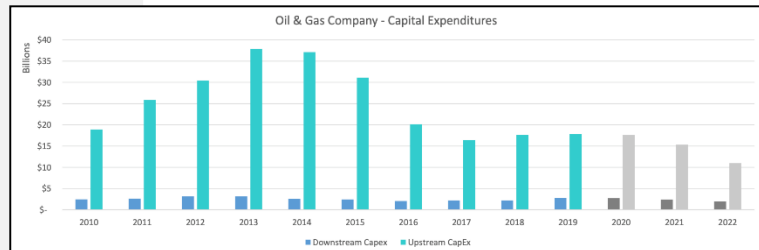


Data Modelling Breakdown (Capital Expenditures)

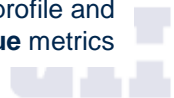
EBITDA



Data Modelling Breakdown (Capital Expenditures)



Data modelling creates a direct and natural correlation between capital spending profile and future shareholder value metrics

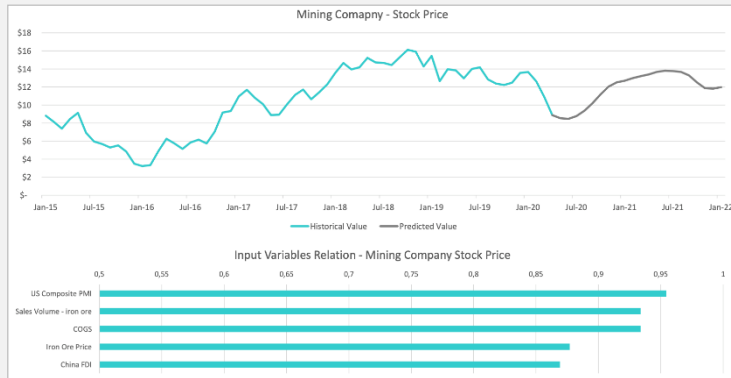


Case 2 – Mining Company

[ILLUSTRATIVE]

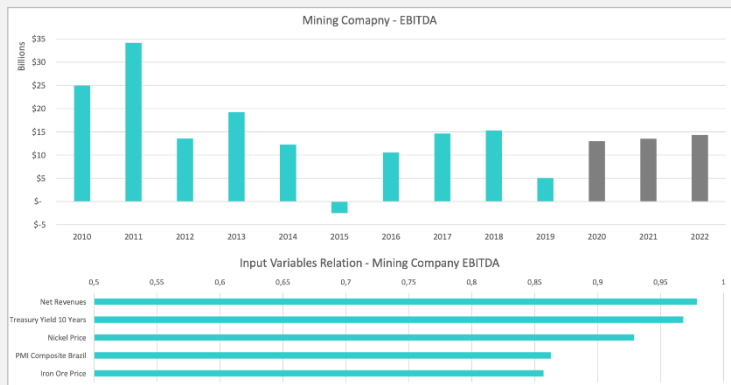
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Stock Prices

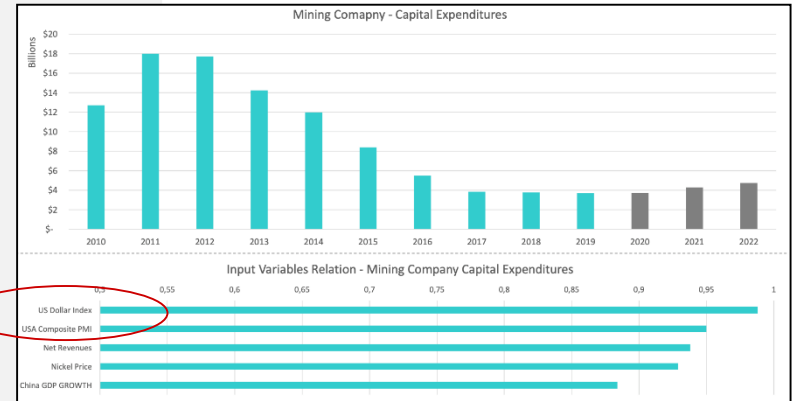


Data Modelling Breakdown (Capital Expenditures)

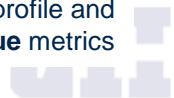
EBITDA



Data Modelling Breakdown (Capital Expenditures)



Data modelling creates a direct and natural correlation between capital spending profile and future **shareholder value** metrics

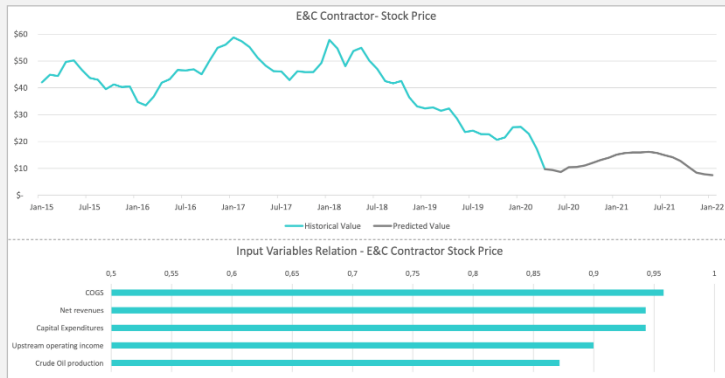


Case 3 – E&C Contractor

ILLUSTRATIVE

The framework aims to stress-test business units' financials and enable rapidly adjustments on capital investment decisions to preserve shareholder value in the long-term

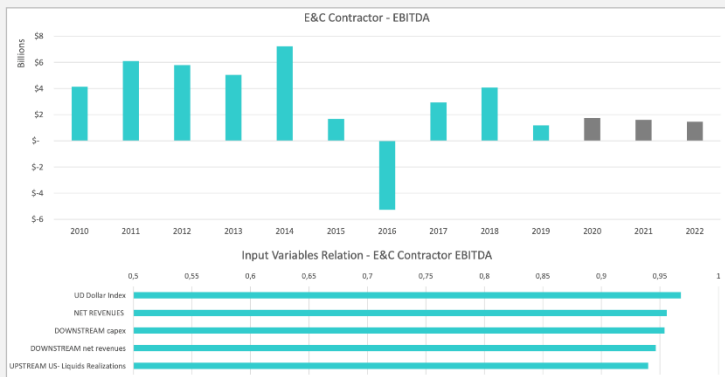
Stock Prices



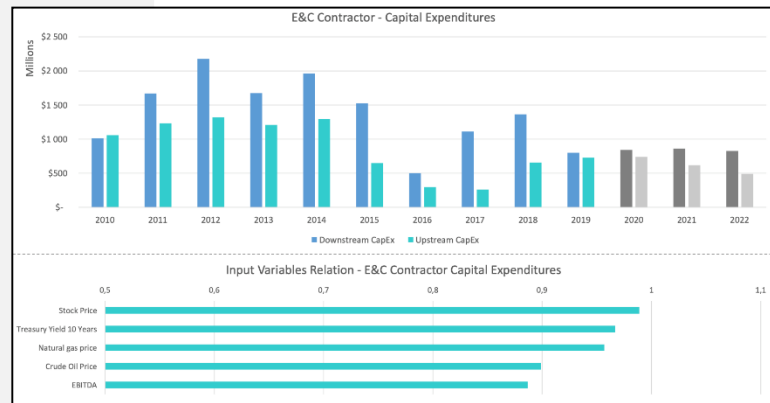
Data Modelling Breakdown (Capital Expenditures)



EBITDA



Data Modelling Breakdown (Capital Expenditures)

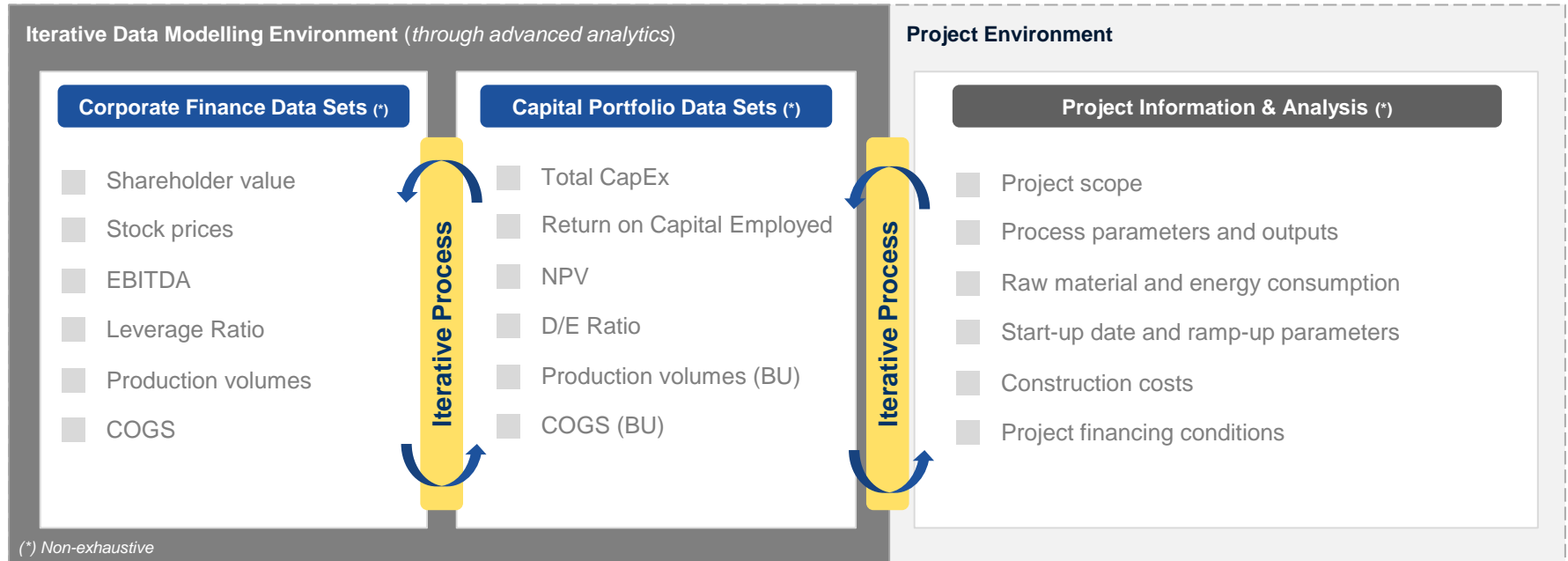


Data modelling creates a direct and natural correlation between capital spending profile and future shareholder value generation metrics



Reshaping Capital Portfolio According to the Scenarios

An iterative approach is used to reshape companies' capital portfolio according to the new required level of spending and test the potential impact of future projects on overall financial performance



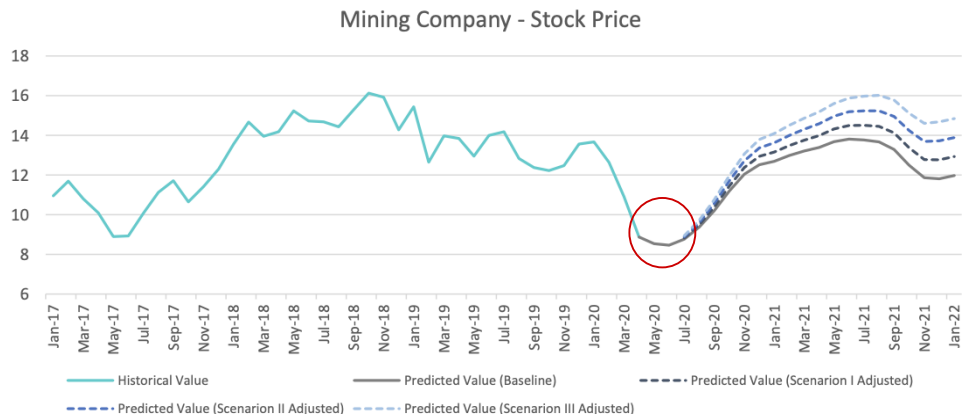
*“What if we adjust a project variable (eg.: process parameters)? **What will be the impact in company’s future financial projections?**”*



Reshaping Capital Portfolio According to the Scenarios (2)

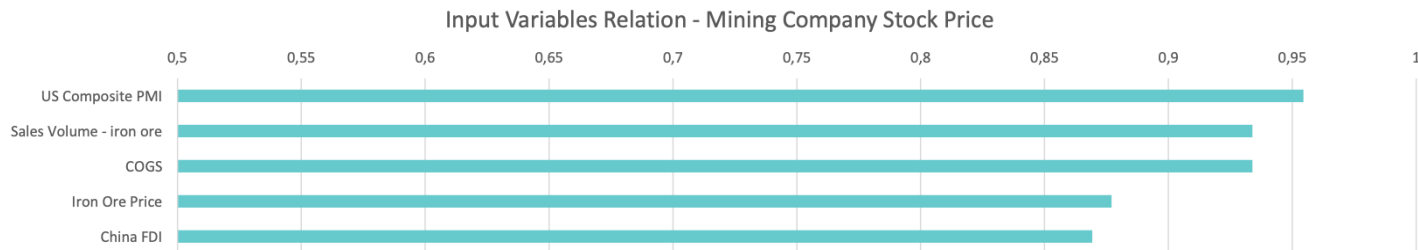
An iterative approach is used to reshape companies' capital portfolio according to the new required level of spending and test the potential impact of future projects on overall financial performance

"What-if" Scenario Example



Scenarios description:

- Scenario I: EBITDA increased by \$500 million
- Scenario II: EBITDA increased by \$1 billion
- Scenario III: EBITDA increased by \$1,5 billion



Restructuring Projects for an Updated Portfolio Strategy

Several actions shall be taken at project level to adapt for severe cash restrictions – however, some of them are also key to drive future project performance required on a potential economic rebound

Project Restructuring Roadmap


 Key actions

Cash Disbursement & Project Financing

- Review project cash flow according to updated project schedule
-  Seek for alternative funding sources
-  Renegotiate debt service payment schedule (eg.: project finance)
- Redesign project financial and non-financial guarantees




Project Design and Benefits

-  Proceed with design-to-capacity reviews
-  Process simplification and project descopeing
- Review of technology trade-offs studies
- Update value engineering analysis
- Proceed with energy optimization reviews
- Develop trade-off studies for detailed design changes vs. impact on construction




Construction & Commissioning Strategy

- Optimize onsite logistics and material storage during mothballing period
-  Review offsite construction and modularization alternatives + AWP
- Update Constructability Reviews and reassess construction methods
- Create fast-tracked commissioning schedules
- Review Staffing Plan



Construction Contracts

- Re-evaluate project contracting strategy
- Proceed with detailed due diligence on subcontractors financial strength
-  Review contract incentives and risk-sharing clauses
- Rebalance progressive payment terms
-  Create claims resolution board for rapid claim resolution



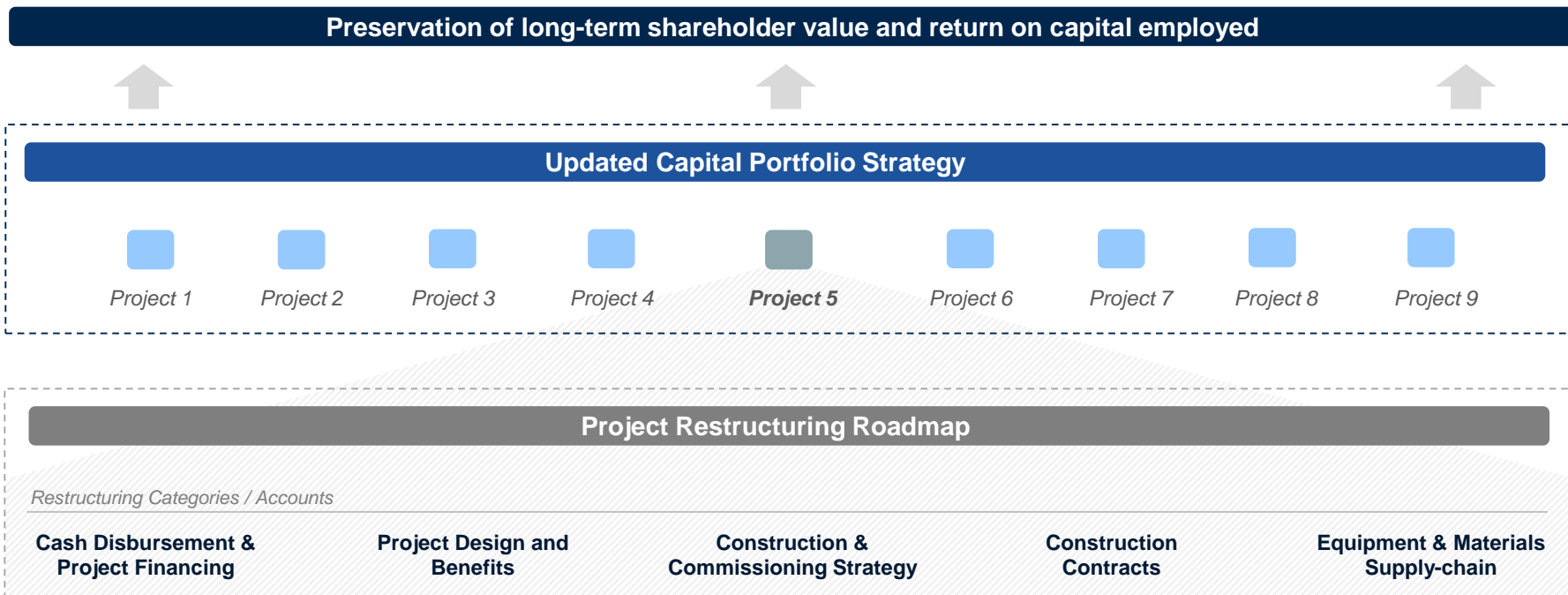
Equipment & Materials Supply-chain

- Re-evaluate project procurement strategy
-  Evaluate alternative material vendors
- Create alternative logistics plans
-  Create contingency plans for critical equipment and long lead items
- Proceed with detailed shop inspection on critical vendors
- Review incentives and progressive payment terms



Restructuring Projects for an Updated Portfolio Strategy (2)

Several actions shall be taken at project level to adapt for severe cash restrictions – however, some of them are also key to drive future project performance required on a potential economic rebound



Questions

Please submit your questions in the questions box.



Riz Shah, Managing Director
Alvarez & Marsal Infrastructure and Capital Projects
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carlo@neuro-data.com



About A&M: Global Reach & Operational Breadth

37 YEARS OF EXPERIENCE ACROSS 4 CONTINENTS



4,000+
PROFESSIONALS

500+
PRIVATE EQUITY SERVICES
PROFESSIONALS

20+ COUNTRIES

60+ OFFICES

The A&M Difference:

Solving complex problems is in our DNA. After 37 years of resolving some of the most urgent challenges in business history, we've honed critical expertise that clients at all levels of health can use to achieve rapid results.

Senior-level experts with deep industry experience. Our senior leaders, many of whom are former C-Level from industry, bring deep insight into the opportunities and challenges faced by businesses with practical approaches that work, versus theoretical approaches that fail.

Urgency for action and results. Our clients frequently comment that we drive change and rapid results where internal teams and other consultants have failed.

Objective and independent. With no audit conflicts, software to recommend, or projects to save, A&M offers objective, credible advice you can trust to be in your best interest, not ours.

Capital Projects

- Project Mgt
- Contractor Selection & Mgt
- Due Diligence
- Operating Models and Procedures
- Sourcing strategy and procurement
- Cash Mgt
- Capital structures
- Org design
- Contracting

Operations

- Assessment & Optimization
- Supply Chain
- Lean Six Sigma
- Organizational Transformation
- Process Transformation

Human Resource

- HR Operational Improvement
- Performance & Rewards
- Talent Management
- Change Management
- Program Management

Technology Services

- IT Transformation
- "Big Bet" Initiatives
- Merger Integration & Divestitures
- Executive Technology
- Advisory Services

Finance and Accounting

- Finance Strategy
- "Big Bet" Initiatives
- Finance & Accounting Ops
- Shared Services
- Treasury, Cash Mgt & Tax
- Accounting Advisory & Remediation
- SOX Readiness

Merger Integration

- Integration Strategy
- Plan & Execute Day 1 / 100 Day Goals

Strategy

- Corporate & Business Unit Strategy
- Operational Efficiency

