A Multicriteria Approach for Selecting a Portfolio Manager

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Abstract

This paper introduces the application of the multicriteria method Promethee II to the selection of a portfolio manager. Such application involves four main steps: (1) defining the list of potential actions or solutions to the problem; (2) defining the list of relevant criteria; (3) evaluating the performance of each action based on each criterion; and (4) aggregating these performances with the multicriteria method Promethee II. The use of a multicriteria approach to this problem is appropriate, as multiple criteria seem to be used by decision-makers in the selection of a portfolio manager. Criteria applied to this model are derived from a set of depth interviews with managers of the 12 major pension funds in the Province of Quebec. We ended up with nine criteria that turned out to be heterogeneous and conflicting in their nature. These criteria were then grouped into four groups: (1) past performance, (2) investment philosophy, (3) staff criteria, and (4) organizational criteria. The richness of data collected through the interviews allowed us to specify accurately the decision-makers' preference functions. It was thus possible to choose an outranking technique as a multicriteria aggregating procedure. The choice was limited to one technique of the ELECTRE family and one of the PROMETHEE family of methods. The Promethee II was thus used because the interviews revealed that no veto thresholds were applicable to the model. Furthermore, the application is a *ranking problem* where it is necessary to prioritize a set portfolio managers of from “best” to “worst”. Finally, the analysis is concluded by an application of the paper to the selection of a small capitalization stock portfolio manager.

Résumé

Cet article introduit l’application de la méthode multicritère PROMETHEE II à la sélection d’un gestionnaire de portefeuille. Une telle application implique les quatre étapes suivantes: (1) définir la liste des actions ou solutions potentielles du problème; (2) définir la liste des critères pertinents; (3) évaluer la performance de chaque action au niveau de chaque critère; et (4) aggréger ces performances avec la méthode multicritère PROMETHEE II. Le recours à une approche multicritère semble adéquat puisque plusieurs critères semblent influencer le décideur pour le choix d’un gestionnaire de portefeuille. Les critères appliqués dans ce modèle sont dérivés d’une série d’entrevues avec les gestionnaires des douze plus importants fonds de pension au Québec. 9 critères ont été identifiés comme pertinents pour la problématique en question. Ces critères se sont avérés hétérogènes et conflictuels. Ils ont été ensuite regroupés en quatre classes de critères: (1) performance passée, (2) philosophie d’ investissement, (3) critères relatif à l’equipe, et (4) critères corporatifs. La richesse des données recueillies au cours des entrevues nous ont permis de définir avec précision les fonctions de préférences du décideur applicables au modèle de décision. Ceci justifie le recours à une technique de surclassement de synthèse comme méthode multicritère d’aggrégation des performances. Le choix était donc limité entre une technique appartenant à la famille de méthodes ELECTRE et une autre appartenant à la famille de méthode PROMETHEE. PROMETHEE II fut donc retenue car les entrevues révèlent qu’il n’y avait pas lieu d’appliquer des seuils de véto au modèle. De plus, la problématique du modèle est une problématique de rangement où il est nécessaire de ranger les candidats potentiels du “meilleur” au “pire”. Finalement, la présente analyse est conclue par l’application du modèle au choix d’un gestionnaire de titres à petites capitalisation.

1. Introduction

Pension funds and other private or institutional investors can potentially loose large amounts of money annually as a result of poor performance on the part of the portfolio manager. The selection of a portfolio

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manager is indeed among the most important decisions that institutional investors have to make. It is not sufficient to simply define an appropriate investment policy; investors must also select a manager who would turn these policies into reality, and allow his/her investors to achieve appropriate expected returns. It is, therefore, desirable to develop a methodology which can aid in selecting a preferred portfolio manager. Through interviews with Quebec's major pension funds' managers, it has been observed that two main criteria are generally considered: past performance of a portfolio manager, and the investment style of that manager. Typically, pension fund managers engage consultants and actuaries to assist them in this choice. These latter have developed a variety of selection techniques which, unfortunately, can lead to divergent and contradictory recommendations. Moreover, these techniques, implicitly or explicitly, use other heterogeneous and contradictory criteria. Without a stable and well-conceived process, selection of a manager may become an arbitrary decision, and will not be the result of any form of objective reasoning.

It is, thus, appropriate to apply a more general approach which allows one to aggregate objectively the different factors relevant for portfolio manager selection. Multicriteria methods are well suited for this purpose. By using such methods, it is possible to avoid relying on a single and possibly biased criterion. multicriteria methods allow for the inclusion of several and possibly conflicting factors, and as well provide mechanisms for properly aggregating them.

What follows is a pension fund manager's perspective on the key portfolio manager selection issues that face them. Criteria of the model are mainly derived from a set of interviews with twelve major pension funds manager from the Province of Quebec. We propose an alternate procedure to select a portfolio manager based on the multicriteria method PROMETHEE II. In section 2, we present an overall review of the standard selection techniques used in the industry, as well as a critique of these techniques. In section 3, we illustrate the methodology of the proposed multicriteria approach and the proposed selection process. Section 4 presents the model's selection criteria. Section 5 highlights the main advantages of a multicriteria approach over the traditional selection techniques, and future prospective improvement of our pilot approach are provided.

2. Usual selection techniques and their principal limits

2.1 Usual selection techniques

A review of the Finance literature and interviews with managers Quebec's major pension funds reveal that two main approaches are used in practice for the selection of a portfolio manager:

- ***Choose the portfolio manager with the highest risk adjusted returns:*** Most practitioners agree that past performance is no longer a fundamental criterion in the selection process. After choosing an index, investors choose the portfolio management firm that had achieved the best past performance over a predetermined period. The final decision will be made after a further analysis of factors explaining the success of the portfolio manager. By screening other elements such as the quality of management and ownership structure, the investor tries to evaluate the likelihood that the portfolio manager will repeat his/her performance in that manager's next mandate.
- ***Choose the portfolio manager with the most appropriate investment style:*** To identify an investment style, several techniques are used by consultants and investors. Some analyze the fundamental characteristics of managers' portfolios. For instance, Barra Inc. has developed software which allows the analysis of domestic and international portfolio managers' investment styles by correlating manager's past returns against a benchmark (Hemmerick 1996). Others compare the portfolios held by the portfolio manager with different benchmarks and identify which of the previous benchmarks these portfolios the most closely track. Sharpe (1992) proposed a technique based on a factorial analysis of manager returns. He proposes a list of benchmark that best represent usual financial instruments used

by portfolio managers. By running a factor analysis, it is possible to determine which benchmarks the portfolio manager is trying to replicate, and thereby identify his investment style.

Whatever the fundamental criteria chosen, investors still consider other factors. The final decision is actually the result of a subjective aggregation of these different factors.

In their quest for the "ideal" portfolio manager, investors appear to have 2 alternatives:

- **build up their own selection process**; In our case, the survey reveals that typical steps for this process are the following:

  1. define selection parameters of investment style and performance measures;
  2. define the list of potential portfolio managers;
  3. proceed to an initial screening and determine the short list of managers;
  4. define the list of selection criteria assets under management, staff, fees, etc.;
  5. analyze the short list and choose the finalists;
  6. interview the finalists and make the final choice;
  7. negotiate a contract.

- **retain a consultant or an actuary**; This practice has became so popular that a secondary market of consultants has been developed, with some consultants specializing in the selection of consultants. Our survey revealed that almost 70% of the sample indicated that an external consultant had been retained to aid in selection of a portfolio manager. After discussing with his client about his privileged investment style and objectives, the actuary or consultant defines a short list of 5 or 6 portfolio managers who may satisfy the client needs. According to the consultant's point of view, these managers fit most closely the pension fund' required investment style, and have displayed an impressive track record over the last 5 five years. The consultant's experience and his personal beliefs are fundamental in this process, which implies that the short list of *finalists* varies from one consultant or an actuary to another. After a deeper analysis of the short list based on 4 or 5 supplementary criteria and interviews with these managers, the consultant provides his client with final recommendations on the manager to select. Through our survey, it was revealed that investment style and past performance are still the most important criteria. It has been noted also that well-defined and objective models are seldom used to aggregate the different selection criteria, or to appropriately weight those criteria.

2.2 Principal limits of selection techniques

While one would normally expect wide variations among portfolio managers, the statement of one of the respondents may reveal inherent weaknesses in the tools presently available for managers selection: « *All the portfolio manager that we approached were classed in the first and in the second quartile. So, where are the others? Who is in the third and the fourth quartile? There are none!* ». This statement exemplifies the relative ease with which managers may present data in order to be in top quartiles. This highlights the limits of the available performance measures (Sharpe Ratio, Treynor Ratio and Jensen Ratio); these limits has been proven by empirical research. Haugen (1993) found that these measures present two main weaknesses. First, they may under-estimate the true market line, which may favor risk-averse portfolio managers. Moreover, they are sensitive to the benchmark used. The ranking produced may differ from one benchmark to another. Roll's (1977) criticism of the CAPM (Capital Asset Pricing Model), casts some doubts on the reliability on this performance measure. Choi (1995) has empirically demonstrated the sensitivity of performance measures to exogenous variables used (i.e. the benchmark returns). He concluded that misspecifying the market benchmark leads to an incorrect performance ranking based on a predetermined performance measure. The appropriateness of the performance measure to use and the investment period over which it is computed, is also problematic to define. The survey revealed that there exists little agreement among the respondents as to the performance measure to use. For instance, half of the respondents use added value as a performance measurement tool, while the other half specified one the various Sharpe Ratio variants.

A second weakness arises from the fact that performance measures are computed with past returns data, which can not be easily projected to the future. An impressive past performance can not, by itself, guarantee that future performance will continue in this way. Practitioners consider that performance follows a cyclical movement (Edwards 1992), and no empirical evidence of the persistence of past performance has been found (Barksdale & Green 1990, Elton, Gruber & Hlavka 1992). Recruiting the manager with the "hottest" track record may signify buying very expensively a manager who would underperform during his mandate with the investor. According to this reasoning, it would be more logical for a pension fund to hire a poor-performing portfolio manager. Hence, this manager would experience his *good cycle* with the pension fund and provide satisfactory returns.

Uncertainty results from two elements. First, consultants may have implicit incentives to recommend a portfolio manager with an impressive track record. This phenomenon is common to relationships implying agency costs. The selection process would be then easier to defend if the portfolio manager performs poorly during his coming mandate. The agent (the consultant) looks after his own interest, and is motivated to provide his client (the investor) with a less optimal but more justifiable recommendation. In the case of a poor performance, the portfolio manager can be fired but the consultant would not be blamed to have recommended him.

Second, it is very difficult, especially in Canada, to obtain returns computed or presented in a standardized way. The risk with ending up with "fake" or "boosted" returns is real. In the United States, the AIMR, The Association of Investment, Management and Research, has proposed several recommendations to standardize the procedure for presenting and computing returns. These standards are today increasingly accepted by investment managers, and are required by pension fund managers. In a survey by Greenwich Associates Research in 1993, respondents stated that "*a portfolio manager would not cheat in his calculations, but he would find several ways to illustrate them*" (Badger 1994). In Canada, there are no similar rules regulating the calculation of portfolio returns. This may offer great possibilities to portfolio managers to mislead investors. Among the most practiced ways to hide their real performance, portfolio managers can:

- consider a performance over a period which may not reflect their overall performance;
- erase from their files accounts belonging to investors who, for insufficient results, withdrew their money;
- present returns of the best performing portfolios.

Investment style tracking techniques exhibit considerable limits. No method is, indeed, commonly accepted for the identification of an investment style. Correlation analysis, the most popular technique to do this, may lead to a style misclassification of the portfolio manager. This is due to the considerable *white noise* resulting from regressing the portfolio manager returns on those of the benchmark. As a matter of fact, correlation analysis may result in misclassifying the portfolio manager risk profile. Christophsen (1995) has found that:

- style classification based on correlation analysis may result from spurious correlation;
- correlation analysis can not detect in time a change in the portfolio manager investment style;
- utilization of correlation analysis for forecasting purposes is very limited.

Finally, as shown by consultants practices, there are numerous criteria to be considered for manager selection in addition to risk-adjusted returns and investment style. Emphasizing a unique criterion and underestimating the others factors, does not allow one to capture all relevant information for the selection.

In conclusion, we illustrate the high cost of a wrong choice. The evaluation of the portfolio manager can not be fairly made before a minimal period of 3 years. A wrong choice would imply compromising the investor asset value by a poor performance or an excess risk. Moreover, the cost of changing the portfolio manager is relatively high. By taking into account all direct and indirect costs, Schillfarth (1989) estimated that pension fund portfolios loose between 2½% and 8% in value. This loss results mainly from changes that are introduced by the new portfolio manager. Not only the pension fund returns will be reduced by commission fees, but also in order to adapt the portfolio under new management to account for the manager's own investment style, the new portfolio manager will proceed to non optimal transactions. Now, big US pension funds change their portfolio manager every 2¾ years. At a minimal cost of 2½%, the cost of change is almost 1% per year.

The multidimensional aspect of the decision, as well as the many weaknesses of performance measures and investment style tracking techniques, justify the application of a multicriteria approach. In the section to follow, a review of some relevant models is provided, and a model to suit this particular application is chosen and illustrated.

3. A multicriteria model for selecting a portfolio manager

The selection of a portfolio manager presents the decision-maker with a *ranking problem* where all potential alternative need to be ranked from the *most* one to the *least satisfying*. Several approaches can be considered. A first group of methods is the group of *"pure ordinal methods"*. A number of models have been developed to handle those multicriteria problems where the available data on the alternatives to be prioritized is either of the likert variety or is ordinal ranks. A typical example where such would be the case in a situation where a large number of projects have to be ranked and each must be evaluated on a number of criteria. A common approach would be to give a score on a 5-point likert scale to each prospect on each criterion, and then rank the criteria themselves on a similar scale. See (Cook et al. 1991, 1993, Koksalan et. al. 1988, and Kohanen 1986) as examples. The paper by Choi and Ho 1997 in the current issue of INFOR describes such a setting. These models are more appropriate when large numbers of alternative need to be processed, and minimal data on preferences is available.

Ratio Scale Methods (Saaty 1980) are also to be considered. Saaty has presented the *Analytical Hierarchy Process* as a multicriteria tool for use when a small number of alternatives are to be evaluated, and pairwise comparison data on a ratio scale are available.

Rating scale methods such as ELECTRE family of methods and *concordance models* where basic thresholds are given are an alternate approach to solving the selection problem. Brans et al. (1984) proposed the PROMETHEE family of methods, as an alternate set of rating scale methods. The informational need is considerably bigger. Besides, as Bouyssou (1987, 1990) asserts, in order to obey the operational criteria of *readability* and *operationality*, the number of alternatives to compare should be small.

As we do possess accurate information on the decision-maker's preference functions, it seems appropriate to choose a multicriteria approach for the problem at hand. The application of a multicriteria approach usually requires the following four steps (Martel 1987):

1. defining the list of potential actions or solutions;
2. defining the list of relevant criteria;
3. evaluating each potential action's performance in every relevant criterion;

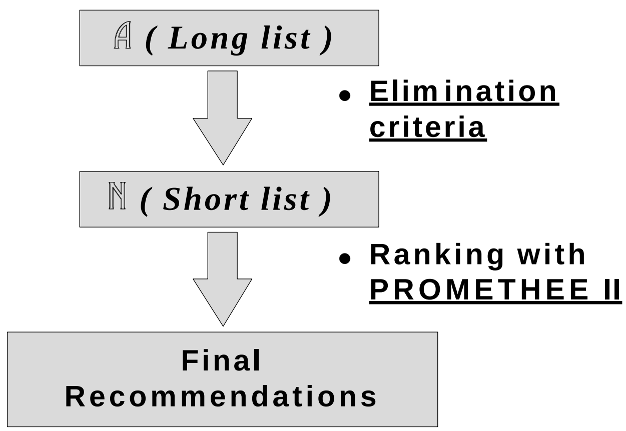
4. aggregating these individual performances and determining the action that most satisfies the decision-maker.

The potential actions refer to *firms and individuals offering portfolio management services*. We do not assign particular geographic limits to the application of our model. However, due to the construction of the model's criteria, its application is constrained to portfolio manager whose natural clients are large-sized pension funds.

The proposed steps for the selection of a portfolio manager are the following:

1. define eliminatory criteria and their respective thresholds;
2. define the list of all potential portfolio managers;
3. proceed to a first selection and obtain a short list of admissible candidate based on elimination criteria; define selection criteria and their respective weights using the technique developed by the project "Volvox", as well as strict and weak preference thresholds.
4. establish final recommendations with the method PROMETHEE II.

Figure 1: Portfolio manager selection process



3.1 Choice of the method PROMETHEE II

Classic optimization problems assume that it is possible to capture with an unique objective function *g* (economic or utility function) all possible effects related to a possible solution of the problem at hand. However, many situation are of such complexity so that the objective function *g* is not exhaustive enough. This *multicriteria paradigm* (Roy 1973) is characterized by:

- multiple criteria explaining the phenomenon at hand;
- criteria that are contradictory in their effects, meaning that an improvement in one criterion may result in a worsening in another;
- a situation where there is no optimum to discover, but rather only a compromise to reach among all different criteria.

For the current application, a decision was made to use an "*outranking relationship approach*". This approach is based on a pairwise comparison of potential candidates. It also introduces the concept of incomparability between two potential actions. It may not be possible to say that if we think that we do not have enough information to express a judgment of preference (i.e. *a* is better than *b*, *a* is as good as *b*, *a* is worse than *b*). It also accepts the intransitivity of outranking relationships between actions.

The objective of this approach is to provide its user with recommendations regarding the most satisfying portfolio manager to hire. Consequently, we face a *ranking problem.* This type of problem aims to sort the potential actions into *equivalence classes*, these classes being ranked consistently with decision-makers' preferences (Sharlig 1985). The basic idea is to rank these actions from best to worst.

As indicated above, several multicriteria methods can be applied to our analysis. The most known methods are: *goal programming* (Kwat and Schnierdenjans, 1985), *Analytical Hierarchy Procedure* (Saaty 1980), and the family of methods ELECTRE (Roy 1973, 1978 and 1982) and PROMETHEE (Brans et al. 1984). We chose, in our approach, an outranking approach. It is based on a *pairwise comparison of potential actions* (i.e. comparing portfolio managers by pair). It introduces the principle of non comparability between actions in cases where we think that we do not possess enough information to possibly express a preference judgment. It also accepts the principle of non transitivity of outranking relations. For instance, if *a* is as good as *b*, and *b* is as good as *c*, then we can not infer that *a* is as good as *c*.

Consequently among these different techniques, the families of methods ELECTRE and PROMETHEE seem to be the most appropriate to our analysis. They include the following methods:

- The family of methods ELECTRE includes: ELECTRE I, ELECTRE II, ELECTRE III, ELECTRE IV, ELECTRE IS, and ELECTRE TRI (Royand & Bouyssou 1993).
- The family of methods PROMETHEE (Preference Ranking Organization Methods for Enrichment Evaluation) which includes PROMETHEE I, II, III, and IV (Brans et al. 1984).

Basically, these methods differ in their MultiCriteria Aggregation Procedure (MCAP). ELECTRE methods incorporate in some criteria a *veto threshold* that blocks the outranking relationship between two potential actions. Besides, they do not call for transitivity in their preference structures. The survey reveals that no *veto thresholds* were applicable to our analysis.

The veto threshold impedes an outranking relationship between a and b if $g_j(b)-g_j(a)\geq v_j$ even if $g_k(a)-g_k(b)\geq p_k$ for any $k\neq j$ where v_j refers to the veto threshold applicable to the criterion j.. In other words, if a is considered to be better than b in all criteria but one and if on that specific criterion j, b is by far better evaluated than a, the huge gap between a and b is that important that it blocks the preference of a over b and makes the two alternate actions incomparable. It also reveals that respondents' preferences were transitive.

Consequently, we have chosen PROMETHEE II as the ranking technique to be used herein. This method defines a global ranking which means that it provides the decision-maker with a ranking of all potential actions. All portfolio managers are thus comparable. A technical description of the method is appended at the end of this paper.

3.2 Weighting criteria

Criteria weights will be determined with the technique developed in the project Volvox (Derot et al. 1997) for the following reasons:

- the "Volvox " technique uses a numerical scale closely tied to decision-makers preferences;
- it requires only (n'-1) comparisons, with $n'\leq n$, where n refers to the number of criteria or subcriteria to weight, instead of $n(n-1)/2$ comparisons as in the Saaty method;
- it gives more weight to more important criteria.

Manager selection is a group decision involving all members of a selection committee. To aggregate the different individual weight vectors, we consider several alternatives:

- Computing a weighted average by the respective importance of each decision-maker of the individual weight evaluation;
- applying the Delphi method (Dalkey, 1950);
- proceeding by way of brainstorming (Osborne 1938), or brainwriting;
- applying the Nominal Group Technique (Van De Ven & Delbecq 1968);
- applying the Saaty method (Saaty 1981).

None of these techniques can be considered as being optimal. However, the Delphi method is still the most elaborate technique and provides the most thoroughly evaluated weights. Such weights are free from external pressure or influence that result from hierarchical or personal interest relationships between selection committee members. It also provides weights developed gradually; this is opposite to other techniques where decision-makers have to provide “one shot” weights. The Saaty technique can also lead to well-thought weights. It is indeed a compromise between the desired degree of accuracy and its marginal cost.

3.3 The approval of the model by the decision-maker

The model was principally built in order to be used later by a major pension fund in the Province of Quebec. To tackle the validity issue, criteria were built following continuous interaction with the future decision-maker, who was in this case the pension fund’s general manager. We could thus ensure that the proposed preference functions reflect the decision-maker’s general preferences. This approval appears also in the criteria weights, which are defined by the selection committee and especially in the choice of the multicriteria aggregation procedure, PROMETHEE II. The use of PROMETHEE II is dictated by the investor’s constraints, which were mainly that no *veto thresholds* were applicable to the selection decision and *preference thresholds* needed to be introduced.

4. Criteria

In order to identify the relevant criteria for portfolio manager selection, the following 5 steps are used:

1. set up a list of all potential factors relevant to portfolio manager selection, based on preliminary finance literature review;
2. distribute a questionnaire to sixteen among Quebec’s major pension funds managers and complete a semi-structured interview to twelve of them;
3. drop redundant and non relevant factors as well as factors about which there is no available information;
4. add relevant factors not considered in the preliminary list;
5. determine the final list of relevant factors and derive the model’s criteria. These criteria have been derived in order to fit most possible situations. However, it is still possible to add certain criteria or to drop others for some specific cases.

4.1 Elimination criteria

Elimination criteria lead to an initial screening of candidates. Each eliminatory criterion has a minimal and/or maximal threshold. We proceed to a *conjunctive analysis* on the set of all “*potential actions*” (the universe of all portfolio management portfolio managers) *A*. We eliminate every candidate who violates at least one of the previous admissibility thresholds. A set of *admissible actions* N can be identified, from which the most satisfying action (portfolio manager) is determining the method PROMETHEE II. The short list of portfolio manager N is defined by:

$$a_i \in N \text{ if } S_j(a_i) \geq S_{jMin} \text{ or } S_j(a_i) \leq S_{jMax} \;\; \forall j ,$$

where S_{jMin} and S_{jMax} refer to minimal or maximal thresholds of the eliminatory criteria *j*, and $S_{j}(a_i)$ refers to the performance of action *i* on criterion *j*.

4.2 Selection criteria

The most satisfying portfolio manager from the short list N is identified with the method PROMETHEE II, based on the criteria that have been judged relevant for our problem. nine criteria, divided in four classes have been retained and are the following:

1. *Returns criteria*, these include the criterion of net performance;
2. *Investment philosophy criteria*, these include the criteria of investment style and assets under management;
3. *staff criteria*, these include criteria of staff availability and staff quality;
4. *Organizational criteria*, these include criteria of reputation, complementary factors, organization stability, and ownership structure.

These criteria were considered as being the most important by the survey's respondents as well as by the finance academic world. We opted for this classification in order to bring together criteria displaying similar patterns. Notice that this classification does not affect the results of the model.

4.2.1 Brief description of selection criteria

Return criteria: This class includes only one relevant criterion which is *past performance*. Two elements are taken in consideration here namely the past net added value (NAV) and its volatility (variance). The net added value is computed as the following: NAV= added value - fees (expressed in percents).

By added value, we mean the past return net of the benchmark (the market) returns. To have a more reliable measure in this criterion, it is advised to compute the NAV and the variance for a period of time that matches the market cycle of the asset at hand. A market cycle coincides to a period starting with a peak of the market index, followed by a minimum level of the index and ending by a subsequent peak. Bauman and Miller (1995) found that mutual funds rankings are more consistent and stable when computations covers a full market cycle of the asset under consideration.

Investment philosophy criteria: This class includes 2 criteria: *investment style* and *assets under management*. The survey reveals that investment style is considered to be among the most important criteria. It is a fundamental element of the analysis, since different investment styles yeild benefits at different times. It helps to identify the best benchmark for the portfolio manager's performance assessment. Finally it helps in achieving a better prediction of the portfolio manager's future returns. We can assign the portfolio manager's investment style to a certain category if we find enough similarities between the portfolio manager's investment philosophy, the portfolio it builds and subsequent returns. See section 4.3.1. for more details.

The second criterion refers to the assets under management. For each market, respondents assume that there is an optimal size V_o for the portfolio manager's assets under management. In excess of V_o, the portfolio manager is considered to have become too big for the market, and thus will be monitored by other agents in the market. Below V_o, the firm may be considered too small. Consequently it may not offer enough guaranties for its clients. Moreover, small sized portfolio managers usually provide a smaller set of financial services and financial products and prefer to focus on a specific type of assets. The final objective is to minimize the reach to the optimal size V_o.

Staff criteria: This class includes two criteria. The first one, *staff availability*, measures the availability of professionals working in the portfolio management firm for their clients. The formula selected for this criterion accounts two elements: the number of managers working in the firm and the percentage that the decision-maker's portfolio represents in portfolio manager’s total assets under management. The second criterion relates to the *staff quality*. Managers working in the portfolio management firm are evaluated on some specific relevant factors. These evaluations are added together and a final score is computed for each potential action. Among the relevant factors to evaluate are: (1) managers’ past experience in the investment industry; (2) manager’s professional and academic background; (3) the transparency and clarity of work procedures of the firm; and (4) the salary system applied by the portfolio management firm (performance-based pay versus fixed salary).

Corporate criteria: This class includes 4 relevant criteria. The first criterion is the *reputation* of the portfolio manager. It is a score measured on 5 point likert scale and is given by the decision-maker on the portfolio manager’s reputation. In this criterion, the *a priori* reputation of the portfolio manager is estimated, i.e. how the selection committee judged the manager *prior* to any analysis.

The second criterion encompasses a set of *complementary relevant factors* not captured elsewhere. These factors are the portfolio manager’s financial situation, age, and clients profile. The third criterion refers to the *portfolio management firm’s stability*. The stability is investigated on three different components: the personnel stability, ownership stability, and clientele stability. The fourth, and last criterion deals with the portfolio manager’s *ownership structure*. See section 4.3.2. for full details on this criterion.

4.3 Building a criterion; examples of the investment style and ownership structure

In this section, we present two examples of how a criterion was constructed.

4.3.1 Investment style

The first example is the *investment style*. Noe and Ramamurtie (1995) identify the investment style with the following four indicators: *assets selection process*, *growth*, *index*, and *market timing*. It is more appropriate in the case of pension funds not to take into account market timing. Besides, the assets selection process is already embodied within the portfolio manager’s level of specialization. However, Noe & Ramamurtie overlooked the degree to which portfolios are managed *actively*. In our approach, the investment style is characterized by three principal axes. These axes are:

- ⇒ axe1: active management versus passive management
- ⇒ axe2: growth-driven management versus revenue-driven management
- ⇒ axe3: specialized management versus index management

These axes have the advantage of comprehending most indicators that should be taken into account when specifying an investment style. The decision-maker evaluates the portfolio manager’s investment style using a 7 point likert scale -3 to +3.

To help the decision-maker in positioning the portfolio management firms on each of the three axis, many indicators can be useful as a benchmark. These indicators have either been quoted by the survey’s respondents or exhibited in the literature.

Concerning the first axis, we propose the following indicators: the portfolio manager’s *investment horizon* (the period during which the portfolio is planning to hold the financial asset), and the *portfolio turnover*, which is measured by the ratio of asset sales and buys over the portfolio’s market value. The higher the value of *investment horizon* and/or the lower the value of *portfolio turnover*, the more likely it is correct to classify the portfolio manager as a passive manager.

Concerning the second axis, we propose the following indicators:

The R^2**:** As defined by Sharpe (1992). It indicates the part of the total variance of the portfolio that is explained by the selection of *n* asset classes. Consequently, it is a proxy for the part of the risk that is explained by the market. From this point of view, 1-R^2 indicate the proportion of the excess risk explained by the *aggressiveness* of the portfolio manager's investment style. The lower R2, the more aggressive the portfolio manager's investment style is likely to be. Sharpe proposes a list of potential factors (F_1, F_2, ..., F_k) which refer to the most representative benchmarks for various financial assets. *The declared portfolio manager's objectives in term of growth and returns* can be found in the portfolio manager's brochures and prospectus and/or known from interviews with the portfolio manager's staff. *The asset mix:* it provides a clear idea on the investment style's degree of growth. A *growth manager* is more likely to build a compound portfolio of stock and liquidity. A *neutral portfolio manager* would rather hold a mixed portfolio composed of stocks, bonds, and liquidity. Finally, an *income manager* would emphasize bonds and liquidity.

Concerning the third axis, we propose the following indicators: the *portfolio manager's asset selection process*; we notice here that a *specialized portfolio manager* would rather follow a strategy identifying arbitrage opportunities and market anomalies. His approach would be rather viewed as a *bottom-up approach*. An *index portfolio manager* would more likely buy the market. His approach is much more a *top-down* one. *The degree of emphasis on sectors and industries not listed on the stock exchange:* the higher this parameter, the more likely we can qualify the manager as a *specialist*. *The number of assets held* and *the number of closely monitored companies:* the lower these parameters, the more likely we can qualify the manager as a *specialist.* Notice that the above indicators have to be computed relative to the market average for the specific kind of asset that will be given under management. Our method aims to identify the portfolio manager that possess the investment style closest to the one desired by the investor.

We compute for each portfolio manager the difference between the perceived position of the portfolio manager in the active management axis and the investor's desired one. This same difference is computed for the second axis, as well as the third axis. Then, these differences are standardized by the total length of the scale (in this case 7 points) and we multiply the standardized differences by their relative weights, π_1, π_2, and π_3.

Consequently, the marginal contribution of the first axis, which can be labeled *"degree of agreement in regard to active versus passive management"* is given by the following formula:

$$x_{1i} = \frac{|e_1(a_i) - e_1(pf)|}{\text{lenght of axis1}}$$

where $e_1(a_i)$ refers to the perceived position of the portfolio manager *i* on the first axis;

$e_1(pf)$ refers to the desired position of the pension fund on the first axis;

p_1 is the given weight to the first axis (active versus passive management)

The same measures x_{2i} and x_{3i} are computed for the 2 other axes. To visualize this idea, we can project the set of candidates in a three-dimensional space, where each dimension captures one of the three introduced axes. In this criterion, the aim is to minimize the distance to the "ideal investment style". This distance is given by the formula:

$$d(a_1, pf) = \sqrt{x^2{}_{1i} + x^2{}_{2i} + x^2{}_{3i}}$$

4.3.2 Ownership structure

The survey revealed that respondents were sensitive to the p*ercentage of capital owned by the firm's employees*, and the *decision-maker's degree of preference to a local firm*. Decision-makers showed also a preference for local portfolio management firms. Barnea et al. (1981) found the first factor relevant, since an outsider ownership by investors who do not manage the portfolio manager can be a source of agency costs. External ownership can be indeed an incentive to the company's management to make non optimal business decisions, and self-interested motivated expenditures that depreciate the net value of the company. This is explained by managers' propensity to take non-optimal and self-interest based decisions when they are not investing their own money in the company. These agency costs are found to be increasingly proportional to the external ownership of the portfolio manager (1-p_e), where p_e measures the percentage of capital held by the firm's employees. They are also found to be existing in small and mid-sized Canadian firms (Gagnon and Suret, 1989). Most portfolio management firms are small or mid-sized portfolio managers. The second factor relates to who owns or works in the portfolio management firm. The survey reveals that some investors assign a social dimension to the selection issue. They prefer to hire locally owned firm or a firm whose employees are local. It is interesting to highlight that a Quebecois pension fund specifically states in the annual investment policy guideline *"at an equal cost, transactions have to be executed at the Montreal Stock Exchange, or by means of a corporation operating in Quebec"*.

Let p_q refer to the degree of *"locality"* of the portfolio management firm. p_q can be fixed with the following table:

Table 1: determining the degree of preference for a local portfolio manager

P_{qn} \ P_{qc}	weak	strong
weak	0	to be fixed by the decision-maker
strong	to be fixed by the decision-maker	1

P_{qn} refers to the percentage of local employees of the portfolio manager.

P_{qc} refers to the percentage of capital owned by local investors

The intermediary cases are to be filled out by the decision-maker.

Finally, the degree of preference for a local portfolio manager is expressed by means of the coefficient γ, this coefficient is measured in percentages and can be viewed as a bonus given to local portfolio managers, in proportion to the extent of *locality* of the portfolio manager. This criterion is to be maximized. The final formula is:

$$g_9(a_i) = p_e + g p_q$$

5. *Application*

In this application, we replicate the selection of a small capitalization stocks portfolio manager by the pension fund that ordered the study. This event occurred in May 1995. Not all necessary data are available since they had not been requested at the time of the selection. Consequently, some of the data have been approximated which may have resulted in some uncertainty in the application findings. In this application, we either added or dropped any criteria. The decision-maker added, however, some elimination criteria, especially related to the portfolio manager's reputation and to the investment plan. After applying the elimination criteria, we ended up with 4 portfolio managers- 2 from Montreal, which will be labeled later Montreal 1 and Montreal 2, one form Toronto, labeled Toronto1, and one from Calgary, labeled Calgary 1. The model ranks Montreal 1 first and Calgary 1 second. These portfolio managers are those that have been recommended by the pension fund manager to the placement committee. Montreal 1 was indeed selected in May 1995 to manage the small-capitalization portfolio for the pension fund. Two main elements explain this ranking: the importance of weight given to the criteria of reputation and investment style where

Montreal 1 dominated other portfolio managers. Besides, Montreal 1 had recorded fairly good evaluations on all criteria, and was not dominated in any criterion.

Table 2 presents the performance of each action evaluated on the model's criteria. For instance, on a 1 to 5 likert scale, Montreal 2 had a score of 4 on the *reputation* criterion, as its reputation was judged to be "*very good*". Montreal 1 is judged to obey an investment style that has a distance of 0 to the decision-maker's *ideal* one. This means that Montreal 1's investment style emulates perfectly the decision-makers investment philosophy.

Table 3 summarizes all parameters that had to be defined for purposes of this multicriteria application. Row 2 of the table indicates which type of function had been selected by the decision-maker to reflect his preferences in criterion *j*. Row 3 indicates in which way actions are ranked according to criterion *j*. Row 4 indicates the weight attributed to criterion *j*. Rows 5, 6 and 7 indicate the applicable thresholds to criterion *j*.

Table2 : Performance table

	$g_1(a_i)$	$g_2(a_i)$	$g_3(a_i)$	$g_4(a_i)$	$g_5(a_i)$	$g_6(a_i)$	$g_7(a_i)$	$g_8(a_i)$	$g_9(a_i)$
Calgary 1	1.08	0.71	10 268	3.00	47	5	1.00	1.00	1.00
Montreal 2	0.40	1.19	3 899	0.67	43	4	1.00	1.00	0.49
Toronto 1	- 0.40	0.55	144 188	0.80	40	5	1.00	1.00	0.00
Montreal 1	1.00	0	119 999	1.00	49	5	1.00	1.00	1.00

Table3 : Preference functions and applicable thresholds

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9
type	IV	IV	VI	VI	IV	II	VI	III	V
Max/ Min	Max	Min	Max	Max	Max	Max	Max	Min	Max
p_j	9.70%	25.17%	5.48%	3.74%	9.70%	25.17%	3.09%	14.21%	3.74%
p_j	0.150	0.580			5.000			0.000	0.300
q_j	0.050	0.470			3.000	1.000			0.200
s_j			63 128	0.950			0.000		

type: preference function type chosen among the 6 possible ones proposed by Brans et al. (1984).

Min/Max: criterion to be minimized or to be maximized;

p_j: weight given to the criterion *j*;

p_j: strong preference threshold for the criterion *j*;

q_j: weak preference threshold for the criterion *j*;

s_j: standard deviation of observations for the criterion *j*;

Table 4 displays the final ranking provided by PROMETHEE II according to the actions' net flow. Montreal 1 is ranked first while Montreal 2 is ranked fourth. As we can see in Tables 2 and 3, Montreal 1 owes his ranking mainly to the adequate investment style that he obeys, as this criterion is greatly weighted by the decision maker (25%). A second important factor is the excellent reputation of Montreal 1, as reputation is also a criterion of considerable importance (its weight is 25% as well)

Table4: ranking of potential portfolio managers by net flow

rank	portfolio manager	net flow
1	A..4: Montreal 1	0.25590
2	A..1: Calgary 1	0.11640
3	A..3: Toronto 1	-0.16687
4	A..2: Montreal 2	-0.20544

6. Conclusion

After a second set of interviews with some of the survey's respondents, a certain interest was expressed by pension fund's managers in this pioneer effort toward a more rigorous procedure for selecting a portfolio manager. This approach, based on the multicriteria technique Promethee II, allows one to curb the subjectivity of the choice that may result from hierarchical and interest-based relationships among selection committee members, and as well it aggregates also in a more objective way different criteria relevant to the decision problem.

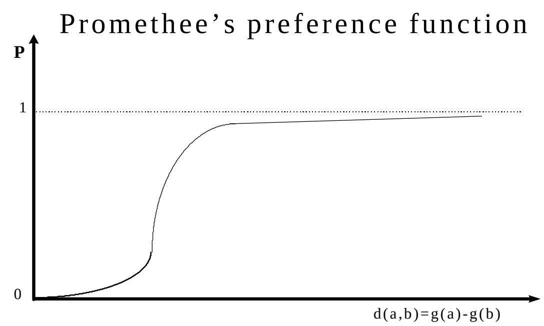
This approach seems to be extremely useful, especially in the case of small and medium pension funds which expend significant resources in the process of selecting a portfolio management firm. In order to validate further this technique, it is recommended to proceed to an empirical validation of selection criteria. This model can also be personalized depending to its user. In fact, selection criteria and indicators that have to be used in the model differ from one class of investors to another. It seems reasonable to assume that individual investors don't share the same selection criteria set as institutional investors or large pension funds. In each specific case, some criteria have to be dropped and others have to be added. Another step to improve the model would be to search for more reflective decision-maker's preference functions. One should mainly focus on important criteria such as investment style and reputation which seem to be the most important criteria according to our survey.

7. Appendix: PROMETHEE II

PROMETHEE was first created by Brans et al. in 1984. It stands for Preference Ranking Organization METHods for Enrichment Evaluation. It followed the flow of multicriteria literature initiated by Roy in 1973 with the issue of ELECTRE as a first multicriteria methods to tackle decision-making problems under a multiple criteria perspective.

In PROMETHEE, a preference function P_j is defined according to the intensity of preference of action *a* over action *b*. P_j is defined as the following: P_j: $R x R \rightarrow [0,1]$ where *R* is the set of range of the performance function *g*. P_j has values ranging from 0 to 1. 0 refers to the situation where *a* is not preferred at all to *b* on the criterion *j*. 1 refers to the situation where *a* is totally preferred to *b*. P_j is a *non decreasing function* of the difference *d* between the evaluation of *a* and *b*. $d_j(a,b) = g_j(a) - g_j(b)$. The preference function $P_j(d_j(a,b))$ applicable the criterion *j* has the following shape*:*

Figure 2: Shape of a preference function in Promethee



In order to define this function, 1 or 2 thresholds are to be fixed:

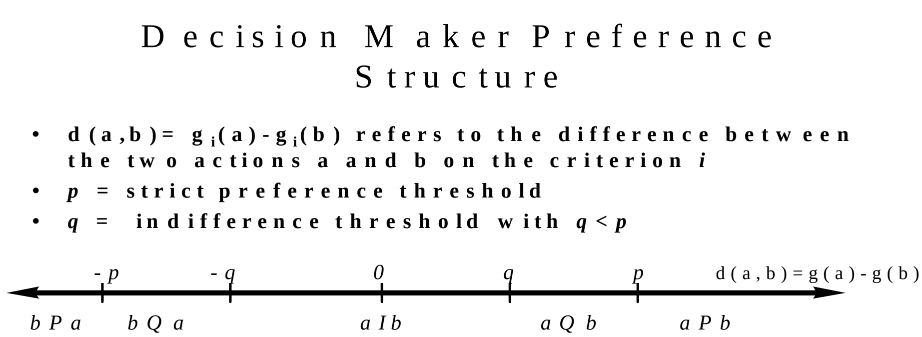
- q in an indifference threshold. it is the lowest value of $d_j(a,b)$ below which the decision maker considers there is indifference between *a* and *b*.
- *p* is a strict preference threshold. it is the lowest value of $d_j(a,b)$ below which the decision-maker considers there is strict preference of *a* over *b*.
- *s* is a well known parameter directly connected with standard deviation of a normal distribution.

All these parameters symbolize for the decision-maker an economic value. They can be expressed mathematically as the following:

$$|g(a) - g(b)| \leq q \Rightarrow aI_g b \text{ (a is as good as } b\text{)}$$
$$q \leq g(a) - g(b) \leq p \Rightarrow aQ_g b \text{ (a is weakly preferred to b)}$$
$$g(a) - g(b) \geq p \Rightarrow aP_g b \text{ (a is strictly preferred to b)}$$

where p refers to the strict preference threshold and q refers to the indifference threshold.

Figure 3: indifference and strict preference thresholds in MCDM



Another desirable feature of PROMETHEE is that the decision maker can choose one among a set of 6 possible preference functions types that the technique provides. See Brans et al. (1984) to know about the situational appropriateness of each type.

The procedure to aggregate different performances in PROMETHEE II is the following:

1. Compute for each action *a* all flows on individual criteria *j*, $j = \{1, 2, \ldots, n\}$. In this case, $\sum_{b \in A} \pi(a,b) = \sum_{j=1}^{n} w_j P_j(d_j(a,b))$ where w_j refers to the weight assigned to the criterion *j* and $P_j(d_j(a,b))$ refers to the value of the preference function accorded to the difference between the evaluations of actions *a* and *b* on the criterion *j* ($d_j(a,b) = g_j(a) - g_j(b)$).
2. Compute for each action *a* total outflow which is equal to the sum of positive flows $\Theta^+(a) = \sum_{b \in A} \pi(a,b)$ (where *a* is dominating other actions) less the sum of negative flows $\Theta^-(a) = \sum_{b \in A} \pi(a,b)$ (where *a* is dominated by other actions *b*)
3. Rank the actions by their total flow where for each action *a:* $\Theta(a) = \Theta^+(a) - \Theta^-(a)$
4. Provide the decision with final recommendations.

Summary

In order to summarize the previous section, let's first recapitulate what are the parameters to estimate in a multicriteria analysis:

1. $a_1, a_2, \ldots, a_m$: possible actions or choices;
2. $c_1, c_2, \ldots, c_n$: criteria (dimension) accounted by the decision-maker;
3. $g_1, g_2, \ldots, g_n$: performance functions used to build criteria;
4. $w_1, w_2, \ldots, w_n$: relative weights assigned to criteria;
5. $P_1, P_2, \ldots, P_n$: preference function type assigned to criteria. According to Brans et al. 1984, there are 6 possible types of preference functions embodied in PROMETHEE family of methods;
6. $g_i(a_j)$: evaluation of the action j on the criterion i.

Second, we run the PROMETHEE II software to generate for each action total inflows and total outflows by proceeding to a by-pair comparison against all other actions. The actions are finally ranked according to their net flows.

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