Introduction
Companies have become well aware of how challenging it can be to compete in the current rapidly changing marketplace. Couple this increasing pace of doing business with economic and political uncertainty and it is clear that the ability to react to change is more important than ever. Companies that are well prepared and able to quickly execute strategically thought-out plans are better positioned to thrive during uncertainty.

Suppose your boss, the chief financial officer or chief strategy officer, asked you how your company’s revenue would be impacted by a changing economic climate in coming years. How would you quantify the potential impact of specific events or variables? Unfortunately, there is not a crystal ball to create a revenue forecast. Scenario-based planning using econometric analysis may be the next best thing and can assist you in being better prepared for future uncertainties.

Scenario-based planning is a tool designed to assist the development of strategies for operating in any of several contrasting business and economic environments that could lie ahead. Scenarios can run the gamut of plausible outcomes and can be used to develop a wide range of plans from tactical contingency planning for near-term economic developments to fundamental changes in strategy caused by global paradigm shifts. Here we provide an introduction to using the statistical techniques of econometric modeling and multiple regression to project financial performance within scenario-based planning.
Business uncertainties

Business uncertainties can be driven by various factors. Using scenario-based planning and econometric modeling to identify the potential impact of changes in market conditions can enable your company to adapt quickly to new threats and opportunities. At the corporate level, the scenarios can help a company establish an overall frame of reference for its strategic planning processes. The corporate development group can use results of the models as input to make limited, expandable investments in assets that would facilitate adaptation to a scenario. At the business-unit level, planners can develop scenarios and models to test and refine how these scenarios would impact their existing strategies. On an ongoing basis, business units can use scenarios to make tactical decisions on how to cope with near-term uncertainties that threaten the execution of their current strategy.

Definition of econometrics

The term "econometric" can be defined as the application of statistical techniques to analyze economic data. Econometric models can be used to determine the relationship between a set of economic factors and organizational performance. These models can help you make decisions to better prepare not only for sustaining health through turbulent times, but adequately positioning for growth once the new developments have been taken into account. The following sections focus on the process of developing an econometric model to project revenue based on various economic indicators within worlds depicted by scenarios. Considerations required when performing scenario-based planning, as well as tips and suggestions are also discussed. In summary, we highlight the opportunities to use econometric modeling as a tool to enhance both strategic and tactical decision making.

Distinguishing between shorter- and longer-term initiatives

Econometric models can be used in a variety of forward-thinking situations. Models can be developed to illustrate how the conditions prevailing within the longer term, macro-scenarios used in developing strategic plans would affect selected key market and business indicators. This provides a more detailed, quantitative understanding of a scenario’s impacts than is typically possible when relying solely on a qualitative, narrative description. Models can also be developed for shorter-term scenarios when executing the strategy a business has adopted. It can be helpful to group these different applications into three tiers.
First tier: Longer-term macro-scenarios — These high-level scenarios are developed to provide context for corporate-level strategic planning. They are “broad brush” and overarching scenarios. While these scenarios are at a higher level, they may be the most important scenarios as their input sets the direction and tone of the corporate strategy. For example, modeling out shifts in consumer behavior may prompt an increased research and development investment in specific product segments that the scenarios highlight as particularly variable.

Second tier: Impact of macro-scenarios on business units — After the longer-term scenarios have been developed, you then want to dive into how each would impact the various business units, markets, industries, etc. Once the potential impacts of each scenario have been identified and the appropriate strategic responses are defined, each business unit determines what future market conditions it will assume and strategy it will adopt. Competitive strategy will vary and should be tailored based on the intricacies of each business unit and its market. In a company with many lines of business, the array of strategies will be correspondingly diverse.

Third tier: Ongoing, lower-level analyses — Once strategies have been identified and implemented by the business units, additional, more tactical scenarios and analyses will need to be developed periodically as new uncertainties emerge. These scenarios help to analyze the significance of changes that have already emerged and to experiment with different theories as to what additional developments might be on the way. It is important to assess what situations may impact the business unit’s ability to execute against the strategy.

Sensitivity analysis and contingency planning can both be used in conjunction with existing scenarios as an input for decision making. The purpose of sensitivity analysis is to test the impact of specific variables or indicators used in the scenarios. This can be beneficial in evaluating the criticality of indicators being used, as well as the subsequent impact on the business. Contingency planning can be used to assess plausible outcomes and impacts of new developments that raise questions about how best to execute the strategy that is in effect. This type of planning focuses on tactical approaches to financial or operational risks identified during the scenario-based planning process.
### Scenario-based planning process

A scenario is a plausible sequence of future events that can affect an organization’s strategy and operations. As stated above, the underlying principles used to create the models across all tiers are very similar. The following section provides an overview of the phases involved in developing these scenarios. Throughout the development life cycle, the scenario-based planning process can be divided into four phases.

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Phase I — Define the purpose, scenarios, and associated strategic implications

As an example of how econometrics can be used in connection with a scenario-based planning initiative, consider a U.S.-based multinational manufacturing company that is concerned about the implications of changes in the eurozone. This particular company has manufacturing operations in Asia, while most of the sales are generated in the United States and in markets across Europe. Assume the company’s executives decide they want to use scenarios to evaluate the effects of the euro crisis over the next 12 months.

The first step to developing your scenarios is determining that the process is properly keyed to the purpose that has been defined. In this case, the focus would be on plausible downside developments affecting the eurozone over the next year.

The number of scenarios can vary, but the range of two to four is typically the most manageable. We will assume three for the purposes of illustration. Each involves “what-ifs” concerning events within the eurozone and the changes that occur. For example, in Scenario 1, fiscal reforms and a series of emergency measures prevent any national defaults, but the value of the euro falls substantially. In Scenario 2, Greece defaults and it, along with one or several other countries, leave the eurozone, resulting in multiple sets of monetary and economic repercussions (inside and outside the smaller eurozone). In Scenario 3, internal dissension causes a breakup of the eurozone altogether, with a wider range of aftereffects.

Leadership should be engaged throughout the scenario-based planning process. It is important to work closely with the key stakeholders who will be using the scenarios and econometric model. They will have the strategic insight and wherewithal to determine the future direction of the business given the scenarios. Their input and sense of ownership is critical to the success of the exercise, as they will be the people driving the decision making and plan execution. Once the scenarios have been defined, you can work with the business owners and the strategy team to identify the strategic impacts as the different scenario storylines unfold.
At this time, you should also determine the economic indicators that may impact business performance. Examples of these indicators at the macro level might be figures, such as gross domestic product (GDP), currency values, or inflation rates. At the business-unit level, they may include more specific indicators, such as consumer spending, cost structure, or investment in a particular sector. The first step is to develop a higher-level relationship between performance and the indicators. As we will discuss in Phase IV, you will have the opportunity to narrow or change existing indicators, as well as introduce additional indicators as the model matures. It is important to treat the model as a living object that will evolve throughout the process.

Phase II — Conduct the financial impact analysis
In this phase, you will estimate the financial impact of each scenario. In our manufacturing example, a weakened European economy would have a direct impact on European sales, as well as a potential indirect impact on U.S. sales. At the same time, the euro would be weakened as compared to U.S. dollar and Asian currencies. For euro-based markets, there would be lower demand for the goods in both Europe and the United States. Moreover, the weakened euro would make the European operations less profitable. As the euro weakens against Asian currencies, the relative cost of manufacturing of products in Asia in turn becomes more expensive. In the second and third scenarios, there would be national currencies to consider also. Which national and product markets are affected and to what extent will be different in each scenario.

By analyzing the ripple effects of the different versions of a weakened European economy, executives can identify contingency plans and tactical, operational solutions which we will discuss in Phase III.

In order to project the potential financial impact of your scenarios, you should first identify the economic indicators that impact your business. Once they are identified, you can build a financial model to establish a historical relationship between organizational performance and economic indicators. This model can show you how each scenario would impact your business based on these indicators.

You should continue to work with appropriate levels of management involved in and impacted by the scenario-based planning to identify issues that may arise and impact the execution of strategies. These potential issues will understandably vary depending on whether you are planning for the business as a whole or the impact on specific business units. For example, this could include a review of your company’s financial positioning, a targeted market analysis, or competitor assessments.

Two of the most challenging parts of this process are forecasting the economic indicators and obtaining historical data extracts. It may be advisable to have an economist or external consultant develop realistic projections of how the economic indicators could behave in each scenario. Another challenging aspect can sometimes come as somewhat of a surprise — getting historical data from your company’s systems. In order to build a statistically relevant model, you should aim to have over 30 data points to achieve statistical relevance. That is, if you want to project your quarterly European sales revenue in the event of an economic downturn, you would need more than 30 quarters of historical European sales revenue on which to base the model. Models can be developed using fewer data points, but the reliability of the results would be reduced substantially. Often, systems as well as taxonomy get upgraded and changed throughout the years. If you need to extract historical data from multiple systems, be careful to determine the data is consistent across the full time frame.

Once you have obtained the appropriate data, you can begin to develop an econometric model to establish a relationship between your historic performance and economic indicators. Multiple regression is a common technique used to make predictions and projections. Multiple regression is a powerful tool because the estimated trajectory of the output is based on multiple independent factors as opposed to a single input variable (i.e., simple linear regression). For example, multiple regression analysis can be used to estimate the monthly heating costs of an apartment building based on the historical average monthly temperature and the monthly average number of units occupied. Similarly, models can be built to estimate organizational performance based on economic factors.

Our manufacturing company may find that European revenue in its three scenarios is correlated to three economic indicators: European sovereign state GDP, the exchange rate between the U.S. dollar and the euro, and durable goods orders. This correlation is established based on regression between the company’s historical revenue and the historical economic indicator values. To project revenue, you first need to forecast the values of the three economic indicators for the time frame of analysis. Once the indicator forecasts are established, you can project revenue based on the historical correlation between the indicators and revenue.
After initial projections are established, you can focus on the lower-level, ongoing activities. A monitoring process should be established to identify trending and changes in the indicators. Maintaining ongoing commentary surrounding changes to the forecasts will allow you to gauge whether your scenarios and corresponding actions are still appropriate. It will be easier to act on your scenarios for your shorter-term tactical operations, or perhaps identify a new scenario, if you are current on what is happening in the economy.

Econometric models using multiple regression analysis can be created in Excel and do not necessarily require sophisticated statistical software packages like SAS or SPSS. The requirements for building a model are a solid background in elementary probability theory and a strong hypothesis about how the indicators should relate to each other. Once the model is built, it can be easily updated to generate projections on a recurring basis.

**Econometric modeling considerations**

Before building an econometric model, you need to consider the various aspects of both the data and your business that could impact results. There are an infinite number of factors and adjustments that can impact a model; below are some of the common considerations needed:

- **Seasonality adjustments** — Most companies exhibit seasonal trends which can skew results if used as-is. The macroeconomic data is seasonally adjusted at annual rates, so organizational data also needs to be adjusted in order to make meaningful, “apples to apples” comparisons between past and future and between scenarios. For example, a toy store may tend to have a spike in sales at the end of the year due to increased shopping during the holiday season. This spike must be deseasonalized so the projections do not take the spike in sales “out of context,” so to speak, and depict the spike continuing into the new year.

- **Mergers** — Organizations are dynamic and there may likely be mergers that have occurred in the past. It is important to include the applicable data from the acquired company into the overall revenue prior to the acquisition. Only using the performance from the current-state organization can lead to inaccurate correlations. Similar consideration should be given to any divestitures.

- **Lags** — Growth performance often lags the economy and other variables for a variety of reasons. The model should be built taking into consideration the nature of and reason for possible lags. For example, your revenue may have a direct correlation to GDP, but it may take a number of quarters for a decrease in GDP to translate into decreased revenues.

- **Business diversity** — For a company with diverse businesses, using just one model may not reflect reality; separate models may be required for different business segments. For example, say a company owns a construction company and a financial institution. A construction company and a financial institution may react to an economic downturn in drastically different ways. Even though both are owned by the same company, it may be prudent to consider them separate entities for the purposes of building a model.
**Log normal data** — It is sometimes difficult to find significant correlation between absolute organizational performance and absolute economic factors. The relationship can be more easily established between growth in the organization factor and growth in the economic factor by converting the data to log normal before running the regression.

**One-time effects** — There might be a significant one-time, noneconomic event that has an effect on your business (e.g., health care reform legislation). Care should be taken to either adjust the organizational performance for this impact or introduce a dummy variable that mitigates the change in behavior of your business over the specific time period. A dummy variable can be thought of as a way to avoid future growth being based off that one-time event. For example, revenue may spike due to increased work around the ramifications of the new health care legislation, however, this spike should not be taken as being indicative of future growth.

**Dummy variable: Forecast comparision**

Your finance staff can refer to Appendix A on the specifics around creating an econometric model.

**Phase III — Analyze scenario impacts and define responses**

Once the potential financial impacts are identified in Phase II, the next step is to draw inferences and think about what the company would do given the insights as to the impacts of each scenario. In our example, the multinational manufacturing company can develop plans to mitigate potential revenue loss incurred in each of the eurozone distress scenarios. It may identify strategies ranging from increasing global integration to diversifying its product portfolio and/or customer base, from reducing cost structure through headcount or process improvements to changing their marketing strategy. Thinking this through provides valuable insights as to how to deal with any of several versions of the next year in Europe.

Through monitoring the current environment as well as the forecasts of both the economy and the indicators that most impact its businesses, the company can determine when it would be appropriate to put the plans into effect. Should events appear to be moving toward conditions described in one of the scenarios, the company is well positioned to quickly pull the trigger on the appropriate predetermined plans to mitigate the negative effects.

When you identify and design specific actions to take, your company as a whole can be better prepared to react under changing circumstances. Once strategies have been identified, you can move toward establishing an integration plan and socializing change. You should carefully consider how you are going to integrate these actions into existing processes. Adjustments will need to be made to current practices to implement new measures needed to deal with scenario conditions. Success can depend on how well received the plans are as well as how much ownership key managers feel they have over the process.

**Effective socialization throughout all phases of model development is critical to the effectiveness of a scenario-based planning initiative. Important steps include:**

- Engage key stakeholders throughout the process
- Manage expectations of model development and evolution
- Elicit feedback regarding key issues, strategic priorities, impact and direction
- Develop stakeholders’ sense of ownership in the models and scenario plans
- Work with stakeholders to integrate scenarios into current processes
- Continue to team with stakeholders throughout the recurring development process
A company may also identify some changes that should be implemented regardless of whether eurozone troubles actually worsen. For instance, say the manufacturing company typically expatriates revenue from Europe to the United States. In these scenarios, there would be new conditions, including a potential return to multiple national currencies. If national currencies were reinstated, there could be a wide range in the strength of these currencies against the dollar. For instance, countries such as Germany, Austria, Finland, and Switzerland, would likely have stronger currencies versus Greece, Ireland, Italy, Spain, and others who would likely have weaker currencies. Other countries, such as France, would be harder to predict. Therefore, the real value of the revenue would be dependent on the country in which it originated. This could lead to a decision by management to restructure the way the company is currently set up in order to avoid a drop in reported revenue. This is a change that could be implemented and prove beneficial regardless of what scenario plays out and would also provide added flexibility in the future.

Phase IV — Adapt and refine the econometric model
Perhaps the biggest key to success is to ensure that the model evolves. It is important to manage your expectations as well as those of your key stakeholders. Expect to first develop a modest model which will evolve over time. It can take several business cycles to develop a sound working model. Gaining the confidence of the decision makers as to the credibility of the model is crucial to success.

Once your model has achieved baseline functionality, it is a good idea to socialize the model with stakeholders in your business. Integrating the model into existing planning activities should be as organic as possible. You should continue to work closely with the different business units during the socialization process. As you have already worked closely with the business owners to develop the models, they can help effectively integrate the models into their day-to-day efforts.

After the initial model has been successfully socialized and the key stakeholders feel comfortable not only with the model, but the process itself, you will essentially restart the process, going again through the four phases. You will need to continue to move through the process of evaluating the model in order to expand and hone the base model until it reaches its full functionality. After a version of the model is completed, it is important to reconvene with the business owners to get their feedback. This will help not only in making the necessary adjustments to enhance the model, but build your relationships with the owners while building their trust in you and the process.

During this time, you can also discuss whether additional economic variables should be introduced. For instance, instead of using GDP, you may decide that using the S&P 500 Index better correlates to your business performance. This will be accomplished through the commitment of the business owners and feedback they can provide on each model’s results. As discussed, you should not expect to deliver a so-called “final” model in a few months; the process can take time to develop.

Common challenges in using econometric models
Statistical analysis is not immune to human psychology. As with any process, there are places where error can be introduced. This section highlights two common mistakes made when creating and using econometric models using multiple regression.

Misinterpreting correlation
One obstacle to using a multiple regression analysis is that it can be difficult to interpret the relationship between each variable and the resulting behavior. In a linear regression, the output is directly correlated to a single input. However, in a multiple regression, the correlation of one input is also dependent on the other inputs.

For example, imagine GDP is the only factor that impacts your revenue. A linear regression could show the direct impact of GDP on revenue. Since historical revenue can be compared to historical GDP, it is easy to establish the correlation between the two and use the correlation to predict revenue based on projected GDP. However, if your revenue is dependent on both GDP and overall investment in information technology (IT), a multiple regression would be used to project revenue. When IT investment is introduced, the correlation between GDP and revenue may change. That is, if a 1% change in GDP alone results in a 2% change in revenue, it would be erroneous to assume that a 1% change in GDP will still drive a 2% change in revenue if IT investment is also a factor.
Subjective probability
When beginning the process of building a new model, you should test numerous variables to reach a best-fit design. The challenge can lie in distinguishing between a model that looks sound statistically and a model that looks sound from a logical business perspective. It can be tempting to engage the “throw spaghetti at the wall” technique and see which variables yield the strongest statistical model. However, you also need to consider what variables make sense. In other words, you should have a hypothesis about the variables in question. Regardless of how strong the model appears to be using a given variable, the model will not be reliable if there is not a strong business correlation.

For example, say that the strongest statistical model shows that federal spend and IT investment are the leading indicators for projecting your revenue. However, your company does not conduct significant business with federal agencies or businesses funded by federal dollars. While using federal spend looks strong statistically, there probably is not a true correlation from a business perspective.

Use of models within Deloitte
Deloitte creates econometric models to project quarterly revenue for the organization, as well as its different businesses across multiple scenarios. This helps leadership better prepare for economic uncertainty. Scenario-based planning efforts enabled our leadership to plan for an economic downturn in the fall of 2006. In response, Deloitte started preparing and developing strategies to be taken if the downturn became a reality. The organization made sure that it had enough liquidity and was in a strong position to manage costs where appropriate while continuing to make strategic investments. As a result, Deloitte was in a position to make the biggest acquisition in its history at the beginning of 2009 and achieve distinctive financial performance even amidst a recession.

As noted, scenario-based planning can also be used for strategic planning. Within Deloitte, revenue projections generated by the econometric models are used by leadership as input to consider while planning and managing the business.

The key to the success of these models was the credibility that was gained throughout the process. This was done through a slow maturation process not only of the model itself, but also the relationships with key stakeholders. The models were developed over a number of years, during which the credibility gained facilitated the input needed to make adjustments to the models. The development process was very interactive between those building the models and the stakeholders. Stakeholder confidence and feedback was essential to the success of the models.
Conclusion

It is becoming increasingly vital for businesses to incorporate scenario-based planning into their processes. Navigating through challenges as they come your way can open you up to unnecessary risks. Leveraging scenario-based planning can help to plan strategically for a wide variety of events.

Once an econometric model is built and the financial impact of your scenarios has been established, your business can continually assess the strategic actions that should be taken.

A robust scenario-based planning effort using econometric analysis can enhance the competitive advantage of your business by making it more nimble and able to adapt to an ever-changing global environment.
Appendix A: How to create an econometric model

Once you have identified the impacts of the economic downturn scenarios, you will need to develop an econometric model to project the revenue impacts of the scenarios.

The schematic below provides the process flow for creating a multiple regression econometric model in Excel. This example will include projecting revenue, however, as stated above, there are many figures that can be projected. The regression can be done using the LINEST function. While building the model, it is advisable to allow flexibility for future modifications. For example, include the ability to add additional inputs if needed in future models. The model should also contain the functionality to adjust the lag and use of economic indicators with ease.

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