Integrating student projects with real-world problems: the case of managing commodity price risk

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Abstract
Purpose – In this article, the authors aim to describe an approach used in a purchasing/supply management course at their university that provides students with a realistic, problem-based learning experience with client involvement while maintaining consistent learning outcomes and a manageable faculty workload term after term. Students use a standardized approach to assess commodity price risk and decide upon an effective risk management strategy. The specific commodity that students analyze is selected by client companies who then actively participate in the course.
Design/methodology/approach – An illustrative case is presented describing how universities can partner with companies to integrate student projects into the curriculum using a standardized, repeatable process.
Findings – There are numerous benefits obtained for students, faculty, universities, and companies when engaging in commodity price analysis and risk management projects. These include the applied learning for students, providing new insights to companies, networking opportunities for students and companies that may lead to hiring, fostering closer relationships between universities and companies, providing research contacts and opportunities, and ensuring that the course is repeatable each semester.
Originality/value – The authors' approach capitalizes on the realism of client involvement while reducing the variation in learning outcomes and increased workload introduced by doing different types of client-based company projects each term.

Keywords Client-based projects, Commodity price volatility, Price risk, Company partnerships, Case studies, Prices, Commodity markets, Students

Paper type Case study

Introduction

Supply chain management is an applied academic discipline in which its learning is enhanced by understanding, dissecting, and analyzing real-world problems to improve business practice. Scholars suggest that to create a more effective learning experience and to better prepare students for success in supply chain careers teaching approaches should more closely emulate the business environment (e.g. van Hoek, 2001; West, 2011; Brandon-Jones *et al.* 2012). Approaches such as guest lectures, traditional written cases, research projects, business simulations, and client-based company projects (sometimes referred to as live cases) introduce realism into the classroom to varying degrees. Of these approaches, client-based company projects introduce the most realism but have some major drawbacks such as difficulty in finding willing clients, the large amount of faculty time needed for planning and coaching, and unpredictable, variable learning outcomes (Elam and Spotts, 2004; Lopez and Lee, 2005; West, 2011).

In this article, we describe an approach used in a purchasing/supply management course at our university that provides students with a realistic, problem-based learning experience with client involvement while maintaining consistent learning outcomes and a manageable faculty workload term after term. Students use a standardized approach to assess commodity price risk and decide on an effective risk management strategy. The specific commodity that students analyze is selected by client companies who then actively participate in the course. Although commodity research projects are used in supply management courses by other universities, to our knowledge client companies do not usually participate in those classes. van Hoek (2001) highlights the need for both research and market based skill development and describes the use of research projects and short client-based projects within a single course. Our approach builds on and extends the approach which van Hoek (2001) suggests by combining research and client-based company involvement within a single-project. Further, our

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approach capitalizes on the realism of client involvement while reducing the variation in learning outcomes and increased workload introduced by doing different types of projects each term.

This paper begins with a brief review of prior research investigating the relationship between industry and academe in client-based projects. Then, the curriculum of Bowling Green State University's undergraduate supply chain management program, and how the study of commodity price volatility and risk management fits within this program are explained. Next, we describe the overall process for teaching students how to assess volatility and identify commodity price risk management strategies. From this background we discuss how this process has been used with five different commodities at three companies and the benefits for students, the companies, the university, and faculty.

Relating industry and academe

Having a strong link between academia and the business community is vital to the growth of relevant scholarly research that enhances corporate success and enriches the education of students preparing to enter the workforce. Unfortunately though, in some instances there is still a divide between what students experience in the classroom and what companies need from new employees entering into the field of business. As stated by Bennis and O'Toole (2005), the driver behind this has been a change in the way business education has been taught over the past half century, with scholars providing research and teaching rooted in a "scientific model" similar to that of chemistry or geology that is very academic and theory based, as opposed to more practical and engaged research that addresses real business situations relevant to practitioners. Mentzer (2008) underscores this point, stating that academics feel rigor is more important than relevance in scholarly research to meet the standards for publication in top-tier academic journals. Practitioners typically do not read these academic journals as the situations and problems addressed are not relevant to the real world situations and decisions they face in their businesses.

Ways to bridge the gap between industry and the classroom range from using guest lecturers to client-based company projects. van Hoek *et al.* (2011) describe the challenges and benefits of using guest lecturers (GL) to provide "insights from the industry" as part of a SCM curriculum. For students to appreciate the relevance and importance of the GL, the learning outcomes and assessment need to be explicit. Students should be assessed on understanding the information from the lecture or activity and how it applies to real world situations. Faculty can benefit from the use of GL's due to them having an "insight" into the particular industry, increasing the opportunity for further collaboration. Companies benefit by the increased association with the university, which helps increase employer branding and possibly preferential access to potential employees.

Equally important to the relevance of the concepts being taught is the manner in which these concepts are presented in a classroom setting. Problem-based learning (PBL) (Barrows and Tamblyn, 1980; Smith, 2005) an extension of experiential learning (Kolb and Fry, 1975; Kolb, 1984) seeks to engage students beyond lectures and involve them in small group problem-solving exercises. While working together to create a solution to the problem that has been posed by the instructor, students draw from their own experiences to provide ideas which are combined collaboratively to create a solution. By working through a real-world problem with the help of others that may have different experiences or ideas, students fill voids in their personal knowledge base. As opposed to lecturing, the instructor is a facilitator offering guidance throughout the course of the exercise, and leads a discussion at the end of the project reflecting on what was achieved by the group. Though originally introduced for medical education, PBL is commonly used is multiple domains such as MBA programs, higher education, engineering, economics, and pre-service teacher education (Smith, 2005; Savery, 2006). Smith (2005) lists the benefits of PBL which include increasing understanding, knowledge application, and integration.

Many universities have expanded the idea of problem-based learning by bringing together industry and academics using client-based company team projects. Hutt (2008) describes how the Department of Marketing at Arizona State University has been successful in engaging organizations in graduate student research projects through establishing the Center for Services Leadership (CSL). Also at the graduate level, Kopczak and Fransoo (2000) detail a program provided by Stanford University and four other partner schools across the world in which students' collaborate on a company-sponsored project that addresses a global supply chain business need. The universities and businesses gain from these projects as well, as solutions to the company's problems are solved, and the universities gain partners for future research projects.

Client-based company projects also are used at the undergraduate level, especially in "capstone" courses. For example, van Hoek (2001) describes a PBL logistics course taught at Erasmus University that integrates cases, a research study on the markets for logistics services, and a one-week in-company project. Razzouk *et al.*(2003) describe how student teams work on ten-week client-based company projects as part of a marketing strategy course. Client-based company projects increase realism, can be more challenging and interesting for students, as well as help faculty stay current in their fields (e.g. Razzouk *et al.*, 2003; Elam and Spotts, 2004; Lopez and Lee, 2005; Parsons and Lepkowsak-White, 2009).

However, there are significant challenges with using client-based projects, especially in an undergraduate course. Razzouk *et al.* (2003) caution that faculty members have to closely manage the projects to ensure their success and that if not properly managed students and clients will be dissatisfied. For example, if students do not complete the work required on the project, the relationship with the company and the program's reputation can be negatively affected. Thus, client-based projects typically consume a large amount of faculty time as compared with traditional teaching approaches (e.g. Razzouk *et al.*, 2003; Elam and Spotts, 2004; Lopez and Lee, 2005; Parsons and Lepkowsak-White, 2009). Selection of clients and specific projects are instrumental to success (Lopez and Lee, 2005; West, 2011) and can be especially challenging when a number of unique projects are needed. Clients need to be willing to participate in the classroom, share information, and interact with students. West (2011) describes situations when clients are too involved in the project, essentially taking on the instructor role, and others that are not involved enough and do not provide information or feedback that students need. Even if the client is a good fit for client-based projects, often it is difficult for the

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client and faculty member to identify a project that is a good fit with the course's learning objectives and has a scope that is neither too large nor too small. Thus, while the literature suggests that there are benefits to client-based company projects, effectively implementing these cases, especially in an undergraduate course, can be difficult and risky.

Background of the supply chain management program and course

This section provides a brief overview of the undergraduate supply chain management program which has been in existence at Bowling Green State University for over 30 years. This program has close relationships with numerous companies, as demonstrated by companies continuously participating in career fairs, hiring of interns, and having a Supply Chain Management Institute that facilitates numerous activities such as guest lectures, mock interviews, resume critiques, and coordinating networking events between students and businesses. Many of these events are student led and run, often in conjunction with local affiliates of professional organizations such as The Association for Operations Management (APICS) and the Institute for Supply Management (ISM).

The undergraduate supply chain management specialization requires seven courses as part of the BS in Business Administration. Two courses in the supply chain management specialization focus on the purchasing/supply management (P/SM) business function. The first course provides a foundational background to P/SM and includes topics such as P/SM structure, strategic sourcing, buyer-supplier relationships, make versus buy analysis, and single versus multiple sourcing. The second course, which students usually take the semester before graduation, and the focus of this paper, provides in-depth coverage of commodity price volatility and risk management, price and cost analysis, and negotiation. These topics are discussed in sequence and build on each other. Specifically, the class begins with several weeks discussing commodity price risk management. Afterward, the knowledge obtained from understanding and forecasting commodity prices is built into the topic of cost analysis, and how various cost elements are derived, to include those of total cost of ownership. The learning from the cost analysis is utilized in an experiential exercise on how to conduct negotiations with suppliers. The topic of supply chain risk is also covered to better orient students to those factors that can disrupt supply chains. The learning lessons obtained in commodity price analysis, and subsequently price and cost analysis, serve as critical inputs to how students obtain the competencies for conducting appropriate analyses in preparing for fact-based negotiating with their marketing and sales counterparts.

The project – creating a commodity price risk management strategy

In the course, the students apply a standardized five-step process to assess commodity price volatility and manage risk that includes:

1 understanding the importance of managing price volatile commodities;
2 forecasting short-term price movements with a technical analysis;
3 forecasting long-term price movements via a fundamental analysis;
4 assessing price risk and organizational risk tolerance; and
5 developing a flexible commodity price risk management strategy.

Each of these steps is briefly discussed in this section. A more in-depth discussion of this process for creating a commodity price risk management strategy can be found in Zsidisin and Hartley (2012a, b).

Understanding the importance of managing price volatile commodities

Many commodities are subject to price volatility. These significant price movements affect almost every type of business. Manufacturing companies are affected both directly in the form of many raw material purchases and the components and subassemblies containing significant portions of these commodities, as well as indirectly in all of the support activities necessary for firms to operate. Depending on the industry and form of products or services provided, many organizations are subject to the threats of commodity price volatility in the purchased products and services they acquire. Examples of these consist of the raw materials that organizations transform into products such as corn, wheat, and soy into the cereals that consumers buy from retail stores, various metals such as copper that is processed to make wiring, and petroleum by-products that are the key feed-stocks in the plastics used in many products, equipment, and packaging materials. For example, a food products company such as Kellogg's is exposed to price risk from corn, soybeans, sugar and cocoa that are used in its products, from paper and plastics used in its packaging materials, from natural gas used as energy in manufacturing, and from diesel fuel for transportation in its distribution network (Kellogg Company, 2010).

Price volatility can also positively or negatively affect the product cost structures of an organization's suppliers. This has subsequent effects on the prices paid for the multitude of products, subassemblies, components, packaging, equipment, and services sourced by firms. The ability of suppliers to manage price volatility can further influence their ability to meet customers' requirements. If price fluctuations are not well managed, issues such as requests for price increases, delays, and even supply disruptions can result, detrimentally affecting the overall cost structures and sourcing options of purchasing firms.

In order to manage commodity price volatility, supply chain professionals need to forecast short and long term commodity prices to determine if, and to what extent, they need to manage this risk. The next two subsections describe the tools and methodology for forecasting short and long-term price movements using technical and fundamental analyses.

Forecasting short-term prices with technical analysis

A technical analysis assumes that historical pricing patterns will predict the future so the first step is to gather historical weekly, monthly, or quarterly commodity prices for the past two to three years. Then these data are plotted on a graph to observe price patterns and judge if those patterns will continue into the future. Depending on the price patterns observed, statistical forecasting models can be applied, such as weighted moving average, exponential smoothing, trend-

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adjusted exponential smoothing, or regression. Each forecasting model needs to be assessed for accuracy using MSE, MAD, and MAPE, with the most accurate model usually used to forecast short-term commodity prices. These models need to be monitored and adjusted as necessary. For example, if the underlying price pattern shifts, a new model is needed. The technical analysis information is utilized to determine how forecasted short-term price movements (week, month, or quarter) should be best managed.

Forecasting long-term prices with fundamental analysis

Long-term forecasting uses fundamental analysis, which assumes that the relationship between supply and demand drives commodity prices. A fundamental analysis involves examining the underlying forces that affect supply and demand, estimating how supply and demand will change, and then assessing what impact the change has on price. The key steps in this approach are shown in Figure 1. The first step is to gather information on supply, demand, and price. This entails plotting supply, demand, and price data and looking at their relationships. The next step consists of understanding the basics of supply and the underlying factors affecting supply, and estimating how supply may change during the future. Similarly, the next two steps –numbers four and five in Figure 1 are repeated for demand.

After completing a qualitative analysis of supply and demand, the relationships between supply, demand, and price are examined using statistical tools, such as correlation analysis and regression. The correlation evaluates the strength and direction of relationships with price. If the correlation is statistically significant, a model to estimate price can be developed using simple linear regression using the surplus (supply minus demand) as the independent variable, and annual commodity prices as the dependent variable. If there is a futures market for the commodity, the next step (Number 8 in Figure 1) consists of incorporating future price trends qualitatively into the analysis. All the knowledge obtained about the commodity including prices from regression models and futures prices is combined to develop the final forecast, using judgment.

Assessing price risk and organizational risk tolerance

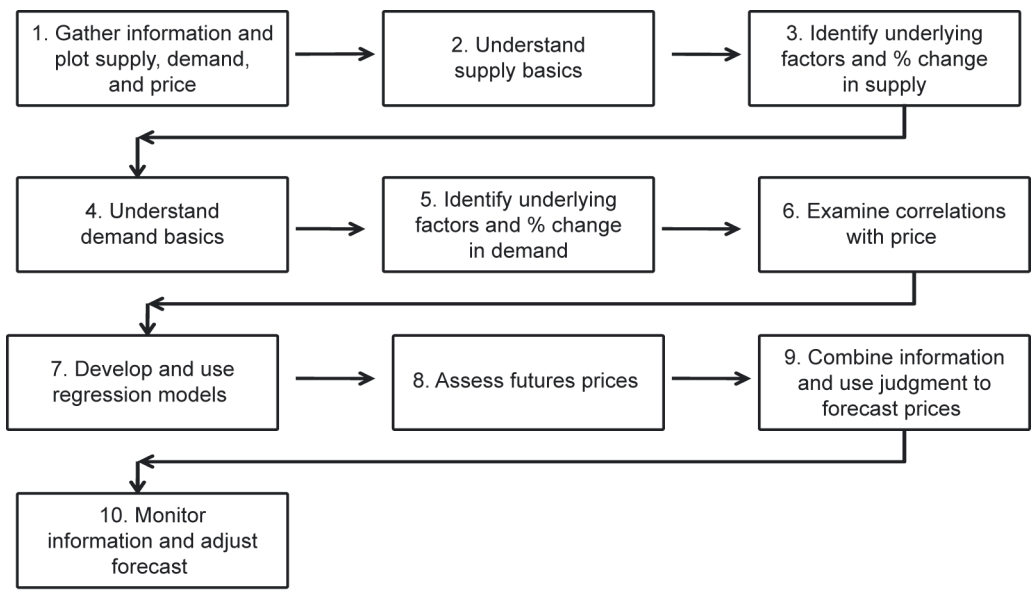
An organization's overall price risk exposure can be evaluated based on the degree of dependence on the commodity and the historical and predicted future direction and volatility of commodity prices. Key factors affecting dependence include the amount of a commodity directly purchased, the amount purchased by upstream suppliers, and the flexibility and ease of substituting a different material for the commodity. A commodity's degree of price volatility can be measured by the standard deviation of price movements and by calculating how far a commodity's price fluctuates from the mean price during a given year. Commodity price volatility risk should be managed if there is a somewhat high degree of dependence on the commodity and there are significant price movements.

In addition to assessing overall price risk exposure and degree of volatility, another important part of the analysis is to gauge the organization's risk tolerance levels when managing its supply chains. Risk tolerance depends on factors such as the organization's culture, industry, stage of products in the product lifecycle, customer base, experiences, and corporate leadership. A company's risk tolerance can be generally viewed on a continuum from being risk averse, to risk neutral, to having a high risk appetite. The analysis should consider the level of risk exposure at which active management becomes necessary, depending on the organization's risk tolerance level. Risk tolerant organizations may be willing to accept higher price volatility than their risk-adverse counterparts.

Deriving a flexible commodity price risk management strategy

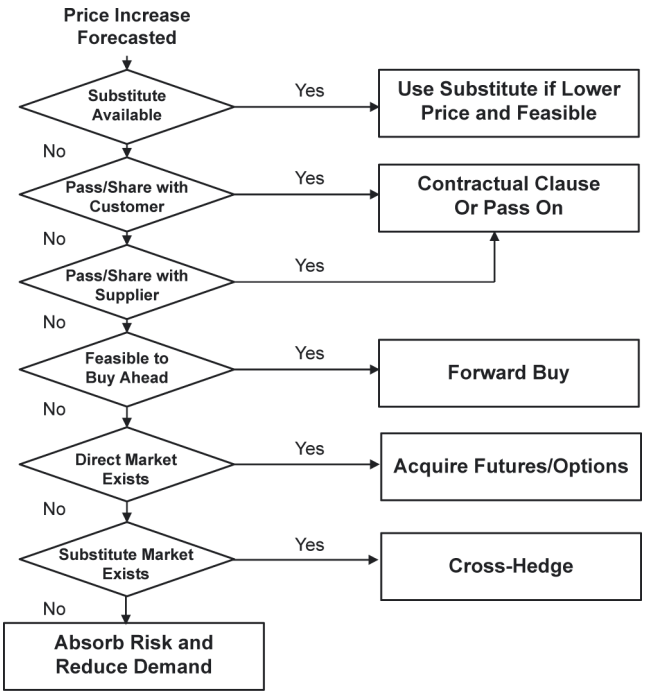
When the risk exposure and tolerance assessment indicates that active management is needed, there are a number of strategies to consider, as outlined in Figure 2. It's important to remember that in pursuing any of these commodity price risk management strategies that flexibility is key – just as it is

Figure 1 Fundamental analysis steps



Source: Zsidisin and Hartley (2012a,b)

Figure 2 Creating a flexible commodity price risk management strategy



Source: Zsidisin and Hartley (2012a,b)

with managing the overall supply chain. Also, the decisions, actions, and policies enacted today can significantly affect the options available for managing commodity price risk tomorrow.

When forecasts suggest that commodity prices will increase, explore if an approved lower-cost substitute material or energy source could be used. If so, estimate if the total cost savings obtained by shifting to the approved substitute is justified by the commodity's lower purchase price. Successful substitution of materials almost always requires the input, buy-in, support, and cooperation of multiple internal business functions as well as external supply chain partners. One challenge is that in some cases the cost and time to approve the substitute material may overshadow any cost savings, especially since the cost of the substitute material may also increase.

When substitution is not a viable option, a second option may be to share or pass on the burden of price risk to customers and/or suppliers. This strategy depends, in part, on how much leverage the firm has in contracting with suppliers or customers. One option for sharing commodity price risk with customers and/or suppliers is to use escalator clauses that distribute the price risk between the two firms. During negotiations, the buyer and supplier can agree on what changes would effectuate the escalator clause, such as an increase or decrease in the commodity price that reaches a certain level, say 5 percent. Frequently an objective, third-party source such as the Producer Price Index (www.bls.gov/ppi) is used as a reference point.

If passing or sharing price risk with supply chain partners is not feasible, the next option to consider is a forward buy, which locks in the prices of future purchases. Forward buys are possible if firms acquire commodities via spot market purchases, and have the capital, capability, and desire to acquire and store the material. Further, there are increased costs and risks associated with holding additional inventory that needs to be taken into consideration in the analysis.

When an organization does not have the ability or desire to execute a forward buy, another option to consider is hedging using futures contracts. A futures contract is an agreement between two parties to buy or sell a commodity at a particular time in the future for a particular price through exchanges such as the Chicago Mercantile Exchange (www.cmegroup.com) and the London Metal Exchange (www.lme.com). Hedging using futures contracts and other derivatives are intended to be utilized as financial instruments rather than a primary source of the physical commodity.

One of the limitations with hedging using futures contracts is that some commodities are not traded in futures markets. Thus, cross-hedging is utilized by identifying and trading a commodity whose price movements are strongly related to the movements of the actual physical commodity to be purchased. A high correlation (at least 0.80) is required by Financial Accounting Standards Board standard 133 (in the USA), as well as other criteria for utilizing a cross-hedge.

While the strategies outlined in Figure 2 provide a flexible approach for managing commodity price risk, there may be situations where it is simply not possible to pursue any of the various alternatives presented. When companies are forced to absorb the immediate risk, it can potentially spur creativity to minimize risk exposure for the future. For supply chain managers, one principal way is to encourage product and process innovations designed to reduce the demand (usage) for a price-volatile commodity. In the long term, organizations can reduce their exposure to price risk by reducing or eliminating their need for the commodity. For example, many companies have installed new lighting fixtures that use energy efficient light bulbs and sensors that turn off lights when they are not in use to reduce electricity consumption. Redesign of products, processes, and packaging can significantly reduce the demand for a commodity, lowering spend and reducing exposure to price risk while also helping the environment. For example, Arrowhead redesigned its water bottle to use 30 percent less plastic while maintaining functionality and achieving a high level of consumer acceptance (Anonymous, 2007).

Company participation

The process for garnering company support begins with the ongoing interaction our supply chain faculty have with our Supply Chain Management Institute, firms that recruit students for full time and co-op positions, and through formal and informal events associated with the college and university. Supply managers in many of these firms are graduates of the university and thus are aware of the curriculum, and subsequently, the topic of commodity price volatility and risk management. In the past five years we have worked with three different companies to analyze five separate commodities. The companies are a packaging company and agricultural firm for their sourcing of natural gas, the same agricultural firm in studying spend on two raw materials, sunflower and urea, and an aerospace supplier that is exposed to price risk from titanium and Inconel 100.

After initial discussions, the instructor and company representatives mutually select a commodity that the students will analyze. There are several parameters and factors to consider when selecting a commodity to study.

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First, unless the data are publically available, the company has to be able to obtain and share historical monthly or quarterly pricing data for a minimum of three years. Further, they also need to obtain and share the average annual price, aggregate annual supply and demand (preferably global, but can be domestic) data for the commodity to be studied ideally for at least ten years. These data are necessary for the students to be able to conduct the technical and fundamental analyses, without having to spend their personal funds to obtain data from a subscription service. For energy commodities such as natural gas data are available free of charge at the US Energy Information Administration web site (www.eia.gov/).

A second factor to consider in selecting a commodity is that it has to be important to the company. The commodity does not necessarily have to be directly purchased by the company, but it does need to have some financial importance to the firm's success. This is to ensure that the project's results add value for the firm. For example, for one project students studied the price volatility associated with Inconel 100. This commodity, often utilized in the aerospace industry, is a combination of several different metals. The firm did not directly purchase Inconel 100, but it accounted for a significant amount of the cost of some components purchased from suppliers. Therefore, the instructor and company representatives decided that it would be an interesting commodity for the students to study. When working with the same company in consecutive semesters it is important to consider changing the commodity to ensure that the company continues to get value from the project.

The project usually begins during the second or third week of the semester with a "kick-off" presentation by one or two representatives of the company, one of whom is usually at least at the director level in the firm. Involvement of a higher level manager signals to students that the project is important to the company. This presentation gives an overview and background of the company, describes its overall sourcing and supply chain processes, and then provides an in-depth discussion of the commodity and how it is used at the firm. The objective is to ensure students understand the general sourcing requirements for the commodity, gain a sense of the company's culture, and have an opportunity to ask questions.

The class is divided into teams of approximately four students each, depending on overall class size. From our experience, this exercise is best run in classes having between 15-25 students, with no more than five students in a team. Teams of five or less allow all students to participate in the analysis, report, and presentation in a meaningful way. If the classes are larger, then two different commodity analyses can be done concurrently so that the final presentations do not become redundant. Student teams have approximately one month to complete their analyses, write a 15 page report and prepare a 20-30 minute presentation that will be given to the company representatives. A detailed grading rubric (see the Appendix) is provided ahead of time for guiding the students in their analyses and creating their reports and presentations. Presentations often include extensive questions and discussions with the company representatives. After all teams have presented, the company representatives provide overall feedback on the presentations, and take copies of the reports and presentations to share with other supply chain professionals at their firm.

Stakeholder benefits

Although the process for analyzing commodity price volatility and managing price risk can be taught without company involvement as it was for many years at Bowling Green State University, there are additional benefits to the students, the company, the supply chain program and the faculty from working with companies during the course. The students directly benefit from engaging in this project in several ways. First, by working with companies, students are more likely to gain a better understanding of the relevance of commodity price volatility and risk management to their future careers. This helps to show that the concepts taught have a real application rather than just being theoretical. In addition, students apply various tools taught in the curriculum (forecasting, buyer-supplier relationships, creating a sourcing strategy) in a realistic situation. For example, students experience the challenges of analyzing real data that are often incomplete or must be transformed before use as opposed to "clean" textbook or case datasets. The interaction with managers during the project and especially the final presentation helps students to further hone professionalism and communications skills. For example, students experience the types of questions that may be asked when presenting analyses and recommendations on the job. For students who have not yet completed an internship, the project provides an excellent example that they can discuss during interviews. A quote from a former student helps illustrate the project's benefits.

> Having been a student that participated in the commodity sourcing project at Bowling Green State University, I was able to learn how price volatility could affect a corporation like Goodrich as well as ways to mitigate the risk that price volatility presents (Jeff Rietman, Strategic Buyer, Goodrich Corporation).

The participating companies benefit as well from engaging in this project. The biggest benefit is from obtaining different perspectives of commodity forecasts, risk levels, and management approaches. However, because of the standardized approach, managers know the general type of output that they can expect before deciding to participate in the project. Because the project is standardized, companies can easily engage with the university and its students in the classroom without spending a lot of time and effort trying to identify meaningful projects on their own (see Appendix, Table AI)

In recent years, the companies involved have all been members of our Supply Chain Management Institute so this project is one of the benefits that the firms obtain as a result of providing financial support for the Institute. This project also increases student awareness of the companies as a potential employer which helps the companies recruit supply chain talent. The direct interaction, presentations, and written reports provide more information about student competencies and behaviors than is typical in traditional interviews.

The following quote illustrates company benefits.

> The commodity sourcing projects from Bowling Green State University students help Goodrich Aircraft Wheels and Brakes to stay apprised of best practices in commodity price forecasting. Goodrich also benefits from unique perspectives relative to sourcing strategies and commodity price hedging techniques, while students benefit from practical, real-life case studies. Further, Goodrich gains the opportunity to identify high-talent potential employees (Mike Grondalski, Vice President, Operations, Goodrich Aircraft Wheels and Brakes).

The SCM program benefits in several ways as well. First, similar to the benefit that companies attain, the SCM program also benefits from the stronger relationships formed with the participating companies. In many circumstances at least one of the company participants was a graduate of the program, and the project is a way of engaging these alumni. The feedback received on the projects helps us to ensure that the curriculum stays on the cutting edge in terms of the course content. Further, interactions with company representatives have created research opportunities with the companies beyond the projects.

The faculty member also benefits by being able to engage companies in the classroom while using a clearly-defined repeatable process. Often company projects are unique to a specific problem and thus change semester after semester. Because of their unique nature, company projects often require faculty members to modify their courses so that projects fit with the company's unique problem. For example, in a given semester one company may request a spend analysis and the next semester a different company may want a supplier scorecard to be developed. The commodity price volatility project allows faculty to use a standard approach to the course each semester, and integrate this subject into the broader supply management practices of cost analysis and negotiation. Although the company and the commodities may change, the process used to analyze commodity price risk is consistent each semester. Student learning outcomes are consistent and the course content does not need to be significantly modified to fit the project.

The faculty workload is slightly higher than would be the case if no clients were involved but is less than unique client-based projects. The faculty member still must identify and recruit an acceptable client company and coordinate with the company throughout the semester. However, the faculty member does not need to learn unique aspects of the client's business or processes for the student project to be successful.

Conclusions

Supply chain management faculty members looking for ways to increase realism in their classrooms have a number of approaches to choose from ranging from guest lecturers to client-based company projects. We describe a hybrid approach that reduces variation from term to term while introducing the realism that comes from client involvement. The specific approach involves partnering with companies on student projects to analyze commodity price volatility and recommend risk management strategies. Anecdotally, the companies, students, faculty, and the supply chain management program all benefit from the closer relationships that evolve as a result of these collaborative projects. Future research should focus on empirically measuring the benefits of this approach. Further, although this approach focused on a purchasing/ supply management course, we believe the concept of using a standardized approach with client involvement could be used in a variety of different courses.

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Appendix. Sample commodity sourcing project description and grading criteria

Commodity sourcing project – Spring 2012

Purpose

The purpose of this project is for you to gain experience analyzing actual commodity data and developing a sourcing strategy for a commodity whose price fluctuates due to market conditions. Commodity prices impact the entire supply chain. For many companies such as Hershey's, Kellogg's, and Starbuck's, commodities account for a large portion of direct product costs. The operating costs of airlines and transportation companies are greatly affected by the cost of petroleum products. Supply managers must analyze the factors impacting a price volatile commodity to develop an appropriate sourcing strategy. The research process used can be applied to many common purchases such as plastic resins, paper, pulp, chemicals, metals, and electronics.

This project will be done in conjunction with the XXX Company. Your team must develop an understanding of the market forces impacting Inconel 100 and forecast what you believe the spot price of that commodity will be for February 2012, and a long-term price for 2012.

Based on your analysis and understanding of Inconel 100 your team will recommend a sourcing strategy as applicable to the XXX Company.

Project deliverables

A written report of no more than 15 pages, and copy of the Powerpoint presentation. The report should contain the following sections:

1 Executive summary.
2 Introduction.
3 Technical analysis and short term forecast.
4 Fundamental analysis and long term forecast.
5 Assessment of price risk.
6 Sourcing strategy alternatives and recommendation.
7 Conclusions.
8 References.

Present in 30 minutes your team's price forecast, the rationale for the short-term forecast of February, longer-term forecast for 2012, and your respective sourcing strategy. The time of your presentation will include questions and answers.

Written report

Executive summary

The one-page, single-spaced summary should condense *all sections* into one page so a manager does not have to read the entire report. The summary must include the objective, the approach, the key findings, and recommendations.

Introduction

A one paragraph introduction section should state the objective of the report and the topics that will be covered.

Technical analysis

- Include a graph of monthly prices for at least the last two to three years. The graphs should have x/y axes labels, a title, figure number, and should be integrated into the body of the report.
- Explain the price pattern (increasing, decreasing, seasonality) that you observe. Do you expect this pattern to continue? Why or why not?
- Determine what you think the price will be only based on the pricing pattern for February 2012. Clearly explain how the price was developed. You should use quantitative models and clearly explain how the price was obtained.
- How accurate do you expect the forecast to be? Why? Use MAD or MAPE if appropriate.

Fundamental analysis

- Include a graph of annual data showing supply, demand, price, and other potential factors that can affect price all on *one* graph. Explain why certain price highs or lows occurred in the past. Are these likely to happen again in the future? Why or why not? Often, commodities go through repeatable cycles.
- What factors affect supply (to possibly include production and inventory) in the long run and which, if any, will affect supply into 2012? How will supply change? Why? How confident are you in your results?
- Repeat the process for demand.
- Use judgment and an understanding of historical supply, demand, and price relationships. What is the balance between supply and demand? How will this impact price? Why?
- Quantitative tools can be used to describe the relationship if any among supply, demand, and price. Explore the correlation between price and supply, demand, the ratio of supply and demand, or other factors that may be important. Use regression to determine the relationship between these factors with price if the correlation suggests there is a relationship. Use the regression models or non-linear models, if statistically significant, to estimate the change in price. Correlation and regression assume that the relationship between a factor and price are linear and this may not be the case.
- Based on the knowledge gained in the entire fundamental analysis, use *judgement* to forecast price behavior, to include an analysis of futures market prices.

Price risk

Provide and explain a quantitative measure for price risk.

Sourcing strategy

Discuss and assess the alternatives for sourcing Inconel 100 based on your forecast and the price risk for the commodity.

Recommend a strategy and explain your recommendation.

Conclusions

Summarize the key findings from the report.

References

A list of references should be included. Within the report, the references should be listed (Authors' last names, year).

Table AI Commodity written report evaluation rubric

Team	Possible points	Points received
Executive summary: include all the details so there is no need to read the rest of the report to understand the objective, analysis, results, and recommendations	8	
Introduction: report objective and explanation of what will be contained in the report	5	
Technical analysis		
Show price graph and explain pattern and the likelihood of the pattern repeating itself	6	
Based on the pattern, discuss the forecast and how it was developed	5	
Explain your level of confidence in the accuracy of the forecast	4	
Fundamental analysis		
Present and discuss one graph showing supply, demand, and price, and possibly other factors that may influence price. Discuss patterns and the likelihood of these patterns being repeated	5	
Describe the long-term factors that can affect supply (production and inventory) and how supply can affect price	6	
Describe the short term factors affecting supply and the expected percent change in supply	6	
Describe the long-term factors affecting demand and how demand may affect pric	6	
Describe the short term factors affecting demand and the expected percent change in demand	6	
Use judgment, combining findings from supply, demand and futures prices, to present a final price. Clearly explain logic used	5	
Price risk		
Calculate and explain price risk	5	
Sourcing strategy		
Present and describe viable sourcing alternatives	5	
Recommend a strategy	5	
Conclusions: summarize the key aspects of the report	5	
Formatting		
Cover page with title, date, team designation, & team members	2	
Tables/figures have title/number	2	
Use and listing of appropriate references	2	
Headings	1	
Page numbers	1	
Organization		
Organization and transition sentences	5	
Grammar and spelling	5	
	100	

About the authors

George A. Zsidisin is an Associate Professor of Supply Chain Management at Bowling Green State University, Ohio. He has published over 60 research and practitioner articles and book chapters, many of which focus on the topics of supply chain risk and commodity price volatility management. His research has been funded by the AT&T Foundation, IBM, and CAPS Research, and has received numerous awards, such as from the Institute for Supply Management, Deutsche Post, Council of Supply Chain Management Professionals, and the Decision Sciences Institute. He has edited two books on supply chain risk and recently co-authored *Managing Commodity Price Risk: a Supply Chain Perspective* with Janet Hartley. He is one of the initial founding members of the International Supply Chain Risk Management (ISCRiM) network, and has taught and led discussions on supply chain risk and other topics with numerous companies and universities in North America and Europe. He currently serves as the Co-Editor of the *Journal of Purchasing and Supply Management* and sits on the Editorial Review Board for several academic supply chain journals. George A. Zsidisin is the corresponding author and can be contacted at: gzsidis@bgsu.edu

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Wesley A. Collins is an instructor of construction management in the College of Technology, and a former graduate assistant in the College of Business, both at Bowling Green State University.