TOPICS: J00 Meaning of Art
           J50 Mere Plan

SUJETS: J00 Signification de la technique
           J50 Simple plan

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2635393, having been rejected under subsection 30(3) of the *Patent Rules*, has subsequently been reviewed in accordance with paragraph 30(6)(*c*) of the *Patent Rules*. The recommendation of the Patent Appeal Board and the decision of the Commissioner are to refuse the application.

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INTRODUCTION

[1] This recommendation concerns the review of rejected patent application number 2635393, which is entitled "Method and Systems for Providing an Anti-Benchmark Portfolio" and is owned by Yves Choueifaty. The issue to be addressed is whether the claimed subject matter is not patentable.

[2] A review of the rejected application has been conducted by the Patent Appeal Board (the Board) pursuant to paragraph 30(6)(*c*) of the *Patent Rules*. As explained below, our recommendation is that the application be refused.

BACKGROUND

The Application

[3] Patent application 2635393 (the instant application) was filed in Canada on June 19, 2008 and was laid open to the public on December 22, 2008.

[4] The instant application relates to selecting and managing a portfolio of securities with maximum diversification.

Prosecution History

[5] On January 28, 2016, a Final Action (FA) was written pursuant to subsection 30(4) of the *Patent Rules*. The FA stated that the application was defective on the ground that claims 1-27 on file encompass subject matter that lies outside the definition of "invention" and thus do not comply with section 2 of the *Patent Act*.

[6] In a July 28, 2016 response to the FA (RFA), the Applicant submitted a first set of proposed claims and submitted that this first set of proposed claims was directed to a patentable category of invention.

[7] As the Examiner considered the application not to comply with the *Patent Act* and *Patent Rules*, the application was forwarded to the Board for review on October 11, 2016, pursuant to subsection 30(6) of the *Patent Rules*, along with an explanation

outlined in a Summary of Reasons (SOR) that maintained the rejection based on the defect identified in the FA.

[8]   With a letter dated October 19, 2016, the Board sent the Applicant a copy of the SOR and asked the Applicant to confirm continued interest in having the application reviewed. In a response dated January 18, 2017, the Applicant confirmed its continued interest in having the application reviewed.

[9]   A Panel was formed to review the application under paragraph 30(6)(*c*) of the *Patent Rules* and to make a recommendation to the Commissioner as to its disposition.

[10]   In a Preliminary Review letter (PR letter) dated July 30, 2018, the Panel set out its preliminary analysis and rationale as to why, based on the written record, the claims on file and the first set of proposed claims encompass subject matter that lies outside the definition of "invention" and thus do not comply with section 2 of the *Patent Act*. The PR letter offered the Applicant the opportunities to attend an oral hearing and to make further submissions.

[11]   In a response to the PR letter (RPR), dated October 1, 2018, the Applicant submitted a second set of proposed claims and argued that this second set of proposed claims is directed to a patentable category of invention. The Applicant's argument was supported by a declaration of Tristan Froidure (Froidure Affidavit), Head of Research of TOBAM (the investment management company founded by the inventor Yves Choueifaty, TOBAM's CEO and Chief Investment Officer). The Applicant also proposed amended description pages to include language corresponding to the proposed claims.

[12]   In an oral hearing held October 4, 2018, the Applicant further expanded upon the submissions in the RPR.

ISSUES

[13] The issue to be addressed by this review is whether the claims on file define subject matter that falls outside the definition of "invention", thus non-compliant with section 2 of the *Patent Act.*

[14] We will also analyze the second set of proposed claims and consider whether they constitute amendments necessary for compliance with the Act and Rules.

LEGAL PRINCIPLES AND PATENT OFFICE PRACTICE

Purposive construction

[15] In accordance with *Free World Trust v Électro Santé*, 2000 SCC 66 [*Free World Trust*], essential elements are identified through a purposive construction of the claims done by considering the whole of the disclosure, including the specification and drawings (see also *Whirlpool v Camco*, 2000 SCC 67 [*Whirlpool*] at paras 49(f) and (g) and 52). In accordance with the *Manual of Patent Office Practice*, revised June 2015 (CIPO) [*MOPOP*] at §13.05, the first step of purposive claim construction is to identify the person skilled in the art and his or her relevant common general knowledge (CGK). The next step is to identify the problem addressed by the inventor and the solution put forth in the application. Essential elements can then be identified as those required to achieve the disclosed solution as claimed.

[16] The Applicant in the RPR at pages 2-3 disagreed with the Office's approach to claim construction. In particular, the Applicant submitted that "the first step in claim construction is not to identify the person skilled in the art, rather it is to construe the claims in order to give them meaning and determine their scope" (RPR, page 2, para 3). The Applicant further submitted that the cannons of claim construction are found in *Whirlpool* and *Free World Trust* wherein subsequent steps define the person skilled in the art and establish the CGK (RPR, page 3).

[17] The Applicant's submission may be viewed in two distinct ways. The submission may be viewed as a step-wise approach to claim construction in which the first step

is to construe the claims in order to give them meaning and scope and the second step is to define the person skilled in the art and the CGK.

[18] One of the steps of claim construction as found in *Whirlpool* and *Free World Trust*, and highlighted by the Applicant, is that "claims are to be read in an informed and purposive way with a mind willing to understand, viewed through the eyes of the person skilled in the art as of the date of publication having regard to common general knowledge".

[19] In our view, this requires that a purposive construction occurs only after having identified the person skilled in the art and the CGK. This approach is reflected in the guidance of *MOPOP* at §13.05.02*b* that specifies a properly informed purposive construction must consider the specification as a whole, as read through the eyes of the person skilled in the art, against the background of the CGK in the field or fields relevant to the invention, so as to identify the problem and solution addressed by the application. The solution to that problem informs the identification of the essential elements: not every element that has a material effect on the operation of a given embodiment is necessarily essential to the solution.

[20] Alternatively, the Applicant's submission may be viewed as stating that all claim elements must be considered essential. Also with respect to essential elements, the Applicant submitted at the hearing that "[a]n essential element may be found to be essential on the basis of the intent of the inventor as expressed or inferred from the claims", citing *Halford v Seed Hawk Inc*, 2006 FCA 275 at para 13.

[21] In our view, Canadian jurisprudence establishes that purposive construction cannot be determined solely on the basis of a literal reading of the patent claims and that a feature of a claim may not form part of the set of essential elements of a claimed invention, as per *Canada (Attorney General) v Amazon.com Inc*, 2011 FCA 328 [*Amazon.com*] at paras 43 and 44:

> [43] However, it seems to me that the jurisprudence of the Supreme Court of Canada, in particular Free World Trust and Whirlpool, requires the Commissioner's identification of the actual invention to be grounded in a purposive construction of the patent claims. It cannot be determined solely on the basis of a literal reading of the patent claims, or a

determination of the "substance of the invention" within the meaning of that phrase as used by Justice Binnie, writing for the Supreme Court of Canada in Free World Trust, at paragraph 46.

[44] Purposive construction will necessarily ensure that the Commissioner is alive to the possibility that a patent claim may be expressed in language that is deliberately or inadvertently deceptive. Thus, for example, what appears on its face to be a claim for an "art" or a "process" may, on a proper construction, be a claim for a mathematical formula and therefore not patentable subject matter. That was the situation in Schlumberger Canada Ltd. v. Canada (Commissioner of Patents), [1982] 1 F.C. 845 (C.A).

Non-statutory subject matter

[22]   The definition of invention is set out in section 2 of the Patent Act:

"invention" means any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter.

[23]   Following the Federal Court of Appeal decision in *Amazon.com*, the Office released an examination memo "Examination Practice Respecting Computer-Implemented Inventions" PN 2013-03 (CIPO, March 2013) [*PN 2013-03*] that clarified the Office's approach to determining if a computer-related invention is statutory subject matter.

[24]   As stated in *PN 2013-03*, Patent Office practice considers that where a computer is found to be an essential element of a construed claim, the claimed subject matter will generally be statutory. Where, on the other hand, it is determined that the essential elements of a construed claim are limited to matter excluded from the definition of invention (for example, the fine arts, methods of medical treatment, mere ideas, schemes or rules, etc.), the claimed subject matter will not be compliant with section 2 of the *Patent Act*.

ANALYSIS

Overview of the instant application

[25]   The PR letter at pages 3-5 provided an overview of the instant application:

> Benchmark indices are portfolios of financial instruments representing some aspect of the total market, such as market capitalization, sectors, market trends, etc. For example, the S&P 500 and Dow Jones Industrial Average are two of the most popular large capitalization stock benchmarks. Index mutual funds or index exchange-traded funds are financial portfolios constructed to track major indices and allow investors to incorporate such funds in their investment portfolios. These funds are constructed using pre-defined rules, such as weighting of individual assets based on their market capitalization.

> One problem with market capitalization-weighted benchmark indices is that they are more likely to overweight overvalued securities and are thus vulnerable to market volatility or systematic risk (instant application, page 11, lines 4-11). In other words, market capitalization-weighted indices incur a higher level of risk than necessary in order to achieve a return that tracks its underlying market. The instant application highlights a goal of a more efficient portfolio and references the Efficient Frontier, an optimal portfolio that offers the lowest level of risk for a given return (instant application, Fig. 1).

> According to the instant application, research indicates that designing portfolios with the deliberate intent of having low correlation to indices within acceptable risk management constraints leads to lower risk portfolios without giving up on expected returns over multi-year holding periods (page 3, lines 6-9).

> The invention is directed to a method and system for selecting and managing a portfolio of securities in which correlation and covariances of the same assets of a benchmark are used to select the securities of the anti-benchmark, wherein weightings of portfolio assets are determined by optimizing the diversification of the portfolio, using standard portfolio optimization techniques. The anti-benchmark portfolio becomes an investment product that offers a similar return but at a lower volatility or risk than the corresponding benchmark thereby achieving a better return-to-risk ratio (instant application, page 1).

[26]   There are 27 claims on file at the time of the FA, with three independent claims.

Independent claim 1 reads as follows:

> A computer-implemented method for providing an anti-benchmark portfolio, the method comprising:
>> acquiring, using a computer system, data regarding a first group of securities in a first portfolio, wherein the computer system comprises a computer processor and memory coupled to said processor;

identifying, using a computer system, a second group of securities to be included in a second portfolio based on said data and on risk characteristics of said second group of securities; and

providing, using a computer system, the individual weightings for each of the securities in said second portfolio according to one or more portfolio optimization procedures that maximizes the anti-benchmark ratio for the second portfolio wherein the anti-benchmark ratio is represented by the quotient of:

a numerator comprising an inner product of a row vector of holdings in said second portfolio and a column vector of a risk characteristic of return associated with said holdings in said second portfolio; and

a denominator comprising the square root of a scalar formed by an inner product of said row vector of said holdings in said second portfolio and a product of a covariance matrix and a column vector of said holdings of said second portfolio.

[27] Dependent claims 2-9, 11-18 and 20-27 define further limitations on the independent claims, such as refining the "anti-benchmark ratio" and defining characteristics of the portfolios, and reciting additional steps to provide a combined portfolio of the first and second portfolios and to transform the portfolios using specified asset transformations.

[28] For the purposes of this review, we consider that independent claim 1 is representative of the independent claims on file (method claim 1, non-transient computer readable storage medium claim 10, and system claim 19), as the independent claims all recite subject matter generally similar to the subject matter recited in claim 1, albeit as expressed as different embodiments. As the dependent claims define further limitations but do not add essential elements that would affect our assessment of non-statutory subject matter, we also consider claim 1 representative of all the claims on file.

[29] We note in particular dependent claims 9, 18 and 27, which the Applicant has rewritten in independent form as the basis for the second set of proposed claims. These dependent claims on file refine the proposed independent claims to further comprise:

transforming, using a computer system, said second portfolio into an equivariant portfolio via the Choueifaty Synthetic Asset Transformation and

back-transforming said equivariant portfolio via the Choueifaty Synthetic Asset Back-Transformation

Purposive construction

The person skilled in the art

[30] The PR letter at page 5, citing the FA, characterized the person skilled in the art as follows:

> The skilled person, who may be a team of people, is skilled in the field of administration processes for managing portfolios of securities/financial instruments and the computing devices (software and hardware) with network connections to carry out these processes.

[31] The Applicant at both the hearing and through the submission of the Froidure Affidavit at para 7 made clear that "one skilled in the art of the claimed invention would be someone with my credentials and experience or the equivalent" in quantitative financial research and financial asset management. Such credentials and experience are detailed in the Froidure Affidavit at para 2 and Exhibit "B". The Froidure Affidavit at para 15 identified the art of portfolio optimization as also being part of the skilled person.

[32] Based on these submissions and on the recognition that the instant application is directed to creating and optimizing portfolios based on quantitative financial principles, we revise our identified person skilled in the art to include team members skilled in the fields of quantitative finance and financial portfolio optimization.

Common general knowledge

[33] The PR letter at pages 5 and 6 identified the CGK based on references to the instant application.

[34] The Applicant submitted in RPR at page 4 that the person skilled in the art "would perhaps have the relevant knowledge identified by the PAB on pages 5 and 6 of the Preliminary Review". However, the Applicant further submitted that the assessment of the CGK was misconstrued, and that in order to understand the claims on file or

the proposed claims, it "would require much more than the CGK envisioned … by the PAB on page 6 of the Preliminary Review". Specifically, the Applicant submitted in the RPR on page 5 and clarified at the hearing, supported by the Froidure Affidavit, additional elements of the CGK.

[35] Given that we revised the characterization of the person skilled in the art above to include team members skilled in the fields of quantitative finance and financial portfolio optimization, we view that the CGK of the person skilled in the art includes both the CGK elements identified in the PR letter (based on references to the instant application detailed below) and additional elements associated with quantitative finance and portfolio optimization as identified by the Applicant (based on the Froidure Affidavit):

- selecting and managing portfolios of securities/financial instruments including:
  - securities/financial instruments to include index funds, index trackers, fundamental indexes and diversity indexes (instant application, pages 11-13);
  - various biases in portfolio selection, such as the small-cap, cyclic factor and valuations effects (instant application, pages 10-11);
  - various measures associated with portfolio management, such as alpha, beta, Sharpe ratio and the Efficient Frontier (instant application, pages 1-3 and Fig 1);
- general purpose computer systems and the internetworking of computers through networking means;
- the diversification ratio (instant application at page 8, line 6) is a quasi-concave function (Froidure Affidavit, paras 8-9);
- the equation labelled (3) (instant application at page 9, line 8) is a convex problem (Froidure Affidavit, para 12);
- a quasi-concave or a quasi-convex function is a type of function that can be challenging to optimize when data sets are large. A convex problem may be solved significantly faster and more efficiently in terms of processing time and processing power than solving a quasi-concave or a quasi-convex problem,

particularly for any portfolio that included large numbers of securities (Froidure Affidavit, paras 10 and 13); and

- the use of optimization software, such as MATLAB and the associated Optimization Toolbox, as "standard portfolio optimization techniques" (Froidure Affidavit, para 15).

Problem and solution

[36]   The PR letter at pages 6 and 7 identified the problem and solution as follows:

> *Problem*
>
> The problem was identified in the FA at page 2 as "reducing the volatility of an investor's portfolio in comparison to the market and return to risk ratio".
>
> The RFA at page 12 countered the assertion in the FA that the invention is not solving a computer problem by highlighting the invention is "an improvement to portfolio engineering and is solving a portfolio engineering and investing problem".
>
> As demonstrated in the section above on CGK, the specification makes only a passing reference to a computer, as quoted above. Given the near complete absence of computer-related implementation details in the specification, our preliminary view is that the person skilled in the art would understand that the specification is not directed to any computer problem nor directed to a problem associated with implementing the steps for defining an anti-benchmark portfolio. We agree with the Applicant insomuch as the invention appears to be directed to a portfolio engineering and investing problem, but we do not view this problem, as described by the specification, as encompassing a computer problem *per se.*
>
> Therefore, our preliminary view is to accept the problem as identified in the FA while acknowledging it is part of a portfolio engineering and investing problem.
>
> *Solution*
>
> The solution was identified in the FA at page 2 as:
>
> > The application provides a method for construction of Anti-Benchmark portfolio by selecting and managing a portfolio of securities with maximum diversification using a scalable long-only approach within a given universe of securities. (page 2, lines 18-21; page 3, line 10 to page 4, line 21).
>
> The Applicant did not contest this characterization and we adopt it for the purposes of this preliminary review.

[37] Although the Applicant submissions in the RPR were made with respect to the second set of proposed claims, the general submission put forth by the Applicant is that the claims reflect an improvement in computer functionality, evidenced by the following passages in the RPR at page 6:

> Regarding eligibility based on an asserted improvement in computer functionality, it is respectfully submitted that the specification discloses sufficient details such that one of ordinary skill in the art would recognize the claimed invention as providing an improvement in computer technology and the claims reflect the improvement in technology.
>
> …
>
> Accordingly, the claim reflects the improvement in computer technology. The improvement in computer functionality alone requires a conclusion that the claims are not directed to an abstract idea, scheme or rule.

[38] As we noted in the PR letter, the instant application at page 6 provides the only reference in the description to a computer:

> In another aspect, the invention comprises software for performing the steps described above, and in another aspect, the invention comprises one or more computer systems operable to perform those steps. Both the software and the computer system will be apparent from the description of the various embodiments of the method provided herein.

[39] According to *MOPOP* §13.05.02*b*, the CGK provides a baseline of information such that the person skilled in the art will read the specification in the expectation that it sets out something beyond the commonly known solutions to the commonly known problems. Given the CGK as identified above, the knowledge that computers are generally used for computations, and the fact that the description does not refer to any specific problem with the computer or any challenges associated with the computer implementation of the solution, our view is that the person skilled in the art would understand that the specification is not directed to any computer problem nor directed to a problem associated with implementing the steps of claim 1 for defining an anti-benchmark portfolio.

[40] In light of the above, with respect to the claims on file, we view that the problem is directed to a financial portfolio engineering and investing problem to reduce the

volatility of an investor's portfolio in comparison to the market and return to risk ratio. The solution is the construction of anti-benchmark portfolio, wherein the weighting of each security within the portfolio is calculated according to an anti-benchmark ratio such that the portfolio of securities maximizes diversification using a scalable long-only approach within a given universe of securities.

[41]　We will consider the Applicant's further submissions with respect to the problem and solution regarding the second set of proposed claims under the "Proposed claims" section below.

Essential elements

[42]　The PR letter at pages 7 and 8 identified the essential elements, citing the FA, as follows:

- acquiring data regarding a first group of securities in a first portfolio;
- identifying a second group of securities to be included in a second portfolio based on said data and on risk characteristics of said second group of securities; and
- providing the individual weightings for each of the securities in said second portfolio according to one or more portfolio optimization procedures that maximizes the anti-benchmark ratio for the second portfolio wherein the anti-benchmark ratio is represented by the quotient of:
  - a numerator comprising an inner product of a row vector of said holdings in said second portfolio and a column vector of a risk characteristic of return associated with said holdings in said second portfolio; and
  - a denominator comprising the square root of a scalar formed by an inner product of said row vector of said holdings in said second portfolio and a product of a covariance matrix and a column vector of said holdings of said second portfolio.

[43]　The Applicant submitted in the RPR at pages 7-8, and re-affirmed at the hearing, that "the present invention is inextricably linked to the use of the computer and involves a specific implementation of integers that is different to generic computer technology" (RPR, page 7, para 3). The Applicant's view that the computer-related details of the claims are essential to the implementation of the solution flows directly from the Applicant's position that the claim reflects an improvement in computer technology.

[44] As explained in *MOPOP* at §13.05.02*c*, not every element having a material effect on the operation of a given embodiment is essential to the solution; some recited elements define the context or environment of the embodiment but do not actually change the nature of the solution. Accordingly, purposive construction must consider which elements are required for the solution – proposed by the description and underlying the claimed embodiment – to achieve its result.

[45] As identified above, the problem in this case is not one of computer implementation but rather is directed to financial portfolio engineering and investing. The solution is the construction of anti-benchmark portfolio wherein the weighting of each security within the portfolio is calculated according to an anti-benchmark ratio such that the portfolio maximizes diversification to create an efficient portfolio.

[46] Our view is that the person skilled in the art, based on this identified solution, would understand that the computer-related elements are not essential. The solution works solely through the scheme or rules – the calculation of an equation – for constructing the anti-benchmark portfolio, but does not lie in any particular computer implementation of specific calculations used to construct the portfolio. Thus, the recited computer-related details are not essential.

[47] The Applicant had also previously argued in the RFA that the claimed data gathering steps were essential to the solution and constituted patentable subject matter, as was found in *Re Progressive Casualty Insurance Co, Patent Application* 2235566 (2013), CD 1349 (PAB & Com'r Pat). This submission was further expanded upon at the hearing where it was argued that the data used to calculate the anti-benchmark portfolio is constantly changing market data and thus the data and the associated calculations used to create the anti-benchmark portion are real-time in nature.

[48] We first note that the instant application claims the data as "data regarding a first group of securities" (instant application, claim 1). The description describes such data as historical market data, for example at page 13, lines 21-23:

> Anti-Benchmark is based on methods where a portfolio may be constructed
> using historical statistical relationships of past returns (especially covariance
> relationships) as the primary driver of security selection and weightings.

[49] We also note that the Froidure Affidavit at para 16 highlights Exhibit "C" as a technical report comparing different ways to construct the anti-benchmark portfolio that maximizes the anti-benchmark ratio. Exhibit "C" at page 3 describes the datasets used in the calculations; all the datasets described are historical data.

[50] Therefore, in our view, the person skilled in the art would understand that the essential step of "acquiring data" does not refer to any physical or real-time data gathering step but rather refers to the input of historical data to the anti-benchmark portfolio calculations to maximize the anti-benchmark ratio.

[51] In light of the analysis above, our view is that the essential elements for claims 1-27 on file are as identified above at para [42].

Non-statutory subject matter

[52] The PR letter at page 8 agreed with the FA analysis that the essential elements are directed to a scheme or rules involving mere calculations used to construct the anti-benchmark portfolio and thus not directed to patentable subject matter.

[53] The Applicant submitted in the RPR at pages 7-8 that there is no Canadian jurisprudence that determines conclusively that a business method cannot be patentable business matter.

[54] We agree. However, our analysis above shows that the essential elements of the claims on file are directed to a scheme or rules involving mere calculations used to construct the anti-benchmark portfolio, not that they are directed to a business method. According to *PN 2013-03*, such schemes or rules are not patentable subject matter.

[55] The Applicant argued in both the RPR and at the hearing that "the present claims on file and as amended herewith are directed to a patentable apparatus and a method that effects a discernible change" (RPR page 8, para 3), equating the present claims with an equivalent discernible change and physical existence as in the granted *Amazon.com* claims (RPR pages 8-10).

[56]   In our view, given that the person skilled in the art would not view either the physical data gathering steps or the computerized processing steps as essential, then the essential steps are those associated with the calculation of security's weightings used to create an anti-benchmark portfolio that maximizes the anti-benchmark ratio. Such matter does not manifest a discernible effect or change of character or condition in a physical object. It merely involves the carrying out of a scheme or rules – the calculations of security's weightings in a portfolio – without the production of any physical results proceeding directly from the operation of the scheme or rules itself. Such matter is outside the categories of invention.

[57]   The RPR at pages 17-18 also referred to a decision of the Federal Court:

> The Applicant submits that in a recent Decision of the Federal Court in *Georgetown Rail Equipment Company v. Rail Radar Inc.* 2018 FC 70, Justice Fothergill held that Georgetown's Canadian Patent Nos. 2,572,082 and 2,766,249 were valid and infringed. The Decision, including the main validity attack, based on obviousness, turned entirely on the facts. The patents in suit related to an automated system and method for inspecting railroad track using a laser and camera, to collect information about the railroad track, plus a processor to analyze the information according to a specified algorithm [16], [31]. The individual components were known, and there was no suggestion of inventive ingenuity in adapting those components to implement the algorithm. However, the Judge accepted that the patents were inventive, "only in respect of their algorithms" [129]. Accordingly, despite the PAB and Examiner's view, many Canadian patents including Canadian Patent Nos. 2,572,082 and 2,766,249 recite patentable subject matter which include claims containing one or more algorithms. [Emphasis in original.]

[58]   As noted in the RPR, that case, which turned entirely on its facts, was concerned with obviousness; the Federal Court did not consider non-statutory subject matter. In *Amazon.com* (at para 62), a case where the Federal Court of Appeal did consider the issue of subject matter, the Court stated:

> Schlumberger exemplifies an unsuccessful attempt to patent a method of collecting, recording and analyzing seismic data using a computer programmed according to a mathematical formula. That use of the computer was a practical application, and the resulting information was useful. But the patent application failed for want of patentable subject matter because the Court concluded that the only novel aspect of the claimed invention was the mathematical formula which, as a "mere scientific principle or abstract theorem", cannot be the subject of a patent because of the prohibition in subsection 27(8).

[59] The inclusion of an algorithm in a claim does not automatically make it non-statutory. When a claim's essential elements are only the rules and steps of an abstract algorithm, however, that claim is non-statutory. This is the present situation for the claims on file, which we consider to be analogous to the claims at issue in *Schlumberger Canada Ltd v Canada (Commissioner of Patents)* [1982] 1 FC 845 (CA).

[60] In light of this analysis, we consider that claims 1-27 on file define non-statutory subject matter and thus do not comply with section 2 of the *Patent Act*.

Proposed claims

[61] The Applicant submitted with the RPR a second set of proposed claims using dependent claims 9, 18 and 27 on file, rewritten in independent form, as the basis for the proposed claims. The independent claims of the second set of proposed claims recite the Choueifaty Synthetic Asset Transformation element to further define the portfolio optimization procedure to maximize the anti-benchmark ratio.

[62] According to the RPR at pages 5-6, this element transforms the anti-benchmark ratio (instant application equation (1) on page 8, line 6), a quasi-concave function, into an equivalent equation (instant application equation (3) on page 9, line 8), a convex problem. Equation (3) may be solved significantly faster and more efficiently in terms of processing time and processing power than solving equation (1), particularly for any portfolio that includes large numbers of securities (Froidure Affidavit, paras 8-12).

[63] The Applicant summarizes the effect of the transformation as "one skilled in the art would recognize that the purpose of disclosed synthetic asset transformation is to transform the maximization of the [anti-benchmark] ratio into an equivalent optimization problem so that it can be quickly and efficiently solved" (RPR, para bridging pages 7 and 8; Froidure Affidavit paras 13-14).

[64] As the recited transformation more effectively computes the anti-benchmark ratio, the Applicant argues that the claim element reflects an improvement in computer

technology (RPR, page 6, last para), thereby further supporting the Applicant's submissions that the problem and solution are directed to a computer and that the computer is an essential element.

[65] We first consider whether the recited transformation alters the identified problem or solution with respect to the claims on file. In our view, the person skilled in the art would consider that the problem and solution has not changed: the problem remains as a need to reduce the volatility of an investor's portfolio in comparison to the market and return to risk ratio. The solution remains as the creation of an anti-benchmark portfolio involving calculation of security's weightings that maximizes the diversification ratio. The newly recited element merely refines how that particular calculation is carried out.

[66] Next we consider whether the recited transformation alters the identified essential elements with respect to the claims on file that includes "portfolio optimization procedures that maximizes the anti-benchmark ratio for the second portfolio". The person skilled in the art would understand the recited transformation as a particular optimization procedure. We also view, similar to the stance taken above, that the person skilled in the art would understand that the solution works solely through the calculation of an equation for constructing the anti-benchmark portfolio, but not in any particular computer implementation of the calculations used to construct the anti-benchmark portfolio. Thus, the recited computer-related details are not essential in the second set of proposed claims.

[67] Given that the problem, solution and essential elements of the second set of proposed claims are identical to those identified in the analysis above with respect to the claim on file, the essential elements of the second set of proposed claims are also directed to a scheme or rules involving mere calculations used to construct the anti-benchmark portfolio and thus not directed to patentable subject matter.

[68] Therefore, for the reasons set out above, we view that the second set of proposed claims 1-63 would define non-statutory subject matter and therefore are non-compliant with section 2 of the *Patent Act*. As such, they do not overcome the non-

statutory subject matter defect for the claims on file and are therefore not "necessary" for compliance with the *Patent Act* and *Patent Rules* as required by subsection 30(6.3) of the Patent Rules.

CONCLUSIONS

[69] This review has determined that claims 1-27 on file define subject matter falling outside the definition of "invention", thus the claims on file are non-compliant with section 2 of the *Patent Act*.

[70] We have also determined that the second set of proposed claims 1-63 do not overcome the non-statutory subject matter defect and therefore the second set of proposed claims do not constitute a specific amendment that is "necessary" pursuant to subsection 30(6.3) of the *Patent Rules*.

RECOMMENDATION OF THE BOARD

[71] In view of the above, the Panel recommends that the application be refused on the basis that claims 1-27 on file define subject matter falling outside the definition of "invention", thus non-compliant with section 2 of the *Patent Act*.

[72] Further, the second set of proposed claims do not overcome the non-statutory subject matter defect and therefore the Panel declines to recommend the introduction of these claims since they do not constitute a specific amendment that is "necessary" pursuant to subsection 30(6.3) of the *Patent Rules*.

Lewis Robart   Paul Fitzner   Liang Ji
Member   Member   Member

DECISION OF THE COMMISSIONER

[73] I concur with the findings and recommendation of the Board that the application should be refused because claims 1-27 on file define subject matter falling outside the definition of "invention", thus non-compliant with section 2 of the *Patent Act.*

[74] Therefore, in accordance with section 40 of the *Patent Act*, I refuse to grant a patent on this application. Under section 41 of the *Patent Act*, the Applicant has six months within which to appeal my decision to the Federal Court of Canada.

Johanne Bélisle

Commissioner of Patents

Dated at Gatineau, Quebec,

this 27th day of February, 2019.