

# SUPPLYCHAIN

May/June 2024

## MANAGEMENT REVIEW

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revolution

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# Managing inflationary price risks in supplier-buyer contracts through indexing

By Sime Curkovic, Ph.D.

Research emphasizes the need for innovative supply chain and financial solutions, paving the way for the integration of technology to enhance operational efficiency and economic value.



Ongoing inflationary pressures have led both buyers and suppliers to adopt measures for sharing price risks through mechanisms like indexing and other economic adjustments within their contracts. This approach has become increasingly common across several industries, according to our research and other recent studies (i.e., World Commerce and Contracting, *The Impact of Inflation*, 2022). However, our research, which spans companies of various sizes in diverse sectors, reveals that there is a loss of economic value during the implementation phase, placing additional strain on supply chain and finance professionals. The management of indexing and financial economic adjustments requires significant manual effort, often involving the creation and maintenance of complex and error-prone spreadsheets.

To gather a holistic view of the impact of inflationary pressures on contractual price risk-sharing mechanisms and their effects on supply chain and financial management practices, we used a combination of research tools. We completed an exhaustive review of the academic literature and industry reports. The intersection of automation, economic adjustments, and price indexing in buyer-supplier contracts is a niche but crucial area for supply chain management and procurement efficiency. Direct studies focusing on automation specifically for economic adjustments and price indexing in contracts are very rare, but some research has highlighted the importance of integrating automation for optimizing procurement processes and dealing with price uncertainties.

Further, we conducted numerous in-depth interviews with supply chain managers at various managerial levels across several industries. We also administered surveys yielding a collection of both qualitative and quantitative data. Our research illuminates the pressing need for innovative solutions in the realm of supply chain and financial management, paving the way for a future where the integration of technology not only mitigates the challenges posed by inflation and contract complexities but also enhances operational efficiency and economic value across industries. In this study, we outline these challenges and propose potential technology-based solutions.

## What to do about inflation?

Inflation is becoming a permanent fixture in our economic landscape, driven by several consistent factors: ongoing supply chain disruptions dating back to the COVID pandemic, the heightened volatility in commodity and energy prices, and fundamental changes in labor markets. These inflationary challenges are set to pose significant hurdles for professionals in supply chain and finance. As we adapt to this new norm, the pressure from inflation is likely to intensify conflicts between buyers and suppliers.

However, strategic cooperation will emerge as essential for enduring supply chain resilience, emphasizing the shared management of inflationary risks between buyers and suppliers.

Acknowledging these emerging pressures, recent research highlights a tangible shift in how businesses are responding to inflationary challenges within their contractual agreements. For example, the aforementioned 2022 study by World Commerce & Contracting surveyed 443 participants from 23 industries and found that more than 70% of today's supplier contracts contain inflation-driven economic adjustment clauses, with price indexing being the most common.

The strategic value and benefits of indexing have been well documented, even before the COVID pandemic that has been a key driver to implement indexing. The 2016 Monitor Deloitte article titled *Index Based Pricing: Managing Risk and Profitability*, provides a good overview of strategic benefits and best practices. Our research shows that most of these are still relevant today, but so are many of the challenges and executional complexities mentioned, that still have not been solved by industry.

## Key elements of contracts with price indexing/economic adjustments

Contracts incorporating price indexing or economic adjustments are structured to align pricing with market variations. These contracts are anchored by an agreed upon, specific, recognized, and transparent index, or several indices, ensuring that economic adjustments are based on objective and reliable data. Selecting the appropriate index that would be agreeable to buyer and supplier, and would be relevant in terms of industry, geography, and timing, is a critical task. Contracts typically include a predefined formula for an economic adjustment calculation, utilizing one or multiple indices.

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The frequency of these calculations is clearly defined within the contract, normally ranging from monthly to annual intervals. Contracts may also feature more complex clauses for specific scenarios, such as trigger events, floors, ceilings, risk-sharing ratios, and conditions for price escalation or de-escalation. Common indices used in these contracts include commodity exchange market data, third-party pricing data services like S&P, Dow Jones, CRU, Argus, and a host of others, as well as government agencies such as the Bureau of Labor Statistics (BLS). These elements collectively ensure that pricing remains relevant and fair, adapting to market changes over the contract's duration.

## Key benefits of price indexing and economic adjustments

Price indexing, particularly in a risk-sharing context between buyers and suppliers, brings the key benefit of enhancing financial transparency that helps to safeguard profit margins. In terms of efficiency, this approach is more straightforward and less time-consuming than traditional annual pricing reviews, as index-linked adjustments can be automated, reducing the need for extensive meetings reliant on mutual goodwill. Furthermore, price indexing offers flexibility and adaptability, allowing for swift responses to market changes, ensuring that pricing remains fair and competitive in dynamic market environments. This method streamlines the pricing process, making it more efficient and responsive to market fluctuations (both up and down).

## Challenges of managing price indexing calculations

Price indexing in contracts presents several operational challenges, primarily due to the complexity of integrating multiple data sources that often have varying update schedules, use different units (such as pounds, tons, seconds, or hours), and may involve multiple currencies. Operational complexity increases with the ongoing collection of index data and other inputs required to conduct regular calculations that ensure that pricing remains current. Managing this process often involves extensive manual inputs, particularly into multiple massive spreadsheets and all their revisions. At the tail end of this process, auditing these formulas and their outcomes becomes a significant task, compounded by the potential

for errors and the need to integrate multiple formats of spreadsheets and timestamps. In addition, generating an accurate forecast of future pricing using a price indexing formula, is a separate effort and often more complex, as underlying forecast data typically updates more frequently than the frequency defined in the price indexing formula.

*(Following is an example of a price indexing formula, which highlights some of its potential complexities. The formula calculates the price of manufactured steel parts, as may be defined in a contract between buyer and supplier.)*

Cost calculation formula for manufactured steel parts, quarterly priced using a third party steel price index, a different third party steel scrap price index, and Bureau of Labor Statistics current employment statistics index.

$$P_n \text{ quarterly price} = W_1 A_n - W_2 C_n + t * L * D_n + E$$

The variables are as follows.

$W_1$ : weight of steel blank

$A_n$ : average of three monthly steel prices published towards the middle of each month by 3rd-party data service

$W_2$ : weight of scrap

$C_n$ : average of three monthly scrap steel prices published at the end of the month by another 3rd party data service

$t$ : processing time

$L$ : number of operators

$D_n$ : average of three monthly salary values published after the beginning of the each month (for the previous month) in BLS CES salary indices

$E$ : value adder

Ideally, both buyers and suppliers would perform the indexing calculation on a shared platform, but in most cases, each party will perform its own calculation. In some cases that came up in our research, only one of the parties (either buyer or supplier) performed the calculation and shared its outcomes with the other party. Additional complexities might arise from the real-world implementation of the above formula. These include:

1. An update of one or more of the indices may be delayed, or provided initially as an estimate.
2. Determining that a calculation is complete, given it has updates on all its inputs, requires a time stamp. If not implemented correctly, a

calculation may be deemed “current” despite waiting on input data.

3. Auditing the above calculation at a later date may be problematic if time stamps are not managed adequately.
4. In some cases, an adder or another parameter may be changed by buyer or supplier and agreed upon by the other party (over a phone call or email). In most cases, this would be captured as a note in a spreadsheet, but this may create confusion and errors. Creating a digital trail of such changes and their time stamps is a process that is often implemented by utilizing additional communication methods (emails, etc.), increasing the challenge of remaining compliant with agreed upon contractual terms.

### **Initial findings from our ongoing study**

WMU’s Supply Chain Management Center has been interviewing companies from different industries to understand how they implement indexing and economic adjustments, focusing on the real-world challenges of implementing such a methodology.

During our research on how companies handle price indexing and economic adjustment calculations, several common challenges have emerged, pointing toward potential areas for improvement. One notable issue is the lack of clear organizational ownership of these processes, leading to a disjointed approach and inefficiencies. This ambiguity often results in human errors and a lack of a proper audit trail, making it difficult to track changes and correct mistakes. The processes are also predominantly manual, consuming significant time and effort due to a lack of automation. This manual nature further contributes to limited collaboration and visibility across different departments, hindering effective communication and coordination. Additionally, scalability issues arise as businesses grow, with existing processes struggling to adapt to increased demand, often requiring additional human resources due to the manual nature of the operation.

Manual and labor-intensive operations will force supply chain and/or finance professionals to perform repetitive tasks that could be automated for much greater efficiency and accuracy, allowing employees to focus on more fulfilling work, which would be seen as a major positive in today’s workforce. Instead of gathering and

populating data within spreadsheets, such professionals could be providing highly valuable insights to support decision-making on timely strategic issues.

Data security and access control also remain concerning, as sensitive pricing information must be securely managed and appropriately accessed. In addition, limited integration with other business systems exacerbates these challenges, creating silos of information and hindering the efficient flow of data. Addressing these issues could significantly streamline the administration of price indexing and economic adjustments in various industries.

Also, we observed that pricing calculated by the buyer or supplier and communicated to the other party (for example, as quotes from a supplier, or in the form of a purchase order with updated pricing from the buyer) had calculated results that have not been agreed to or validated by the other party. Validating the other party’s calculation is often burdensome as well and could benefit from automation.

### **Work smart and be effective. How?**

Working smart and effectively can be achieved by leveraging technology to streamline business processes and automate repetitive tasks. Embrace cloud-based tools for storage, collaboration, and processing; their seamless integrations and remote access capabilities allow for maintaining work-life balance while not sacrificing productivity from any location. Start by identifying the key indices and data points your price indexing contract needs to track and then set up automated tools that will manage the process for you. The addition of AI large language models to automate the reading of proprietary internal data is also something that is being attempted.

There are various tools available that can automate the data collection, perform the calculation of these complex formulas based on their defined schedules or dependencies, enter the necessary time stamps, and disseminate the results to relevant stakeholders. This can be done down to each part number and/or assembly of parts, with available “drill down” tools to evaluate each calculation with its components and inputs. Such tools make use of data visualization, which is invaluable in simplifying the understanding and communication of complex data sets, transforming raw data into clear, actionable insights. By adopting such an automation strategy, you can enhance

FIGURE 1

## Trailing quarter average of COMEX aluminum with COMEX aluminum MW U.S. transaction premium

Quarterly price, USD per lb., forecast available. Value is indexed using trailing quarter's averages of COMEX aluminum futures with COMEX aluminum MW U.S. transaction premium platts (25MT) futures contracts' closing prices.

Description:  $P_n = X_n / K + Y_n$

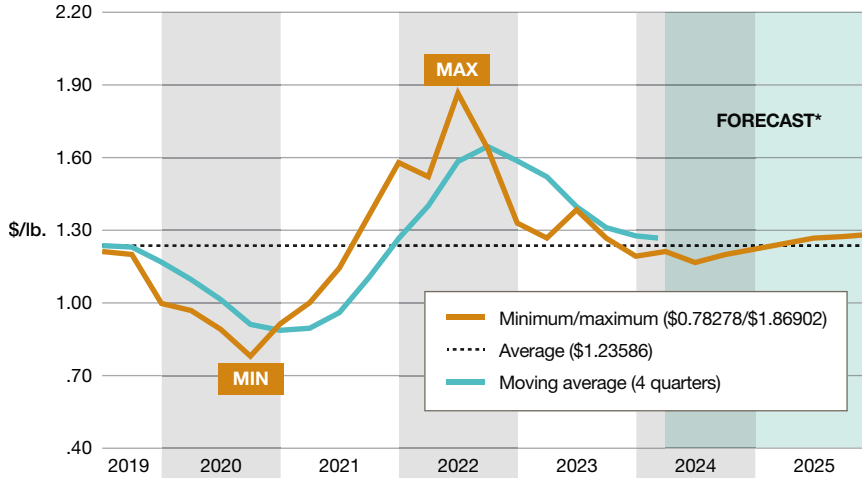
Overview: 5 years

Interval: Quarterly

Time zone: CST

The price change over the selected period of 5 years is **-0.00932 (-0.77%)** from **\$1.21766** to **\$1.20834**

The current price of **\$1.20834** is lower by **0.02752 (2.23%)** than the average price of **\$1.23586** in the last 5 years



\* Forecast as of 03/08/2024 3:10 CST

Source: N-Alpha's MaterialX platform

FIGURE 2

## Aluminum fender 9" x 72" x 20"

Indexed using COMEX aluminum and U.S. MW premium trailing quarter average price

Description:  $P_n = 7.6^* (X_n^* (1 - 0.02) + 5.05)$

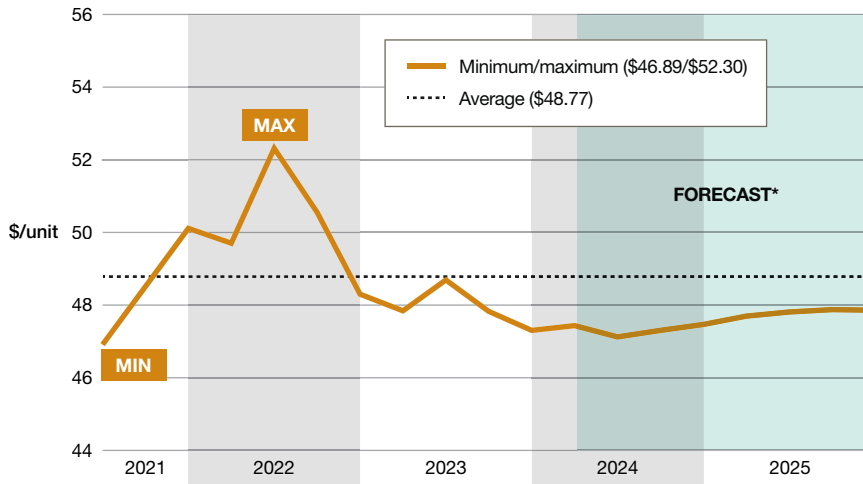
Overview: 3 years

Interval: Quarterly

Time zone: CST

The price change over the selected period of 3 years is **+0.49 (+1.05%)** from **\$46.89** to **\$47.38**

The current price of **\$47.38** is lower by **1.39 (2.86%)** than the average price of **\$48.77** in the last 3 years



\* Forecast as of 03/08/2024 3:10 CST

Source: N-Alpha's MaterialX platform

efficiency and focus on more strategic tasks.

One such software tool that has been made available to our Supply Chain Management program at WMU is N-Alpha's MaterialX platform. The platform provides connectivity to multiple data sources and a "formula engine" that allows it to tie formulas to their data sources and provide the necessary time stamps and outputs on an automated basis throughout the full lifecycle of indexed supplier-buyer contracts. In essence, spreadsheets are unnecessary to obtain the calculated "quarterly price per part" or any set of parts, relying on an underlying formula infrastructure that updates automatically with the publication of pricing data. (See Figures 1 and 2.)

Forward-thinking organizations should strive toward protecting the value created by indexing by implementing automated processes and strategies that perform the basic functionality while minimizing manual effort and the potential for errors. Their ability to pinpoint erroneous calculations and their sources in a timely manner, and the ability to audit such calculations, should allow such organizations to recover error-driven costs and comply with their costing and pricing objectives.

## What we teach at WMU

Our students are going into a job market that is in most cases inundated with outdated tools and processes. Manual and labor-intensive operations will force our graduates to spend hours every week doing repetitive tasks that could be automated for much greater efficiency and accuracy, allowing them to focus on more fulfilling work. Much of their time will be spent on gathering and managing data, while much less will be spent analyzing and providing insights to support strategic decision-making, which carries much more value.

Traditionally, we have worked very hard to help our students develop very sophisticated data analytics skill sets to manage very large and complicated forms of information, but there seems to be a mismatch between the potential for our students to implement their skills in the job market and the realities that they face at their workplaces. For example, employers told us they place a premium on the following data-related skill sets (of which are built into our Business Analytics minor curriculum):

1. advanced Excel (power query & pivot) & macros;
2. data visualization (Tableau, Power BI & python w/ seaborn & matplotlib);

3. data mining/RapidMiner, machine learning and data science;
4. Python and Jupyter notebook (data analytics and statistical libraries such as pandas, numpy);
5. relational data models (Excel data model); and
6. graphic and statistical libraries (Seaborn, Matplotlib, Pandas, and Plotly).

While some of these capabilities can be seen as advanced, in reality, many current processes are based on partial data, spreadsheets, and email threads. There are alternatives rooted in technology that will allow for doing things better, faster, and more cost-effectively from an operational perspective.

When we asked many former students what the most prevalent technologies they used in their supply chain and business roles, the two most common answers were Excel spreadsheets and email. In fact, with all the innovation that has been taking place in information technology, Excel spreadsheets seem to be the one tool that is used predominantly in most companies—from the largest to the smallest.

Our research shows that many hiring managers do not have a full understanding of the required skill sets associated with our graduating students, and how they may be utilized optimally to serve the organizations that they'll enter. Our business students told us many times that their hiring managers valued only their traditional Excel capabilities (i.e., lookup functions, pivot tables, etc.), as they were hired by specific skill sets. Hiring managers greatly overlook the opportunities brought by critical thinking and incorporating additional analytical solutions (which are skill sets that many of our students possess). This makes it a bit difficult to sell the analytical techniques taught in classes that go beyond our Advanced Excel and Predictive Analytics courses.

Hopefully we do a better job of training our students to promote and prove their analytics and process development skills, and managers become more open to embracing the benefits of such processes and process automation (which may require a culture change in many organizations). Embracing and trying new technologies requires leadership that is willing to try new things and commit to their implementation. Otherwise, we keep using spreadsheets and email to manage very large and complicated data sets, which often presents challenges when scaling and growing businesses. •



# Managing Price Risk in Buyer-Supplier Contracts Through Indexing



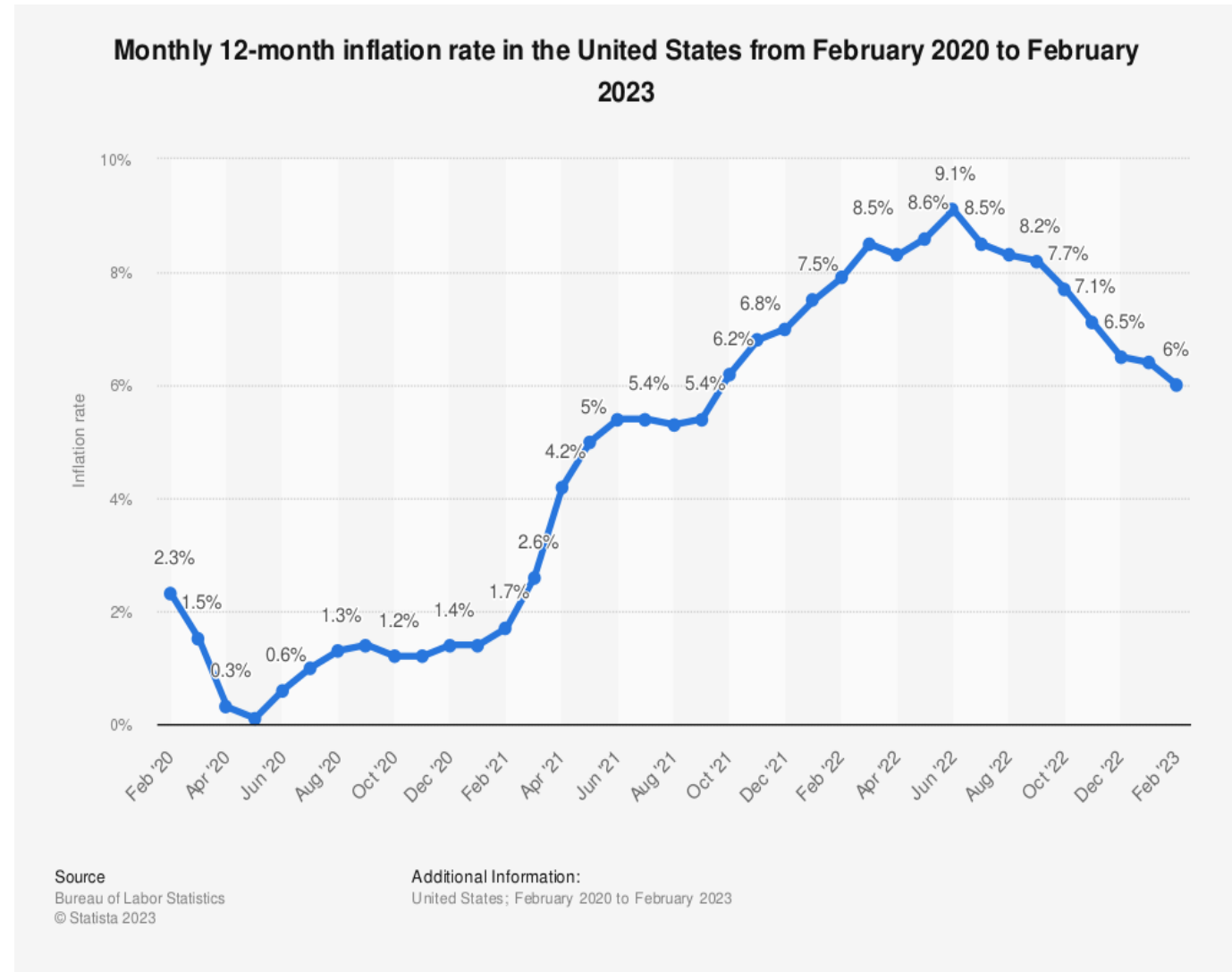
*Professor Sime (Sheema) Curkovic (Western Michigan University)*





# Inflationary Times Are Here to Stay

- Supply chain disruptions seem to be persistent since the pandemic
- Increased volatility of commodity and energy costs
- Structural shifts in labor markets
- Inflation woes will remain a key challenge for supply chain professionals moving forward



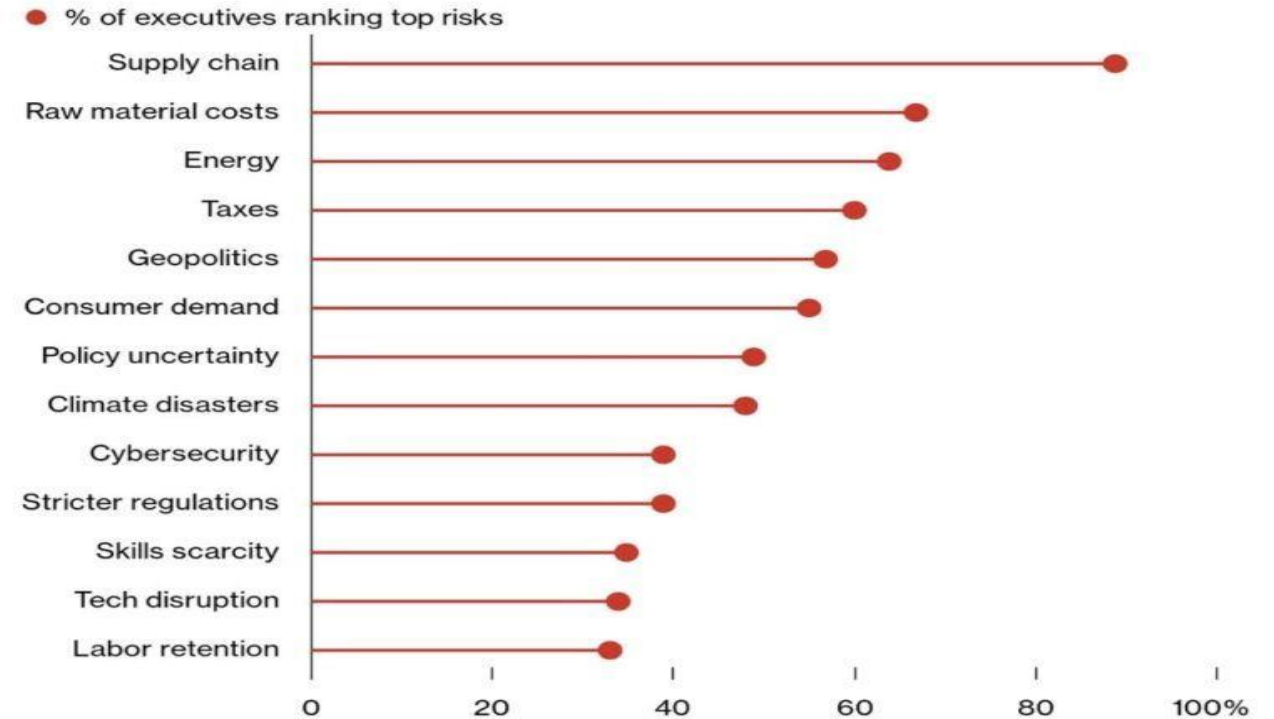


# Adjusting to a New Reality

- Inflationary pressures generate increased tensions between buyers and sellers
- Collaboration and strategic partnering are viewed as a necessity for long term supply chain resilience, where buyers and sellers share inflationary risks

## Still a Top Concern

Supply chains are still the top concern for firms over the next 18 months



Source: Capgemini Research Institute

Bloomberg

Capgemini Research Institute 2023

<https://prod.ucwe.capgemini.com/wp-content/uploads/2023/01/Final-Web-Version-Report-Davos-2023.pdf>

# World C&C Study (July 2022)



 World Commerce  
& Contracting

443 participants, 23 industries, key finding:

- Survey respondents indicated that 70% of new supplier agreements contain inflation driven economic adjustment clauses with the use of indices being the most common.
- Link to study: <https://www.worldcc.com/the-impact-of-inflation>





# Benefits of Price Indexing

- Risk sharing between buyers and sellers
- Increased transparency towards financial planning, where price adjustment clauses take into consideration cost structures and protecting profit margins
- Index-linked pricing adjustments are definitive and can be automated, as opposed to annual reviews that often require multiple meetings and rely on mutual goodwill
- Solution offers flexibility and adaptability

# Key Aspects of Contracts with Price Indexing / Economic Adjustments



- The contract adjusts prices based on changes to a specific, recognized and transparent index
- The contract includes a pre-defined price adjustment formula using an index or multiple indices
- The frequency of the indexing calculation is defined (monthly, quarterly, semi-annual, annual, etc.)
- Additional clauses may be added: trigger event, floors, ceilings, risk sharing ratios, escalation / de-escalation conditions
- Common indices used for price indexing:
  - Commodity exchange data
  - 3<sup>rd</sup> party pricing services: S&P, Dow Jones, CRU, Argus, Fastmarkets, etc.
  - Government agencies: Bureau of Labor Statistics (BLS), Energy Information Administration (EIA), US Department of Agriculture (USDA)



# Indexing Based Contracts – Example 1

## Supplier Agreement with Quarterly Price Adjustment using Labor and Commodity Bureau of Labor Statistics (BLS) Producer Price Index (PPI)

$P_0$  is a Base price for January 2017

$X_0$  is taken from a labor index: BLS CEU (current employment, manufacturing) index for 12/2016

$Y_0$  is taken from a commodity index: BLS WPU (all commodities) index for 12/2016

Step 1:  $F_n$  is an unadjusted price  $F_n = P_0 \left( 20\% + 35\% \frac{X_n}{X_0} + 45\% \frac{Y_n}{Y_0} \right)$

$X_n$  is the average of the BLS CEU indices for the previous quarter

$Y_n$  is the average of the BLS WPU indices for the previous quarter

Step 2: Adjustment: Sharing the risk in case of large change vs. previous quarter Price,  $P_{n-1}$

$P_n$  - Adjusted Price:

- if the change between  $F_n$  and  $P_{n-1}$  is between -3% and +3% then  $P_n = F_n$  : use the unadjusted price
- if the change between  $F_n$  and  $P_{n-1}$  is between -6% and -3% then  $P_n = 97\%P_{n-1}$
- if the change between  $F_n$  and  $P_{n-1}$  is between +3% and +6% then  $P_n = 103\%P_{n-1}$
- if the change between  $F_n$  and  $P_{n-1}$  is greater than 6% split the remainder evenly
- if the change between  $F_n$  and  $P_{n-1}$  is smaller than -6% split the remainder evenly



# Indexing Based Contracts – Example 2

Cost Calculation for Manufactured Steel Part Monthly Indexed Price using 3<sup>rd</sup> party steel price index, 3<sup>rd</sup> party steel scrap price index, and BLS CEU

$$P_n \text{ monthly Price} = X_n + Y_n + Z_n$$

$X_n$  material cost,  $Y_n$  insourced cost (manufacturing process),  $Z_n$  outsourced cost (packaging, transportation, etc.)

Material cost formula:

$$X_n = W_1 A_n - W_2 C_n$$

$W_1$  part weight,  $A_n$  raw material 2<sup>nd</sup> Wednesday price by steel price index

$W_2$  scrap weight,  $C_n$  scrap material end of month price by scrap price index

Insourced cost formula:

$$Y_n = t(C + L * D_n)(1 + M)$$

$t$  processing time,  $C$  machine burden rate,  $L$  number of operators,

$D_n$  average of the BLS CEU indices for the previous 6 months,

$M$  markup percent (including SG&A)

Outsourced cost:  $Z_n$



# Price Indexing Challenges

- Incorporate multiple data services as inputs – each of which has its own frequency for pricing; different units that take part in the formulas {lb., short ton, metric ton}, {seconds, hours}; multiple currencies, etc.
- Selecting the correct index and relevance in terms of industry, geography, and schedule
- Ongoing collection of index and other inputs and consequent calculations of pricing to remain up-to-date (complexity and administration)
- Extensive manual labor to manage multiple spreadsheets
- Auditing of formulas and their outcomes (different users, errors)
- Managing timestamps
- Accurately forecasting future pricing trends can still be challenging





# Ongoing Study by Western Michigan University's SCM Program

- Studying how companies in different industries administer indexing and economic adjustments, their challenges, and how such processes may be improved
- Initial findings:
  - Organizational ownership of process is not well defined
  - Human error, lack of audit trail
  - Lack of automation, requiring sufficient time and manual effort
  - Limited collaboration and visibility
  - Scalability issues
  - Data security and access control
  - Limited integration
- You are invited to join our study
- Software tools will be provided to evaluate how companies may implement business process automation, for example → Technology Demo...



# Thank You!

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# Some Practices that Can Make Your Commodity Related Supply Chain Job More Fun and Rewarding (\$\$\$)



# Let automated tools do the work for you

It's 2023, SCM commodity tracking, indexing, and price analysis do not have to largely consist of manually driven spreadsheets.

Become recognized for your knowledge and insights that drive strategy, not for menial tactical work.

[YOU ARE HERE](#) > [Browse](#) > [Formulas](#) >

## Pricing Formula for Aluminum Parts

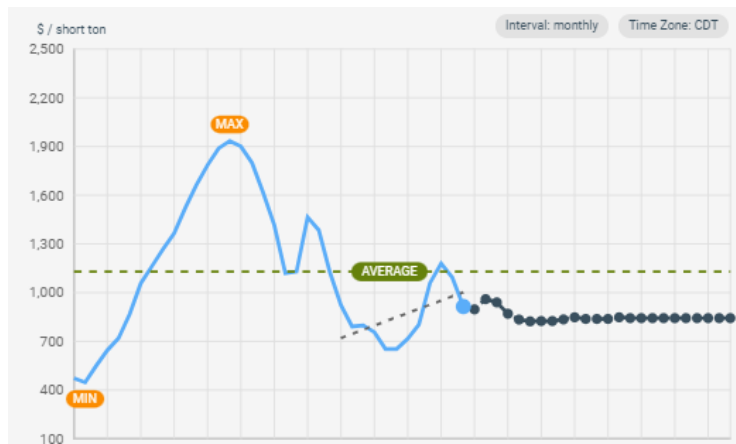
Pricing formula for parts manufactured using Aluminum purchased from multiple suppliers. Quarterly price for aluminum part, USD per unit, forecast available. Price is indexed using average of previous quarter's LME Aluminum with US Midwest Premium futures contracts closing prices. Forecasts available, updated on a monthly basis using published prices and price curves by the LME.

Description					
$P_n = W * ( X_n / K * ( 1 - D ) + C )$					
Name	Definition	Type	Value	Last Update	
<b>P<sub>n</sub></b>	Price	Calculated price for quarter n (USD / unit)	result		01/03/2022 2:21 PM
<b>W</b>	Weight		parameter		07/13/2023 4:25 PM
<b>X<sub>n</sub></b>	Trailing Quarter Average Price	Calculated for quarter n, average of trailing quarter's LME Aluminum with US Midwest Premium (USD / metric ton)	formula		01/03/2022 2:21 PM
<b>K</b>	Unit Conversion Factor	From metric ton to lb	constant	2204.62	01/03/2022 2:21 PM
<b>D</b>	Discount (%)		parameter		07/13/2023 4:25 PM
<b>C</b>	Value-Add Adjustment	Annually fixed value-add adjustment (USD / lb)	parameter		07/13/2023 4:25 PM

Parts								
Name	S/N	Price (P <sub>n</sub> )	Price Change	Price Change (%)	Weight (W)	Discount (%) (D)	Value-Add Adjustment (C)	Last Update
<a href="#">Aluminum Part 1</a>	ALP1001	\$5.545	-0.363	-6.14%	3.9204 lbs	4%	\$0.185	06/30/2023 11:00 PM
<a href="#">Aluminum Part 2</a>	ALP1002	\$6.707	-0.434	-6.08%	4.6882 lbs	4%	\$0.201	06/30/2023 11:00 PM

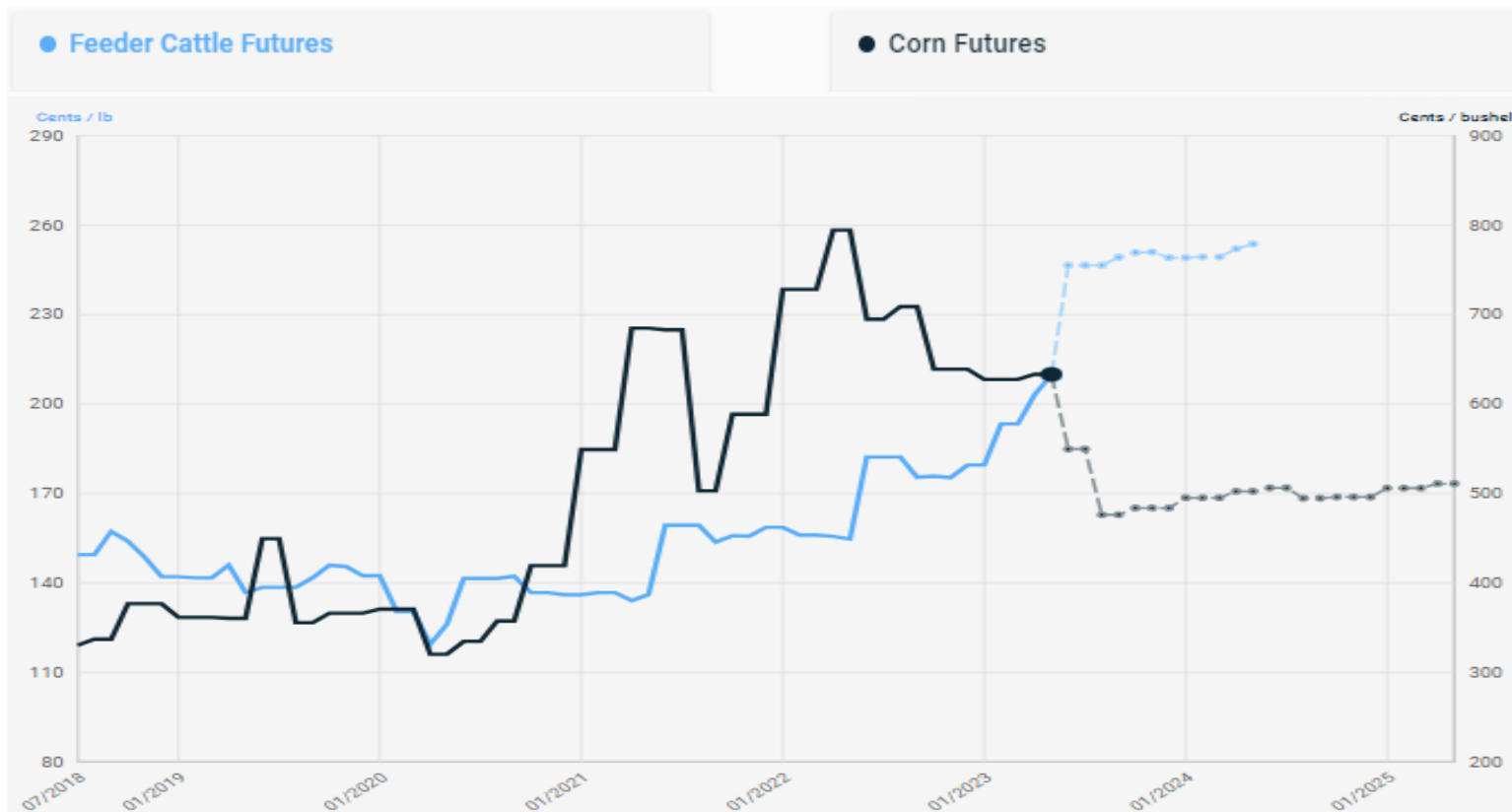
## Always be ready to intelligently address C-suite questions like:

"How do you leverage data analytics in your forecasting process? Do you have techniques to measure the accuracy of your forecast? How often do you review your forecasts and adjust your plans accordingly?"



"What tools or software do you use to track price trends? How do you communicate changes in price trends to other departments or stakeholders?"

## Communicate visual & insightful information by using interactive data tools



Present data to your org in a collaborative and understandable way. Your peers will appreciate and recognize you for making your understandable insights accessible to them.

Engage your team by incorporating dynamic charts, graphs, or dashboards. These tools can help your peers interact with the data & draw their own conclusions.

# Solicit feedback and insights from others in your “community”

Establish yourself as a mentor and as someone that would like to be mentored (i.e., stay in touch w/ your professors & PLEASE fill out their research surveys).

Share key insights on social media (i.e., LinkedIn). In other words, secure future personal growth opportunities.

Update your LinkedIn profile, share your accomplishments, and engage with posts by others. A strong online presence can attract potential employers and open doors to new opportunities.



My team often utilizes oil forward price curves in our polymers (PP) purchase planning considerations. We understood the importance of understanding how accurate these forecasts are, and have recently started using analytics ...see more



## Work smart and be effective. How?

Figure out what you need to track. Set up your tools to do the tracking for you.

Automate repetitive tasks where possible (i.e., buyer-supplier price indexing formulas). There are tools available that can help automate these tasks.

Use cloud-based tools for storage, collaboration, and processing. They often offer seamless integrations and allow you to work from anywhere (i.e., remote work/WLB).

Utilize data visualization tools to better understand & communicate complex data sets.

**Add Alert**

Set the alert parameters. The condition is evaluated using the end of day price. If triggered, email notification will be sent.

Delivery: Dec 23

Current Price: 828 \$ / short ton

Specific delivery

Threshold Type: Percent change

Percent Change (+/-): -10 %

Threshold Value: 745.2 \$ / short ton

Only Once  Every Time

Cancel Create



We are doing our best to prepare students to thrive in today's economy by teaching everything on the previous slides.

Please share more ideas if you have them.

\* All sample images in this presentation were taken from Materialx, a [N-Alpha](#) software service that we've been using in the WMU SCM program for training and research. We are always grateful to our supply chain technology partners. Thank you.

