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Whitefish: An Economics Primer

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The 2007 Ontario Court of Appeal decision in *Whitefish Lake Band of Indians v. Canada* (*Attorney General*) sets out, for the first time, a set of guidelines for establishing compensation for cases in which the Crown allegedly breached its fiduciary duties to a First Nation band. The influence and financial implications of this decision are far reaching, extending well beyond the Ontario courts. Indeed, going forward, it is difficult to imagine a case in Canada of breach of duty by the Crown in which the Crown or Plaintiff's arguments regarding compensation will fail to take account of the *Whitefish* decision.

Nonetheless, a consensus concerning this decision has not yet emerged; all parties agree that *Whitefish* is important and yet, for the same set of circumstances, the financial implications of *Whitefish* are said to differ, not just between the Crown and Plaintiff's positions but sometimes also among the "experts". This would seem to suggest that the implications and implementation of the *Whitefish* guidelines are legitimately open to different interpretations.

This article demonstrates that this view is wrong. It establishes that the only internally consistent and empirically grounded framework for implementing *Whitefish* is the standard economic model of consumption-saving decision making. Other interpretations implicitly make assumptions about individual behaviour that are at odds with known data, rational economic behaviour and common sense. The article also clarifies which historical data need to be applied to limit the range of feasible compensation, consistent with the application of the standard economic model, for any given case.

1. Introduction

In *Whitefish Lake Band of Indians v. Attorney General of Canada* (02-CV-237453CM3), the plaintiff alleged a breach by the Crown of its fiduciary duty owed to the plaintiff, pursuant to the Robinson-Huron Treaty, in that the sale of timber on the plaintiff's Reservation land in 1886 was not to the plaintiff's "best advantage." As summarized by the presiding judge, Justice Blenus Wright, the case had two main issues: "What was the fair value of the timber in 1886? How is the fair value in 1886 dollars to be translated into 2005 dollars?"

The answer to the first question depends on the economic circumstances of 1886, about which we have nothing to contribute. Whitefish surrendered timber rights on its reserve to the Crown in 1886; acting for Whitefish, the Crown then sold those rights for \$316. Before the trial, the Crown admitted that it had breached its fiduciary duty by failing to obtain a fair value for the timber rights. The trial judge valued Whitefish's timber rights in 1886 at \$31,600, and this amount was subsequently upheld on appeal;

Whitefish Lake Band of Indians v. Canada (Attorney General), 2007 ONCA 744 (C44923).

The second question is the more interesting and subtle one, and is the focus of this paper. To make progress, however, we must first understand the intent of this so-called "translation" of dollars in 1886 into dollars in 2005. One possible goal is to ensure equivalent purchasing power, which is easily achieved once the values of an agreed upon price index are determined for the initial and final dates. At trial, the Crown argued that such an adjustment for inflation would represent fair compensation and the trial judge agreed. The total compensation he awarded was $1,095,888 plus costs.[1] Whitefish appealed this award.

Justice John Laskin, writing for the Court of Appeal, summarized as follows Whitefish's claim that the trial judge erred in three related ways [6]: "First, (Whitefish) claims that the trial judge erred by failing to compensate it in equity for its lost opportunity to have the $31,600 invested for its benefit, and to have the use of the investment income; second, it says that the trial judge erred in law by holding that he could not include compound interest as an element of equitable compensation; and, third, it says that the trial judge's finding that the sale proceeds would have been "dissipated" is contrary to the terms of surrender, the provisions of the *Indian Act*, R.S.C. 1886, c. 43, and the principles of equitable compensation, and is unsupported by the evidence." The Court of Appeal agreed with Whitefish's three arguments, and so set aside the trial judge's award. However, the Court of Appeal chose not to impose its own award. [7] "Because the record is insufficient, this court cannot substitute its own award for that of the trial judge. I would order a new hearing to determine the equitable compensation to which Whitefish is entitled." The two keys issues in determining an award are, then, equitable compensation and the factual record. While the Court of Appeal's decision in Whitefish will no doubt impact the parties' bargaining positions in many ongoing and future First Nation cases, this decision remains vague concerning how the factual record should be used to determine equitable compensation.

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[1] He determined this value by first adjusting $31,600 for increases in the Consumer Price Index, from 1887 to 1992, and by then allowing simple prejudgment interest of 5% per year to the date of the trial. This was because a 1992 amendment to the *Crown Liability and Proceedings Act*, R.S.C. 1985, c. C-50 that obligated the Crown to pay simple prejudgment interest on money that it owed in accordance with provincial legislation.

The goal of this paper is to provide guidance to the courts from an economics perspective. Its main contribution is to develop a broadly applicable mechanism for estimating equitable compensation that is built upon conventional economic principles. In a small number of special circumstances, we show that it is possible to accurately assess equitable compensation. More generally, this is not the case. In these other circumstances, the best that can be done is to determine a lower-bound value for equitable compensation, that is, a value that is smaller than the true (but difficult to assess) value. Our analysis also allows us to identify circumstances in which the plaintiff's estimate of compensation in Whitefish would have been appropriate. In all circumstances, however, the Crown's methodology is flawed and, as a result, its compensation offer was well below any economically plausible value.

2. Laskin's Algorithm

Equitable compensation requires that the award of compensation should attempt to restore to the plaintiff what has been lost as a result of the breach, that is, to restore the plaintiff to the position that the plaintiff would have been in had the fiduciary not breached its duty. In addition, Laskin notes that [49] "equitable compensation is assessed at the date of the trial … (rather than) at the date of the breach" and that "equity presumes that the trust funds will be invested in the most profitable way or put to the most advantageous use."

Equitable compensation is effectively an algorithm for converting the historical record into a contemporary award. Laskin's description of the data that should be collected reflects his view of how this algorithm is meant to work and is, therefore, worth quoting at length:

> [115] The two main deficiencies in the factual record before us concern Whitefish's annual spending patterns and the federal government's practice of paying interest on band trust accounts.[2]

[2] Each band has two different government trust accounts, a capital account and an interest or revenue account. Deposits are made to the capital account. Every year, interest earned on the balance in the capital account is transferred to the revenue account. Withdrawals from either account were possible.

> [116] If Whitefish is to be restored to the position it likely would have been in but for the Crown's breach, then the question whether Whitefish would have spent the money it ought to have received and the question how it would have spent that money need to be addressed – not by speculation but on a proper evidentiary record. …
>
> [117] What is needed is evidence either from the Whitefish trust account records or elsewhere showing Whitefish's annual spending patterns over the period. For example, annually, how much of the interest in the interest account did it spend and on what? Annually, how much interest remained in the interest account and was it reinvested? Annually, was interest paid on the interest account and, if not, why not? Annually, how much money did Whitefish spend out of the capital account and on what? …
>
> [118] Also, the Crown should clarify whether money in band trust accounts earned simple interest or compound interest over the period 1886 to 1969 …[3]

The suggestion here is that if we know the consumption, saving and investment decisions that Whitefish made with its incomes and assets, from 1886 on (including the pattern of deposits and withdrawals from its trust accounts), and if we know the actual rates of return from these various activities throughout the 1886-2005 period, then we should, in principle, be able to restore Whitefish "to the position it likely would have been in but for the Crown's breach."

Justice Laskin's algorithm appears to be straightforward: determine Whitefish's past actions and returns, and use these parameters coupled with knowledge of how the Crown would have behaved, had it fulfilled all of its obligations, to transform each additional $1 in 1886 into some additional value, say, V dollars, in 2005. On the assumption that Whitefish would have proportionately made the same decisions over time, regardless of scale, it follows that if Whitefish instead had 31,600 more dollars in 1886, it would then have had V times 31,600 more dollars in 2005. The latter sum is presumably the equitable compensation to which Whitefish is entitled.

[3] The record does show that at least since 1969, money in band trust account earned compound interest at rates prescribed by successive Orders-in-Council.

3. Simple v. Compound Interest

"(C)ompound interest is interest on the accumulated principal and interest; simple interest is interest on the principal alone." [64] Numerical examples quickly reveal why the distinction between simple interest and compound interest is so important to the parties. Consider an account that has a 5% annual rate of interest. After 100 years, a $1 investment in this account yields $6 with simple interest and $131.5 with compound interest; after 120 years, the corresponding payouts are $7 and $348.9. In the latter case, a $31,600 investment yields $221,200 with simple interest and $11,025,240 with compound interest.

First Nation bands have two trust accounts, a capital account and a revenue account. Money is deposited by the Crown on behalf of the band into its capital account; withdrawals could be made from either account. Each year, interest earned on the balance in the capital account is placed in the revenue account. The historical question is whether or not interest (at the same rate) was paid on the balance in the revenue account prior to 1969 (the trust accounts have paid compound interest since 1969): if so, the trust accounts are said to have paid compound interest; if interest was not paid on the balance in the revenue account, the trust accounts are said to have paid simple interest.

In Laskin's view, "equity presumes that the trust funds will be invested in the most profitable way or put to the most advantageous use." This notion is inconsistent with the payment of simple interest, which requires that funds in a First Nation revenue account be left idle. The Crown could have paid interest on these funds using the same rate that was applied to the capital account, which is the case of compound interest; alternatively, the Crown could have used these revenue account funds to purchase government bonds, thereby earning strictly positive compound market returns. If the Crown ever paid simple interest, however, it would have effectively imposed a zero nominal return on revenue account funds; when the prices of goods and services are rising over time, simple interest delivers a negative *real* return on these funds as the same dollars purchase fewer goods and services in the future than they can today.

The Court of Appeal decision in Whitefish failed to consider whether or not the Crown's fiduciary duty to profitably invest First Nation trust account funds extends to the payment of compound interest. Regardless, the analysis we undertake below does not depend in any substantial way on whether First Nation trust accounts paid simple or compound interest in the past. Rather than develop both cases, we simplify the exposition by assuming that the First Nation trust accounts always paid compound interest (the only substantial implication of simple interest is that the corresponding final account balances would be smaller in magnitude). While the arguments we make do not depend on how trust account balances accumulate over time, they do imply that an account that pays only simple interest is likely to be a less attractive vehicle for saving.

4. A Generic First Nation Case

This paper describes how equitable compensation is determined in First Nations' cases and makes clear what role the plaintiff's consumption, saving and investment behaviour plays in these calculations. However, rather than focus attention on the particulars of the recent Whitefish Lake Band of Indians case, we provide a more general analysis by considering the generic case set out below that involves a *payment deficiency*. As in Whitefish, the starting point is a breach of the Crown's fiduciary duty to the First Nation, whether that breach was deliberate or not.

In the case of a payment deficiency (such as Whitefish), a First Nation band claims that when agents of the Crown acting on its behalf negotiated an agreement or treaty to transfer an asset (e.g., land) or its use (e.g., timber rights) to the government or a third party, the First Nation band received less compensation than it should have received based on local market conditions when these transactions occurred. The payment deficiency is the difference between the amount that should have been paid and the amount that was received.

A First Nation case may involve a single alleged payment deficiency in a particular year or a series of such payment deficiencies over time. In the former situation, suppose that the Court determines that the payment deficiency at the time of the transaction was x dollars. The methodology described later below determines equitable compensation today, given the band's loss of x dollars in the past. In cases that involve a sequence of payment deficiencies, the same methodology would be applied to each such payment deficiency.

Since all variations on this case reduce to a consideration of one or more payment deficiencies, we henceforth focus attention on a hypothetical case for which all parties agree that there is a single payment deficiency of $100. The remaining portions of this paper describe how to determine the corresponding equitable compensation.

5. A Full Information Benchmark

Equitable compensation is assessed at the date of the trial and aims to restore the First Nation band to the position that it would have been in had the Crown not breached its duty. The difficulty in assessing equitable compensation is the need to accurately describe what would have happened had the breach not occurred. This requires considerable information and supporting evidence for a hypothetical history. These informational demands are best appreciated by first examining an ideal situation in which all of the requisite information is readily available. An example is presented below that starts with a $100 payment deficiency. The next section of this paper uses this example as a point of departure for a realistic assessment of the information limitations of the historic record, and then describes how best to overcome these limitations.

What would have happened had the breach not occurred? What would the First Nation have done with the money that it should have received (the payment deficiency), and what would it have done with any of the additional income that would subsequently have been earned from the original sum? In what follows, we consider two broad uses for any additional First Nation funds, saving and spending. Savings are deposits to the First Nation band's trust account. The fraction of each additional dollar that is not saved is spent. Spending is decomposed into consumption and investment. We use Laskin's definitions [106]: Consumption includes expenditure "on items of ordinary daily use that had no income-generating potential or gave no long-term benefits to the band and its members," while investment includes expenditure "to purchase farm equipment, build roads or bridges on the reserve, or construct houses and schools." The latter list is certainly not exhaustive. Investment also includes spending to clear and cultivate land, for equipment to support resource extraction (hunting and fishing, oil and gas, timber and minerals) or manufacturing, and to develop a tourist industry; medicines and relief in situations near starvation (which were not uncommon) may also be viewed, in part, as investments in human rather than physical capital that have long-term benefits in terms of survival, fecundity and productivity.

Example: The trial begins today. The breach of duty occurred exactly one year ago. Evidence is available which reveals that had the First Nation band received the $100 payment deficiency one year ago, it would at that time have saved $20 in its trust account, invested $30 and consumed the rest, $50. The historical record also shows that during the past year the trust account annual rate of interest was 5%, the rate of return on First Nation investments was 6% and the rate of price inflation was 4%; in particular, suppose that the price of one unit of the consumption good at the beginning of the year is $5 and so the end-of-year price is $5.20.[4] Evidence is also available which indicates that, given knowledge of its circumstances at the trial date, the First Nation band would have been indifferent between consuming 10 units of the consumption good at the time of the breach and consuming 11 units one year later.[5]

Equitable compensation attempts to restore to the band what has been lost as a result of the breach, assessed at the date of the trial. In the present example, what was lost was the opportunity to save $20, invest $30 and consume $50 one year ago. The $20 that would have been saved last year would have generated $21 today (i.e., 1.05 times 20), and the $30 that would have been invested would have generated $31.80 today. This means that had the band had knowledge of the actual rates of return at the time of the breach, it would have been indifferent between saving $20 at that time and receiving $21 one year later; likewise, it would have been indifferent between investing $30 and receiving $31.80 one year later. In consequence, $21 plus $31.80, or $52.80, is equitable compensation for the band's lost opportunities to save and invest.

In the case of consumption, the First Nation lost the benefit of consuming 10 units of the consumption good a year ago (i.e., $50 worth of consumption at $5 per unit of consumption). Had this consumption occurred, there would be nothing to show for it today. But this consumption did not occur as a consequence of the breach. How then can

[4] All numbers in this example were chosen for illustrative purposes and do not reflect any particular historical period. While distinguishing different types of consumption may be more realistic, it is also more complicated and does not affect the results. To simplify, we restrict attention to one all-purpose consumption good.

[5] Indifference here means that, at the time of the breach, the increment to band members' welfare would have been exactly the same whether they collectively consumed an additional 10 units at that time or expected to consume an additional 11 units one year later.

we, in the present, restore to the First Nation band what was lost in the past? Assessed at the time of trial, we know that the benefit one year ago of consuming 10 units of the consumption good would have been viewed by the band to be exactly the same as the benefit of consuming 11 units of the consumption good one year later. The benefit of consuming 10 units one year ago is what the First Nation band lost. But that historical loss is equivalent, from the band's perspective, to forgoing the benefit of consuming 11 units today. Since equitable compensation should make up for the historical loss of consumption, assessed today, it follows that equitable compensation for the band's lost consumption opportunity is 11 units of the consumption good which, at today's prices, is $55 times 1.04 or $57.20.

In the present example, equitable compensation for the First Nation band's lost saving, investment and consumption opportunities as a consequence of the $100 payment deficiency one year ago is $52.80 plus $57.20 or $110.00.

6. The Historical Record is Incomplete

Two key pieces of information are required to determine equitable compensation for any given payment deficiency. First, for each additional dollar of income received in each year from the time of the breach to the present, we need to know how that dollar would have been divided between saving, investment and consumption. Second, for each of these activities, we need to know the corresponding rate of return over different time horizons, including the historical tradeoffs between current and future consumption, as assessed at the date of the trial.[6] Both information collection tasks seem daunting.

A. Saving, Investment and Consumption

First Nation cases typically involve alleged breaches of trust that occurred in the 1800s or early 1900s and, as a result, the number of decisions and rates of return that need to be understood and documented quickly become overwhelmingly large. For example, on the investment side alone, in every year from the breach to the present, the band could have

[6] As indicated earlier, there are many different types of investment available to First Nation bands, and so a different rate of return would have to be specified for each investment that would have been undertaken. Allowing for different types of investments is a complication that fails to enhance our understanding of the issues and so, again, to simplify, we restrict attention to a single investment activity.

chosen several different projects to undertake from among a range of possible investment projects with different expected returns, risks and maturity structures.

We can never know exactly what the First Nation band would have done with each additional dollar that would have been accumulated and earned had the payment deficiency been received at the time of the breach. The best we can do is to use our general understanding of consumption-saving behaviour to extrapolate from the known record of what the First Nation actually did over the same period with its earned income. This record includes trust account transactions, and so deposits, interest revenue and withdrawals from these accounts are known. In turn, this provides information on how, each year, a First Nation band divided its income between saving and spending; this picture is incomplete, however, as the corresponding decisions concerning other incomes (that did not pass through the trust account) are generally not well documented. We also know something about the pattern of spending from the trust accounts. This is because First Nation bands were required to explain what would be done with money withdrawn from their trust accounts, as the Crown's approval was required. For example, the distribution of spending of trust account funds over time among broad categories of spending is generally available (such as for medicine/medical services, relief, distributions to band members, and community infrastructure); a difficulty is that the category definitions change over time.

The division of each additional dollar of a band's income among spending and saving depends on the band's level of wealth (accumulated assets), income and the rates of return available from spending and saving (see section 7 below); that is, for the same level of wealth, a band will generally divide its 100^{th} dollar of income and its 1000^{th} dollar of income between spending and saving differently; and for the same level of income, its division among spending and saving will also vary with the band's level of wealth. Since a payment deficiency represents additional income that should have been received, the inferences that can be drawn from the historical record are limited; the additional income did not materialize and so we are forced to extrapolate.[7]

[7] Moreover, whether a band perceives such additional income as a temporary or permanent change to its income will also affect spending-saving decisions.

B. Rates of Return

The annual rate of interest paid by First Nation trust accounts is readily available from 1867 on. *The Manual for the Administration of Band Monies* does not describe trust account interest rates prior to 1867. Based on earlier treaties, some have claimed that the rate of interest was (or should have been) fixed at 6% per year. Nevertheless, since the overwhelming majority of trust account interest rates from 1867 to 1969 exceeded the corresponding annual yield on long-term government bonds, market data, which are available throughout the 1800s and earlier, can be used to provide lower-bound values for the trust account returns prior to 1867. From 1969 on, the trust account rate of interest has tracked the average long-term Government of Canada bond yield. Thus, for all time horizons of interest, the rates of return on saving in the band trust accounts (or, at least, lower-bound rates of return) are straightforwardly determined. Assessing the rates of return for different investment projects at different points in time is considerably more difficult; and, the counterpart to a rate of return for consumption, in turn, would seem to be even more difficult to assess.

Surprisingly, the latter rate of return for consumption is easily identified using the standard economic model of consumption-saving decision making.[8] This model and its application to determining equitable compensation for lost historic consumption opportunities are described in Sections 7 to 9 below. A discussion of investment and the determination of compensation for lost investment opportunities is postponed to Section 10.

7. Consumption and Saving: An Overview

Individuals consume today and save for the future. This observation is universally true but not very insightful. This section discusses the factors that affect patterns of consumption and saving over time, what economists call intertemporal choice. The central decision-making unit in this discussion will be an individual, but could as easily be a household or multigenerational group of households (such as a First Nation band). Individuals have an implicit *consumption plan* which determines his or her level of consumption in the current time period and their planned level of consumption in

[8] See, for example, N. Gregory Mankiw (1998), "The Theory of Consumer Choice," Capt. 21 in *Principles of Economics* (Dryden Press, Orlando).

every future time period over the individual's remaining planning horizon. In this setup, time is discrete, consumption and saving decisions are made at the end of each period, and the length of a period is the shortest interval of time over which price changes can be accurately forecast. When parents are concerned about their children's welfare and generations are linked by *in vivo* transfers and bequests, an individual's planning horizon will extend well beyond their expected remaining lifetime.

Individuals differ in terms of their tastes over current and future consumption. Nevertheless, for all individuals, the level of utility (enjoyment, welfare) derived from consuming in any period, whether today or in a future period, increases with that period's level of consumption; in other words, at any point in time, consuming more cannot make the individual worse off.[9] The total utility provided by a given consumption plan is generally taken to be a weighted sum of the individual utilities, one per period, resulting from the consumption plan's prescribed pattern of actual and planned consumption over time.[10]

Total utility is a summary measure of an individual's personal payoff from a consumption plan that impacts his or her welfare at different points in time in the future. The total utility of an altruistic parent also includes the discounted total utility of her children, which also includes the discounted total utility of their children, *etc*. We will say that one consumption plan is better for an individual than another one if the former plan provides that person with a higher level of total utility; another individual with different tastes may, of course, rank the same two consumption plans differently.

An individual's most-preferred consumption plan is the one that delivers the largest value of total utility from among those that are feasible (affordable) over the individual's planning horizon. In each period, the set of feasible consumption plans is determined by the same five factors: the individual's current wealth, income stream, the

[9] The general view is that the utility from consumption in each period is characterized by *diminishing returns*. This means that the increase in utility from a given increase in consumption decreases with the total level of consumption; e.g., the first meal a hungry person eats provides a substantial increase in utility, while an extra meal for a well-fed person leads to a much smaller increase.

[10] The weight applied to future utility is called a discount factor and is meant to reflect *time impatience*. That is, the utility derived from a given level of consumption in a future period is discounted relative to (or, valued less than) the utility derived from the same level of consumption during the current period, with the discount being greater for periods that are further in the future. Discount factors are an element of taste and also differ from one individual to another one.

available saving/borrowing opportunities, current and future prices of the consumption good, and tax obligations. In the discussion that follows the payment of income tax is ignored because First Nation bands are not subject to taxes.

An individual's current wealth is the value of her assets, which are the result of past saving and borrowing decisions. An income stream describes an individual's level of income in the current period and the expected level of income in every future period over his or her remaining planning horizon. An individual's saving/borrowing opportunities at a point in time are represented by the rates of interest at which he or she can currently save and borrow (in general, these rates differ), and the expected rates of interest at which she anticipates being able to save and borrow in each future period. The consumption good's current and expected future prices determine that expected rates of price inflation for every future period of individual's planning horizon.

In each period, an individual "re-optimizes," i.e., choosing a new most-preferred consumption plan. Since this plan describes the actual level of consumption for the current period as well as planned levels of consumption for every future period, the only portion of the current plan that is actually implemented are the current choices for consumption and saving. In turn, these choices will differ from what had been planned in the past for the same period only if something unexpected has happened during the intervening periods, i.e., only if preferences, the realized values for the individual's wealth, income stream, saving/borrowing opportunities, or the consumption good price differ from what were originally anticipated.[11]

8. Costs and Benefits of Saving

A simple two-period version of the standard model can be used to illustrate how individuals identify their most preferred consumption plans. Our goal here is to develop a framework for determining equitable compensation. The first period of the model is labeled period 1 and the following period is labeled period 2. We will need to introduce some notation as we proceed. Here, let P_1 denote the price of the consumption good in

[11] A consumption plan chosen in 1950 describes consumption in 1950 and planned consumption in 1951, 1952, … Later, the consumption plan chosen in 1952 describes consumption in 1952 and planned consumption in 1953, 1954, … If consumption in 1952 differs from what was planned in 1950 for 1952, one or more of the determinants of consumption or preferences must have changed between 1950 and 1952.

period 1 and let P_2 denote the price in period 2. These prices are taken as given when individuals make their consumption decisions. The rate of price inflation between periods 1 and 2 is equal to the price change, P_2 minus P_1, divided by the initial price, P_1.

To simplify the model we assume that there is no uncertainty, so that incomes and interest rates in period 2 turn out to have the same values for these variables that were anticipated in period 1. This assumption implies that there are no surprises, and so consumption in period 2 will be exactly the same as what was earlier planned for period 2. We consider uncertainty separately later below.

During the first period of this model, the planning horizon has two periods; the corresponding consumption plan then describes the individual's level of consumption for period 1, the current period, and her planned level of consumption for period 2. During the second and final period, the planning horizon has only one period, and the corresponding consumption plan describes the level of consumption for period 2. Since there is no future beyond period 2, there is no incentive to save for future consumption nor is it possible to borrow against future income. Thus, during period 2, the individual simply consumes his or her entire wealth and income.[12] We now consider the choices available in period 1.

Consider an arbitrary but feasible consumption plan for period 1, describing consumption in period 1 and planned consumption in period 2. The algorithm we employ to determine if this plan can be improved upon uses two conceptual tools, the *marginal rate of substitution between current and future consumption* (MRS) and the *rate of intertemporal exchange* $1+r$, where r is the rate of interest (e.g., if the rate of interest is 3%, then r is .03 and $1+r$ is equal to 1.03).

The marginal rate of substitution measures the rate at which an individual is just willing to substitute consumption between periods, in the present case, between the periods 1 and 2. The MRS is the additional amount of second-period consumption that is

[12] Two remarks: First, the observation that the individual consumes all of the resources available to her in the final period is a feature of any finite-horizon problem, even when the initial planning horizon is quite long. A finite horizon is a modeling device that simplifies the problem; with this class of problems, the interesting economic issues arise only in those periods before the last one. Second, while an individual's own lifetime is finite, concern for children and grandchildren can motivate saving in the last period, effectively creating a planning horizon that extends beyond any one person's lifetime. The simple two-period model considered here abstracts from the possibility of children and bequests.

needed to just "compensate" an individual for the loss of one unit of first-period consumption. In other words, the individual is indifferent between having 1 extra unit of consumption today and expecting to have MRS extra units of consumption next period. Expressed in real terms (i.e., in units of the consumption good), the individual is indifferent about saving and consuming an extra unit of the consumption good when the real return on saving equals MRS.

We can express the same idea in nominal or dollar terms. Given prices P_1 and P_2, an individual who is indifferent between having 1 extra unit of consumption in period 1 and MRS extra units in period 2 will also be indifferent between spending P_1 additional dollars on consumption in period 1 and spending MRS times P_2 additional dollars on consumption in period 2. Equivalently, dividing both values by P_1, the same individual is indifferent between spending one additional dollar on consumption in period 1 and spending

$$\text{MRS}\frac{P_2}{P_1}$$

additional dollars on consumption in period 2.

An individual's marginal rate of substitution is not fixed or constant. Instead, its value depends on the individual's consumption plan, the utility that the individual derives from consumption in each period, and the weight he or she assigns to second-period utility when determining total utility. Other things equal, an individual's MRS declines as her current level of consumption increases. This is a consequence of what economists call "diminishing returns," whence the benefit of increasing current consumption declines as the overall level of current consumption increases. Since the price ratio P_2 / P_1 is fixed, $\text{MRS}*(P_2 / P_1)$ also declines as current consumption increases

Suppose that we now offer the individual an intertemporal trading opportunity, to transform current income into future consumption by saving. The nominal rate of intertemporal exchange is $1+r$. That is, if the individual saves an additional dollar in period 1 (by reducing current consumption expenditure by $1), he or she can increase second-period income by $1+r$ dollars, which can be used spent purchasing additional units of the consumption good in period 2. The value of *r* is independent of the individual. In most circumstances, *r* is simply the market rate of interest; in the present context, however, the appropriate rate of interest is the First Nation trust account rate.

Consider the following saving decision calculus: The benefit for an individual of saving an extra dollar in period 1 is the opportunity to have $1+r$ additional dollars of income in period 2 to finance the purchase additional consumption in period 2. The cost of saving an extra dollar in period 1 is that current consumption falls by $1 worth of the consumption good. Since we cannot directly compare consumptions in different periods, we need to first translate these benefits and costs into common dollar-time units; for the present discussion, we'll use period 2. Since the individual is indifferent between reducing consumption in period 1 by $1 and reducing consumption in period 2 by $\mathrm{MRS}*(P_2/P_1)$ dollars, the cost of saving an extra dollar in period 1 is equal to the loss from reducing consumption in period 2 by $\mathrm{MRS}*(P_2/P_1)$ dollars. Thus, measured in terms of period 2 dollars, the benefit of saving an extra dollar in period 1 is $1+r$ extra dollars to spend on consumption in period 2 while the cost of saving that extra dollar in period 1 is equivalent to the loss from reducing expenditure on consumption in period 2 by $\mathrm{MRS}*(P_2/P_1)$ dollars.

Determining whether and how the initial consumption plan can be improved upon therefore involves a straightforward comparison of the corresponding value of $\mathrm{MRS}*(P_2/P_1)$ with $1+r$. If $1+r$ is larger than $\mathrm{MRS}*(P_2/P_1)$, the net impact on total utility of saving an extra dollar (and consuming one dollar less) must be positive; this is because the positive impact of $1+r$ additional dollars spent on second-period consumption more than offsets the negative impact of (the equivalent of) spending $\mathrm{MRS}*(P_2/P_1)$ fewer dollars on second-period consumption. In other words, modifying the initial consumption plan by shifting a dollar from current consumption to saving increases total welfare and makes the individual better off. If $1+r$ still exceeds $\mathrm{MRS}*(P_2/P_1)$ (after reducing first-period consumption expenditure by $1 and increasing second-period consumption expenditure by $1+r$ dollars), total utility can be increased further by reallocating an addition dollar of income from consumption to saving in period 1.[13]

Suppose, instead, that the value of $\mathrm{MRS}^*(P_2/P_1)$ is larger than $1+r$. In this case, welfare is enhanced by reallocating first-period income in the opposite direction, from saving to consumption. That is, the benefit of increasing current consumption by $1 is equivalent to the gain from increasing future consumption by $\mathrm{MRS}^*(P_2/P_1)$ dollars, while the cost of decreasing current saving by $1 is the loss of $1+r$ dollars of future consumption (which is less $\mathrm{MRS}^*(P_2/P_1)$ dollars).

There are three possible outcomes of this adjustment process, that is, three types of most-preferred consumption plans, as depicted in figure 1. In all three figures, consumption is measured from left to right and saving from right to left. The downward sloping $\mathrm{MRS}^*(P_2/P_1)$ line describes the benefit of spending an additional dollar on current consumption while the flat trust account return describes the cost (in terms of forgone expenditure on future consumption). The discussion to this point argues that increasing current consumption increases welfare as long as the benefit of doing so exceeds the cost, i.e., as long as $\mathrm{MRS}^*(P_2/P_1)$ exceeds $1+r$. The individual's most-preferred first-period plan thus has either: (i) only saving with zero consumption (figure 1a), when the benefit of current consumption, $\mathrm{MRS}^*(P_2/P_1)$, is less than the cost, $1+r$, at all levels of consumption spending; or (ii) a mix of positive amounts of both consumption and saving (figure 1b), when the individual's $\mathrm{MRS}^*(P_2/P_1)$ exceeds the trust account return at low levels of consumption but not at high levels of consumption; or (iii) only consumption with zero saving (figure 1c), when the benefit of current consumption, $\mathrm{MRS}^*(P_2/P_1)$, is greater than the cost, $1+r$, at all levels of consumption spending. Each of these figures can be viewed as depicting the consumption-saving decision of a different individual or, in the present context, a different First Nation band (or, the same band in different circumstances).

[13] Since utility in each period is characterized by diminishing returns, it can be shown that the value of MRS increases when first-period consumption decreases and/or second-period consumption increases. Thus, as a consequence of reallocating income away from consumption towards saving in period 1, either the value of $\mathrm{MRS}^*(P_2/P_1)$ eventually equals $1+r$ (whence the incentive to increase saving further is gone) or first-period consumption goes to zero before this equality is attained.

9. Equitable Compensation

We can now employ the same two-period consumption-saving model to determine the financial loss that results with a payment deficiency (later below, we extend this framework to longer time horizons). This financial loss is the amount that should be paid to the individual at the time of trial to compensate for the opportunities that were lost as a result of the payment deficiency. We proceed as follows: First, we consider an individual whose first-period income is increased by \$100 and determine how this affects his or her spending and saving. Then, we consider the same individual without this additional first-period income (a situation that mirrors a \$100 payment deficiency relative to the initial situation) and determine the amount that should be paid in the second period to compensate for the first-period income loss.

Consider an individual with a given initial wealth and income stream, facing a 5% rate of interest ($r = 0.05$). Suppose that we increase period 1 income by \$100. As depicted in figure 1, there are three types of responses. We consider each case in turn.

Suppose that the individual's preferences correspond to the $\mathrm{MRS}*(P_2 / P_1)$ schedule depicted in figure 1a. In this case, the individual would have saved the entire \$100 increase in income, and so she would have had \$105 in the trust account one year later. A \$100 payment deficiency therefore imposes a \$105 loss at the trial date, and so equitable compensation is \$105.

Suppose that the individual's preferences correspond to the $\mathrm{MRS}*(P_2 / P_1)$ schedule depicted in figure 1b. In this case, the individual would have divided the \$100 increase in income between saving and consumption. In particular, suppose that she would have chosen to consume \$60 (i.e., 60 units of the consumption good) and saved \$40, as depicted in figure 2a. Equitable compensation for the \$100 payment deficiency should restore the individual to the position she would have enjoyed but for the breach. Since \$40 at 5% would have yielded \$42, equitable compensation for the lost saving opportunity is \$42. Since equitable compensation for lost saving is equal to the amount of saving that would have occurred times $1 + r$, it is represented by ABCD in figure 2a, the area below 1.05 and to the right of 60.

Equitable compensation for the lost consumption opportunity is easy to see in the figure but difficult to measure. For the first unit of consumption, the value of

$\text{MRS}*(P_2/P_1)$ is 1.5; for this individual, the benefit of the first dollar spent on consumption is the same as 1.5 additional dollars spent on consumption one year later, at the trial date. As a result, equitable compensation for the loss of that first dollar of consumption is $1.50. With each subsequent dollar of consumption spending, the corresponding value of $\text{MRS}*(P_2/P_1)$ is reduced until the 60^{th} dollar is reached, at which point $\text{MRS}*(P_2/P_1)$ is exactly equal to 1.05. Equitable compensation for the loss of each dollar of consumption spending, from 1 to 60, is then given by the corresponding value of the individual's marginal rate of substitution times the relative increase in prices. Total consumption compensation is simply the sum of the individual consumption compensations, which is represented by GADEF in figure 2a, the area below the $\text{MRS}*(P_2/P_1)$ line and to the left of 60.

Altogether, equitable compensation for the loss of $100 is equal to the sum the equitable compensations for consumption and saving. This is given by the combined area GABCDEF (ABCD + GABCDEF) in figure 2a.

While we can, in principle, describe an individual's behaviour (or at least estimate what would have happened had the breach not occurred – in the present example, consume $60 and save $40), a difficulty for measuring equitable compensation is that we cannot verify individuals' tastes. In other words, if we have evidence that an individual would have consumed $60, this is equivalent to claiming *only* that his or her $\text{MRS}*(P_2/P_1)$ schedule would have intersected the $1+r$ line at 60. It doesn't tell us much else about her $\text{MRS}*(P_2/P_1)$ line, which we can't observe. This measurement problem is best illustrated with the individual depicted in figure 2b who would also have chosen to consume $60 but whose $\text{MRS}*(P_2/P_1)$ line starts at 1.2 and is considerably flatter than the one depicted in figure 2a. For this individual, equitable compensation for the lost saving opportunity is also $42; for consumption, it is again equal to the area under the $\text{MRS}*(P_2/P_1)$ line to the left of 60, which is smaller than the corresponding area in figure 2a.

Since we cannot observe individual tastes, we cannot exactly locate an individual's MRS line and hence we cannot accurately assess equitable compensation for lost consumption opportunities. Nonetheless, figures 2a and 2b demonstrate that whether an individual's MRS schedule, and hence her $\text{MRS}*(P_2/P_1)$ schedule, is steep or flat, the corresponding equitable compensation must be greater than the area below 1.05 and to the left of 60 (area ADEF in figure 2a). More specifically, we have shown that *equitable compensation for lost consumption opportunities must be greater than the amount that would have been earned had the expenditure on consumption been entirely saved*. In the present case, at 5%, the latter value is $63. We have therefore identified a lower-bound estimate for equitable compensation; the reason it is a lower-bound is that the individual would have been even better off had she had the opportunity to consume some portion of the payment deficiency rather than save the entire amount. We cannot accurately measure equitable compensation but have determined that it must be at least as large as what would have been earned had the entire $100 been saved, which is equal to $42 plus $63 or $105.

Finally, suppose that the individual's preferences correspond to the $\mathrm{MRS}^*(P_2/P_1)$ schedule depicted in figure 1c. In this case, the individual would have consumed the entire $100 increase in income; this is because her $\mathrm{MRS}^*(P_2/P_1)$ value, for every level of consumption expenditure from 1 to 100 dollars, exceeds $1+r$ = 1.05. The only claim that can be made here is that current consumption would have been $100, and that this would have occurred for any $\mathrm{MRS}^*(P_2/P_1)$ line that lies above 1.05. Equitable compensation for the loss of this consumption opportunity again equals the area below the $\mathrm{MRS}^*(P_2/P_1)$ line. Regardless of the position of that line, however, equitable compensation must exceed the area below 1.05 and to the left of 100, which equals $105. As before, equitable compensation will be at least as large as what would have been earned had the entire $100 been saved.

A. Looking Backwards versus Forwards

We have shown how to develop a lower-bound estimate for equitable compensation in the context of a straightforward two-period problem; in fact, this is the best that can be done, other than for the special case in which the individual would have chosen to save the entire payment deficiency. If we take the length of time between the current and future period in this example to be, say, 1 year, we are left with the obvious question of whether or not these same conclusions are relevant for First Nations' cases where the time interval from the alleged breach and the date of trial may well exceed 100 years or more. The answer is affirmative, but requires some explanation.[14]

The simplest illustrative case is a three period situation, with periods 1, 2 and 3; in this scenario, period 1 marks the occasion of the breach while period 3 marks the trial date. Following the earlier discussion, a representative individual would, in period 1, choose current consumption and (via his or her current saving decision) a plan for future consumption and saving in period 2, and for future consumption in period 3. Then, in period 2, the individual would again choose current consumption and a plan for future consumption in period 3. The consumption-saving decision in period 2 is a two-period problem, one that is conceptually identical to the one that has already been considered (and whose solution is depicted in figures 1). The interesting decision takes place in period 1.

In period 1, the plan for consumption in period 2 (and implicitly for period 3) can be described using figure 1 again, with one critical exception. From the perspective of period 1, periods 2 and 3 lie in the future and so there may be some uncertainty concerning incomes, interest rates and prices at those times. Notation that distinguishes known current values from uncertain future values is helpful. Let $r_{1,2}$ and $r_{2,3}$ denote the trust account rates of interest between periods 1 and 2 and between periods 2 and 3, respectively. Let $\mathrm{MRS}_{1,2}$ denote the marginal rate of substitution between consumption in periods 1 and 2, and let $\mathrm{MRS}_{2,3}$ denote the corresponding marginal rate of substitution between consumption in periods 2 and 3. $\mathrm{MRS}_{1,2}$ and $\mathrm{MRS}_{2,3}$ are each decreasing functions of the current levels of consumption in periods 1 and 2, respectively. Accordingly, for a given level of consumption in period 1, the individual is indifferent between consuming one additional unit of the consumption good in period 1 and $\mathrm{MRS}_{1,2}$ additional units in period 2; likewise, he or she is indifferent between consuming one additional unit of the consumption good in period 2 and $\mathrm{MRS}_{2,3}$ additional units in period 3. The prices of the consumption good over time are denoted as P_1, P_2 and P_3.

In period 1, the individual is well aware of his or her current circumstances. He or she knows $\mathrm{MRS}_{1,2}$ and $r_{1,2}$, and prices P_1 and P_2, but is unaware of future circumstances.

[14] Importantly, this argument does not depend on the length of time between periods; it could as easily be 6 months, 3 months or 1 month.

Choices are then made on the basis of expectations concerning these future circumstances. We therefore need to distinguish the expected value of some variable in the future and its realization, and will do so using a superscript *e*. Thus, in period 1, the individual makes decisions concerning current consumption and planned future consumption on the basis of current values for $\mathrm{MRS}_{1,2}$, $r_{1,2}$, P_1 and P_2, and expected future values $\mathrm{MRS}^e_{2,3}$, $r^e_{2,3}$ and P^e_3. Then, later in period 2, the individual makes decisions on the basis of current values for $\mathrm{MRS}_{2,3}$, $r_{2,3}$, P_2 and P_3. With the exception of P_2, these variables need not have the same values as those that were expected in the past, $\mathrm{MRS}^e_{2,3}$, $r^e_{2,3}$ and P^e_3.

Recall that the breach occurred in period 1 while the trial takes place in period 3. Thus, compensation in period 3 for consumption that was lost in period 1 is based on the marginal rate of substitution between consumption in periods 1 and 3; this marginal rate of substitution, which we denote by $\mathrm{MRS}_{1,3}$, specifies how many additional units of consumption in period 3 would make up for the loss of one unit of consumption in period 1.

Looking forward, from the time of the breach, the *expected* marginal rate of substitution between consumption in periods 1 and 3, $\mathrm{MRS}^e_{1,3}$, is equal to the product of $\mathrm{MRS}_{1,2}$ and $\mathrm{MRS}^e_{2,3}$. This is because $\mathrm{MRS}_{1,2}$ indicates how many additional units of consumption in period 2 would make up for the loss of one unit of consumption in period 1 and $\mathrm{MRS}^e_{2,3}$ indicates (from the perspective of period 1) how many additional units of consumption in period 3 are expected to make up for the loss of one unit of consumption in period 2. $\mathrm{MRS}_{1,2}\ \mathrm{x}\ \mathrm{MRS}^e_{2,3} = \mathrm{MRS}^e_{1,3}$ does not, however, represent equitable compensation (at least in real terms) for the loss of a unit of consumption in period 1. This is because equitable compensation is assessed at the date of trial.

Looking backwards, from period 3, the actual marginal rate of substitution between consumption in periods 1 and 3, $\mathrm{MRS}_{1,3}$, is equal to the product of $\mathrm{MRS}_{1,2}$ and $\mathrm{MRS}_{2,3}$. In dollar terms, the individual would have been indifferent between spending \$1 on consumption in period 1 and spending $\mathrm{MRS}_{1,3}$ times P_3 / P_1 dollars on consumption in period 3; i.e., $\mathrm{MRS}_{1,3} * (P_3 / P_1)$ is equal to the product of $\mathrm{MRS}_{1,2} * (P_2 / P_1)$ and $\mathrm{MRS}_{2,3} * (P_3 / P_2)$. Again, the best that we are able to produce is a lower-bound estimate for equitable compensation. The illustrative example below is fully generalizes to any number of periods.

Suppose that the payment deficiency is $100 in period 1 (as in the previous two-period example). Suppose further that the pattern of consumption and saving that would have resulted had that money been received can be described as follow: Suppose that the individual always consumes 80% of each additional dollar of income that the individual has as a result of the original $100 deficiency payment, and that the trust account rate of interest 5% between periods 1 and 2 and 6% between periods 2 and 3. Then, starting with an additional $100 in period 1, $80 would have been consumed and $20 would have been saved; at 5%, saving $20 in period 1 would have generated $21 additional dollars in period 2; starting with $21 in period 2, $16.80 (80%) would have been consumed while $4.20 (20%) would have been saved; finally, at 6%, saving $4.20 in period 2 would have generated an additional $4.452 in period 3. In this specific example, the individual would have consumed $80 in period 1 and $16.80 in period 2, and would have had a trust account balance in period 3 of $4.452. Equitable compensation for the initial $100 payment deficiency is then determined as follows.

Compensation for the lost saving opportunities is exactly $4.452. The best we can do for the two lost consumption opportunities is to estimate lower-bound values for equitable compensation. Since the individual is presumed to have been willing to consume a fraction 0.8 of any individual dollar received in periods 1 and 2, we know that the nominal marginal rate of substitution for the last dollar spent on consumption in each of these periods is exactly equal to the corresponding trust account returns, as depicted in figure 1b. That is, the smallest value of $\mathrm{MRS}_{1,2} * (P_2 / P_1)$ is 1.05 and the smallest value of $\mathrm{MRS}_{2,3} * (P_3 / P_2)$ is 1.06. The historical record thus tells us that each dollar spent on consumption in period 1 would have been equivalent to at least $1.05 spent on consumption in period 2, that each dollar spent on consumption in period 2 would have been equivalent to at least $1.06 spent on consumption in period 3 and, therefore, that each dollar spent on consumption in period 1 would have been equivalent to at least 1.05 times 1.06, or $1.113 spent on consumption in period 3. Equitable consumption is no less than $80 times 1.113 ($89.04) plus $16.80 times 1.06 ($17.808) plus $4.452, which equals $111.30. In this example, the lower-bound estimate for equitable compensation is equal to the amount that would have been earned had the entire payment deficiency been deposited and retained in the trust account from period 1 to period 3, i.e., $100 times 1.05 times 1.06, which is $111.30.

B. A Lower-Bound Estimate

The Court of Appeal decision in Whitefish states that any hypothetical pattern of First Nation spending and saving applicable to the payment deficiency must be based on "a proper evidentiary record." Taking this hypothetical pattern of spending and saving as given, it is then a straightforward mechanical exercise to determine the amount that would have been consumed and saved every year from the time of the breach to the present. Equitable compensation would include the resulting trust account balance at the time of trial plus compensation for each of the band's lost consumption opportunities.

For each year in the past in which consumption would have occurred, compensation is based on the amount that would have been spent on consumption and the marginal rate of substitution between consumption spending in that year and at the trial date, as assessed retrospectively at the trial date. Determining the latter MRS involves two steps: first, starting at the time of the breach, we determine the MRS for consumption between each year and the following one; and second, for each year in the past in which consumption would have occurred, we multiply the annual MRSs together from that year forward to determine the marginal rate of substitution between consumption spending in that year and at the trial date.

Consider a case in which the breach occurred 100 years before the trial date. To determine equitable compensation for lost consumption opportunities over this 100 year period, we have to first assess 99 different annual marginal rates of substitution, starting with $\mathrm{MRS}_{1,2} * (P_2 / P_1)$ and all the way to $\mathrm{MRS}_{99,100} * (P_{100} / P_{99})$. The marginal rate of substitution between consumption spending in any specific year in the past and at the trial date is found by multiplying together the annual marginal rates of substitution for consumption spending from that specific year on. For example, as assessed at the trial date, the individual would have traded off $1 spent on consumption 35 years ago for $\mathrm{MRS}_{65,100} * (P_{100} / P_{65})$ dollars spent on consumption at the trial date; in turn,

$$\mathrm{MRS}_{65,100}\frac{P_{100}}{P_{65}}=\mathrm{MRS}_{65,66}\frac{P_{66}}{P_{65}}\,\mathrm{x}\,\mathrm{MRS}_{66,67}\frac{P_{67}}{P_{66}}\,\mathrm{x}\ldots\mathrm{x}\,\mathrm{MRS}_{98,99}\frac{P_{99}}{P_{98}}\,\mathrm{x}\,\mathrm{MRS}_{99,100}\frac{P_{100}}{P_{99}}.$$

Notice, since the prices cancel out, this equation can be rewritten as,

$$\mathrm{MRS}_{65,100}=\mathrm{MRS}_{65,66}\,\mathrm{x}\,\mathrm{MRS}_{66,67}\,\mathrm{x}\ldots\mathrm{x}\,\mathrm{MRS}_{98,99}\,\mathrm{x}\,\mathrm{MRS}_{99,100}.$$

The latter equation, which is the real counterpart to the previous one, says that the marginal rate of substitution between consumption in years 65 and 100 can be decomposed into the product of annual marginal rates of substitution. Equitable compensation at the trial date for consumption that would have taken place 35 years is equal to the amount spent on consumption multiplied by $\mathrm{MRS}_{65,100}*(P_{100}/P_{65})$.

The next question is, how should we properly assess each of the annual marginal rates of substitution, $\mathrm{MRS}_{t,t+1}*(P_{t+1}/P_t)$, that underlies the determination of equitable compensation? There are two possibilities, depending on the hypothesized pattern of consumption withdrawals from the trust account that are attributable to the original payment deficiency. The first possibility is that, in any year, funds are withdrawn from the trust account for consumption purposes. In this case, the smallest nominal MRS in a given year (for the last dollar spent on consumption in that year) is either equal to the annual trust account return when some funds are withdrawn (figure 1b) or greater than the annual trust account return when all funds have been withdrawn (figure 1c). In these circumstances, a lower-bound estimate for the marginal rate of substitution between consumption in years *t* and *t*+1, $\mathrm{MRS}_{t,t+1}*(P_{t+1}/P_t)$, as assessed at the trial date, is the corresponding annual trust account return, $1+r_{t,t+1}$. As noted earlier, each annual rate of interest, $r_{t,t+1}$, from 1867 on is well documented; at present, it is difficult to make precise statements about the rates that were paid prior to 1867.

The second possibility in any year is that all trust account funds are retained and none are used to finance consumption in that year (figure 1a). In this case, it is clear that $\mathrm{MRS}_{t,t+1}*(P_{t+1}/P_t)$ is less than $1+r_{t,t+1}$. In these same circumstances, it is also clear that some First Nation consumption must have occurred using non-trust account resources (otherwise, it is difficult to understand how the band would have survived). The model of consumption-saving decisions described earlier implies that the smallest value of $\mathrm{MRS}_{t,t+1} * (P_{t+1} / P_t)$ will be greater than or equal to whatever non-trust account rate of intertemporal exchange is available to the band in year *t*.

When data are available that describe a First Nation's historic non-trust account saving opportunities, the corresponding rates of return should be used to estimate $\mathrm{MRS}_{t,t+1} * (P_{t+1} / P_t)$. In general, however, such rate of return information is unlikely to be readily available. When this is the case, it seems reasonable to use the same risk-free, short-term rate of return that was available to other Canadians in the past, that is, the average yield on Government of Canada bonds with one-to-three years to maturity (this yield is always less than the trust account rate of interest).[15] Remember, we resort to the latter return only for those years in which consumption spending from the trust account would have been zero.

C. The Crown's Approach

In Whitefish and other cases, the Crown has proposed compensation that adjusts past consumption opportunities that were lost as a consequence of a breach of trust only for price inflation. That is, for any such level of past consumption, compensation set at the trial date would have exactly the same real value or purchasing power as the dollars that would have been spent originally on consumption.

For example, suppose that the breach of trust occurred in 1859 and it is determined that the First Nation band would have used a portion of the payment deficiency to purchase 1 kg of flour at that time and would have deposited the balance in its trust account. Following the Crown's approach, compensation in 2009 would be a sum of money that would allow the band to purchase exactly 1 kg of flour in 2009, i.e., the 1859 price of 1 kg of flour multiplied by P_{2009} / P_{1859}. The Crown's approach therefore fails to provide any additional compensation to the band for the fact that its consumption would have been postponed by 150 years. Indeed, if correct, the Crown's approach

[15] The average one-to-three year yield is the appropriate one to use when the saving (consumption postponement) decision is for one year; there is nothing in the present approach, however, that is specific to any particular planning horizon, and so three- or six-month rates could be used in circumstances in which there is evidence supporting a shorter-term the view of first nation decision making.

implies that individuals and groups don't require any compensation for delayed consumption. We now show that this assertion is counterfactual.

Suppose, as suggested by the Crown, that equitable compensation in 2009 for money that would have been spent on consumption during year *t* in the past requires only an adjustment for price changes between *t* and 2009; that is, for each $1 that would have been spent in year *t*, compensation in 2009 is equal to P_{2009}/P_t dollars. The standard economic model of consumption-saving decision making tells us that, on a per dollar basis, equitable compensation is equal to $\mathrm{MRS}_{t,2009} * (P_{2009}/P_t)$. Therefore, if the Crown's approach is correct, P_{2009}/P_t must be identical to $\mathrm{MRS}_{t,2009} * (P_{2009}/P_t)$. But, equating these terms gives

$$\mathrm{MRS}_{t,2009} \frac{P_{2009}}{P_t} = \frac{P_{2009}}{P_t} \ .$$

Cancelling out the price ratio on both sides of this equation yields

$$\mathrm{MRS}_{t,2009} = 1 \ .$$

The Crown's approach implies that this will hold for all past years, i.e., for all inter-temporal exchanges (all values of *t* less than or equal to 2008). Since $\mathrm{MRS}_{t,2009}$ can be decomposed into a product of marginal rates of substitution between adjacent years, the Crown's approach implies that the latter marginal rates of substitution all equal one, i.e., $\mathrm{MRS}_{t,t+1} = 1$ for all values of *t*. We now explain why a unitary marginal rate of substitution is inconsistent with available data for Canada and elsewhere.

The real rate of interest in a growing economy is positive and equal to the difference between the market rate of interest and the rate of price inflation. Letting $i_{t,t+1}$ denote the market rate of interest between years *t* and $t+1$, the corresponding real rate of interest is positive if $1+i_{t,t+1}$ exceeds P_{t+1}/P_t.[16] As a factual matter, we know that this inequality has been satisfied for most years in Canada and in other economies. Since

[16] This price ratio is equal to 1 plus the rate of price inflation between years *t* and $t+1$.

$\mathrm{MRS}_{t,t+1} = 1$ (assuming that the Crown's approach to compensation is valid), it follows that $1 + i_{t,t+1}$ would have exceeded $\mathrm{MRS}_{t,t+1} * (P_{t+1} / P_t)$ in Canada in most past years. However, figure 1a then implies that household income will have been entirely saved in most years in the past (when the real rate of interest is positive). In fact, of course, households consume about 90% or more of household income every year.

Canadian consumption data therefore tell us that individuals' and households' marginal rate of substitutions, $\mathrm{MRS}_{t,t+1}$, must exceed one. In other words, an individual that gives up one unit of consumption today requires more than one additional unit of consumption one year later to compensate for that loss. This tells us that individuals and groups require compensation for delayed consumption over and beyond the real value of the forgone consumption. The Crown's approach, which only provides the real value of the forgone consumption, therefore under-compensates First Nation bands for consumption opportunities that they lost as a result of a payment deficiency by the compounded real rate of return.

10. Investment Spending

Introducing investment as an alternative use to consumption for funds that are withdrawn from a band's trust account is straightforward. A simple two-period version of the standard model can be used to illustrate how individuals identify their most preferred investment projects. Our goal here is to develop a framework for determining equitable compensation for investment opportunities that would have been pursued had the payment deficiency been received as compensation in the original transaction. We then apply the two-period logic to longer time horizons.

Potential First Nation investment projects are undertaken in many areas, covering the gamut from health, education and welfare to resource development, infrastructure and tourism. For our purposes, however, these distinctions are unimportant. Instead, we categorize or rank projects entirely in terms of their rates of return. We then use the expression *marginal benefit of investment* (MBI) to describe the total return from directing an additional dollar to an investment project. MBI can be written as MBI=1+*b*, where b denotes the rate of return from directing an additional dollar to the same project.[17]

In principle, for any given set of potential projects, we can order the corresponding MBIs from highest to lowest. In this way, the first dollar of investment spending earns the highest return, the second dollar earns the next-highest return, … etc. (adjacent investment dollars ordered in this way need not be placed in the same project). When constructing this MBI schedule, we implicitly assume that all projects can be undertaken at a small scale (even while total investment in a project can be substantial); this is an expositional simplification and is not conceptually important.

In a two-period model, investment is undertaken only in period 1, and the payoff from any such investment project is received in period 2. Introducing consumption spending along with investment spending adds nothing to the analysis, and so we consider a situation in which the choice is between saving and spending and in which all spending is devoted to investment projects. In figure 3, the given income depicted on the horizontal axis is to be divided between saving and investment. As before, $1+r$ is the return from depositing a dollar to the trust account, where r is the rate of interest between periods 1 and 2; this return is fixed, independent of the level of saving. The MBI schedule summarizes the investment choices that are available to the band, here ranked from highest to lowest return. Investment is measured on the horizontal axis from left to right, while saving is measured from right to left.

At any given level of investment, it will be profitable to shift another dollar of income from saving to investment if MBI exceeds $1+r$; otherwise, it is profitable to reduce investment and increase saving. In figure 3, the result is positive levels of investment and saving that collectively exhaust the given income; the optimal levels of investment and saving are determined where the downward sloping MBI schedule intersects the horizontal $1+r$ line. Our earlier analysis of consumption suggests that there are two other possibilities as well; if the MBI schedule lies everywhere above (below) the $1+r$ line, the given income will be devoted entirely to investment (saving).

[17] Unlike the trust account rate of interest, which is fixed, b and hence MBI will change with the choice and size of investment projects. As there is no benefit to distinguishing b and MBI in the present discussion, we restrict attention to MBI. Note also that, unlike MRS in the case of consumption, MBI is already expressed in dollar terms (i.e., MBI is the dollar payoff from a $1 investment).

Equitable compensation in period 2 for these lost first-period investment and saving opportunities is easily seen in figure 3. In both cases, we simply have to determine what would have been earned had the activity been undertaken. In the case of investment, we sum the returns from each dollar that would have been invested; this is the area under MBI to the left of the MBI-($1+r$) intersection. Likewise, in the case of saving, we sum the returns from each dollar that would have been saved; this is the area under $1+r$ to the right of the MBI-($1+r$) intersection. Equitable compensation then equals the sum of these two areas.

There is an informational difficulty here; a similar problem also arose when we earlier considered the marginal rate of substitution between consumption in adjacent periods. On the basis of the historical record, any level of investment that we conjecture would have been undertaken had the additional income or payment deficiency been received only identifies the point of intersection between the MBI and $1+r$ lines. Unfortunately, there are an unlimited number of different negatively sloped MBI lines that go through that same point, and the historical record is unlikely to help us identify the one MBI line that is relevant. Since the area under each of these lines differs, the resulting estimate of equitable compensation will also differ, for the same level of forgone investment. Although we are unlikely to ever determine equitable compensation for the lost investment opportunity, we can estimate a lower-bound value. This is because the area under MBI to the left of the MBI-($1+r$) intersection always exceeds the area under $1+r$ to the left of the MBI-($1+r$) intersection. In other words, a lower-bound estimate of equitable compensation for the lost investment opportunity is the payoff from saving the same amount. Therefore, if investment would have been undertaken, the lower-bound estimate of equitable compensation is the payoff at the trial date from saving the entire payment deficiency; in the absence of investment, the estimate of equitable compensation is exactly equal to the latter payoff.

A. Short-Term Investment

If we take the length of time between periods to be, say, 1 year, we are left with the question of whether or not the same conclusions concerning compensation for investment spending are relevant for cases where the time interval from the breach to the trial date involves many years. With some qualifications, the answer is affirmative.

Consider a situation with three periods. The breach of trust occurs in period 1 and the trial occurs in period 3. This setting allows for both short-term and long-term investment projects. Short-term investment projects can be undertaken in either period 1 or 2 and mature in the following period; long-term investment projects can be undertaken only in period 1 and mature in period 3. Investment-saving decisions will therefore require a comparison of short- and long-term marginal benefits of investment with the corresponding short- and long-term trust account returns. Information concerning these trust account returns changes over time. In period 1, decision makers know the current rate, $r_{1,2}$, and form an expectation of the future rate, $r^e_{2,3}$; then, later, in period 2, decision makers know the current rate, $r_{2,3}$. Throughout, we assume that interim and final payoffs from investment projects that are received prior to the trial date are either re-invested or deposited in the next-best non-trust account savings vehicle (e.g., a portfolio of long-term Government of Canada bonds).

Investment-saving decisions in period 2 concern only short-term investments, and so the determination of investment spending and equitable compensation must exactly be the same as in the two-period model described earlier. That is, the lower-bound estimate of equitable compensation for any investment spending that would have occurred in period 2 is the payoff at the trial date in period 3 from saving whatever would have been spent on investment; i.e., the lower-bound estimate is $1+r_{2,3}$ multiplied by the investment spending that would have occurred in period 2. Next we consider possible short-term investment-saving decisions in period 1.

Let $\mathrm{MBI}_{1,2}$ denote the payoff in period 2 from investing an additional dollar in a short-term investment in period 1. The proceeds of this investment will be re-invested in one of two ways, either another short-term project or a non-trust account savings vehicle, depending on which of the two provides the higher rate of return. Let $\mathrm{Z}_{2,3}$ denote the expected payoff from this period 2 investment strategy. Then, the expected payoff from a short-term investment in period 1 is $\mathrm{MBI}_{1,2}$ times $\mathrm{Z}_{2,3}$ or $\mathrm{MBI}_{1,2} * \mathrm{Z}_{2,3}$, while the expected payoff from retaining the same funds in the trust account in period 1 is $(1+r_{1,2}) * \mathrm{Z}_{2,3}$, where $r_{1,2}$ is the current trust account annual rate of interest. It follows that the short-term investment project will be undertaken if and only if $\mathrm{MBI}_{1,2}$ exceeds $(1+r_{1,2})$. This implies that a lower-bound estimate of equitable compensation for any short-term investment spending that would have occurred in period 1 is the payoff in period 3 from saving whatever would have been invested in the trust account between periods 1 and 2 (with interest rate $r_{1,2}$) and then depositing the proceeds into the band's best non-trust account savings alternative between periods 2 and 3 (with interest rate $\hat{r}_{2,3}$). More compactly, the lower-bound estimate is $(1+r_{1,2})(1+\hat{r}_{2,3})$ multiplied by the investment spending that would have occurred in period 1.

B. Long-Term Investment

With a three-period model, long-term investment projects can be undertaken in period 1 that mature in period 3. The difficulty in determining equitable compensation in this setting is that the band must form expectations, concerning investment returns and the alternative trust account returns, and these expectations may not coincide with the realized values (as assessed at the trial date).

Consider a long-term investment project that, in period 1, is viewed to provide a return of $\mathrm{MBI}_{1,2}$ (per dollar of investment) between periods 1 and 2 and an expected return of $\mathrm{MBI}^{e}_{2,3}$ between periods 2 and 3; the total expected return is $\mathrm{MBI}_{1,2} * \mathrm{MBI}^{e}_{2,3}$. The corresponding expected trust account return is $(1+r_{1,2})(1+r^{e}_{2,3})$, where $r_{1,2}$ $(r^{e}_{2,3})$ is the (expected) rate of interest between periods 1 and 2 (2 and 3). In these circumstances, the long-term investment project will be undertaken in period 1 if and only if it is more profitable than the alternative, i.e., if $\mathrm{MBI}_{1,2} * \mathrm{MBI}^{e}_{2,3}$ exceeds $(1+r_{1,2})(1+r^{e}_{2,3})$.

Suppose that this investment project would have been undertaken had the payment deficiency been received in period 1. How do we then determine equitable compensation for the investment opportunity that was lost because the payment deficiency was not received? At the trial date (period 3), the rate of interest between periods 2 and 3, $r_{2,3}$, is known. In general, neither $\mathrm{MBI}_{1,2}$ nor $\mathrm{MBI}_{2,3}$ will be well documented. We therefore need to determine how to estimate equitable compensation when information on investment returns is absent.

Our starting point is Figure 4a, which depicts the expected long-term returns from investment and saving in period 1; the level of long-term investment is denoted by *I* and determined where the two schedules of expected returns intersect.[18] Unlike the earlier cases of consumption or short-term investment, however, we cannot simply compare areas under these curves to estimate equitable compensation. This is because the returns assessed at the trial date (period 3), which are the ones that are relevant for the determination of equitable compensation, will generally not coincide with the values expected earlier at the time of the breach (period 1). Using the latter returns, however, we can straightforwardly determine *expected* equitable compensation, as of period 1, and the corresponding *expected* trust account payoff (these values will play a role later below).

Let EC^e denote expected equitable compensation for investment level *I*, which is the area under $\mathrm{MBI}_{1,2} * \mathrm{MBI}^e_{2,3}$ in figure 4a to the left of I, and let TA^e denote the expected trust account payoff from saving *I*, which is the area under $(1+r_{1,2})(1+r^e_{2,3})$ to the left of I. It is clear from this figure that expected equitable compensation for long-term investment spending *I* exceeds the expected trust account payoff from saving *I*, that is, EC^e is larger than TA^e and so the difference, $\mathrm{EC}^e - \mathrm{TA}^e$, is a strictly positive value. We now consider equitable compensation as assessed at the trial date.

The actual marginal benefit of investment schedule may lie above or below the original expected schedule. This is because investment returns may, due to random factors, unexpectedly improve or deteriorate between periods 1 and 3. Figure 4b depicts both possibilities: the actual marginal benefit schedule ab lies above the original expected schedule (dashed line), while the actual marginal benefit schedule cd lies below the original schedule.[19]

Equitable compensation assessed at the trial date for not undertaking investment *I* in the past, which we denote by EC, is equal to the area under the actual return schedule to the left of *I*. If the actual investment return schedule turns is ab in figure 4b, then EC is larger

[18] Figures 3 and 4a look alike. The key difference is that the first figure depicts short-term investment and saving returns while the second one depicts the corresponding expected long-term values.
[19] The discussion that follows below does not depend on the shapes or relative positions of either the actual or expected marginal benefit schedules (as long as they are downward sloping).

than EC^e, and if the actual schedule is cd, then EC is smaller than EC^e. Letting z_{EC} denote the difference between EC and EC^e, we can write equitable compensation EC as follows:

$$\mathrm{EC} = \mathrm{EC}^e + z_{\mathrm{EC}} .$$

That is, equitable compensation is equal to expected equitable compensation plus unanticipated changes in equitable compensation. When z_{EC} is positive, corresponding to an improvement in investment returns (schedule ab) , EC exceeds EC^e, and when z_{EC} is negative, corresponding to a deterioration in investment returns (schedule bc), EC is less than EC^e. Importantly, when investment decisions are made in period 1, the expected value of z_{EC} is zero; any *ex post* difference between EC and EC^e is the result of unanticipated events that will have occurred after period 1. The random factors that cause the investment return, $\mathrm{MBI}_{2,3}$, to deviate from its expected value, $\mathrm{MBI}^e_{2,3}$, and hence cause EC to deviate from EC^e, generally satisfy two conditions, first, positive and negative deviations (values of z_{EC}) of the same magnitude are equally likely, and second, larger deviations are less likely to occur than smaller ones.[20]

We have so far highlighted random variations in investment returns. Yet we also know that the actual trust account return may be greater or less than the original expected return. Figure 4c depicts both possibilities: the actual trust account return schedule ef lies above the original return schedule (dashed line) when the realized value $r_{2,3}$ exceeds $r^e_{2,3}$, whereas the actual return schedule gh lies below the original schedule when $r_{2,3}$ is less than $r^e_{2,3}$. The trust account payoff assessed at the trial date from saving *I*, which we denote by TA, is equal to the area under the actual return schedule to the left of *I*. If the actual return schedule is ef in figure 4c, then, TA exceeds TA^e, while if the actual schedule is gh, then

[20] The specific and more technical assumptions are that the probability density function for the distribution of perturbations to equitable compensation is uni-modal and symmetric about zero. This characterization of the distribution of disturbances to equitable compensation is commonplace. For example, the distribution of examination results, the so-called bell curve, is uni-modal and symmetric about the class average.

TA is less than TA^e. TA and TA^e differ because of unanticipated factors that cause $r_{2,3}$ and $r_{2,3}^e$ to differ. Letting z_{TA} denote the difference between TA and TA^e, we have :

$$\mathrm{TA} = \mathrm{TA}^e + z_{\mathrm{TA}} \ .$$

For the same initial level of saving *I*, the actual trust account payoff, TA, will be greater than (less than) the initially expected payoff, TA^e, when interest rates are higher than (lower than) expected and z_{TA} is positive (negative). We expect that the random factors that cause actual and expected trust account interest rates to differ generally satisfy the same two conditions described earlier, that is, positive and negative deviations (z_{TA} values) of the same magnitude are equally likely, and larger deviations are less likely to occur than smaller ones.

We are now ready to assess equitable compensation, EC. The actual trust account payoff, TA, will be a lower-bound estimate for EC if TA is smaller than EC or, equivalently, if the difference EC – TA is positive. With random shocks to investment and trust account returns, we have EC = $\mathrm{EC}^e + z_{\mathrm{EC}}$ and TA = $\mathrm{TA}^e + z_{\mathrm{TA}}$. As a result, EC – TA can be written as

$$\mathrm{EC} - \mathrm{TA} = (\mathrm{EC}^e + z_{\mathrm{EC}}) - (\mathrm{TA}^e + z_{\mathrm{TA}}) = \mathrm{EC}^e - \mathrm{TA}^e + z_{\mathrm{EC}} - z_{\mathrm{TA}} \ .$$

Given that $\mathrm{EC}^e - \mathrm{TA}^e$ is strictly positive (see figure 4a), it follows that EC will be larger than TA whenever $z_{\mathrm{EC}} - z_{\mathrm{TA}}$ is positive; in this case, the trust account payoff TA is a lower-bound estimate for equitable compensation EC. If, on the other hand, $z_{\mathrm{EC}} - z_{\mathrm{TA}}$ is negative, there are two possibilities. If the cumulative shock, $z_{\mathrm{EC}} - z_{\mathrm{TA}}$, is negative but smaller than $\mathrm{EC}^e - \mathrm{TA}^e$ in magnitude, the sum of these terms will still be positive, and so EC will still exceed TA. If , however, $z_{\mathrm{EC}} - z_{\mathrm{TA}}$ is negative and larger than $\mathrm{EC}^e - \mathrm{TA}^e$ in magnitude, the sum of these two terms will also be negative and, in these circumstances, the trust account payoff overestimates equitable compensation.

Whether or not the actual trust account payoff from saving *I* dollars in period 1 is a lower-bound estimate of equitable compensation for losing the opportunity to invest *I* dollars in period 1 depends on the realization of $z_{\mathrm{EC}} - z_{\mathrm{TA}}$, the difference between the investment and trust account return shocks. While the actual values of z_{EC} and z_{TA} are unobservable, we can still make statements about their likely relative magnitudes. Since, for each of the underlying shocks, positive and negative values of the same magnitude are equally likely, it follows that the difference $z_{\mathrm{EC}} - z_{\mathrm{TA}}$ is also equally likely to be positive or negative. Since $z_{\mathrm{EC}} - z_{\mathrm{TA}}$ is negative 50% of the time, it will be both negative and larger than $\mathrm{EC}^e - \mathrm{TA}^e$ in magnitude even less than half of the time, if at all. This tells us that most often (well over 50% of the time), $\mathrm{EC}^e - \mathrm{TA}^e$ plus $z_{\mathrm{EC}} - z_{\mathrm{TA}}$ will be positive or, equivalently, EC will be larger than TA. In these circumstances, the trust account payoff TA will be a lower-bound estimate for equitable compensation EC.

C. Proxy Returns

It is possible (though not likely) that the payoff from saving the *ex ante* level of investment in the trust account, TA, exceeds equitable compensation for that investment, EC, and so an alternative measure of equitable compensation is needed.

The direct approach for determining equitable compensation is to use actual investment returns. An insurmountable difficulty with this approach is that the data needed to determine realized rates of return for any investment project that a band hypothetically would have undertaken do not exist, precisely because this project was not in fact undertaken. This is why the trust account payoff, which generally underestimates equitable compensation, should be used when possible. For circumstances in which the trust account payoff overestimates equitable compensation, however, the only alternative approach for determining equitable compensation is to use a proxy return in place of unobservable investment returns. Though we are unable to identify these circumstances, we know that they occur less that 50% of the time and likely much less.

The ideal proxy return moves one-for-one with the returns on First Nation investment projects. We are not aware of any such a proxy. Given that compromise is unavoidable, we view the rate of return for long-term investment projects in Canada as acceptable. A risk-free measure of long-term investment returns in the Canadian economy is the rate of return on a laddered portfolio of long-term Government of Canada bonds.[21] For holding periods that are relevant for most First Nation disputes, from the time of the alleged breach to the present, the payoff from investing $1 in a laddered long-term bond portfolio is less than the trust account payoff over the same period. This would thus provide a conservative estimate which, although reasonable from a government and hence public policy perspective, may still leave the First Nation somewhat disadvantaged.

11. Concluding Remarks

In this paper we have proposed an economic framework for estimating equitable compensation in situations where a First Nation band alleges a breach of fiduciary duty on the part of the government. The Court of Appeal decision in Whitefish provides general guidance concerning the determination of equitable compensation, and gives a broad overview of the factors that need to be taken into account. However, a mechanism for transforming these factors into a value of equitable compensation is missing from that decision. This paper's contribution is to provide a robust and widely applicable mechanism for estimating equitable compensation that is built upon standard economic principles.

In this final section of the paper we employ our mechanism to expand on a significant remark made by Justice Laskin in the Whitefish appeal decision: "If Whitefish is to be restored to the position it likely would have been in but for the Crown's breach, then the question whether Whitefish would have spent the money it ought to have received and the question how it would have spent that money need to be addressed." We agree. The following example, however, reveals some subtle but important caveats.

Consider a hypothetical breach of trust that occurred in 1909, exactly 100 years ago, and that involved a payment deficiency of $1. Equitable compensation paid at the trial date, in 2009, will depend on the historical record. Two broad spending scenarios are considered (in each case, we presume that evidence is available to support that scenario).

[21] A laddered portfolio of 15-year bonds, for example, is a bond portfolio in which all bonds that are purchased have 15 years to maturity. At any point in time, the portfolio contains bonds with 1 to 15 years to maturity; and, on average, about 1/15th of the value of the entire portfolio matures each year and is re-invested in new 15-year bonds.

Scenario I: The band would have consumed the $1 payment deficiency in 1909. Indeed, this was the Crown's position in the first Whitefish trial, that the payment deficiency would have been immediately and entirely "dissipated." The discussion of consumption in Sections 7-9 explains how to determine a lower-bound value for equitable compensation in 2009 for reducing the band's 1909 consumption spending by one dollar. We first need to estimate the year-to-year marginal rates of substitution, from 1909 to 2009, between consumption spending in one year and consumption spending in the following year; we then compound these individual nominal MRSs to determine the rate of substitution between $1 of consumption in 1909 and consumption spending in 2009.

The Court of Appeal decision recognizes the importance of the historical record, but doesn't explain how it can be exploited. Our key results provide the necessary guidance: first, for each year in which the band withdrew funds from its trust account for consumption purposes, the smallest nominal marginal rate of substitution (for the last dollar spent on consumption in that year) is greater than or equal to the annual trust account return; and second, for each year in which the band failed to withdraw funds from its trust account for consumption purposes, the smallest nominal MRS is equal to the annual non-trust account return enjoyed by band members. We proposed modeling the latter return as the average 1-3 year (short-term) Government of Canada bond yield.

If trust account funds are withdrawn for consumption in every year, equitable compensation is greater than the compound trust account return from 1909-2009, which is the payoff from saving $1 for 100 years in the trust account. This payoff is $404.59 (i.e., if the payment deficiency were instead $10,000, equitable compensation would be $4,045,900).[22] If trust account funds are never withdrawn for consumption purposes between 1909 and 2009, equitable compensation is greater than the trust account return for 1909 multiplied by the compound non-trust account return from 1910-2009.[23] This payoff is $110.49. The difference between $404.59 and $110.49 is significant; it is due to the persistent positive gap between the trust account rates of interest and short-term bond yields, a difference that is exacerbated over longer compounding intervals.

[22] The data used to perform the calculations reported in this section are described in the data appendix.
[23] Since the payment deficiency could have been deposited in whole or part to the trust account in 1909, the assertion that it would have been entirely consumed is equivalent to stating that the nominal MRS in 1909 was at least as large as that year's trust account return.

More generally, for any pattern of consumption withdrawals from the trust account over time, we can compound the corresponding sequence of trust account and non-trust account annual returns to determine a lower-bound estimate of equitable compensation; the result will be a value that lies between \$110.49 and \$404.59 and that increases with the number of years in which withdrawals are made from the trust account for consumption purposes.

The Crown's approach in Whitefish adjusts the payment deficiency only for price inflation; in the present scenario, \$1 in 1909 buys the same goods and services as \$21.20 in 2009, which is considerably less than either \$110.49 or \$404.59. The Crown's approach presumes that forcing an individual to postpone consumption does not affect his or her wellbeing, an assessment that is inconsistent with economic theory and our understanding of consumption behaviour.

Scenario II: The band deposits the \$1 payment deficiency into the trust account in 1909 and subsequently spends some portion of the interest income. We consider three very different spending patterns. The historical record will provide some guidance as to which pattern would best characterize the band's additional spending had the payment deficiency been paid; this seems to be Justice Laskin's view of the role that history can play in determining equitable compensation.

Suppose that the band saves 10% of each dollar of interest income and consumes the remaining 90%. In this case, the funds retained in the trust account are brought forward with compound trust account interest and, because funds are withdrawn every year for consumption purposes, equitable compensation for consumption each year is at least as large as the payoff from saving the corresponding amount in the trust account. In this case, the lower-bound estimate of equitable compensation is again \$404.59. In fact, for any pattern of saving and consumption of interest income in any year, the result will still be \$404.59 as long as some interest income is consumed every year. Again, the Crown's approach gives a very different result; bringing saving forward with compound interest and consumption forward using CPI adjustment, the resulting payoff is only \$44.75 in 2009.

Suppose that the band saves 10% of each dollar of interest income, consumes 80% and invests 10%. In this case, the funds retained in the trust account and all consumption spending are all brought forward with compound trust account interest. The discussion of investment in Section 10 identifies two possibilities. If the *ex post* differential impact of the realization of equitable compensation and trust account return shocks is not too negative, investment spending is also brought forward by compounding the trust account return, and the lower-bound estimate of equitable compensation for the $1 payment deficiency in 1909 is $404.59 in 2009. Otherwise, when investment spending is brought forward by compounding the laddered long-term bond portfolio returns, the lower-bound estimate of equitable compensation for the $1 payment deficiency is $393.22 in 2009.

As noted earlier, we cannot directly observe the realization of either equitable compensation shocks or trust account return shocks. One approach is to argue that the differential effect is not likely to be very negative, and so we expect that the lower-bound estimate for equitable compensation will lie between $393.22 and $404.59, though closer to the latter value. An alternative approach would be to use the historical data series on trust account rates of interest and long-term bond yields to estimate a forecasting model for each series; this use of the historical record is not envisaged in the Court of Appeal decision. The expected future value of a variable at a point in time is then provided by the forecast generated by the corresponding forecasting model; these expected values can then be compared with their counterpart realized values to determine the size of the deviation or shock. If the difference between the long-term bond yield shock (a proxy for the equitable compensation shock) and the trust account return shock is positive, then the trust account payoff is the basis for determining equitable compensation for investment. If the difference is negative, however, we would need to assess whether it is large or small in magnitude relative to a standard that we cannot measure. In these circumstances, it would seem best to use a weighted average of the trust account and laddered portfolio results.

Finally, suppose that the band saves 10% of each dollar of interest income, consumes 10% and invests 80%. Saving and consumption are both brought forward using the trust account returns. If investment spending is also brought forward using the trust account returns, the lower-bound estimate of equitable compensation is again $404.59 in 2009. If investment spending is brought forward by compounding the laddered long-term bond portfolio returns, the lower-bound estimate of equitable compensation for the $1 payment deficiency is $314.66 in 2009. Because the trust account pays more than the laddered bond portfolio, the negative impact of the laddered portfolio on equitable compensation increases with the percentage of spending that is devoted to investment.

Data Appendix

A number of other data series are used in the different scenarios developed in Section 11 for the 1909-2009 period. These include the trust account annual rates of interest, long-term bond yields, short-term bond yields and the CPI.

The First Nation band trust account annual rates of interest over the relevant time period is given in Appendix B.1 (Rates of Interest on Capital and Revenue Accounts) of the *Manual for the Administration of Band Money*, Indian and Northern Affairs Canada (http://www.ainc-inac.gc.ca/pr/pub/man/mon_e.html).

Two series are needed to describe yields on long-term government bonds because the Bank of Canada Historical Series for long-term bonds begins in 1919. Although Canadian government and railway bonds were available prior to 1919, especially in the London (U.K.) bond market, we use yields on U.K. government bonds for the earlier period because Canadian bonds were newer and riskier. Since U.K. bond yields were lower than the corresponding Canadian yields at the beginning of the 20th Century, using the U.K. data will produce lower estimates of investment earnings than would result with riskier Canadian bonds, and hence lower estimates of equitable compensation.

Long-Term Yields: 1909-1918 – British Data: Yield of the "2.5% Consolidated Stock", annual average. Data are available from the UK Debt Management Office (http://www.dmo.gov.uk).
1919-2007 – Canadian Data: Average Yields of Government of Canada Bonds over 10 years, monthly (April) data. Data are available from the Bank of Canada.

The payoff from holding long-term bonds cannot be determined simply by compounding the annual yields described above. These yields were available in the market only if the bonds in question were held to maturity. As a result, we estimate long-term investment returns by simulating a "laddered" portfolio in which different bonds are purchased in different years, and each bond that is purchased is held for 15 years, with the proceeds on maturity re-invested for another 15 years, and so on until the end of the sample period in 2009. The payoff from any one 15-year bond is the 15-year compounded return using the yield corresponding to the year in which the bond was purchased. In 2009, any bond purchased after 1994 will be valued prior to its maturity. As bond yields declined (and bond prices rose) throughout the 1994-2009 period, those bonds valued prior to maturity will also have appreciated in value. To simplify the computations, we ignore these appreciations, and so the estimated long-term investment returns are lower than had we included these appreciations at the end of the damages period. The correct procedure is to take account of any appreciation (or depreciation) of the outstanding bonds in the portfolio at the trial date.

The Bank of Canada Historical Series for short-term bonds that describes monthly data (in particular, the April bond yields) begins in 1949; from 1936 to 1948, the short-term data that are available from the Bank describes annual averages only. Prior to 1936, we again revert to using U.K. data which are readily available, in this instance, 3-month treasury bills. The U.K. data are used for the period 1909-1935. Using the U.K. data for the earlier period again contributes to an underestimate of the opportunity cost of postponing consumption and hence of equitable compensation.

Short Term Rates: 1909-1935 – British Data: 3 months Bank Bills rates. Data are from Mitchell, B. R. “British Historical Statistics”, Cambridge University Press, 1988. 1936-1948 – Canadian Data: Average Yields of Government of Canada Bonds for 1-3 years, annual data. Series J472 from the Historical Statistics of Canada, download from the Statistics Canada website on July 14, 2008. 1949-2007 – Canadian Data: Average Yields of Government of Canada Bonds 1-3 years, monthly (April) data. Data are available from the Bank of Canada.

The Consumer Price Index series combines two different series: 1909-1913 – Estimated Consumer Price Index from Dick and Floyd: "Canada and the Gold Standard" Cambridge University Press, 1992; and 1913-2007 – Consumer Price Index for Canada, provided by Statistics Canada.

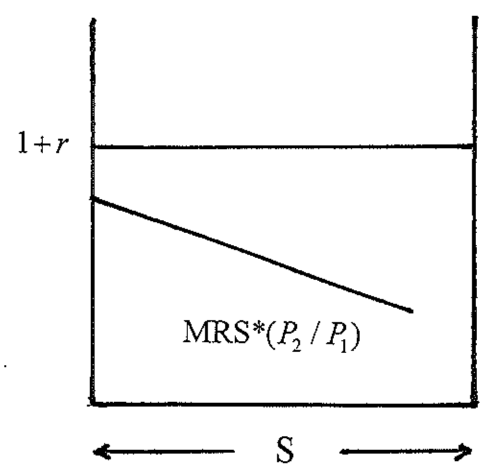

Figure 1a

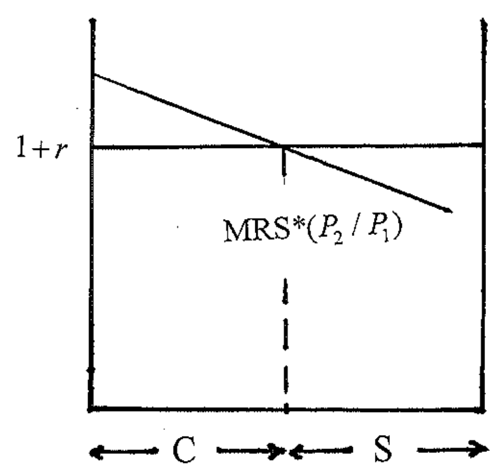

Figure 1b

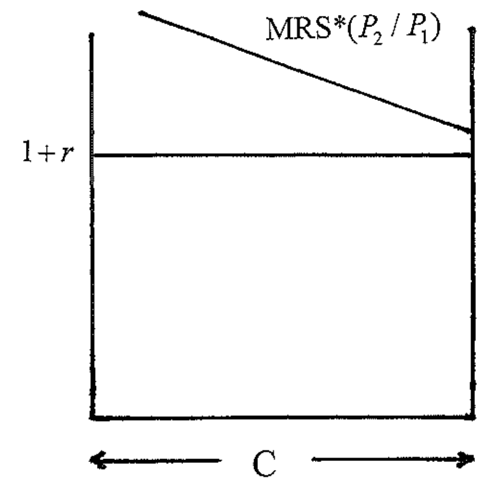

Figure 1c

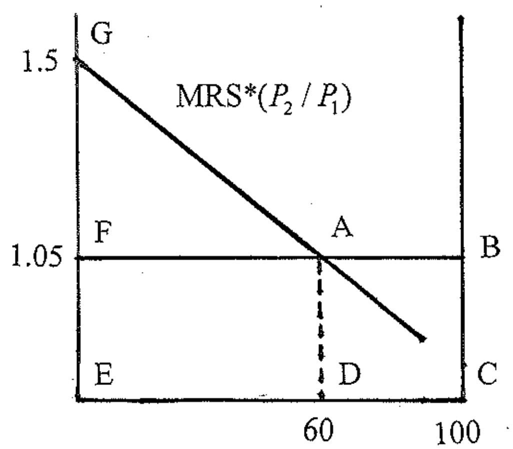

Figure 2a

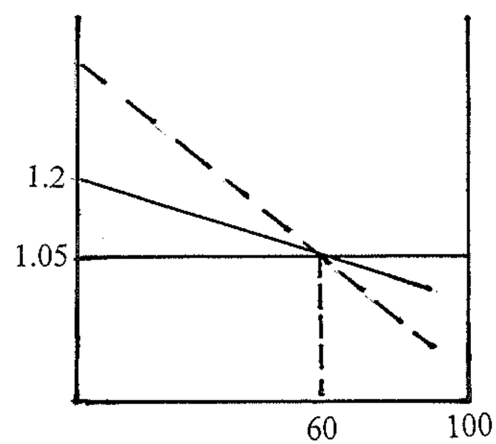

Figure 2b

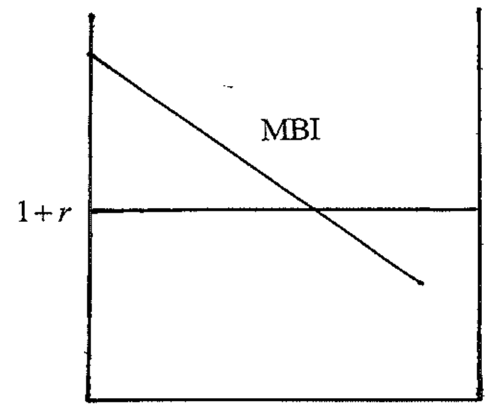

Figure 3

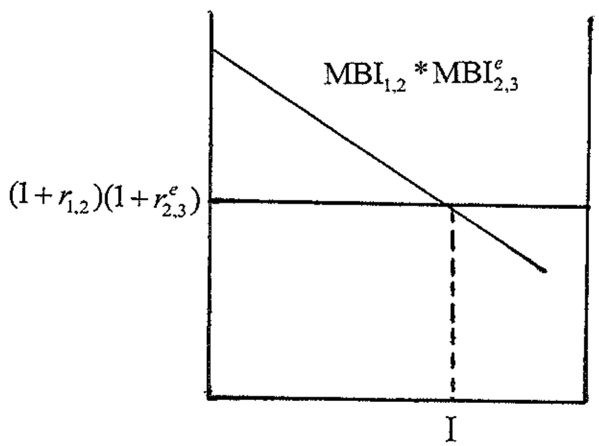

Figure 4a

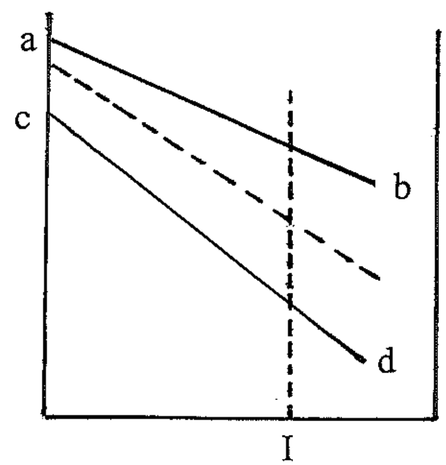

Figure 4b

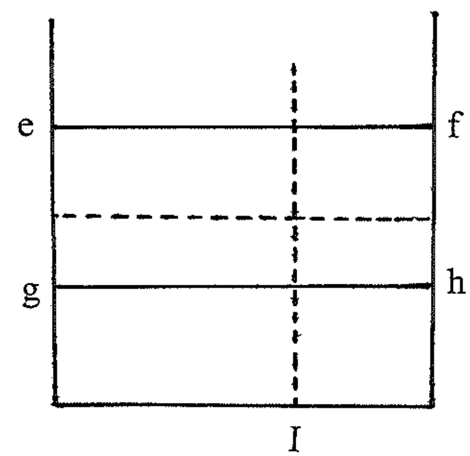

Figure 4c