Research Program

2003-2004

SUMMARY

FINANCE

PROJECTS

The efficiency frontier in the presence of asymmetry [49]
Participant : Éric Renault (University of North Carolina)

This project pursues previous work on risk-return models in the presence of multivariate asymmetry. The general goal of this research program is to mathematically develop the rigorous theory of the RMVF and SMVF frontiers in dimensions greater than two, to fine-tune their economic interpretation while specifying their applicability in terms of the relevant statistical techniques, as well as their application to concrete issues (government debt, hedge funds), which will give rise to specific computational and numerical stability difficulties. Moreover, we will seek to integrate the usual finance models, based on specific probability distributions and representations of investors' preferences, into this framework.

Decisions in monetary theory and the central bank [150]
This project is also under : Experimental Economics Laboratory
Participant : Jim Engle-Warnick (McGill University)

From January to April 2004, approximately 150 individuals participated in a study that sought to identify the principal rules that come into play in a central bank's decision making process. The goal was to establish whether a simple guideline, the Taylor Rule, proves the dominant rule in a given situation—the experiment used a hypothetical scenario in which the subjects had to fix a short-term interest rate in order to control inflation in the context of a computerized economy. This issue is of interest since, while the Taylor Rule provides a perfect description of the decision rocess of many central banks, it appears highly unlikely that they actually use it (because it is too simple). Nonetheless, despite the fact that this principle is so straightforward as to be completely intuitive to economists, its use by banks can be justified in terms of transparency and as a way to help agents better understand their work, and thus to identify their goals. Initial results indicate that the application of Taylor-type rules predominates, though the exact rule (thus, the best performer) is rarely used. The group of subjects we are currently studying is particularly heterogeneous.

Regime shifts, structural parameters, and the term structure of interest rates [193]
Participant : René Garcia (Université de Montréal)

This project develops and estimates a structural utility model of the term structure of Canadian interest rates. The model contributes to a better understanding of the economic forces that generate interest rate gaps as well as links between factor risk premiums, the various regimes, and the business cycle. We have also evaluated the empirical performance of the model in terms of implications for the term structure, associated measures of risk such as the value-at-risk, and anticipated movements in the interest rate.

Evaluating and refining an exchange rate and interest rate forecasting model for active management of government debt [55]
Participants : Lisa Busca Pinheiro, René Garcia (Université de Montréal), Benoit Perron (Université de Montréal)

In an earlier project called "Time series models for forecasting rates" we developed a global model for forecasting these rates. The model contains two essential elements: exogenous forecasts of the mean from an independent service and a covariance matrix that evolves over time following a dynamic conditional correlation model allowing large dynamic covariance matrices to be estimated. In this new project, we evaluate our new model's potential for active management of government debt. This evaluation occurs in two phases. The first consists of a statistical analysis of the model's properties (conditional heteroscedasticity, serial correlation, etc.). The second, and most important part, is to judge the impact on borrowing costs and the risks run by the government.

Integrating implicit and explicit factors in the nonlinear analysis of hedge funds [196]
Participants : Lisa Busca Pinheiro, René Garcia (Université de Montréal), Jean-Paul Truong (CIRANO)

This project's purpose was to integrate the use of implicit factors (significant principal components) and explicit linear and/or nonlinear factors into the analysis of the yields of speculative funds. We developed and applied a methodology allowing application of our results to a previous 2003–2004 project called "Style analysis for speculative funds," so as to provide a comprehensive tool for selection and analysis permitting the study of fund yields using various types of explanatory factors.

The Loss Distribution Approach applied to operational risk [44]
Participant : Susan E. K. Christoffersen (McGill University)

This project continues the 2003–2004 project entitled “Empirical studies of risk factors that generate operational losses in financial institutions.” We have already purchased an external database of banking losses containing several thousand events causing losses of over one million dollars within the institutional banking sector. The results of our analysis of this database of operational losses are the subject of a CIRANO Working Paper (publication pending), titled “Operational Losses: Characteristics of an External Data Base.” The current plan for this project is to concentrate on the Loss Distribution Approach (LDA), the most sophisticated of the internal approaches for computing the total capital to allocate to operational risk.

Real options and the valuation of investments [139]
Participants : Marcel Boyer (Université de Montréal), Peter Christoffersen (McGill University), Éric Gravel (Groupe d'analyse), Pierre Lasserre (UQAM)

The purpose of this project was to demonstrate that the currently prevalent practice of computing the net present value (NPV) of expected cash flows at the risk-adjusted return on capital (RAROC) needs to be expanded to correctly value implicit managerial flexibility. The fact that the dominant method, as currently used by firms, is incapable of capturing the value of this flexibility implies that the value of the firm is not optimized.

Which measure of risk to use: the importance of the estimation risk [48]
Participants : Peter Christoffersen (McGill University), Sílvia Gonçalves (Université de Montréal)

The ES (Expected Shortfall) constitutes a measure of portfolio risk that simultaneously features the simplicity of the value at risk and contains information on the tail of the distribution. This method is often recommended by academics, but has not yet been adopted by practitioners. The purpose of this project is to quantify the estimation risk of this measure in order to compare it with that of the value at risk, thus providing a compelling argument for the choice of one of these measures.

Confidence intervals for estimating the value at risk [43]
Participants : Peter Christoffersen (McGill University), Sílvia Gonçalves (Université de Montréal)

As a responsible risk manager, our partner is interested in evaluating the error in the estimates of the value at risk in his portfolios. To accomplish this, the project develops tools for estimating these errors by calculating the distribution of the estimates of the value at risk using "bootstrap" resampling methods.

Analysis of futures contracts on government of Canada bonds [46]
Participant : Bryan Campbell (Concordia University)

This project examines futures contracts from the perspective of derivatives-based risk management. Several aspects of futures contracts on government of Canada bonds (CGB contracts) that are liable to influence their effectiveness as hedging tools will be examined in detail.

Backtesting procedures for the value at risk [47]
Participant : Peter Christoffersen (McGill University)

This project deals with backtesting methods for the value at risk and falls under the umbrella of financial risk management. Thus, in this project we seek to develop a new tool based on the time elapsed between two violations of the value at risk. The study will also include a detailed Monte Carlo analysis to provide a broader overview of the properties of these new tests.

Mean-variance portfolio management with Bayesian methods [53]
Participants : Éric Jacquier (HEC Montréal), William McCausland (Université de Montréal)

This project draws on Bayesian methods and reduction procedures to propose a software implementation of methods for calculating the optimal portfolio. These methods are robust to changes in the estimated values of the means, variances, and covariances of the broad classes of assets considered. In addition, this approach will provide managers with a tool for incorporating their own opinions into the calculations and to verify the sensitivity of the results to various combinations of models, opinions, and scenarios.

Models with diffusion indices for macroeconomic forecasting [63]
Participants : Bryan Campbell (Concordia University), John Galbraith (McGill University)

This project will facilitate comparison of the quality of forecasts of the principal macroeconomic variables generated by different institutions, including private forecasting firms, international organizations such as the OECD, and the models with diffusion indices developed by CIRANO. The possibility of including such models in our partners' forecasting processes will also be examined for various horizons.

PROJECTS IN FINANCIAL RISK

The Gordian knot in access to network structures: promoting competition while simultaneously ensuring the development and maintenance of infrastructure [140]
This project is also under : Corporate Governance
Participants : Marcel Boyer (Université de Montréal), Éric Gravel (Groupe d'analyse), Pierre Lasserre (UQAM)

This research project is a new approach to the 2003–2004 project, “Prices for access to network infrastructures: the option cost of inflexibility,” and fits within an international current in research in financial mathematics: the use of real options in investment decisions in the broadest sense. Our goal this year is to make a significant contribution to one of the most difficult issues currently confronting regulators, how to promote competition in networks without creating an inefficient duplication of the essential elements of these networks

Financial asset prices and inflation: an analysis of causal links [192]
Participant : Jean-Marie Dufour (Université de Montréal)

While there is a school in the literature that seeks to understand whether central banks should be concerned about developments in asset prices when conducting monetary policy, and another that examines the opposite relationship by measuring the impact of monetary policy on asset prices, no study has examined both sides of this issue simultaneously. We expect to develop a methodology that will allow us to accomplish this. The methodology consists of specifying multivariate time-series models in which causality links between the various variables can be explicitly tested.

Modelling risk with Markovian regime changes [198]
Participant : Éric Jacquier (HEC Montréal)

We propose a project implementing correlation estimation and forecasting methods using changes in the Markov chain regime. Our implementation of Markovian regime changes will increase the robustness of the factor model while preserving the advantages of its parsimony. The methodology proposed in this project springs from developments inspired by our collaboration with partners having a particular interest in its application to portfolio management, especially relating to pension funds.

Looking for the New Economy [220]
Participant : Simon van Norden (HEC Montréal)

While the emergence of new productivity growth trends has played an important role in policy formulation, formal testing of whether the trend growth rate of aggregate productivity has changed significantly is rare, and the best work done to date appears to reach conflicting conclusions. This project examines the existing evidence for a shift in aggregate trend productivity growth and attempts to assess its reliability as a basis for policy making.

Strategic Asset Allocation in the Presence of Hedge Funds [221]
Participants : Jérôme B. Detemple (Boston University), René Garcia (Université de Montréal), Marcel Rindisbacher (University of Toronto)

Pension funds have recently looked at alternative asset classes such as hedge funds, private equity, emerging markets and real estate to improve the sagging performance of their portfolios of traditional asset classes. Two sets of questions arise in this context. To what extent the various strategies pursued by hedge funds provide an increase in returns without increasing the risk of the portfolios of pension funds? How large an exposure should pension funds have in such strategies? A second line of inquiry relates to the type of benchmark pension funds should measure their performance against if they abandon a fixed portfolio benchmark.

Regime Shifts or Factor Models? Implication on optimal portfolios [224]
Participant : Éric Jacquier (HEC Montréal)

The Markov regime switching model specifies the existence of two or more regimes where the parameters of the model are constant. Financial data stylized facts suggest the existence of regimes. Portfolio volatility is greater when the component’s

yields are negative. This relation is not caused, just as it is commonly suggested, by a leverage effect but by a portfolio effect. Precisely, correlations between assets increase with the volatility. These stylized facts can be incorporated in a concise regime switching model. Another approach also model these stylized facts and it uses factor model with time changing variance factors. Literature on these stylized facts exists but there are no studies that confront these two approaches in a portfolio optimization context. There is the aim of this project.

Growth Options Implication on Systematic Risk Forecasting [228]
Participant : Éric Jacquier (HEC Montréal)

Betas are fundamental parameters in portfolio composition. Hedge funds must be able to forecast these betas if they want to neutralize the systematic risk of their portfolio. Some pension funds have to respect certain levels of systematic risk. Volatility time variation's models, such as GARCH or SVOL, are very popular when it comes to forecasting individual asset variance. Things are different when systematic risk forecasting is concerned. Transposition of models such as GARCH and the addition of financial leverage do not improve the naïve methods and do not diminish the estimation error. This project will demonstrate the importance of growth options characteristic variables in forecasting the betas. The operational leverage effects are in fact much more important than financial leverage effects.

Investments Evaluation in the Public Sector: Uncertainty, Flexibility, Real Options and Discounting [229]
This project is also under : Corporate Governance
Participants : M. Martin Boyer (HEC Montréal), Marcel Boyer (Université de Montréal), Peter Christoffersen (McGill University), Pierre Lasserre (UQAM)

During the last thirty years, the breakthroughs realized in financial instruments valuation (options, futures) have greatly influenced evaluation techniques and investment decision-making. Despite the fact that these techniques are quite popular in the private sector, the possible applications in the public sector are still limited to scientific analysis. We believe that these analytics tools must be developed and be implemented as soon as possible to improve decision-making in public organisations which, just like private ones, evolve in a more and more volatile environment. Diverse cases could be considered. This far-reaching project will use the authors' knowledge in real options theory and is the follow-up to the discounting cash flow in uncertainty project.

Rethinking Speed Limit Policies: Optimal Monetary Policy and Measurement Issues [232]
Participants : Florian Pelgrin (Banque du Canada), Simon van Norden (HEC Montréal)

Policy rules using output gaps have long been characterized as infeasible because the output gap is not directly observed. Data revision also implies similar problems for income growth targets. This project uses real-time data sets for Canada and the US to compare the relative importance of revisions and estimation uncertainty for a) Taylor-style output gap rules, b) Walsh-style speed limit rules and c) Jensen-style nominal income growth targets.

Portfolio management using statistical learning methods [56]
Participant : Yoshua Bengio (Université de Montréal)

This project aims to improve automated management methods for portfolios of derivatives. Its goal is to develop an expert system that will allow transaction rules to be selected in consideration of transaction costs, and to enable rapid tests of all such rules to ensure that their profitability is not simply an artifact of a selective exploration of the data.

Modelling contagion effects [61]
Participants : Karine Gobert (Université de Sherbrooke), Patrick González (Université Laval), Michel Poitevin (Université de Montréal)

This project continues the work begun last year on the fragility of the banking system. This year the project will concentrate on studying the following question: In terms of efficiency and stability, can a coalition of endogenous banks be preferable to a decentralized structure based on independent transactions (absence of a coalition) on liquidity markets?

Method of valuing options from volatility and implicit prices [57]
Participants : René Garcia (Université de Montréal), Éric Renault (University of North Carolina)

In this project we intend to examine whether parsimonious functions are able to generate good forecasts of options prices on the basis of volatilities and implicit prices extracted from observed options prices. If this procedure yields better results than the current practice, which uses only the implicit volatility, it could become the standard among practitioners.

The dynamics of the betas: implications for risk management [58]
Participant : Éric Jacquier (HEC Montréal)

This project examines the impact of the choice of model for the betas' variations over time on the volatility of portfolios. A preliminary comparative study using a single factor model suggests that the best such model would in fact allow a considerable reduction in the volatility of a portfolio, representing considerable economic benefits to risk managers.

Buyer-seller gaps in index options: CBOE versus OTC [62]
Participants : Peter Christoffersen (McGill University), Kris Jacobs (McGill University)

Stock market participants wishing to trade options have the choice between options traded on stock exchanges, such as the Bourse de Montréal or the Chicago Board of Options Exchange (CBOE) and options traded over the counter (OTC). The goal of this project will be to empirically analyse the difference between the buyer-seller gaps for options traded on the CBOE and OTC in order to understand the effects of liquidity and relative competition.

PROJECTS IN STATISTICAL AND ECONOMETRIC METHODS APPLIED TO FINANCE

Les extrêmes et la dépendance extrême dans le NASDAQ et le S&P 500 [45]
Participant : John Galbraith (McGill University)

This project follows up on the work conducted in the framework of the 2003–2004 project “Estimating tail indices with indirect inference.” In this project, we have examined the tail index of the two major U.S. large-cap indices (the DJIA and the S&P 500). Using state-of-the-art statistical inference methods, we found significant changes in the tail indices that were compatible with modifications to market regulation introduced to control computerized trading. In this new study, we intend to present a tail index analysis of the NASDAQ market covering a similar historical period, beginning with the introduction of the NASDAQ composite index in 1984.

Style analysis for speculative funds [52]
Participants : Julien Foreix (CIRANO), Nicholas Papageorgiou (HEC Montréal)

This project was developed in the context of speculative fund management. A preliminary analysis of the yields of speculative funds reveals that the usual methods of style analysis are not effective for these funds, owing to their limited liquidity and the extensive use of derivatives, which yield nonlinear returns. The goal of this project will thus be to develop a new nonlinear methodology to allow extraction of the principle categories of risk to which these funds are exposed from their yields.

The content horizon for forecasts of some key macroeconomic variables [194]
Participant : John Galbraith (McGill University)

Macroeconomic variables are usually forecast over several horizons, generally between one month and several years. The informational content of forecasts diminishes as the horizon increases and, past a certain point (the content horizon), they no longer contain any information beyond the mean value of the series. Earlier studies have analyzed the content horizon of GDP and inflation. In this project we plan to extend this analysis to a broader range of series of macroeconomic variables, using Canadian and U.S. data: the interest rate, growth in stock prices, the unemployment rate, exchange rate movements, and measures of housing starts.

Price discovery for ten-year Government of Canada Bonds [195]
Participant : Bryan Campbell (Concordia University)

This study will examine the existence of a lead-lag relationship between futures contracts on Government of Canada bonds (CGB) and the underlying ten-year bond. High-frequency data (intraday)—or minute by minute quotes and operations—will be used to study the possibility of lead-lag and/or feedback relationships. If we are able to establish such a relationship, we will then examine its nature. The sample will cover the past two years. The literature on the price discovery process includes a variety of different methods for identifying this type of relationship, and the study will contrast these competing methods.

A subsampling approach for event-driven studies [203]
Participant : Sílvia Gonçalves (Université de Montréal)

The purpose of event-driven studies is to examine the impact of financial events (such as share issues, mergers, or regulatory changes) on corporate yields. More precisely, the goal is to test whether such events have a statistically significant

impact. Our main objective in this project is to develop a subsampling-based approach that is independent of assumptions on distributions and remains valid under very general hypotheses on interdependence of the errors, notably including serial and cross-sectional correlation. As an application of our methodology, we intend to analyse the impact of regulation using data on share prices.

Nonlinear combinations of forecasts [205]
Participant : Bryan Campbell (Concordia University)

As Stock and Watson suggested, macroeconomic forecasts generated by diffusion indices have proven as reliable as those yielded by traditional time series models. When these forecasts are linearly combined with those from international forecasting agencies, we observe a slight improvement in performance. A more detailed examination of the contributions of these forecasts suggests that a fixed linear combination may not be adequate. The goal of this project will be to study nonlinear methods to combine nonparametric forecasts from diffusion indices with, for example, annual forecasts from the OECD. In this study, special attention will be paid to using data available at the time of the forecast for generating and evaluating it.

Macroeconomic and Financial Panel Data Analysis [222]
Participant : Benoit Perron (Université de Montréal)

The interest for modeling macroeconomic and financial panel data has increased substantially during the last ten years. This interest has forced researchers to analyse stationnarity properties of panel data. More recently, procedures using factor models have been proposed to allow dependence between data series. The submitted project will discuss many issues:

Estimation and tests of common component This analysis will extract common components of panel data series, by main components for example. We suggest applying this analysis on yield or market price series to determine the common movement's sources.

Identification of stationary series Unit root and cointegration tests of panel data are usually used as a preliminary analysis (pre-testing). In the case where a test reject the unit root hypothesis for all the series of the panel data, it's impossible to conclude that all the series in the panel data are individually stationary. We suggest developing tools that would identify series that are most likely to be stationary so that an efficient empirical treatment of these data would be possible.

Estimation of factors on realized variance/covariance A lot of interest has been recently given on volatility and realized covariance measures obtain by summing the squares and crossed products of high-frequency yields. However, very little work has been done on situations where a lot of assets are involved. We suggest modeling, by factor models, covariance matrixes that will be estimated with high-frequency yields.

Dynamic and Approximate Programming for hedge funds portfolios statistical management [233]
Participant : Yoshua Bengio (Université de Montréal)

We have recently developed statistical learning algorithm for hedge funds portfolio management. An important question still needs to be studied to allow this study to go farther so that it considers interactions between decisions taken during period t and those taken in the future, interactions due to non linearities such as transaction costs, slippage and other market effects. To do that, we would like to take advantage of the recent progress in the statistical learning by reinforcement community, progress that can be seen as approximate methods to do dynamic programming in high dimension environment (where the exact solution is computationally impossible to obtain).Theses researches will be evaluated in the context of futures portfolio management where the underlying assets of these futures contracts are not very correlated with the equity market.

PROJECTS IN COMPUTER MODULES

Applied Research Modules for Practitioners [120]
Participants : Bryan Campbell (Concordia University), Julien Foreix (CIRANO), Evelyne Giard (CIRANO), Olivier Marquis (CIRANO), Jean-Paul Truong (CIRANO)

Our modules are user-friendly software packages that allow the practical demonstration and application of recent research on the Excel platform. We have developed these modules in collaboration with CIRANO partners to answer specific needs for the practical application of innovative techniques. These modules represent a unique transfer tool as they allow the direct implementation of the most recent research results.

Our approach is to code or translate our programs into C++. The code is then precompiled and configured as an add-on in Excel. Users therefore only need to have Excel installed on their computer to have operational access to the modules. Visual Basic is used to create a user-friendly interface and serves as the link between Excel and the C++ code. The precompiled code offers the performance advantages of C++ inside the universal user-friendly Excel platform. We develop techniques that could lead to specialized modules in a variety of fields, including:

Derivatives

This module applies and compares different valuating techniques of options in a user-friendly and interactive way. Mainly, it evaluates equity or indices European and American options. Mallliavin calculus allows the module to derive the general Greeks simulation techniques so as to obtain faster and more performing estimations. These methods are more effective than the classical finite differences methods. Precisely, we are interested in: 1) Pricing of derivatives: analytical methods, Monte Carlo simulations, trees, finite differences and other specialized methods 2) Fast and efficient estimation of the Greeks with Malliavin calculus for more a precise estimation in a variety of contexts.

Risk Management

Value-at-risk has become, despite all the weaknesses linked to its calculation, one of the key concepts in finance. These days, it is the dominant method to characterize risk exposure. Many researches conducted at CIRANO deal with value-at-risk. Topics such as backtesting, estimation risk quantification or decentralization effects on value-at-risk estimations have been studied. All these elements are subject to possible integration into a risk management module. CIRANO's modules are also considered for the development of yield-risk models in asymmetry. Financial returns volatility presents well-known empirical characteristics. Important shocks on asset prices are most of the time followed by other important shocks (volatility conglomerate). Also, negative shocks have a more important effect on volatility than positive shocks. So, returns-risk models are developed to take into account this volatility's persistence and asymmetry. Precisely, we are interested in: 1) Value at risk: backtesting, quantification of estimation risk, decentralized use of VaR 2) Asymmetry, returns-risk models, volatility persistence and asymmetry.

Hedge funds

Hedge funds present non-linear relations with other asset classes and with other factors such as the S&P500 and its volatility. With style analysis, these relations can be classified and used to construct a general cartography of hedge funds. One of CIRANO's modules enables the cartography of these funds based on their relations with the factors. These factors can be an economic variable or an implicit variable (main component). This module then generates optionality in comparison with one of the factor to describe theses non linear relations. Forecasts based on the factors autoregressive models and on the coefficients of the style analysis regression may also be realized. The module also allows the calculation and the graphical representation of the fund's Omega. We consider creating in the module a hedge funds portfolio optimisation tool based on the Omega measure that will be more appropriate than the usual return/risk ratio.

Precisely, we are interested in: 1) Non-Linear methods, style analysis, principal component analysis 2) Regression on implicit and explicit factors, forecasting 3) Omega measure for funds performance analysis

Portfolio management

This mean-variance analysis module enables the choice of different mean and covariance estimation methods such as historical estimation, exponential smoothing, and GARCH modelling. Future possible developments of this module are mean – value at risk analysis, confidence intervals of the efficient frontier and portfolio performance analysis. The development of other modules on portfolio management is also considered. A Monte-Carlo simulation that incorporates hedge terms to calculate the shares of an optimal portfolio in a dynamic context is of great interest. It is also possible to use a Bayesian approach that allows managers to have a tool to incorporate their expectations in the portfolio optimization calculation. Like this, calculation methods are more robust to changes in the estimated values and enable the verification of the results sensibility to diverse models and expectations combinations.

Precisely, we are interested in: 1) Portfolio analysis with exposure constraints, more efficient estimation of the means, time-varying variance-covariance matrices and Bayesian integration of practitioners' expectations 2) Optimal dynamic portfolio shares selection through Monte Carlo simulations.

Volatility

In finance, we often use the option prices observed on the market to inverse the Black-Scholes formula and to deduce the implied volatility of the underlying asset. Implied volatility is then used to obtain forecast on volatility and on option prices for

the days to come. This procedure can be generalized in a user-friendly way into a module to first deduce the volatility and the implicit prices at the same time and then to jointly found the forecasts on these two variables. In the variance-covariance matrices modeling, where these matrices are of great dimensions and variable through time, the important number of parameters needed make the classical models, such as the multivariate GARCH model, difficult to use. The DCC method (Dynamic Conditional Correlation), used in one of our module, will allow the resolution of this problem by adjusting univariate models to different variables and by using the standardised residuals to model correlation in an autoregressive way.

Precisely, we are interested in: 1) Joint evaluation of an option's volatility and implicit price 2) Forecasting models, time varying variance-covariance matrices modeling with GARCH DCC methods

Real Options

This module enables, with the help of real options, the use of tools developed in the financial options context to evaluate investment projects. These methods are more efficient than the classical analysis of the net present value (NPV) because they allow the evaluation of the intrinsic flexibility of the projects. The possibilities to stop a project on certain dates, to wait or to change its dimension are options that have values which can be quantified and incorporated in the evaluation process.

Precisely, we are interested in: Project evaluation, financial options, project's intrinsic flexibility.

Operational Risk

Since its definitive integration into the Basel Accord in June 2004, operational risk has become a part of the risks that have to be considered in the banking regulation process and so, it has caused a great deal of interest into the banking industry. The operational risk management module is currently the only one using an Internet interface. This choice is dictated by the necessity to use a server to control the behaviour of many users that are simultaneously in different geographic places. Thanks to questionnaires filled by the different users, the module is able to determine the best frequency and severity lost distributions of a certain type of risk into a specified business sector. Monte-Carlo simulations and the use of copulas enable the application of the advanced "Lost Distribution Approach" method and then to calculate the capital requirements and to aggregate them to bank's level.

Precisely, we are interested in: 1) Internet interface, multi-users questionnaires, Lost Distribution Approach, Lost, lost severity and frequency 2) Monte-Carlo, copulas, capital requirements aggregation

Collateralized Debt Obligations (CDO)

Two CDO evaluation models are implemented into a CIRANO's applied research module. The first one, and the simplest one, is the Monte-Carlo simulation. This well-known method gives a robust overview of the product that has to be evaluated. Given a significant calculation time and using default probabilities of the collaterals and their correlation as parameters, the module give a good price approximation. A Gaussian copula structure is used for the correlation and Weibull functions are for the default probability smoothing. The other implemented model contains closed forms with Gaussian copulas. Faster than the Monte-Carlo simulation, it extracts the prices using the default probabilities and the correlation between the collaterals and the market index. The two models calculate the spreads and the lost associated with the different tranches of a CDO. Sensibility data (deltas) are also part of the output and it is possible to reverse engineer certain parameters to gauge some examples. The development of another type of model allowing calibration with market indices and the refinement of the general hypothesis (correlation and defaults structure) is currently in process.

Precisely, we are interested in: 1) Monte-Carlo simulation, Gaussian copulas, tranche prices 2) Closed forms, sensibility, calculation time, reverse engineering.

RISK

OVERVIEW OF THE ISSUES AND GOALS

Risk is a growing preoccupation to firms and society in general. We have made it a central theme of our research program. For financial institutions, risk analysis and management are of paramount importance. These institutions must account to regulatory agencies for the implementation of satisfactory risk management systems, in particular based on controlling the value at risk. To satisfy this requirement of banking institutions, we have established a team of researchers whose interests touch on this issue.

Many of these researchers are from Québec universities, but others come from elsewhere in Canada and the United States. Each year they pursue work in various areas, such as derivatives, dynamic portfolio optimization, the intertemporal evaluation of financial assets, the term structure of interest rates, corporate finance, and corporate governance. The fields of study, the issues, and the methods developed over the course of these labours are numerous and varied: dynamic portfolio management, the use of nonparametric methods for valuing assets, modelling the volatility of financial series, dynamic factor models for valuing assets, estimation methods and statistical tests based on simulations, the analysis of high frequency data, the microstructure of financial markets, etc.

The number of joint projects with our financial partners has increased significantly, and we are actively working on formalizing more far-reaching partnerships with several of them. One key goal of our program this year will be to continue in this vein of developing fruitful relationships with our partners, all the while maintaining the course set by our overall mandate of advancing scientific knowledge.

Our risk assessment and management program also covers the broader fields of business, technology, and environmental risk. Areas of study extend from the analysis of risk associated with adopting software to risks in hospitals, and include the analysis of investments with real options. A key, unifying project is that of Valorisation Recherche Québec (VRQ) on the development of tools for measuring, integrating, and managing risk.

Finally, another important phase is risk regulation, extending from regulating financial markets to regulating risk by informing the public.

RESEARCH FUNDING

The Risk Analysis and Management phase is financed by the Institut de finance mathématique de Montréal (IFM2), as well as by various research projects with our partners. The partners interested in this issue are: the Bank of Canada, the Laurentian Bank of Canada, the National Bank of Canada, the Royal Bank of Canada, the Bourse de Montréal, Hydro-Québec, Gaz Métropolitain, and the Ministère des Finances du Québec.

In the upcoming year, particular efforts shall be made to develop our relationship with the Bank of Canada. Furthermore, we have set ourselves the goal of establishing a research relationship with the Caisse de dépôt et de placement du Québec.

As to the issue of integrated risk, we are the beneficiaries of a VRQ subsidy that will extend over the next two years. Industry Canada, the Ministère de la Santé et des Services Sociaux, and other public agencies round out the financing for this theme.

PROJECTS

PROJECTS IN BUSINESS AND INTEGRATRED RISK MANAGEMENT

Management of network risks [178]

Participants : Nathalie de Marcellis-Warin (École Polytechnique), Bernard Sinclair-Desgagné (HEC Montréal)

In the context of a study on the domino effect in network risks and interdependency relationships with firms' partners, a literature review of risks connected to inter-corporate networks (with an application to managing risks associated with the supply chain) is currently in progress in collaboration with a research team at the Sorbonne.

Evaluating the risk of installing software packages [50]

This project is also under : Information technologies Participants : Benoit A. Aubert (HEC Montréal), Michel Patry (HEC Montréal), Suzanne Rivard (HEC Montréal)

Software packages are increasingly used in organizations. While the potential benefits associated with these solutions are considerable, the risks are proportionate. Several initiatives have had to be abandoned, and others entailed severe consequences for the organizations having tried them. This project aims to develop and test a computerized tool to measure and monitor these risks within an organization.

The inherent risk associated with implementing IT is well known and has been widely documented. As substantial as the potential benefits associated with this type of project are, the negative impacts of failure can be just as far-reaching. Horror stories on this subject abound and testify to the high cost of these experiences, the outcomes of which are often hard to foresee even when a solid team is in place. Even though companies are increasingly turning to off-the-shelf software packages, such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM), rather than developing proprietary systems, the element of risk remains. Indeed, while it appears intuitively obvious that installing previously tested software is less risky in many organizations than developing customized solutions, the breadth of application of these programs, as well as the fact that they are linked into other systems, means that important challenges remain to firms. While introducing software remains risky and subject to problems, the potential benefits are nonetheless proportionate (cost reduction, shortened cycles, increased productivity, higher quality of customer service, improved resource management, better decision making, more accurate performance monitoring, etc.). This is why risk management plays an important role in these endeavours.

The goal of the research conducted at CIRANO is to test the use of tools to measure implementation risk for integrated computer programs and to better understand how to manage these risks. Several tools have been developed and are currently being used by large organizations. Monitoring large projects in these vast organizations permits a better evaluation of the tools and the associated issues in risk management.

Developing risk measurement, integration, and management tools [66]
Participants : Benoit A. Aubert (HEC Montréal), Henri Barki (HEC Montréal), Jean-Grégoire Bernard (HEC Montréal), M. Martin Boyer (HEC Montréal), Marcel Boyer (Université de Montréal), Gaétan Carrier (Université de Montréal), Peter Christoffersen (McGill University), Nathalie de Marcellis-Warin (École Polytechnique), René Garcia (Université de Montréal), Pierre Lasserre (UQAM), Michel Patry (HEC Montréal), Éric Renault (University of North Carolina), Suzanne Rivard (HEC Montréal), Benoît Robert (École Polytechnique de Montréal), Bernard Sinclair-Desgagné (HEC Montréal)

Valorisation Recherche Québec's (VRQ) Integrated Risk Management project groups researchers from various disciplines, such as finance, economics, medicine, engineering, IT, etc.

The principal goal of this project is to supply managers will a set of integrated management- and decision-support tools for administering risk. This project is divided into four groups, one of which is working on financial risk, a second environmental and technological risk, a third human health risks and, finally, a fourth contract and project risk. The tools to be developed will have a flexible architecture and integrate several methodological instruments and computer programs within a procedure designed to frame the decision maker's progression.

This project will facilitate (1) further development of risk measurement and management tools, (2) advancement of the theoretical aspects of their integration, and (3) the construction of a framework to render these theoretical elements operational. The methods and computer programs developed will thus allow organizations to better evaluate risks, and to do so in a more integrated fashion. In addition, since our work also examines risk-management processes, these methods and programs will also play an advisory role, suggesting risk management modes appropriate to each situation.

Audit of a risk assessment measure (Theme Risk) [51]
Participants : Benoit A. Aubert (HEC Montréal), M. Martin Boyer (HEC Montréal), Michel Patry (HEC Montréal), Suzanne Rivard (HEC Montréal)

This project evaluates a risk assessment method currently used by a company. A series of recommendations as to paths for improving the method will be made.

PROJECTS IN TECHNOLOGICAL RISK

Exploratory study on the economic evaluation of fire departments [60]
Participants : David Boisclair (Ministère de la Santé et des Services sociaux), Nathalie de Marcellis-Warin (École Polytechnique), Ingrid Peignier (CIRANO)

Legislation, regulation, and safety codes, combined with the activities of fire departments, contribute to reducing the number of fires and the associated damages. However, these measures are costly. Evaluating the costs and benefits (economic and social) of fire departments may make it possible to: (1) justify some investments and the sharing of the associated financial

burden; (2) help public resource-allocation decisions related to fire departments; and (3) evaluate the pertinence of setting up partnerships (e.g. with insurers or other interveners in emergencies). This economic evaluation must yield an overview of the issues confronting the entire community, i.e. all individuals, workers, firms, the government, and insurers.

Documenting and estimating losses and costs associated with cyber-incidents [179]
Participants : Nathalie de Marcellis-Warin (École Polytechnique), Ingrid Peignier (CIRANO)

More and more companies are the victims of cyber-attacks, but they find it very difficult to evaluate the real losses associated with these incidents. The estimated financial losses are often limited to direct costs: material losses, unavailability of a machine, foregone revenue associated with a specific business process (e.g. an online retail site). Much more difficult to evaluate is the inconvenience to the user, customer dissatisfaction, links between the attack and a fall in the share price, and loss of face, all of which can represent high indirect costs. Thus, firms do not always proceed to a rigorous evaluation of the consequence of cyber-incidents, either because they do not know how to comprehensively identify the cost factors, or because they cannot quantify them. This project seeks to classify the costs associated with cyber-incidents and identify and analyse the valuation methods in use and existing data sources. We shall demonstrate the importance of being aware of the real costs, so as to not overestimate or, conversely, underestimate them, e.g. by neglecting the impact of damage to the corporate image. The final goal is to assist the overall evaluation of the incidence of the costs of cyber-incidents using a standardized analytical grid for them.

Managing technological risks and innovation – the case of nanotechnologies [180] Participants : Catherine Beaudry (École Polytechnique), Nathalie de Marcellis-Warin (École Polytechnique), Dina Feigenbaum (CIRANO), Albert Nsamirizi (École Polytechnique de Montréal), Ingrid Peignier (CIRANO), Bernard Sinclair-Desgagné (HEC Montréal)

Government bodies have various instruments at their disposal that impact on technological development and innovation. In an era in which more and more use is made of innovation to increase competitiveness and foster economic development, it is important to apply each of these instruments wisely, accounting for potential interactions between them. However, a cursory glance at the administration of medical and environmental standards, for example, reveals that they are poorly coordinated with typical programs to stimulate innovation. Thus, the purpose of this project is precisely to lay the groundwork for a process that integrates the management of technological risks with public policies to stimulate innovation. The point of the exercise will be to articulate concretely the issues surrounding the inevitable arbitrage between incentives to innovate, the spearhead of growth, and a management of technological risk that meets society's needs. In order to come up with questions that are specific and relevant, we will frame our thoughts by concentrating on investigating nanotechnologies. These are currently experiencing extremely rapid growth—naturally linked to promising applications—but also frequently raise concerns regarding their impacts on human health and the environment. Owing to the newness and speed of these developments, it appears to us that there is no better “laboratory” to test and refine our questions, concepts, and methods.

Applied research on the U.S. “Local Emergency Planning Committees” [181]
Participants : Nathalie de Marcellis-Warin (École Polytechnique), Ingrid Peignier (CIRANO), Bernard Sinclair-Desgagné (HEC Montréal)

To better understand the “information-based regulation” approach and to assist the department in its decisions and actions in the field of communicating risks and consensus building, CIRANO intends to examine the operation, the roles, and the mandates of the LEPCs. The problem is that LEPCs are only known by the legislation, but what are they in reality? Are they effective? How are they appointed? What is the profile of their members? What territory do they cover? How are they financed? What information do they receive from firms? What information do they release to the public (normalized or alternative scenario)? How do they disseminate information? For all of these reasons, CIRANO decided to conduct a survey of the 4000 LEPCs in the United States and compile information describing the reality of their activities, their funding needs and methods, their impact on the effectiveness of information-based regulation (How much confidence do they elicit?), and their role in assisting firms (especially SMEs).

(*English translation not available*) Évaluation économique du service de premiers répondants au sein du Service de Sécurité Incendie de Montréal [187]
Participants : David Boisclair (Ministère de la Santé et des Services sociaux), Nathalie de Marcellis-Warin (École Polytechnique), Ingrid Peignier (CIRANO)

(*English translation not available*) C'est dans le cadre de la Loi no 96 sur les services préhospitaliers d'urgence de décembre 2002 et de la fusion des services d'incendie de l'île de Montréal, que s'inscrira notre rapport sur l'implantation d'un service de premiers répondants à Montréal. Le mandat du CIRANO consiste à effectuer une étude exploratoire des coûts et des bénéfices économiques (notamment la réduction des coûts sociaux de santé) des services de premiers répondants. Les recherches en cours montrent que l'existence d'un service de premiers répondants présente des potentialités considérables (en termes d'efficacité et d'impacts), même si souvent des problèmes relatifs à l'organisation et au financement ne manquent pas de se manifester. Le projet de recherche du CIRANO regroupera donc l'ensemble des éléments nécessaires pour permettre de bien structurer la réflexion concernant la mise en place d'un service de premiers répondants au sein du service

incendie de la ville de Montréal ainsi qu'à évaluer sa rentabilité (ses enjeux pour la collectivité). Toutefois, les premiers répondants sont l'un des maillons de la chaîne d'intervention des services préhospitaliers d'urgence et l'évaluation des impacts doit tenir compte de l'ensemble de la chaîne. Pour conclure, ce rapport proposera un examen sommaire des principales options de financement à la disposition du SSIM, à partir d'une réflexion économique et de la réalité vécue dans d'autres juridictions, superposées à une analyse coûts-bénéfices.

PROJECTS IN ENVIRONMENTAL RISK

Life-Cycle analysis [182]
Participants : Dina Feigenbaum (CIRANO), Bernard Sinclair-Desgagné (HEC Montréal)

Until recently, policies in the area of the environment were largely independent and sectorial. The Integrated Product Policy (IPP) approach is all-encompassing and holistic, as the name suggests. It combines the basic principles of sustainable development with product-oriented policies, targeting the ongoing improvement of goods' and services' environmental performance in a life-cycle framework. Life-cycle analysis (LCA) is an instrument for comparing products, procedures, or services that fulfil the same function, by evaluating their impact over their entire life-cycles: "from the cradle to the grave." LCA is a tool that can be very useful for project management, decision support, and ultimately for risk management. It provides the opportunity to identify risk factors, to analyse the risk associated with technological danger, and to compare the technological risk of two different processes. LCA is one of the primary instruments of Integrated Product Policy (IPP). It allows the nature and scope of the commitment required from stakeholders—producers, distributors, consumers, and public and private buyers—to be grasped. More generally, any strategy for bolstering and coordinating environmental policy affecting goods requires new forms of governance. Specifically, the purpose of our study will be to examine the relevance of IPP in the North American context and to develop the tools necessary for its introduction.

Propagation des risques biotechnologiques : Le cas du maïs StarLink [188]
Participants : Caroline Debuissy, Bernard Sinclair-Desgagné (HEC Montréal)

Analyse du cycle de vie et analyse multicritère [189]
Participants : Renaud Caillet (École de technologie supérieure), Dina Feigenbaum (CIRANO), Bernard Sinclair-Desgagné (HEC Montréal)

PROJECTS IN HEALTH RISK

Chronicling undesired occurrences during anaesthesia [239]
Participants : Nathalie de Marcellis-Warin (École Polytechnique), Michel Sfez (Société française de gestionnaires de risques en établissements de santé)

Chronicling undesired occurrences during anaesthesia has been the subject of many publications. All of the methods used are, at least partially, based on voluntary reporting by members of the team of anaesthesiologists. Since December 2002, it has been obligatory to declare all incidents/accidents occurring in healthcare facilities in Québec. This declaration must be made using the form dedicated to that purpose (form AH-223, currently being revised). This form is not specific to anaesthesia.

The most extensive study, conducted in Australia, allowed identification of factors that contribute to the occurrence of accidents and pointed in directions for effectively preventing them. However, this type of running digest is most suitable to an epidemiological approach and of limited use to any given team. When the registry deals with elementary events, such as the one recommended in France by the Société française d'anesthésie et de réanimation, two important supplementary limitations come into play. It is currently impossible to isolate risk factors other than those related to the patient, or even the competencies of the front-line actor. Indeed, the canvassing grid yields no information concerning the organizational elements established for conducting anaesthesia. Furthermore, neither of these two approaches provides information on measures for recovering from accidents or, by extension, on the effectiveness of barriers that exist within the system to mitigate the consequences of identified undesirable events.

The proposed project will seek to elaborate a methodology for chronicling serious undesirable occurrences in anaesthesiology in cooperation with a team of French researchers. The method shall be based on the most relevant elements from among the techniques developed in France and Québec (notably the Recuperare-Santé method). We hope for the following results: a more exhaustive chronicling of events, early identification of serious events along with a greater relevance of the flagged elements to the recovery process, and improved barriers for containing the consequences of these events.

Analysis of undesirable events in the framework of healthcare provision: Structured Procedure and analytical grid [183]

This project is also under : Public Policies
Participants : Nathalie de Marcellis-Warin (École Polytechnique), Geneviève Dufour

This project will lay the groundwork for a normative framework useful for evaluating and collating incidents and accidents related to the provision of healthcare within general hospitals. On one hand, our goal is to help hospitals set up a structure for a comprehensive analysis of accidents and incidents while conserving their flexibility when they are already using other tools. On the other hand, we seek to standardize the identification of undesirable events and the analysis of causes, along with factors relating to context and the management of risky situations—thus allowing information to be gathered for the local and the national level. We shall propose a structured approach to conducting in-depth studies and present an analytical tool (called the “Grille d'analyse CIRANO”), which is based on a model used in the nuclear industry and that has been validated by numerous studies, in order to identify vulnerabilities in the system. The “Grille d'analyse CIRANO” may provide a shared basis for the institutions and allow a minimal standardization of local logs. It may, indeed, be used as an analytical tool if it is integrated into the proposed procedure, or otherwise for reporting results in the event that other analytical tools are selected. A pilot project is currently underway in four general hospitals in the province. In addition, a study is currently being conducted to adapt the analytical grid to other types of establishments (CLSCs).

(*English translatin not available*) Déclaration des incidents et des accidents dans les centres hospitaliers [186]
This project is also under : Public Policies
Participants : Nathalie de Marcellis-Warin (École Polytechnique), Geneviève Dufour, Ingrid Peignier (CIRANO)

(*English translatin not available*) La démarche de déclaration des incidents et accidents s'insère dans un processus continu d'amélioration de la qualité. Les informations recueillies doivent être de qualité et utilisables pour permettre de comprendre ce qui s'est passé et mettre en place les mesures de prévention adaptées. Nous avons fait une enquête auprès de 200 établissements de la province concernant la déclaration des incidents et des accidents et le formulaire de déclaration utilisé. A partir des résultats de l'enquête, nous allons faire une analyse critique du formulaire de déclaration des incidents et des accidents AH-223. Nous détaillerons section par section le formulaire AH-223 actuellement proposé par le MSSS. Nous analyserons l'information demandée, son utilisation et nous proposerons un certain nombre de modifications. Nous conclurons par des recommandations et des pistes de réflexion sur les possibilités de révision du formulaire AH-223 et de l'ensemble de la démarche de report des incidents/accidents.

PUBLIC POLICIES

OVERVIEW OF THE ISSUES AND GOALS

The Theme Public Policy at CIRANO is an umbrella for several research sub-themes, five of which will be used in the following to group the various projects. This research program reflects the concerns of our government partners. For the public and parapublic sectors, CIRANO provides a door into Québec's university network. In its principal areas of activity, CIRANO has the ability to assemble teams of top-flight researchers specialized in the subject at hand from a variety of Québec universities. Since they, in turn, are plugged into an international network of cutting-edge academics, we can guarantee our partners the most up-to-date skills, regardless of the area of government policy of interest. **Economic development**: macroeconomic policies, economic growth, regional development. **Public finance**: taxation, the government budgetary framework, evaluation of public policy, privatization, local public finances. **Social policies**: health, the elderly and aging, family policy, income support. **Environmental policy**: lifecycle analysis, regulation of industrial risk, agricultural pollution. **Human capital**: education, success in school, employment, labour market.

RESEARCH FUNDING

The Group's principal partners for 2003–2004 are governmental. They are: Ministère des Finances du Québec (MFQ), continuing the partnership begun in 2002–2003, Centre d'étude sur l'emploi et la technologie (CETECH), connected to Emploi-Québec, Revenu Québec, Human Resources Development Canada, Industry Canada, and the Social Sciences and Humanities Research Council of Canada (SSHRC).

PROJECTS

PROJECTS IN ECONOMIC DEVELOPMENT

Factor productivity: sources, dynamic effects, and the impact of macroeconomic policy in Québec [134]

Participants : Samuel Danthine (UQAM), Louis Phaneuf (UQAM)

The primary goal of this project is to identify the sources underlying variations in factor productivity in Québec, the transmission paths over which these shocks impact on productivity, and the incidence of current and new fiscal policies on variables associated with the labour market, especially average labour productivity. Since factor productivity is among the principal determinants of economic and employment growth, important questions arise. What causes productivity to accelerate or slump? What are the dynamic effects of technological developments on labour productivity, employment, and economic growth? What is the impact of economic policy, and of fiscal policy in particular, on productivity? More specifically, the project will address the following issues from a macroeconomic perspective: 1) Constructing a database. 2) A comparative analyse of the determinants of factor productivity in Québec and North America. The first order of business will be identifying and quantifying the underlying sources of variations in factor productivity using a vector-autoregressive (VAR) approach. Subsequently, the dynamic effects of these variations on growth and on macroeconomic variables linked to the job market—especially labour productivity and employment—will be estimated. 3) Modelling endogenous mechanisms of dynamic propagation in a dynamic general equilibrium framework, yielding an understanding of the outline of the dynamic responses previously estimated. 4) Simulating the impact of various economic policies, existing and new, within the framework of dynamic general equilibrium models, and evaluating the role played by different labour market regulations and institutions.

Profitability of incentives to foreign private investment in Québec [137]

Participants : Alain Guay (UQAM), Nicolas Marceau (UQAM)

The acceleration of global economic integration—i.e. the greater mobility of goods, factors of production, and information—appears to have imposed new constraints on governments, which must be incorporated into policy analysis. Indeed, it is possible that greater economic integration will exacerbate competition between governments in their choice of economic policy, and that this competition will act as a constraint and be detrimental.

In parallel to globalization, we observe decentralization movements in several countries, in which the power to tax, spend, and regulate is shifting from national to "regional" governments (provinces, states, départements, etc.). These reforms may eventually increase the efficiency of governments, ensuring a better alignment of government policy with the desires of the citizenry. However, just like the acceleration of economic integration, decentralization may also have the effect of exacerbating tax competition, which is harmful is some ways.

Thus, the statement that Québec is in competition with its neighbours when attempting to attract foreign private investment should not surprise. What is surprising is that we have few or no indicators of the profitability of Québec's investments in this area. In this project we seek to remedy this state of affairs.

Regulation of securities (CVMQ) [64]
Participants : Cécile Carpentier (Université Laval), Jean-Marc Suret (Université Laval)

CVMQ has funded an initial examination, which will serve as the basis for the elaboration of Québec's position on reforms to the regulation of securities. CVMQ wishes to pursue this work in several directions, and hopes to see a core of expertise develop in Québec to counterbalance Toronto's CMI (Capital Markets Institute), in terms of the regulation of capital markets and access to capital. Over the course of the upcoming year, we will pursue the scientific and profession dissemination of work conducted to date, using articles, presentations and a national conference to be held this fall at CIRANO. We anticipate collaborating with CVMQ in work along several lines, including:

- Establishing measures to ensure continuance of securities markets in Canada, in light of the rapid flight to the United States;
- Designing measures aimed at implementing viable mechanisms for financing and raising equity capital, including our involvement with the advisory committee on regulating the junior market;
- Conducting a more thorough analysis of mechanisms and concepts of regulatory competition in terms of securities in Canada;
- Providing for better supervision of start-up capital firms; and
- Studying and exploring the manipulation of books, especially during IPOs.

Our priority will be to build a team able to address the economic, legal, and financial dimensions of this dossier and obtain the corresponding funding from the Ministère des Finances and the CVMQ.

Productivity of Québec's public sector [73]
Participants : Claude Montmarquette (Université de Montréal), François Vaillancourt (Université de Montréal)

Expenditures by publicly-owned bodies represent nearly 45 per cent of Québec's GDP. In light of the magnitude of this ratio, it is clear that the efficiency with which the public sector executes its tasks must necessarily have an impact on the overall productivity of the Québec economy. For example, whether a dollar spent on education yields more, or less, training, will affect the quality of Québec's workforce and its eventual productivity. Similarly, if spending on transfers to individuals, or collecting government revenues, imply a high overhead in manpower and organization, this situation will translate into a corresponding lower ability to spend. Measuring governments' productivity, in terms of output per dollar spent, is difficult: How can government output be defined? The government sector is to a large extent a service sector, and thus confronts the same obstacle in evaluating productivity as private sector service firms, without counting the difficulties in evaluating the productivity of a sector that is mostly non-market. The measurement problem, however real, does not exempt us from dealing with this issue. Governments are very preoccupied by productivity in the private sector, so how can they justify ignoring their own productivity when they represent 45 per cent of GDP?

Corporate financing: issues, solutions, and recommendations [142]
Participants : Cécile Carpentier (Université Laval), Jean-Marc Suret (Université Laval)

Can the government of Québec intervene to improve the situation in terms of the financing of expanding firms? Governments have come up with a variety of solutions, most of which were directed at increasing the supply of capital through tax expenditures, direct intervention, or subsidies. This approach has its limitations, which it would be useful to study and, especially, to understand. This is why we intend to use an original conceptual framework to examine the principal programs that have been implemented in Québec, the United States, and Europe. It is also essential to understand the regulatory approaches that are indispensable complements to policies targeted at ensuring access to financing. A study of the financing conditions confronting growing firms in Québec is also on the agenda. Finally, we intend to generate a synthetic document that will allow decision makers to familiarize themselves with the various factors that interact in the complex issue of financing growth companies. We will present a selection of paths, along with the benefits and drawbacks of implementing them in Québec. Indeed, we believe that a single cohesive action that incorporates all the main aspects will provide solutions to the many problems that fall under the issue of financing growth firms.

Québec's policies with regard to patented drugs [136]
Participants : David Boisclair (Ministère de la Santé et des Services sociaux), Claude Montmarquette (Université de Montréal)

Federal legislation governing the protection of innovative drugs changed in 1987 and 1993. In 1993, the duration of the protection of pharmaceutical innovations was brought into line with other types of patents, rising from 17 to 20 years (or from 7 to 10 years in terms of "effective" protection) and the system under which licences had to be granted to generic manufacturers was abolished. As a quid pro quo, the manufacturers of generic drugs received the right to obtain approval for, and produce, their copies before the patents expired, so as to be able to sell them as of that moment. As to Québec, in 1994 it introduced the "fifteen-year rule"—an exception to the rule of the lowest price—that provides for reimbursement by the public plan of brand name drugs for a 15-year period after they are listed. This practice confers additional protection on brand name drug manufacturers by allowing them to retain a certain market share even after the patent expires and the introduction of generic drugs. How can the fifteen-year rule affect pharmaceutical firms' decisions of where to locate? their R&D decisions? What could Québec gain by abolishing it? Are these results compatible with our industrial policy?

Environnement de travail et performance (Banque Nationale) [130]
Participants : Marc R. Blais (UQAM), Ursula Hess (UQAM), Christian Leveillé

PROJECTS IN PUBLIC FINANCE AND TAX POLICY

Tax rate, context and information level [148]
Participants : David Masclet (Université de Rennes I), Claude Montmarquette (Université de Montréal)

The goal of this experiment is to introduce a reference group dimension into the experimental protocol, which is liable to influence labour supply in the context of different choices of tax regime. Indeed, subjects are generally prone to evaluate their situation by comparison to that of other subjects, i.e. their reference group. Thus, we may wish to know what impact agents' knowledge about other participants has on their own level of effort. We distinguish between two sorts of information that subjects may have concerning the other participants. The participants may know to what rate the others are subjected, which may be different from their own rate, and they may also know the level of effort supplied by the others for a given rate.

Does an agent's knowledge of other participants' activity level provide an incentive to account for the latter's efforts when choosing his or her own level of effort? Furthermore, will subjects be sensitive to the fact that others are subject to a different rate, for example that they pay more, or less, in taxes? Indeed, when subjects are informed of the rate imposed on the other participants and that it differs from their own, feelings of injustice may result, leading them to modify their labour supply. The theory of equity is based on the assumption that all rational agents invest of themselves in an activity until the benefits derived from it are proportional to the investment. Individuals will appreciate the benefits they derive from their activity in relationship to how much effort they put in, relative to those of others. Any imbalance gives rise to a feeling of unfairness. Dissatisfaction, born of a perceived relative injustice, must then translate into a behavioural change. Thus, when subjects observe that they are taxed more highly than others for the same level of productive activity, they may be motivated to reduce their labour supply.

Tax-advantaged funds in Quebec [254]
Participants : Cécile Carpentier (Université Laval), Jean-Marc Suret (Université Laval)

Our purpose here is to update and disseminate our work on labour-sponsored funds in Québec. We will be addressing the impact these funds have on the financing of privately held corporations in Québec, analyzing their cost to the government, and measuring the yields to these funds (FSTQ, Fondaction, CRCD).

A proposal has been submitted to the MFQ and we are awaiting their response.

Labour-sponsored funds in Canada [255]
Participants : Cécile Carpentier (Université Laval), Jean-Marc Suret (Université Laval)

This is an extension of our Québec-based examination of labour-sponsored funds to all of Canada. We will (1) evaluate the impact of these funds on the financing of small Canadian firms, in particular those active in the technology sector, (2) devise an appropriate measure of the risk of return to the main Canadian funds—from the perspective of the investors—before and after taxes, (3) conduct a cost-benefit analysis of this type of tax-advantaged fund, and (4) propose modifications to this program.

This work will fall under a study of Canadian programs providing tax breaks for financing, but will also contribute to a new evaluation of these programs in Québec. This was one of the main recommendations of the commission of inquiry into the cost overruns of the modernization of the Papiers Gaspésia inc. mill, which was tabled in early May.

Tax policy and economic development [256]
Participants : Cécile Carpentier (Université Laval), Jean-Marc Suret (Université Laval)

What tax policies best further the funding of privately-owned corporations, especially those in the technology sector? In the past, governments (especially in Québec) have used a very aggressive tax policy to attempt to stimulate the financing of private companies. Despite numerous proofs of their inefficiency, these policies seem to persist. Nonetheless, there are studies that demonstrate that tax credits are an ineffectual and costly means of intervention. An international study also found a negative correlation between the extent of these policies for promoting private investment and the development of venture capital markets. Conversely, strategies designed to ease the tax burden on divestment stimulate investments in private companies. It also appears that regulatory provisions play a key role. However, international studies cannot be directly applied to the elaboration of policies specific to the Québec context: The province does not have full control over its fiscal and regulatory system.

The question we will seek to answer with our research is: In the specific context of Québec, what strategies will best allow growing private firms to have access to capital? These strategies incorporate dimensions of personal and corporate taxation and regulation.

PROJECTS IN SOCIAL POLICY

An income security plan for Québec [247]

Participant : Jean-Yves Duclos (Université Laval)

The economy of Québec is lagging considerably behind those of its principal competitors, especially Ontario and the United States. Moreover, if nothing is done, this discrepancy will grow, owing in no small part to demographic trends that are particularly detrimental to Québec. This fact is disturbing and of concern to all Quebeckers, whatever their age, social position, or political convictions. It is thus essential that Québec's assets be more effectively harnessed to increasing its collective wealth. This must, necessarily, involve rationalizing several government programs and promoting greater efficiency in its use of public resources. All reforms create casualties, even when they are guided by the public good, and the greatest concern must be for low-income Quebeckers. Fortunately, a reform of the welfare state in Québec could allow a more simple and transparent income security system to be established to take over the government's redistribution functions and protect the worst-off from the impact of measures aimed at promoting efficiency and growth. Such a regime would also feature substantial benefits in terms of political transparency, democratic life, and vertical and horizontal equity. This conception of reform is based on the notion of income security (IS). An IS plan would consist of a direct transfer to each citizen and would replace a more or less long list of social programs.

Research in four complementary areas may prove useful for shedding light on the current debate and evaluating the advisability of an IS.

1. It could identify, examine, and document the elements of personal income taxation and income support programs that might be replaced by an IS plan.
2. It could evaluate the budgetary and redistributive effects, from a purely accounting perspective, of the reallocation of resources that would result from a single transfer replacing many others.
3. It could also predict the impact this type of change would have on agents' behaviour (work, savings, consumption).
4. Finally, it could include a comparative study of the impacts of establishing an IS regime with those from reforming other modes of government intervention (such as the allocation and pricing of hydro-electricity and the financing of higher education).

Family policy: daycare [135]

Participants : Pierre Lefebvre (UQAM), Philip Merrigan (UQAM)

Québec devotes considerable public resources to daycare. Public expenditures are expected to reach two billion dollars in 2005 if 200,000 spaces are created between now and then, assuming the provisions of the current policy are maintained and abstracting from any increase in daycare employees' pay. This policy is associated with several goals. On the one hand, it is hoped that these measures will help families better prepare their children for school, especially in the case of low-income families and, on the other hand, they should contribute to consolidating mothers' attachment to the working world, and even motivate some of them to join the labour force, especially the least qualified. Furthermore, these measures ought to have an impact on wages, since on-the-job experience can increase and positively impact on wages. These effects directly correspond to the interests of the Ministère des finances. Indeed, success in school is the guarantor of a productive labour force, and a high participation rate among mothers fosters economic growth. The point of view represented here is that of classical public policy. Indeed, what goals are targeted? Can they reasonably be reached? Does the policy satisfy the usual criteria of efficiency (best bang for the buck)? solid social investment (high social yield)? appropriate incentives (encourage desirable behaviour)? equity (equal treatment of families)? and justice (equal opportunities for children)?

Risk management in hospitals - Part 1 [59]

This project is also under : Risk Participants : Nathalie de Marcellis-Warin (École Polytechnique), Ingrid Peignier (CIRANO)

A report published by the Institute of Medicine in November 1999, To Err is Human, reveals that "avoidable" accidents could be the cause of between 44,000 and 98,000 deaths each year in acute care hospitals in the United States, which would make them the fifth cause of death. Furthermore, these unfortunate incidents increase the duration of hospitalization (on average from one to four days per patient having suffered injury) and the costs of treatment (additional exams, supplementary care, etc.). A study found that the associated costs represent about two per cent of total healthcare expenditures in the United States. An Australian analysis reveals a high accident/hospitalization ratio. While currently no data on medical errors is being collected in Québec, the Report of the Ministerial Committee Francoeur, published in 2001, appears to conclude that there is no reason to believe that the ratio is not of a similar magnitude-raising many questions. Bill 113, adopted last December, which provides for the safe provision of health services in establishments belonging to the health and social services network in Québec, follows up on the Committee's report. This Act requires that health professionals declare all incidents and accidents occurring while care is being given and also that they inform the patients. It further provides for establishing a local and provincial registry of accidents. The CIRANO research project dovetails with this new legislation. The MSSS and the Groupe national d?aide à la gestion des risques et à la qualité mandated us to work on this during the development of the Act. Phase 1 of the research project allowed us to define the basis of a normative framework serving to evaluate and collate various accidents related to healthcare benefits received in hospitals, and to propose a risk-analysis tool. In phase 2, we will test the process and the proposed analytical grid using a representative sample from Québec hospitals and adapt them to other types of establishments (local community health centres, CHLSDs, etc.). In phase 3, we will conduct a study of the cost factors associated with such accidents.

PROJECTS IN HEALTH

The impact of mixed compensation on specialists' practices in Quebec [89]

Participant : Bernard Fortin (Université Laval)

Planning the supply of healthcare services available to Quebecers is no easy task. To accomplish this, the government of Québec has taken a two-pronged approach. The first, which we can call coercive, does not shy away from imposing restrictions, often severe, on healthcare workers? practices. The emergency-medicine legislation, Bill 114, is an example of this type of management imposed on medical resources. Use of the coercive approach can have significant effects on the supply of healthcare. However, it also imposes costs, which are sometimes high, on the workers constrained by the regulations, and contributes to labour conflicts.

The second type of management is incentive-based. Working with monetary or contractual arrangements, it encourages the participants to adopt behaviour that contributes to reaching goals that have been set by the government and professional bodies. One example of an incentive policy is the mixed compensation mode introduced in 1999 for specialists, under which the physician is paid a lump sum per half day or day plus a percentage of the billing. This new type of compensation seeks to achieve greater equity between specialists who perform different tasks. It is also designed to improve the efficiency of physicians? allocation of their working hours: Compensation modes have often been accused of encouraging a proliferation of the number of billable acts while discouraging some productive activities that remain unpaid under that particular system.

This project seeks to evaluate the impact of the introduction of this reform on the professional practices of the affected specialists. An empirical analysis will be conducted-examining the impact on the number of hours worked annually by these specialists, how they are divided between the different activities, and on the volume and types of medical interventions-so as to better evaluate the impact this sort of change to compensation methods has on how physicians allocate their time and, if applicable, to propose the required modifications. Our analysis, which will be based on a model of individual choice applied to the professional activities of specialists, will account for the fact that physicians? participation in mixed compensation is contingent on the unanimous consent of physicians having their primary practice, or a substantial share of their practice, within the department, service, or area of activity. Investment in human capital is at the heart of growth and economic development. It is also perceived as a means of reducing income disparities, to the extent that these differences in earnings are real and based on varying levels of human capital. We observe that there are two broad currents in the treatment of this issue: the ?American way? and the ?French approach.? To Americans, varying levels of human capital trump wage differentials, but the French place less emphasis on compensating the education gap and impose a lower cost on the acquisition of human capital. Québec sits somewhere between the two, but closer to the French. Is it significant whether investments in human capital are less expensive, but also yield less (as with the French), or cost more and yield more (the American approach)? Does the choice of approach impact on the quantity invested? Who among the population invests more in human capital: the most gifted or the least gifted? What are the impacts in terms of public finances of choosing one model over other? Does the Québec position, i.e. a model that more closely resembles the French than the American approach, lead to a ?brain drain??

(*English translatin not available*) Déclaration des incidents et des accidents dans les centres hospitaliers [186]

This project is also under : Risk

Participants : , Nathalie de Marcellis-Warin (École Polytechnique), Geneviève Dufour

(*English translatin not available*) La démarche de déclaration des incidents et accidents s'insère dans un processus continu d'amélioration de la qualité. Les informations recueillies doivent être de qualité et utilisables pour permettre de comprendre ce qui s'est passé et mettre en place les mesures de prévention adaptées. Nous avons fait une enquête auprès de 200 établissements de la province concernant la déclaration des incidents et des accidents et le formulaire de déclaration utilisé. A partir des résultats de l'enquête, nous allons faire une analyse critique du formulaire de déclaration des incidents et des accidents AH-223. Nous détaillerons section par section le formulaire AH-223 actuellement proposé par le MSSS. Nous analyserons l'information demandée, son utilisation et nous proposerons un certain nombre de modifications. Nous conclurons par des recommandations et des pistes de réflexion sur les possibilités de révision du formulaire AH-223 et de l'ensemble de la démarche de report des incidents/accidents.

Analysis of undesirable events in the framework of healthcare provision: Structured Procedure and analytical grid [183]
This project is also under : Risk
Participants : Nathalie de Marcellis-Warin (École Polytechnique), Geneviève Dufour

This project will lay the groundwork for a normative framework useful for evaluating and collating incidents and accidents related to the provision of healthcare within general hospitals. On one hand, our goal is to help hospitals set up a structure for a comprehensive analysis of accidents and incidents while conserving their flexibility when they are already using other tools. On the other hand, we seek to standardize the identification of undesirable events and the analysis of causes, along with factors relating to context and the management of risky situations—thus allowing information to be gathered for the local and the national level. We shall propose a structured approach to conducting in-depth studies and present an analytical tool (called the “Grille d'analyse CIRANO”), which is based on a model used in the nuclear industry and that has been validated by numerous studies, in order to identify vulnerabilities in the system. The “Grille d'analyse CIRANO” may provide a shared basis for the institutions and allow a minimal standardization of local logs. It may, indeed, be used as an analytical tool if it is integrated into the proposed procedure, or otherwise for reporting results in the event that other analytical tools are selected. A pilot project is currently underway in four general hospitals in the province. In addition, a study is currently being conducted to adapt the analytical grid to other types of establishments (CLSCs).

Sustainability of funding by means of efficiency in the healthcare system: prevention and accountability [243]
Participants : André Blais (Université de Montréal), Joanne Castonguay (CIRANO), Nathalie de Marcellis-Warin (École Polytechnique), Claude Montmarquette (Université de Montréal), Robert Perreault (ADRLSSSS- Montréal), Denis Roy (ADRLSSSS- Montérégie)

Sustainable funding of our healthcare system can only be achieved by improving its efficiency. Greater efficiency, in turn, requires more accountability in the decision making of organizations, healthcare stakeholders, and patients, as well as a better synchronization of supply and demand. Our goal will be to more fully understand the preferences of patients, stakeholders, organizations, and the general population, allowing us to propose solutions for increasing the system's efficiency. We will develop an interdisciplinary research program on the sources of efficiency created by greater accountability and preventive behaviour, which we will examine from the economic, ethical, political, and social perspectives. The group’s labours will focus on two research themes: technological choices and medical errors. Under technological choices we will address the arbitrage between various elements, including prevention, medical equipment, drugs, and treatments. The medical errors theme will examine ways to increase the accountability of organizations and stakeholders and to develop organizational cultures that foster learning. Each issue could be the subject of a continuum of research involving the four disciplines: economic, political, social, and ethical analysis.

PROJECTS IN HUMAN CAPITAL

Labour shortage [92]
Participants : Claude Montmarquette (Université de Montréal), Laure Thomas

A working paper may be forthcoming on the subject of the anticipated labour shortage attributable to the aging of the population. This text will be partly inspired by research into matching the labour market and the education market (the education system and in-house training). It will illustrate the mechanics of the concept of the labour shortage and will be based on a solid review of the literature and projecting plausible scenarios. Among other things, it will seek to answer the following questions: Is a labour shortage possible in the long term? Why are business leaders so worked up over this issue? Is their concern reasonable, or is it a strategy to push the government into investing more in training labour? Are there potential and desirable areas of government intervention? Is there a particular difficulty associated with small markets that cannot create sufficient critical mass to attract globally sought-after specialists? Specific case studies could be produced on professional training and labour shortages. In this respect, analyses of two important examples affecting Québec could be conducted: nursing and university professors. The situation with nurses was foreseeable, and to some extent provoked, in Québec. The questions to be examined are thus the following: How did we arrive at this point? Why are we unable to fill the nursing shortage? Is the situation improving? What can we learn from this story? Québec?s healthcare sector is very large, and this analysis will provide a better understanding of the challenges it faces in terms of training a specialized labour force.

It would also be useful to examine how the number of university professors will evolve over the upcoming years. Since the education required to become a university professor is very long (nearly twenty years of studies), the replacement policy can be forecast. Global competition is very stiff in this area of employment. The issues that need to be addressed deal with the existence of an upcoming shortage, incorporating sufficient flexibility into the pay structure to address this shortage, the relevance of using smoothing, and the possibility of a gender-based shortage by discipline.

CORPORATE GOVERNANCE

PROJECTS

PROJECTS IN HUMAN RESOURCES

PROJECTS IN INFRASTRUCTURES

Infrastructures: cost sharing and pricing [105]

Participants : Marcel Boyer (Université de Montréal), Michel Truchon (Université Laval)

*To be revised...*Most, if not all, organizations distribute shared costs among their various divisions or partners in one way or another. Cost-sharing issues are becoming increasingly important since the rules governing the allocation of costs are key contributors to competitiveness and performance. While the scientific analysis is quite advanced, their application within organizations (firms, alliances or networks of firms, governments) remains quite embryonic and is often a holdover of ad hoc historical arrangements rather than rationally designed to maximize the performance and the value of the organization. We believe that organizations, in the broad sense, would have an interest in investing resources in learning cost-sharing methods that are more rigorous, efficient, and equitable, and that provide better incentives than those currently used. We cannot overemphasize the importance of this in an economic context in which the development of shared infrastructures, private as well as public, is ubiquitous and efficiency gains are themselves the cornerstone of competitiveness. In 2002-2003 we produced eight (8) reports on this issue. These reports are available on CIRANO?s Web site. In 2003-2004 we intend to undertake one or two large-scale applied studies. Discussions are ongoing with several partners.

The Gordian knot in access to network structures: promoting competition while simultaneously ensuring the development and maintenance of infrastructure [140]

This project is also under : Finance

Participants : Marcel Boyer (Université de Montréal), Éric Gravel (Groupe d'analyse), Pierre Lasserre (UQAM)

This research project is a new approach to the 2003–2004 project, “Prices for access to network infrastructures: the option cost of inflexibility,” and fits within an international current in research in financial mathematics: the use of real options in investment decisions in the broadest sense. Our goal this year is to make a significant contribution to one of the most difficult issues currently confronting regulators, how to promote competition in networks without creating an inefficient duplication of the essential elements of these networks.

PROJECTS IN GOVERNANCE AND PUBLIC MARKETS

Developing a governance framework for public infrastructure projects in Québec [248]

Participants : Joanne Castonguay (CIRANO), Roger Miller (École Polytechnique), Louise Roy (CIRANO)

In Québec, a number of public infrastructures are in a state of advanced deterioration and need to be replaced or renewed—and this must occur in an environment of scarce government funds. Throughout the world, large-scale public construction projects frequently run significantly behind schedule and over budget, and are furthermore the object of intense media scrutiny and speculation associated with this type of problem.

During the late 1990s, Roger Miller led a multidisciplinary research program on the strategic management of large engineering projects that conducted a detailed survey of the management and performance of sixty large international construction projects. The research of professor Miller and his team made it possible to identify risk factors and practices that made the difference between failure and success for these large projects. The most significant conclusion arising from the projects analyzed within this research program was that the institutional governance framework is vital to the success of large projects.

The research team proposes developing an institutional framework, applicable to the governance of large public infrastructure projects in Québec, that is founded on best practices. The framework we intend to submit is based on the following goals:

1. It will inform the stakeholders on the best practices at each stage of the project cycle and on the questions that need to be answered in order to highlight all the issues associated with the project.
2. It will make provision for a process by which the performance of the project management can be evaluated and practices adjusted, when appropriate, as well as for learning.

Five types of tools will allow researchers to accumulate the information required for success of the project: (1) consultation with the principal actors in Québec; (2) an updated review of the literature; (3) a benchmark for institutional governance frameworks in other jurisdictions; (4) an analysis of large projects in Québec; and (5) a socio-political analysis of project governance.

Investments Evaluation in the Public Sector: Uncertainty, Flexibility, Real Options and Discounting [229]
This project is also under : Finance
Participants : M. Martin Boyer (HEC Montréal), Marcel Boyer (Université de Montréal), Peter Christoffersen (McGill University), Pierre Lasserre (UQAM)

During the last thirty years, the breakthroughs realized in financial instruments valuation (options, futures) have greatly influenced evaluation techniques and investment decision-making. Despite the fact that these techniques are quite popular in the private sector, the possible applications in the public sector are still limited to scientific analysis. We believe that these analytics tools must be developed and be implemented as soon as possible to improve decision-making in public organisations which, just like private ones, evolve in a more and more volatile environment. Diverse cases could be considered. This far-reaching project will use the authors' knowledge in real options theory and is the follow-up to the discounting cash flow in uncertainty project.

PROJECTS IN GOVERNANCE AND MARKETS REGULATION

INFORMATION TECHNOLOGIES

PROJECTS

Organizational transformation by IT [94]

Participants : Benoit A. Aubert (HEC Montréal), Suzanne Rivard (HEC Montréal)

At the dawn of the third millennium, firms are evolving in an environment that is increasingly complex and variable. Saturated markets, increased competitiveness of countries with low production costs, stiffer competition from multinational firms, greater access to information, more demanding and less loyal clients, and modifications to the demographic fabric, are all challenges to which modern firms must rise. In this environment, firms' competitiveness depends increasingly on their flexibility and ability to innovate, as much in their organizational structure and their mode of production as in how they interact with clients and suppliers. Recent developments in IT allow firms to become more agile, making a multiplicity of organizational structures possible, and offering a panoply of models for relationships with customers or suppliers. The project on organizational transformation by IT analyses different forms of transformation as well as the associated issues. Several documents have already been generated within this project, dealing with both the public and private sector. A monograph documenting the Registre des droits personnels et mobiliers identified the winning conditions for this type of project. The goal of this exercise is to allow individuals who will undertake similar projects in the future—whether governmental decision makers, project leaders, or potential partners—to be able to establish the right conditions for their own projects. While bearing in mind that each project has its own particularities and must be structured and managed accordingly, the generic components of the winning conditions that this paper will lay out can serve as valuable benchmarks.

Simple and combinatoric reverse auctions [115]

Participants : Teodor Gabriel Crainic (UQAM), Michel Gendreau (Université de Montréal), Robert Gérin-Lajoie (DGTIC, Université de Montréal), Jacques Robert (HEC Montréal), Isabelle Therrien

Electronic reverse auctions have assumed a key role in B2B. Companies are seeking to better understand the potential of this new method of buying. Experimental analysis and the theory of auctions allow us to analyse different types of auctions and which ones are most suitable in light of the goals of the buyer. In terms of the research, we are particularly interested in multi-object calls for tender, in which several contracts are simultaneously put to auction. Rather than allocate these contracts independently, we have devised sophisticated auctioning mechanisms allowing for combinatorial submissions. Implementing these auctions requires inclusion of combinatorial optimization tools in the auction engine. We have created a Web-based generic auction system (Generic Negotiation Platform, GNP) that enables this type of auction to be conducted. We have begun collaborating with Hydro-Québec on a project to help them acquire an expertise and a strategy for the use of reverse auctions. Trial auctions are ongoing.

Forecasting exchange [116]

Participants : Robert Gérin-Lajoie (DGTIC, Université de Montréal), Jacques Robert (HEC Montréal), Isabelle Therrien, Marc-André Thibodeau

CIRANO has developed a transactions site for trading financial assets: the CIRANO electronic exchange (CEX). The CEX was designed as a forecasting exchange, i.e. the participants exchange futures contracts whose values depend on future events. The values at which these contracts are traded reflect participants' expectations on the upcoming event. During the last Québec election, we set up an electoral exchange in the CEX. We have reproduced experiments similar to others having been conducted outside of Québec (see, in particular, the Iowa Electronic Markets). The results we obtained encourage us to continue, and we are especially hopeful of being able to set up an exchange to forecast the evolution of macroeconomic aggregates.

This tool could also be useful in introductory economics courses.

Decision support agent systems [117]

Participants : Houssein Ben-Ameur (HEC Montréal), Brahim Chaib-draa (Université Laval), Robert Gérin-Lajoie (DGTIC, Université de Montréal), Peter Kropf (Université de Montréal), Sylvain Riopel (Synopsis), Jean Vaucher (Université de Montréal)

NADIM (Negotiating Agents on Distributed Markets) is a multi-agent system for planning and coordinating research, as well as for gathering and aggregating data from external sources (e-markets, Web sites, service suppliers, etc.). Negotiation support is combined with these external sources and the associated information flow management. NADIM is designed as a multi-agent platform that is sufficiently generic to be used in different applications where there is a need for coordinating research and aggregating distributed information, monitoring combined negotiations, and concluding business transactions with several suppliers. There are many applications of this technology in e-business.

One of the applications we are working on is travel. Travel agents' tasks consist of finding and ensuring a combination of products that is often complex. To do this, they must match up various services from several suppliers spread around the world, handling: air and land transportation, accommodations, insurance, etc. Our project aims to apply NADIM (a search and aggregation tool) to this field in order to simplify their work. This project involves two partners from the sector.

Evaluating the risk of installing software packages [50]
This project is also under : Risk
Participants : Benoit A. Aubert (HEC Montréal), Michel Patry (HEC Montréal), Suzanne Rivard (HEC Montréal)

Software packages are increasingly used in organizations. While the potential benefits associated with these solutions are considerable, the risks are proportionate. Several initiatives have had to be abandoned, and others entailed severe consequences for the organizations having tried them. This project aims to develop and test a computerized tool to measure and monitor these risks within an organization.

The inherent risk associated with implementing IT is well known and has been widely documented. As substantial as the potential benefits associated with this type of project are, the negative impacts of failure can be just as far-reaching. Horror stories on this subject abound and testify to the high cost of these experiences, the outcomes of which are often hard to foresee even when a solid team is in place. Even though companies are increasingly turning to off-the-shelf software packages, such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM), rather than developing proprietary systems, the element of risk remains. Indeed, while it appears intuitively obvious that installing previously tested software is less risky in many organizations than developing customized solutions, the breadth of application of these programs, as well as the fact that they are linked into other systems, means that important challenges remain to firms. While introducing software remains risky and subject to problems, the potential benefits are nonetheless proportionate (cost reduction, shortened cycles, increased productivity, higher quality of customer service, improved resource management, better decision making, more accurate performance monitoring, etc.). This is why risk management plays an important role in these endeavours.

The goal of the research conducted at CIRANO is to test the use of tools to measure implementation risk for integrated computer programs and to better understand how to manage these risks. Several tools have been developed and are currently being used by large organizations. Monitoring large projects in these vast organizations permits a better evaluation of the tools and the associated issues in risk management.

Business intelligence [118]
Participants : Jean-François Garneau, Robert Gérin-Lajoie (DGTIC, Université de Montréal), Peter Kropf (Université de Montréal), Jian-Yun Nie (Université de Montréal), Jean Vaucher (Université de Montréal), Stéphane Vaucher (Université de Montréal)

Owing to time and resource constraints, Québec's SMEs are not always able to benefit from international calls for tender that are posted on the Web. In this context, the CERVO (Centre de réseautage et de veille d'opportunités) project was established to devise a call-for-tender search and matching tool for SMEs. The goal of this project is to supply a service of monitoring and matching calls for tender. This project is being developed in collaboration with the Société de développement des technologies de l'informatique (SDTI), the technology firm Nstein, and researchers from the Université de Montréal's RALI, which studies computational linguistics and information searches. We are building a search and indexing tool specialized in calls for tender that will automatically alert SMEs when interesting opportunities arise. Cooperative research funding from the NSERC has been granted to this project. Extensions to this project are envisaged for next year. There is much information targeted at SMEs buried in the Web. In particular, we seek to jointly develop with governments a project on e-permits. But beyond the simple gathering of data, a complete business intelligence process also involves uncovering their meaning: The organization must be able to interpret the information gathered, impute a meaning to it, seek out complementary information, and ultimately make the required strategic decisions.

Process integration [95]
Participants : Benoit A. Aubert (HEC Montréal), Betty Vandenbosch (Case Western Reserve University)

Information technologies allow a growing number of firms to function in an integrated fashion, both internally and in their dealings with their business partners. One of our goals is to provide a tool to measure the level of integration of a given process. This measure will allow identification of the steps required to increase the level of integration (to the extent that this is profitable for the organization) and to assist in the choice of the appropriate technology. Our contribution will be at the level of ERP systems, which are at the core of the internal management of firms. Initiatives using technologies supporting inter-organizational processes must account for ERP systems and integrate into them. This measure should be applicable both to inter- and intra-organizational processes. Eventually, a decision-aid tool will be developed to precisely measure how integrated a process is by modelling and simulating it electronically. Differing degrees of integration will be defined following an examination of various processes. We will then be able to evaluate the profitability of increasing the level of integration

within an organization, which can subsequently be compared with the costs and risks associated with the higher level of integration.

A formal definition of integration has been elaborated, and we are now testing the elements of this definition (accessibility, time, transparency and modularity) in various environments (manufacturing and service sectors, principal and support processes). These cases allow us to verify to what point the proposed definition truly encompasses the concept of integration. In a subsequent step, the notion of the value extracted from a process will be tied in with this project. Several firms are participating in this study.

Recommending music to consumers [209]
Participants : Yoshua Bengio (Université de Montréal), Doug Eck (Université de Montréal), Robert Gérin-Lajoie (DGTIC, Université de Montréal), David Levithin (McGill University), Marc-André Thibodeau

We are also developing a system for recommending songs based on new results from research into cognitive music and statistical machine learning. Experts in statistical learning and musicology are collaborating on a system that will automatically recommend songs and other artistic products to listeners based not only on their previous choices and comments and those of the community, but also on a comparison of detailed electronic prints of the music with the users' personal profile. These latter elements are unique and give the project its innovative quality. Furthermore, this project explores new business models for marketing music and will draw on the promotion of derived products, such as concerts or a personalized broadcast-on-demand service. An application has been submitted for funding from the NSERC's Idea to Innovation (I2I) Program and discussions are underway with future business partners in the field.

EXPERIMENTAL ECONOMICS LABORATORY

OVERVIEW OF THE ISSUES AND GOALS

Experimental economics allows relevant and reliable empirical data to be gathered and the relative weight of specific motivations (such as the search for gain or the need for reciprocity) to be identified and evaluated in agents'' decision-making processes. Experiments are repeated under identical conditions so as to gather sufficient data to proceed with rigorous statistical analysis. Furthermore, experiments allow an environment of new ideas and institutions to be created in a controlled setting, where the impact of certain variables on the decisions and strategies of participants—who are compensated according to their decisions—can be isolated. Experiment participants are confronted with an incentive structure precisely reflecting the experimental design. As several authors have emphasized, this permits an analysis and understanding of possible discrepancies between theoretical forecasts at equilibrium and the results of experiments and everyday observations. It is worth noting that the 2002 Nobel Prize in Economics was awarded to Vernon Smith and Daniel Kahneman, two pioneers of experimental economics. This recognition should bolster the scientific credibility of the methodology. Our laboratory seeks to become particularly specialized in studies of behaviour relevant to economic policy and corporate human resources management policies.

RESEARCH FUNDING

Funding for the Experimental Economics Laboratory is provided by several sources, including the Ministère des Finances, the Ministère du Revenu, Defence Research and Development Canada (DRDC), and Bell University Laboratories.

PROJECTS

For scientific reasons relateed to the validity of the experimentations, the informations on research projets will be available when the experiences will be completed.

PROJECTS IN APPLICATIONS TO PUBLIC POLICY

Decisions in monetary theory and the central bank [150]

This project is also under : Finance
Participant : Jim Engle-Warnick (McGill University)

From January 2004 - April 2004 approximately 150 subjects participated in a study designed to test for dominant decision rules in a central bank decision-making experiment. The research question is whether a simple rule, called the Taylor Rule, emerges as a dominant rule in a game where subjects set the short-term interest rate in an effort to control inflation in a computer economy. The question is interesting because, while the rule does a good job describing the decision-making of many central banks, it is unlikely that they actually use it (it is too simple). However, if this rule is a natural rule for economic agents to discover themselves, then central bank use of the rule is justifiable in terms of its transparency and ease with which it allows economic agents to understand what they are doing and thus to form expectations. Preliminary results indicate that Taylor-type rules are dominant, though the precise (optimal) rule is rarely used. There was a rich degree of heterogeneity amongst the subjects which we are now analyzing

PROJECTS IN GENERAL BEHAVIOUR AND DECISION-MAKING

How People Learn To Make Different Decisions: An Experimental Study in Price Dispersion [176]

Participant : Jim Engle-Warnick (McGill University)

We propose a study that will shed light on an important and puzzling market phenomenon of price dispersion, which is the sale of exactly the same item for different prices by different sellers. It occurs, for example, in internet commerce and the market for petrol, and significantly affects outcomes for consumers. We propose to test our hypothesis that price dispersion is the result of a particular type of learning process, induced on the sellers, by the structure of the market. We will test this hypothesis using a series of economics decision-making experiments, in which human subjects make decisions in a computer laboratory market. We thus propose to advance the use of learning theories that are used to study how people come to make decisions in psychological, social, and economic contexts, and along the way to contribute to the debate regarding the source of an important market phenomenon.