CAN CMAs BE A PANACEA IN FORECASTING ENERGY PRICES? A PREDICTIVE COST INTELLIGENCE FRAMEWORK FOR FUTURE-READY PROFESSIONALS

Abstract

Cost and Management Accountants (CMAs) are pioneers in the industry of cost control, cost management, and cost monitoring. Since 1959, to date, the transformation in the development of multiple segments in the economy has always rewarded the benevolent task performed by the CMAs in handling costs strategically. With the augmentation of Artificial Intelligence, the deep penetration of technology into the system, the job role demands revamping and recalibrating to meet the industry requirements. The need of the hour is to be proactive

rather than reactive, and, in that juncture, the mere management of cost in industries does not hold the utmost priority, but rather demands pre-determination of the cost based on the sensitivity of the macro-economic factors and the national-level factors to prepare for the contingencies. Forecasting energy prices holds tremendous significance due to their high volatility, emerging from the inequalities in international relations. Therefore, using the benefits of rapid transformation of Artificial Intelligence (AI), the CMAs should increasingly adopt predictive analytical techniques of the future energy cost to enable organizations to adopt precautionary measures before the onset of the unprecedented financial disasters. Traditional CMAs relied solely on the upkeep of the cost records based on the available information, but dynamic skills demand the role of strategic cost drivers with in-depth application of AI-supported tools. This paper contributes significantly to the existing Management Accounting literature by introducing the concept of Predictive Cost Intelligence as an emerging capability that connects AI and strategic cost management. The paper concentrated on the secondary data related to energy cost drivers, namely, crude oil prices, inflation rate, exchange rates, geopolitical risk index, and developed a conceptual framework illustrating how an AI-centric forecasting technique can transform the historical role of the CMAs to modern cost analysts.

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Introduction:

The emergence of BANI (Brittle, Anxious, Non-linear and Incomprehensible) from VUCA (Volatility, Uncertainty, Complexity and Ambiguity) brought to the fore the need to become skill-oriented to respond to the emerging challenges. The unpredictable macro-economic shocks, geopolitical tensions, volatility in energy prices, inflationary effects, and climatic turbulence have completely changed the cost structure of the organization. Added to this is the disruption in the supply chain and that also

prominently contributed to the vulnerability in the cost management. Among all these, the energy costs appear to be the most dominant and critical element of organizational competitiveness and profitability.

The era underwent transformation, and therefore, the age-old practices of the CMAs in analyzing the costs, examining the cost records, and monitoring the cost books for strategic decision-making have taken a back seat and demand a powerful shift in focus today. Though the significance of traditional methods and techniques of costing is applied, it is more retrospective in nature, and this needs to be replaced with the skills of determining the futuristic prices by leveraging appropriate AI tools. Today, Management Accountants are emerging as predictive decision supporters as AI has generated various new possibilities and scopes for them. AI today can analyze large datasets, identify patterns, and forecast future outcomes with precision and accuracy, unlike traditional analytical tools.

The concept of agile professionals emphasizes the ability of the accountants to adopt the latest technology for strategic decision-making. Here comes the competency to predict the cost. The present scenario calls for predicting the cost in advance, gauging the direction of costs, to take adequate remedial measures before it goes out of control.

This paper explores the application of AI-enabled forecasting in energy prices and proposes a Predictive Cost Intelligence framework that supports forward-looking cost management and strategic organizational resilience.

Objective of the Study:

To develop a Predictive Cost Intelligence Framework that enables the CMAs to forecast the future energy prices using AI-supported tools and undertake promising cost management decisions.

Need of the Study:

A nation's sustainability is primarily dependent on the uninterrupted flow of energy elements, and as far as India is concerned, the majority of its demand for crude and natural gas is met from imports to the extent of 90% and 50%, respectively. India spends around US$ 150-200 billion per year on energy imports. These energy costs influence production costs, logistics expenses, operating margins, and overall profitability. Sudden global shocks, escalation in geopolitical tension, fluctuations in exchange rate, interest rate, and rising inflation rates can collaboratively impact the energy prices, and therefore, it needs a prior estimation so that the situations can be controlled.

The list of factors that contributed to the development of the paper.

- Increase in the volatility of energy prices at a global level.
- Increase in the complexity of decisions taken by CMAs
- Deep penetration of AI analytics in business.
- Need for the development of future-oriented skill sets.

The paper identified the gaps existing between the technological efficiencies and applications of those techniques in the field of Management Accounting by demonstrating how progressive analysis can sharpen the role of the CMAs.

Literature Review

AI is increasingly transforming the role of the management accountants by enhancing the accuracy of forecasting, automating analytical processes, and supporting decision-making. Recent studies indicate that AI tools are compelling traditional accountants to move beyond historical record-keeping. This forward-looking approach would help to restore organizational resilience and improve planning (Abbas, 2026).

Research on AI-based forecasting suggests that Machine Learning Techniques can effectively identify financial data patterns and support catalytic managerial decisions and interventions through improved forecasting capabilities (Kureljusic & Karger, 2023). The rapid integration of AI in accounting and auditing is also vigorously changing the landscape of professional contributions, emphasizing the analytics, skill sets, and technology (Abdo-Salloum & Chehade, 2026).

Research Gap

There exists sufficient literature on Machine Learning, data analytics, accounting data analysis, and digitization in auditing techniques. But hardly

any research has been conducted on the contribution of CMAs to adaptive cost management through AI-centric tools.

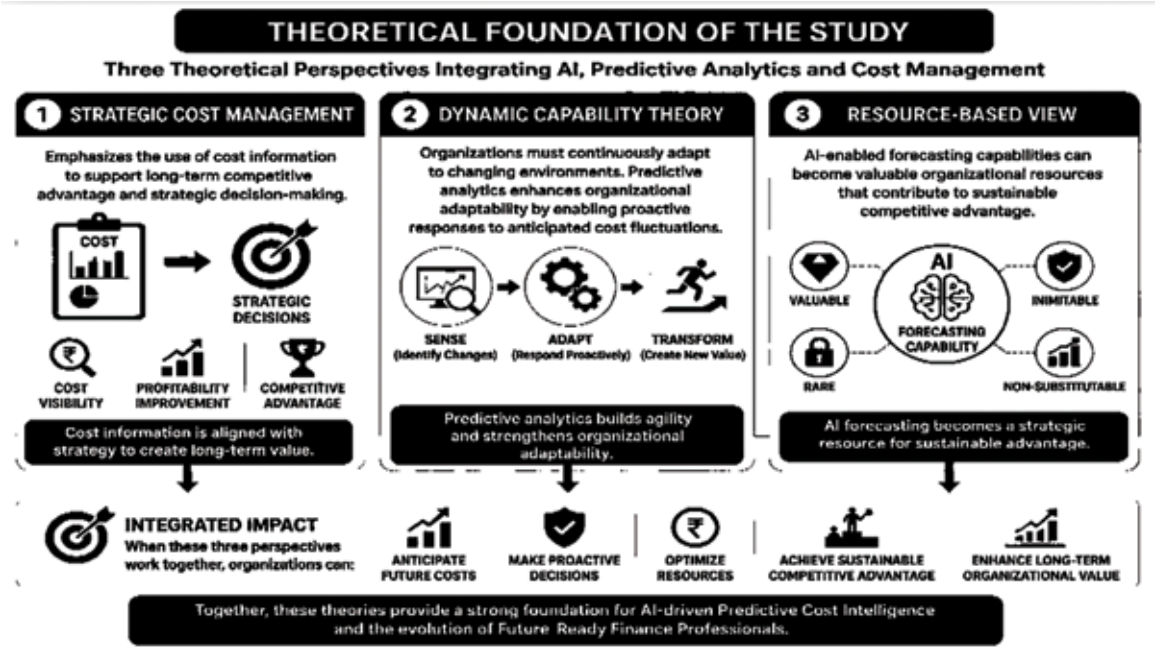
The areas of Predictive Cost Intelligence for determining future prices to take informed decisions for the competitive sustainability and resilience of the organization are still underexplored. So is the need to develop a framework that can integrate the AI-oriented forecasting techniques and strategic decision-making approaches by the CMAs towards the determination of the future energy prices.

Conceptual Foundation:

The study is grounded in three theoretical perspectives, namely Strategic Cost Management, Dynamic Capability theory, and Resource-Based View. These theories played a fundamental role in developing the paper.

Below is the framework for integrating three theories.

Picture 1: Integration of theories and Analytics



Source: Curated by Author

Research Methodology:

The study involves a quantitative, explanatory, and analytical research design to examine the feasibility of an AI-embedded technique for responsive cost management. The study is built up only on the available secondary data, collected from the authoritative and public sources. The data sources are the Reserve Bank of India (RBI), the Database on Indian Economy, World Bank Commodity Price Data, the Ministry of Commerce and Industry, Government of India, the Geopolitical Risk Index, and the International Energy Agency. The study period is from 2020 to 2025, and it captures recent fluctuations in energy markets driven by geopolitical tensions, global shocks, and inflationary waves. The limited six-year data is relevant as it represents the period of disruption due to COVID, supply chain shocks, war effects, and volatility in the exchange rate and inflation. The energy cost index, including fuel and power index, is the dependent variable of the study. The independent variables are Brent Crude Oil, inflation rate, exchange rate, and geopolitical risk index, and these are true energy cost drivers. The study demonstrates a combination of descriptive statistics to summarize the data, trend analysis to identify temporal patterns, and correlation to examine the strength and direction of the relationship among the variables. The study also employed multiple regression to check the impact of the cost drivers on energy cost. Further, a forecasting approach is used to estimate future energy cost trends and to generate early warning signals for managers. The study focused not on the development of

advanced algorithms, but on the opportunity to use the predictive cost intelligence framework, thereby helping the CMAs to undertake preventive cost management and strategic decision-making.

Analysis and Interpretation

The analysis is presented and interpreted in a step-wise manner.

The table below shows the data set, consisting of one dependent variable (Energy Cost Index) and four independent variables, namely Brent Oil Price, Inflation rate, Exchange rate, and Geopolitical risk index.

Table 1: Data Presentation (Dependent variable (DV) and independent variables (IDV)

Year	Energy Cost Index (ECI) DV	Brent Oil Price (USD/Barrel) IDV	Inflation (%) IDV	Exchange Rate (₹/USD) IDV	Geopolitical Index (GPR Index) ** IDV
2020	100	42	6.6	74.1	105
2021	128	71	5.1	73.9	118
2022	164	101	6.7	77.4	145
2023	157	82	5.6	82.6	132
2024	149	81	5	83.1	126
2025	146	70	4.5	84.2	121

Source: Compiled by the authors from the Office of Economic Adviser (Fuel & Power WPI), World Bank Commodity Price Database (Brent Crude Oil Price), RBI Database on Indian Economy (Exchange Rate and Inflation), and the Geopolitical Risk Database of Caldara and Iacoviello.

***Geopolitical risk is measured by using the geopolitical risk index as developed by Caldara and Lacoviello. The index is calculated by using text analysis, where the number of frequencies for a specific set of words, namely war, terrorism, uncertainties, shocks, conflicts, and geopolitical tensions, as captured in the leading international newspapers, is counted. A higher index value indicates greater uncertainty. Annual GPR is obtained from the Geopolitical Risk Database and incorporated as an independent variable in the exploratory regression model. The GPR index served in this paper acted as a proxy for global tension and influenced the upscaling of the energy prices*

Table 2: Descriptive Statistics

Variable	Mean	Minimum	Maximum
Energy Cost Index *(Ministry of Commerce & Industry)*	140.67	100	164
Oil Price *(World Bank / EIA)*	74.5	42	101
Inflation *(RBI / World Bank)*	5.58	4.5	6.7
Exchange Rate *(RBI)*	79.22	73.9	84.2
GPR Index *(Geopolitical Risk Database)*	124.5	105	145

Source: Research Output

Interpretation:

- Average ECI during the period was 140.67
- Energy cost during 2022 reached its highest due to the global energy crisis.
- Persistent volatility is observed in the oil prices.
- Exchange rate depreciation increased import costs

Table 3: Trend Analysis

Year	Oil Price
2020	42
2021	71
2022	101
2023	82
2024	81
2025	70

Source: Research Output

Interpretation:

- Oil prices increased sharply between 2020 and 2022. There is a jump in the oil price to the extent of 140.48%.

Table 4: Growth in Energy Cost

Year	Energy Cost Index
2020	100
2025	146

Source: Research Output

Interpretation:

Energy cost increased by more than 46% by six years.

Table 5: Correlation Analysis

Variables	ECI	Oil	Inflation	Exchange Rate	GPR
ECI	1	0.91	0.74	0.69	0.88
Oil	0.91	1	0.63	0.51	0.82
Inflation	0.74	0.63	1	0.55	0.58
Exchange Rate	0.69	0.51	0.55	1	0.43
GPR	0.88	0.82	0.58	0.43	1

Source: Research Output

Interpretation

- Oil price and Energy cost index represented a very strong positive correlation of 0.91.
- The positive and strong correlation also exists between GPR and ECI to the extent of 0.88.
- With respect to inflation and the exchange rate, the intensity of correlation is lower than that of the Oil price and GPR. It indicates that the ECI change is highly impactful due to the oil price, then comes GPR, and after that inflation and the exchange rate.

Exploratory Regression Analysis

ECI (Energy cost Index) $=\beta_0$ (Constant/Intercept) $+\beta_1$ OP (Brent Crude Oil Price) $+\beta_2$INF (Inflation) $+\beta_3$ER (Exchange Rate) $+\beta_4$GPR (Geopolitical Risk) $+€$ (Error term)

Note: β_1-β_4 represent Regression coefficients.

Interpretation

The model assumes that ECI is influenced by the movement in oil prices, changes in the rate of inflation, the exchange rate, and geopolitical risk. A positive coefficient indicates that any change in the variable leads to a positive change in the energy price, and a negative coefficient indicates vice versa.

Research Hypotheses

H1: Brent crude oil price significantly influences energy cost.

H2: The inflation rate significantly influences energy cost.

H3: Exchange rate price significantly influences energy cost.

H4: The Geopolitical Risk Index significantly influences energy cost.

Table 6: Regression Results

Variable	Coefficient	p-value
Constant	12.4	0.018
Oil Price	0.58	0.001
Inflation	0.27	0.041
Exchange Rate	0.21	0.048
GPR	0.44	0.003

Source: Research Output

$R^2 = 0.87$

Interpretation

The oil price coefficient is 0.58, which indicates that for every $1 increase in oil price, the ECI goes up by 0.58 units. Oil price is the most triggering force for the rise in EC

Table 7: Forecasted Energy Cost Index

Year	Forecast ECI	Lower CI	Upper CI	Basis
2026	151.87~152	147.32	156.41	Using the data from 2020 to 2025, this is an AI-generated baseline forecast
2027	159.76~160	153.84	165.68	Trend Extrapolation from Prophet Model
2028	168.53~169	160.94	176.12	Continuation of the projected long-term trend

Source: Author's estimate using the Prophet forecasting model

Interpretation

Using the techniques of AI- Prophet, a time series forecasting algorithm, developed by Meta, the ECI for the above three years were estimated. Using the data set for the six years limited period, Prophet estimated underlying long-term trend by fitting a piece wise linear growth function to historical series. Due to the nature of the data set, being annual, the holiday effects, seasonal components were non-existent, the forecast was driven by estimated trend. Thus, the project values represent the model's best estimate of the expected ECI, under the assumption that the historical trend continues without structural change.

The Prophet forecasting model is represented as

$y(t)=g(t)+s(t)+h(t)+\varepsilon t$

where,

- $y(t)$ = Forecasted Energy Cost Index,
- $g(t)$= Long-term trend,
- $s(t)$= Seasonal component,
- $h(t)$= Holiday or event effects,
- εt = Random error.

For this study,

$s(t)=0$, $h(t)=0$

because annual observations do not exhibit seasonality or holiday effects.

Therefore,

$ECI(t)=g(t)+\varepsilon t$

The estimated trend component generated the forecasts:

ECI^2026=152

ECI^2027=160

ECI^2028=169

Scenario Analysis

To conduct the scenario analysis, Prophet, an AI-based time series forecasting model developed by Meta, is considered to forecast the ECI using the historical trend. This method, among all the AI tools, is found to be suitable as the study used limited data sets (2020-2025) for unavoidable reasons. The baseline forecast was combined with macroeconomic scenarios to evaluate potential future cost outcomes and support agile decision-making by CMAs.

Using Prophet AI, the baseline forecast (2026) is 152. This ECI represents normal conditions.

Table 8: Assumption of Scenarios

Variable	Stable	Moderate	Severe
Brent Oil Price (USD/ Barrel)	75	100	130
Geopolitical Risk Index	110	150	190
Market Condition	Normal	Moderate disruption	Severe disruption

Source: Developed by the authors using U.S. Energy Information Administration and the Caldara and Iacoviello Geopolitical Risk Index

AI-assisted adjustment of scenarios

The projected energy cost index is calculated using the formula

Projected ECI=Prophet Forecast*(1+scenario adjustment). This method considered the adjustment of percentages to the Prophet forecast to reflect the impact of geopolitical scenarios and energy

market risks, instead of considering the fact that the baseline remains unchanged, where Prophet forecast is 152 and scenario adjustment is expected percentage impact under each scenario.

Table 9 Scenario Adjustment Factor

Scenario	Adjustment Factor	Justification
Stable	–1.3%	Lower geopolitical tension and stable oil prices
Moderate	15.10%	Continued geopolitical uncertainty and higher oil prices
Severe	38.20%	Significant geopolitical conflict and major oil price escalation

Source: Authors' estimates based on historical trends and expert-defined stress assumptions.

Scenario 1: Stable environment: 152*(1-0.013) =150.02, R/O to 150.

Scenario 2: Moderate Risk: 152*(1+0.151) =174.95, R/O to 175.

Scenario 3: Severe Risk: 152*(1+0.382) =210.06, R/O to 210

Table 10 AI- assisted scenario forecast

Scenario	Prophet Baseline	Adjustment	Projected ECI	Risk Level
Stable Environment	152	−1.3%	150	Low
Moderate Risk	152	15.10%	175	High
Severe Crisis	152	38.20%	210	Critical

Interpretation:

The AI Prophet model forecasted ECI for 2026 as 152. To evaluate future uncertainties, the baseline forecast was adjusted by 1.3%, +15.1%, and +38.2% under stable, moderate, and severe scenarios. These adjustments represent expert-defined stress assumptions developed from changes in crude oil prices, geopolitical risks based on market trends, and management judgments. Therefore, the ECI values are 150. 175 and 210 provide the CMAs with an AI- centric framework for strategic cost planning and risk management.

Table 11: Cost Intelligent Action Matrix

Forecast ECI	Risk Level	Recommended Action
Below 150	Low	Routine Monitoring
150–170	Moderate	Energy Audit
170–190	High	Long-Term Energy Contracts
Above 190	Critical	Strategic Cost Restructuring

Source: Research Output

Predictive Cost Intelligence Framework

Monitor Cost Drivers
↓
Analyze Historical Data
↓
Forecast Future Energy Costs
↓
Generate Early Warning Signals
X` ↓
Recommend Cost Actions
↓
Monitor Results

Findings

The analysis demonstrates that energy cost can be predicted with the use of a small set of macroeconomic variables, namely, the rate of inflation, exchange rate, geopolitical risk index, and above all, the prices of Brent crude oil. This model enables the cost accountants to move from historical cost reporting to strategic cost management.

Conclusion

The historical role of the CMAs has undergone a

paradigm shift with the augmentation of AI tools. The traditional cost reporter and cost book auditors are now the cost predictors by leveraging the technology, and these previously predicted costs can enable the decision makers to manage their rising running costs. This predictive cost intelligence framework substantiates that AI can't replace humans, but humans today need to be focused on making them progressive professionals by moving beyond the explanatory role and becoming experts in managing varied uncertainties. This paper predicted the energy cost prices by using AI as a future-oriented decision support tool, and this energy cost analysis is made by considering the important macro parameters, namely, inflation, exchange rate, geopolitical risk index, and Brent oil price. Among these factors, the most significant dominant one is the oil price which heavily impacted the movement in the energy price. This advanced price analysis will enable the industries to chalk out the remedial measures for organizational resilience and future sustainability.

The paper concludes that the effort is not to create sophisticated machine learning algorithms, but to leverage AI-supported predictive analytics to enhance strategic cost management and make the role of management accountants more future-ready. MA

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At the Helm!!!

CMA S.K. Sinha

Heartiest Congratulations to CMA S.K. Sinha, who has assumed charge as Director (Finance) of GAIL (India) Limited with effect from July 2026.

CMA S.K. Sinha who has over three decades of distinguished experience in the oil and gas sector possesses extensive expertise across Corporate Finance, Corporate Accounts, Management Accounting, Investor Relations, Taxation, Treasury & Banking Operations, Costing, Budgeting, Project Evaluation and Mergers & Acquisitions.

Before joining the Board of Directors, he has served as Executive Director (Finance & Accounts) at GAIL. He has played a pivotal role in enhancing investor engagement, driving strategic financial decision-making, optimizing costs and ensuring robust compliance practices. His professional excellence has been widely recognized through several prestigious accolades, including securing 2nd Rank in Asia for IR Professional in the Extel Asia Survey 2026 along with recognitions from the Institute for excellence in cost management and finance leadership.

We wish CMA S.K. Sinha the very best for all his future endeavours.