Canadians' Debt Diversification: Why These Eggs Belong in One Basket

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Executive Summary

We focus attention on the puzzling phenomenon of Canadians who diversify their debts, by owing money to various lenders under differing terms and conditions, instead of consolidating their debts at the lowest available interest rate. We believe that consumers are conditioned to compartmentalize their debts. And while portfolio diversification is an excellent principle when it comes to your assets, it's not a sound practice when applied to your debts.

We identify two dimensions of inappropriate debt management strategies practiced by Canadians. The first is debt diversification across space silos, where money is owed on credit cards, consumer loans and mortgages, but where consolidation would be optimal. The second dimension is debt diversification across time, where discretionary income and savings are not used immediately to pay down debt, but instead wait in low-interest accounts while interest owed on other debt accumulates at higher rates. A typical sub-optimal debt management strategy is the case in which consumers maintain taxable savings accounts – such as for emergency usage – while also drawing on a non-tax deductible line of credit (or mortgage).

This report uses financial simulation techniques to estimate that a typical Canadian family with a residential mortgage -- assumed to have approximately $95,000 in a diversified portfolio of liabilities and an idle cash fund of approximately $2,700 – loses an average of $1,000 dollars per year by not managing debts in an optimal manner, even if they can only afford to make the exact same monthly payments.

We conclude by urging Canadians to take a careful look at the liabilities on their personal balance sheet to make sure that all their eggs - debts and short-term cash assets - are placed in one basket.

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1.) Introduction and Motivation: Most Canadians Have Debt

According to Statistics Canada's *Survey of Consumer Finance* conducted in 1999, close to 68% of Canadian families have some type of debt on their financial balance sheet. In 1999, those who had debts owed approximately $62,872 (stated in year-2005 dollars) to their creditors. This number is estimated to have risen to approximately $66,800 by the year 2004 according to the Vanier Institute[3]. We will refer to (a rounded) $67,000 as the average amount of debt held in 2005, for those family units who actually report having some form of debt. Either way, Canadians are obviously experiencing a growing burden of personal debt and should therefore be searching for ways to optimally manage this debt in the most economic way possible.

This report does not focus on the amount of debt Canadians have – which has been documented elsewhere in a number of other studies -- but rather it is about how they diversify their debts and fail to optimize their debt management strategies.

Indeed, beyond the $67,000 number, Canadians owe money to a wide variety of creditors. For example, debts and liabilities can be held as mortgages, lines of credit, student loans, vehicle loans as well as credit cards and other instalment debts. To provide some context and background, Table #1 provides a summary of the various debts held by Canadians: the percentage of Canadians that have a particular type of debt as well as the average and median debt levels. All numbers have been adjusted to current values using the actual inflation rate experienced from 1999 (the date of the survey) to the year 2005.

For example, $346 billion was owed in the form of mortgages on a principal residence, $30 billion was owed on lines of credit, $16 billion was owed on credit cards, $17 billion was owed in student loans, and $33 billion was owed in vehicle loans. These numbers do not include the *informal* debt markets where money is owed to friends, relatives, community charities, etc. Note that 33% of Canadians have a mortgage on a principal residence, while 39% have credit card debt. The average size of the principal

[3] Sauvé, Roger. The Current State of Canadian Family Finances – 2004 Report. The Vanier Institute of the Family, 2005.

residence mortgage – for those who actually had a mortgage – was $86,677, again stated in year-2005 dollars.

A more refined picture of debt and how it varies over the human life-cycle is provided in Table #2. It breaks down the numbers and percentages in Table #1 according to the age of the primary income recipient in the family unit. As one would expect intuitively, the use of credit escalates in the earlier stages of life and eventually declines. Thus for instance 67% of family units, where the main breadwinner is under 25 years of age, report having some sort of debt. 81% of family units between 35 and 44 years of age report debt. The figure declines to 27% for those 65 and older.

There is yet another perspective from which to measure the debt of Canadians, and that is obtained by comparing what they owe (a.k.a. their liabilities) to their assets. Table #3 places the numbers from the two earlier tables in relative perspective by measuring the magnitude of debt per $100 of assets. For example, the average Canadian family unit has $16 in debts per $100 in assets. Couples with children, on the other hand, have $23 in debts per $100 in assets.

Another recent study has suggested that Canadian household debt is 7% higher in 2005 compared to 2004, and 20% higher than what it was at the beginning of the decade[4]. The trend-line has been moving upward regardless of whether debt is examined relative to income or assets. Since 1981 the growth of household debt has outpaced the growth of income by an annualized rate of 3%, and it has outpaced the growth of assets by 1%. As well, to provide additional perspective, the savings rate of Canadians is at approximately 1% for 2005. In fact, during the months of July to September of 2004, the savings rate dipped to zero, which has not been observed since the Great Depression[4].

In the above analysis, the definition of assets is meant to include both liquid and illiquid assets. However, if we included the value of human capital – which is the present value of future salary and wages – the ratios displayed in Table #3 would be uniformly lower, and Canadians would be computed to have less debt per $100 of assets. Indeed, this might be yet another reason why increasing debt levels are not as alarming as they

[4] Tal, Benjamin. Are We Sitting on a Debt Time Bomb? Consumer Watch Canada, CIBC World Markets, 2005.

might initially appear. If the value of a typical family's human capital increases by more than the value of their debt, their personal financial balance sheet is improving, even if debt is growing faster than actual income, *per se*.

Thus, despite the clear message embedded within Tables #1, #2 and #3, we remain neutral with regards to whether the increasing level of debt is bad, or perhaps even good, for Canadians. Once again, by no means does this report set out to discourage the reliance upon consumer credit. Debt can be a very beneficial component of the personal balance sheet that can help smooth the financial life-cycle. However, the key to deriving the maximum benefits of this tool is effective debt management.

Again, the focus of our analysis – and what concerns us -- is the extent to which Canadians are diversifying their debt by having multiple liabilities at differing interest rates and are not using their income and savings to minimize their costs. And, while most financial commentators understand and advocate the benefits of debt consolidation, this report attempts to quantify the benefit of consolidating all forms of debt into a line-of-credit that charges the lowest possible interest rate. To state it even more simply, our report addresses the following question: *How much would Canadians save each year, if they dumped <u>all</u> of their debt and their deposits into one "basket" that accrued interest at one rate, as opposed to keeping their debts and deposits segregated in silos across space and time?*

To understand the phenomenon of debt diversification, we refer the reader's attention to Table #1, for example. Notice that the numbers in the last column add-up to 141. What this effectively implies is that in aggregate, there are some people who owe money to at least two and perhaps even more different creditors. If each individual relied on just one type of credit, summing up all of the percentage figures would equal the fraction of Canadians holding any type of debt – that is, 68%. However, this is not what we observe. In fact, the greater the sum-of-percentages is, the larger the fraction of the population that has more than one type of liability. Table #2 illustrates how this varies with age. In the age 25 to 34 category, the percentages add up to 183, which implies an even greater number of people who are diversifying their debts. As well, approximately 50% of individuals in this category reported owing a credit card balance,

subject to interest charges[5]. Finally, the lowest debt diversification is observed in the "65 and older" category.

A recent article in *The Globe and Mail* (September 5, 2005) tells a similar story regarding post-secondary school students who report having various sources of debt, with 28% claiming at least two sources and 9% claiming at least three sources. Many students borrow from banks using a personal line of credit, have credit cards and participate in the Federal and Provincial governments' student loan program. Of course, many of the above-mentioned students might not have a choice and are forced to borrow from various sources. Nevertheless, the evidence suggests that a large segment of the borrowing population is able to consolidate and optimize their debt, yet choose not to.

We therefore postulate that the practice of spreading one's debts across various creditors – even in the absence of any liquidity constraints -- might be an unconscious desire to compartmentalize one's liabilities, or perhaps is a remnant of consumers' approach to asset management, where one is told not to place all investment eggs in one basket.

2.) Debt Diversification: Spread over Silos of Space and Time

Anecdotal evidence is also consistent with what the sparse data are suggesting. Informal discussions with financial planners and retail bankers indicate that Canadians choose to rely on various sources of debt, often on an ongoing basis, as opposed to keeping all their debts aggregated in one account. Your neighbour may be running a credit card balance and making monthly home mortgage payments, while financing a vehicle and drawing down a line of credit for renovations, yet all at different interest rates. This practice illustrates one dimension of a flawed debt management strategy – debt diversification across space silos. Another dimension of poor debt management is what we have labelled "debt diversification across time". This refers to the tendency of consumers to hold and deposit income dollars in a low-interest (taxable) bank account

[5] The Assets and Debts of Canadians: An overview of the results of the Survey of Financial Security, Statistics Canada, 2001.

rather than using the funds to immediately reduce outstanding debt balances, where the interest charge accumulates at higher (non-tax deductible) rates.

Clearly, it is not rational to diversify debts across space silos or time (cash-flow mismatch), especially when cheaper debt management strategies are readily available. In other words, even if you can only afford to contribute a fixed payment (budget) toward your various debts in any given month, the benefits of making that aggregate payment to one creditor can be substantial. This might be obvious to many readers, yet it is not widely practiced, perhaps because the magnitude of the loss is not well understood.

What follows are some numerical examples to provide basic intuition for the benefits of debt consolidation. The next two sections provide a more sophisticated perspective.

Table #4 provides an illustrative example using just two possible debt instruments (a.k.a. liability silos): a line of credit and a credit card. According to a research report published in early 2005 by the Bank of Montreal[6], the average Canadian carries a credit card balance of $2,451. We will use this number in the example. Let us further assume for this example that a consumer has the same $2,451 balance outstanding on a line of credit, as well as on a retail store credit card. The hypothetical question we would like to address is as follows: If this person can only afford to make a constant payment of $100 per month in each of these accounts, how long will it take to pay down each type of debt and how much will it cost?

The Financial Consumer Agency of Canada (FCAC) reports that the typical credit card charges an annual percentage rate (APR) of 18%, while the retail store credit card charges 28%. Along with these rates, a typical secured line of credit would charge 4.50%, based on the current (early September 2005) prime rate of interest. We also generated the examples under a 5.25% rate. Both of these numbers are assumed to remain constant over time. The next section will report on the results of more elaborate financial simulations where interest rate fluctuations are modeled over time.

Table #4 illustrates how long it would take to eliminate the balance on each account (debt silo) assuming the same initial balances of $2,451 and the identical payments of $100 per month. The main results are as follows. It takes 25.6 months to

[6] Canadians facing post-holiday financial blues: Canadians & Credit card debt, BMO Poll, 01/17/2005.

pay off the line of credit under a 4.50% rate and 25.8 months under the 5.25% rate. In contrast, it takes 30.2 months to eliminate the credit card debt and 35.5 months to pay off the retail credit card. Table #5 illustrates how the total amount paid will vary for each account. This figure ranges from $2,563 for the lower interest line of credit to $3,548 for the retail credit card – a difference of $985.

Now, if we go even further and assume a hypothetical consumer who has three different types of debt: two credit cards (standard and department store) and a line of credit – all with the exact same hypothetical balance -- and consolidates these three silos into one line of credit, the benefits would be even more pronounced. In total, all the payments that must be made to pay off the three accounts -- i.e. the 4.50% interest rate of the line of credit, and the two credit cards at their respective rates – is $9,133. However, if all three accounts were consolidated into the line of credit (i.e. not diversified), the payments would only total 3 x $2,563 = $7,690, which represents potential savings of $1,443 over the life of the liabilities. In addition, the total amount of debt would be eliminated faster, saving 10 months, compared to waiting 35 months until the last payment on the retail credit card is made. Similarly, transferring the credit card balances to the (higher) 5.25% line of credit, versus holding three separate accounts would result in total payments of $7,749, leading to total savings of $1,383.

It is very important for us to stress that the point of this analysis is NOT to zero-in on credit card companies and high interest rates, but rather to illustrate the benefits of optimal debt management. The numerical results would be comparable if we used a car-loan, student-loan, or even a personal loan charging similar interest rates. Later we will address the risk aspect of linking personal debts to floating interest rates.

A hypothetical numerical example can also demonstrate the impact of debt diversification across time. Mortgage holders typically have a pre-payment option, whereby the financial institution holding their mortgage allows the customer to pay down up to 15% of the principal each year. Furthermore, with an open mortgage, customers can pay down any amount at any time. Yet, many customers do not take advantage of this feature and choose instead to hold excess cash in a savings account, perhaps for emergency purposes, earning negligible (taxable) interest. This is a sub-optimal debt management strategy and we will now demonstrate the magnitude of the possible loss.

According to Statistics Canada's last Survey of Financial Security (1999), the median amount of cash held by Canadians in financial institutions was $2,700 while the average amount was $15,000. Motivated by the larger numbers, consider the following example, which is summarized in Table #6. Imagine that a bank issues a $150,000 mortgage to individual #1, under a fixed interest rate of 5.35% (APR) which is to be repaid over an amortization period of 25 years. Once again, this hypothetical illustration is meant to zero-in on the benefits of consolidation as opposed to capturing the nuances of the market for fixed-rate mortgages.

These input parameters lead to monthly payments of $902.53, which, for the sake of the example, will remain constant during the next 25 years. Thus, after the 25th year or 300th month, the balance will be reduced to zero. A detailed mortgage schedule calculation will reveal that individual #1 will have paid a total of $270,760 in principal and interest at the end of 300 months.

Imagine further that this individual also has a $10,000 balance in a (low interest) savings account, term deposit or GIC, perhaps for use in the case of a sudden cash emergency. Note that even if these emergency funds earn minimal interest while they are waiting to be deployed, the gains will be taxed at this individual's highest marginal (ordinary income) tax rate. At the end of 30 years, if we net the $10,000 in the savings account against the $270,760 in total mortgage payments, we arrive at a net figure of $260,760. This result is obviously un-adjusted for any time value of money. But, even at a 1% after-tax growth rate within the savings account, the $10,000 will earn less than $3,000 in interest after 25 years.

Now consider individual #2 who has the exact same accounts, namely a $10,000 emergency savings fund and a $150,000 mortgage. However, this person optimizes her debt by using the $10,000 cash (GIC) to immediately pay down her mortgage. Note that whether the mortgage is open – similar to a line of credit -- or closed, she should be able to make this payment without breaking the mortgage terms. She also does this with the reassurance that in the event of a cash emergency she will be able to tap-into a line of credit and withdraw the $10,000, or even more if needed. Thus, we are not advocating that Canadians dispense of an emergency account, but rather they dispense

of the savings in the account, if they have access to – and are paying interest on -- a line of credit.

Either way, let's assume that after the initial $10,000 is used to pay down the mortgage debt to roughly $140,000, both individuals #1 and #2 continue to make identical monthly payments of $902.53 until the entire mortgage debt is paid off. Since the mortgage debt of individual #2 starts with $10,000 less initially, and she is making the same payments each month (as her neighbour), she will pay-off her debts much sooner.

The end result for both individuals is quite interesting. Individual #2 (the debt optimizer) would pay-off the mortgage balance after 262 months, or approximately after 21.8 years. She would avoid more than 3 years of payments and will have paid a total of $246,447 in mortgage principal and interest, which is $14,312 less than her neighbour who maintained the emergency savings account for 25 years.

Figure #1 provides a graphical illustration of both the optimal and sub-optimal debt management strategies. The column on the left illustrates individual #1 who starts with a $150,000 mortgage and maintains a $10,000 savings account (a.k.a. emergency fund). The lower section of the column illustrates the amount of principal ($150,000) while the upper section illustrates the interest paid ($120,760) over the 25-year life of the mortgage debt.

In contrast, the column on the far right represents individual #2, who immediately uses the $10,000 to reduce the outstanding debt (from $150,000 to $140,000) by collapsing the emergency fund account. This person ends up paying approximately $96,447 in mortgage interest plus $140,000 in principal for a total of $236,447 in periodic payments. If we then add the original $10,000 in the savings account applied to the original principal, we arrive at a total payment of $246,447. Once again, this nets out to $14,312 less than her neighbour who did not consolidate her savings with her debts.

This simple example – which we emphasize, ignores the time value of money as well as any fluctuations in interest rates -- can be extended to any number of mortgage sizes and saving account combinations. Our objective is simply to develop some basic financial intuition. Table #7 demonstrates how total net gains vary with different input parameters, while holding all other variables constant. For example, if the original

mortgage was $250,000 (instead of $150,000) and the emergency account contained $20,000 (instead of $10,000), then applying this one lump sum to pay down debt would lead to approximately $27,560 in (relative) gains. Note that these numbers are all based on the same 5.35% mortgage interest rate and the 25-year amortization schedule. The underlying arithmetic is rather trivial and these examples can easily be expanded to other mortgage rates, amortization periods and lump sums.

It is important to note that if the $10,000 in the so-called emergency fund actually earned an after-tax rate of interest that equalled or exceeded the cost of debt after tax-reduction the value of the account would grow over time to more than the savings from consolidating the loan. *In that case we would counsel against consolidating*. In fact, this is the precise reason why so many financial advisors advocate borrowing money – perhaps secured against one's personal residence using a line of credit -- to invest in financial assets whose after-tax return is greater than the cost of debt.

Thus, it is important to appreciate that what drives these results is the relationship between the after-tax mortgage interest rate and the after-tax savings account rate. And, since the interest on most consumer loans is not tax deductible, yet the interest earned on (non-RRSP) savings accounts is taxable, the above-mentioned consolidation strategy will pay off for most Canadians. The only question is the precise magnitude of the gains.

In sum, this section has provided a number of simple hypothetical examples to help develop the basic intuition of the impact of debt consolidation. In the next section we move from the hypothetical to real world numbers by calibrating these results to the typical debt loads of Canadians.

3.) Simulation Analysis: How Much Is Lost by Silo Diversification?

We have identified two types of (sub-optimal) debt diversification strategies practiced by Canadians. The first we label "space (silo) diversification", which involves holding different types of debts at differing interest rates, instead of borrowing at the lowest possible rate. We label the second dimension "time diversification", which revolves around the practice of not optimizing cash-flows and keeping extra cash in low

interest earning accounts instead of paying-off the debt immediately and then possibly re-incurring the debt later on.

In this section we report on the results of a financial simulation we conducted at The IFID Centre to measure the benefits a hypothetical Canadian would obtain from consolidating debts into one floating-rate line of credit. To make this analysis more realistic, we used a Canadian family unit as input arbitrarily labelled Mr. and Mrs. Diveronica, or the Diveronica family -- with debts and liabilities spread around a number of silos. First, we assumed this family has $2,451 in credit card debt, as in the previous example. We also assumed an outstanding (principal (STET) residence) mortgage of $76,312, which is the median amount owed by Canadians, presented in Table #1,and a secured line of credit with a balance of $5,695, which is *ticking* at the prime rate. Finally, we assumed the family has a vehicle loan of $10,251 amortized over 3 years, once again based on the numbers in Table #1. In sum, the Diveronicas owe a total of $94,709 to various creditors, which closely approaches the median total debt held by Canadian mortgage holders[7].

The Diveronica family contributes (or can afford) $1,000 each month to the repayment of their debts and allocates this sum in the following way. First, for the outstanding mortgage, the family makes a monthly payment of $516. This is based on a 20 year amortization period and an assumed fixed three year term interest rate equal to 5.35%, which is the median rate quoted by Canadian Financial Institutions[8] at the time of writing. Next, based on the average rate reported by *Bankrate.ca*, we assumed the auto loan charges interest of 7.93% with a monthly payment of $320.90. Finally, they make the minimum monthly payment due on their credit card each month (assumed to be the maximum of $40 and 2% of the outstanding balance). The remainder of the budgeted $1,000 is used to pay down the line of credit.

In sum, we have modeled a family with a diversified portfolio of debts, who is making monthly payments based on average numbers reported from a variety of sources. Later we will calibrate the results to the typical Canadian with a smaller amount of outstanding debt.

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[7] Statistics Canada, Survey of Financial Security (SFS) 1999, Special Table: Composition of Assets and Debts Held by All Family Units Holding a Mortgage.

[8] Source: CANNEX Financial Exchanges

Next, we introduce Mr. and Mrs. Consuelo, also known as the Consuelo family. They live next to the Diveronica family, and as fate would have it, owe the exact same amount to the exact same creditors. However, in contrast to the Diveronicas, the Consuelos have decided to consolidate all of their debts – totalling the same $94,709 -- under one line of credit or liability account. Although, from a psychological point of view, the Consuelo family would much prefer to owe smaller amounts to a large number of creditors, they understand the financial benefit of not being deluded by the fallacy of – what we like to call -- mental accounts. Later we will discuss the theory behind mental accounts, but for now, we will quantify the financial savings the Consuelo family will enjoy, compared to the Diveronica family.

To make this analysis an apples-to-apples comparison, the Consuelos will make the same monthly payment of $1,000 as the Diveronicas, but it will be entirely allocated towards the line of credit, which currently charges an interest rate of 4.50%, which is the Canadian prime rate in September 2005. The Consuelo family is acutely aware of the fact that prime interest rates are likely to increase over the next year or two, but they are reasonably comfortable knowing that the benefits of debt consolidation outweigh the risks of higher interest rates. Our analysis indeed confirms this intuition.

Our baseline model starts in September 2005 when the prime rate of interest stands at 4.50%. Each month our financial simulation model *randomizes* interest rates by allowing rates to a) increase by 25 basis points with probability $\{p_1\}$, b) stay at the same level with probability $\{p_2\}$ or c) decline by 25 basis points with probability $\{p_3\}$. Obviously, current sentiment in the financial market is that floating rates (a.k.a prime, or the BA rate) are likely to increase, which is why we assumed that $\{p_3 < p_1 < p_2\}$. And, although Bank of Canada interest rates do not necessarily change on a monthly basis – they can change at only eight dates during the year – and there is a chance that rates might move by more than 25 basis points, we feel comfortable erring on the side of simplicity. Indeed, Figure #2 provides a graphical illustration of the distribution of monthly interest rate changes during the last twenty years.

We stress that our objective is not to develop a statistical model for the (entire) yield curve and relative movement of short and long term rates. Rather, we believe that it is important to inject some “financial risk” into the process of consolidating all debts

into a floating rate line of credit. Randomizing the underlying interest is the simplest way of doing so.

Notice from Figure #2 that most prime rate changes are concentrated around zero and that large monthly changes are quite rare. We assume that even if the Bank of Canada raises the Bank Rate – which is used to determine the Prime rate – in each and every month during the next 12 months, the most rates would increase by is 3% or 300 basis points. The probability of this happening is formally computed as a mere $\{(p_1)^{12}\}$ which reflects the unlikely nature of this scenario. The parameter assumptions in our baseline simulations – specifically that p_1 = 7/18, p_2 = 10/18 and p_3 = 1/18 for a total of 100% - are described in detail in the technical appendix to this report. Under these parameter assumptions, the probability of the prime rate increasing by 3 percentage points over the next year was assumed to have a 1 in 100,000 probability. In other words, while we are fully cognizant that short term interest rates are more likely to increase than to decline over the next few years, we do allow for the possibility that rates stay at current levels or the minor possibility that they decline at some point in the future. We are now ready to report on the simulation results.

Table #8 addresses the question of how much the Consuelos gain and what are their risks of loss. For example, based on 10,000 scenarios generated by our financial simulation, the average result is that the Consuelo family will owe $929 less than the Diveronicas after one year and $970 less than the Diveronicas after 2 years. There is of course the risk that the prime rate will rise by more than the interest savings, partially offsetting the benefits of consolidating the four accounts. This is reflected in the column labelled 25th percentile. Here, we see that in 25% of the scenarios, the gains will be lower than $776 in the first year and lower than $520 in the second year.

The numbers in the last column of Table #8 report the average interest rate that our financial simulation generated by the end of the first and second year of our analysis. Note that these are not predications for interest rates. Rather, our results are indicating benefits from consolidation even if floating (prime) rates increase.

In fact, we find that even if the prime rate increases steadily from the current 4.50% to 8% over the course of the next 36 months, the benefits from consolidation are worth $854 on average in the first year, $644 in the second year, but they are negative

in the third year with an average of -$298. In other words, as one would expect, if-and-when short term interest rates move well above the fixed rates that are being paid on mortgage debt, the consolidation strategy will no longer add value.

Note that we are careful not to promote the benefits of this strategy by alluding to the superiority of (short-term) floating rate loans over (long-term) fixed rate loans. We assumed that the fixed-rate mortgage debt was at 5.35%, which is a mere 85 basis points above the current prime rate of 4.50%. If the fixed-rate mortgage rate is higher than 5.35%, the savings from consolidation would be even greater. Likewise, if the fixed-rate mortgage is lower, the savings from consolidation -- as it pertains to space (silo) diversification -- would be lower. The key input is the spread between the two rates.

Thus, the prime rate is a moving target and one must recognize that consolidating all debts to a floating prime rate, does in fact carry some financial risk. However, the results in Table #8 indicate that this risk will only become material once rates have risen well above the current low levels. On average, even in the third year of this strategy, there are positive savings from consolidation.

We reiterate that the “long mortgage” versus “short mortgage” debate has been addressed elsewhere and is not the crux of our analysis. Rather, we are trying to illustrate the benefits of NOT diversifying across space (silos).

4.) Simulation Analysis: How Much do Canadians Lose by Space Silos *and* Time Diversification?

Sections #2 and #3 have demonstrated the benefits of consolidating (i.e. not diversifying) debts across space and then across time. The next natural step is to examine the financial impact of embracing both consolidation strategies simultaneously. Thus, suppose that the Diveronicas and Consuelos both have the same debts as they did in the Section #3. That is, the Diveronicas owe $94,709, spread across a mortgage, car loan, line of credit and credit card, while the Consuelos have consolidated all four debt balances under a single line of credit. Both families also continue to make fixed monthly payments of $1000 towards their debts. However, now, the Diveronicas will

also maintain a savings account (or "emergency fund") with a $2,700 balance, which approaches the median amount held by Canadians, as mentioned earlier. To understand what this means from a financial perspective, the family's condensed, summarized balance sheet might be envisioned as is shown in Table #9.

The Diveronica family keeps the $2,700 in a savings account and this amount is therefore part of its financial assets (a.k.a. the left hand side of the personal balance sheet). Conversely, the Consuelo family, who previously consolidated their debts into a line of credit, also used the $2,700 to pay down its debts reducing the total debt of $94,709 to $92,009. The Consuelos' balance sheet is presented in Table #10.

Notice that at the starting point of the analysis, the net worth (equity) of both families is identical. We have denoted this equity using the abstract symbol $y. It doesn't really matter what the number is, nor does it matter what other assets (house, vehicle, etc.) the family has. The point is that the market value of their assets minus the market value of their liabilities is identical at the starting point.

Of course, the two balance sheets will diverge with time and Table #11 summarizes the year-end results for the first two years of the analysis. At the end of the first year, the outstanding liabilities of the Consuelo family will be $3,763 less, on average, compared to the Diveronica family. Then, taking into account the $2,700 cash fund the Diveronicas will have at the end of the year (earning negligible interest), The Consuelos will be $1,063 better off. At the end of the second year, the Consuelos will be $1,289 better off, on average. In sum, combining space and time consolidation increases their annual savings.

Furthermore, while the average mortgage holder may have a median total debt approaching the $94,710, the estimates calculated in Table #11 can also be translated into numbers relevant to the typical Canadian (with debt). Since the median amount owed to creditors by all Canadians is approximately $33,031 we can appropriately scale-down the numbers in Table #9 to (33,031/94,710 =) 35%. If you have $33,000 in debts, the median savings after the first year would be 35% x $1,062 = $370, etc. Note, however, that savings can be substantially higher than this figure for the average Canadian, since the average total outstanding debt is approximately $67,000, as

previously discussed. The reader is welcome to factor their own level of debt into the results and arrive at an estimate of their own savings.

Of course, increasing the monthly budget that is allocated to debt repayment or applying a bigger "emergency cash" balance to the consolidated line of credit leads to higher savings. For example, in Table #12 we summarize the results of a simulation in which we maintained all the same parameters as in Table #11 with the exception of two. We now assumed that the monthly budget allocated to debt repayment is increased to $1,500 from $1,000 and the emergency cash account balance is increased to $3,000 from $2,700.

Note that under this set of parameters, the line of credit balance that is owed by the Diveronicas is reduced to zero within the first year. Thus, we assume that any dollars left over from the monthly $1,500 payment, after that point, are added to the Diveronicas' emergency cash account.

The figures displayed in Table #12 represent the savings the Consuelo family will experience, net of the cash fund. On average, after the first year, the Consuelos will be better off by $1,087 at the end of the first year and $1,725 after the second year.

5.) Conclusion: What Can be Done About the Debt Load of Canadians?

With interest rates at historically low levels and Canadians fretting about the prospect of higher rates going forward, we believe it is important to deflect consumers' attention away from speculating on the Bank of Canada's next move, and more towards examining their own personal financial balance sheet. Optimal debt management strategies can and should be implemented independently of the direction of short term rates.

This report shies away from preaching the virtues of debt-free living or lamenting the increasing debt load of Canadians over the last decade. We take for granted the necessity, inevitability and benefit of having some form of debt. Our main research agenda is to (i) point out the extent of debt diversification and (ii) quantify the benefits of consolidating debt. We suspect that Canadians have been content to compartmentalize their debts. This report identifies two distinct dimensions of inappropriate debt-

management strategies. The first dimension is debt diversification across space (different silos). The second dimension comes from mismanaging debt levels across time, where salary income and deposits sit in low (or zero) interest accounts while the debt clock is ticking at much higher rates. Both forms of debt diversification destroy value.

We believe that the prevalence of debt diversification can be traced to what behavioural economists label the existence of *mental accounts*. According to work inspired by Nobel prize winning economist Daniel Kahneman and his co-researcher Richard H. Thaler, investors tend to segregate and manage their investment holdings in distinct lock-boxes or silos. They make decisions within each of these investment lock-boxes without taking into account the interaction between them. Thus, for example, investors will avoid realizing investment losses on a particular brokerage account because they want to "close it out" at a profit. Consumers often create and adhere to budgets for various financial expenditures, but where the boundaries between these individual activities are structured arbitrarily. Or, Canadian's might have a financial goal to pay-off their mortgage within 10 or 15 years, even if it means incurring other debts and liabilities at higher rates along the way.

We believe that the same behavioural phenomena are evident with personal debts and liabilities. Consumers might be keeping their diversified debts in small mental accounts – perhaps to avoid the "sticker shock" of getting one statement with a very large balance – even though these debts can easily be consolidated. Indeed, if the interest rate underlying the different silos was identical and the payment terms were the same, this practice would be harmless. However, in a world of differing interest rates, small payments over prolonged periods of time can add up to substantial sums.

To go beyond the anecdotal stories and actually quantify the benefits of debt consolidation we use financial simulation techniques to calibrate the implicit risk and return tradeoff. We show that a typical Canadian family erroneously holding a diversified portfolio of liabilities of $95,000, including a residential mortgage, and maintaining an idle emergency cash fund of $2,700 loses more than $1,000 dollars per year on average from not managing its debts in an optimal manner. We arrived at this number by assuming that this family unit consolidates all its debts and the cash account under a

(floating) personal line of credit (LOC) linked to the prime rate – while making the exact same monthly payments as they would have otherwise – instead of making smaller separate payments to each creditor individually. Obviously, if this family is able to make larger payments, the annualized savings would be even greater.

In sum, these eggs belong in one basket!

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Technical Appendix

In our *borrowing at the line-of-credit* (LOC) simulation, the financial simulation algorithm allowed for the possibility that the bank prime rate of interest could either increase, decrease or stay the same in any given month. If the prime rate increased, we assumed it would move up by {x_1 = *25*} basis points and if it declined we assumed it would decline by the same magnitude {x_3 = *-25*} basis points. The 25 basis point "move" is consistent with recent behavior on the part of the Bank of Canada, since the histogram displayed in Figure #2 supports the notion that in any given month, moves larger than 25 basis points are rare. We believe this assumption to be even more reasonable on a forward-looking basis given the current practice of regular (8 per year) announcements for policy changes scheduled by the Bank of Canada as well as the recent increase by the U.S. Federal Reserve to restrict moves to 25 basis point increments.

The probability of an increase {p_1} was assumed to be 7/18, the probability of a decline {p_3} was taken to be a mere 1/18 and the probability of a zero-point {p_2} move was assumed to be 10/18. The justification for these numbers comes from the fact that under these parameters, the average increase in any given month would be approximately 8 basis points, which would lead to an average increase of 100 basis points per year over the next three years. The following formula illustrates how this is calculated:

$$E[X] = p_1 x_1 + p_2 x_2 + p_3 x_3$$
$$E[12X] = 12(25(7/18) + 0(10/18) - 25(1/18)) = 100 \qquad \text{(eq.1)}$$

In addition, the standard deviation of this random variable was assumed to be 50 basis points per year, as computed by the following formula:

$$SD[X] = \sqrt{p_1(E[X] - x_1)^2 + p_2(E[X] - x_2)^2 + p_3(E[X] - x_3)^2}$$
$$SD[12X] = \sqrt{12} \times SD[X] \qquad \text{(eq.2)}$$

These average (and standard deviation) numbers were obtained by calibrating our model to current futures market data for 3-month Bankers Acceptance (BAX), traded on the Montreal Exchange, where the September 2006 contract is reflecting an 80 – 100 basis point increase from current levels. Note that spot B.A. rates are usually 25 basis points less than the official Bank of Canada rate, which in turn is 125 basis points lower than the chartered Bank Prime rate. Thus, our financial simulation model generated various samples paths for the evolution of the B.A. rate over the next 36 months and added 150 basis points in any given month to arrive at the relevant prime rate for that month. We also truncated any simulation paths that led to zero interest rates.

Note that our model does allow for the possibility of a declining prime rate, which might seem unlikely but is certainly possible, especially if the Canadian dollar continues its appreciation relative to the U.S. dollar. Nevertheless, a decline in the prime rate was assumed to have a less than 5% chance of occurring, while maintaining the expectation that rates would increase over time. Indeed, to check for robustness of our results we generated the analysis presented in Table #13, assuming that rates would increase by 25 basis points in any given month with a $\{p_1=1/3\}$ probability and rates would stay the same with a $\{p_2=2/3\}$ probability. This binomial model would also result in an expected increase of 100 basis points over the next year, but the standard deviation would be a (lower) 40 basis points. The differences between the savings listed in Table #13 and Table #8 are, in fact, minimal.

Table 1					
What do Canadian Families Owe And To Whom Do They Owe it?					
	Total		**Median**	**Average**	**% with this Type of Debt**
	$billion	**%**	**$**	**$**	**%**
Main Residence Mortgage	346	67	76,312	86,677	33
Other Real Estate Mortgage	58	12	68,339	100,914	5
Line of credit	30	6	5,695	15,376	16
Credit card and instalment	16	3	2,050	3,417	39
Student loans	17	3	8,315	11,845	12
Vehicle loans	33	6	10,251	12,757	21
Other debt	21	4	4,556	10,593	16
Sum of Percentages:					**141**
Total Debt in any Form:	**522**	**100**	**33,031**	**62,872**	**68**
Source: The Assets and Debts of Canadians: An Overview of the Results of the Survey of Financial Security, Statistics Canada, 2001. Figures stated in 2005 dollars based on Bank of Canada CPI.					

Table 2						
Debts of Canadian Families by Age Group*						
	Under 25	**25-34**	**35-44**	**45-54**	**55-64**	**65 and older**
	%	%	%	%	%	%
Main Residence Mortgage	7	38	49	43	26	7
Other Real Estate Mortgage	2	4	6	7	6	2
Line of credit:	6	17	20	23	15	5
Credit card and instalment debt:	36	50	47	42	33	15
Student Loans:	31	23	9	13	4	1
Vehicle Loans:	19	29	26	25	17	6
Other Debt:	19	22	21	17	12	5
Sum of Percentages:	**120**	**183**	**178**	**170**	**113**	**41**
Total Debt in any Form:	**67**	**84**	**81**	**77**	**62**	**27**
*Based on the age of the major income recipient						
Source: The Assets and Debts of Canadians: An Overview of the Results of the Survey of Financial Security, Statistics Canada, 2001.						

Table 3	
Debt-to-Asset Ratio of Canadians Classified by Family Type	
Family Type	**$ debts per $100 of assets**
All family units	16
Economic families of two or more	16
Elderly families	3
Non-elderly families	
Couples only, no children at home	15
Couples with children	23
Couples with other relatives	15
Lone-parent families	29
Other non-elderly families	14
Unattached individuals	13
Elderly male	2
Elderly female	1
Non-elderly male	22
Non-elderly female	19
Source: The Assets and Debts of Canadians: An Overview of the Results of the Survey of Financial Security, Statistics Canada, 2001.	

Table 4		
How Many Months Does it Take to Pay-off a Debt of $2,451 in $100 Monthly Increments?		
Account	**Standard Credit Card: 18% APR**	**Retail Credit Card: 28% APR**
Line of Credit: 4.50%	25.6 / 30.2	25.6 / 35.5
Line of Credit 5.25%	25.8 / 30.2	25.8 / 35.5

Table 5		
How Much Does it Cost to Pay-off $2,451 in Debt, Paid in $100 Monthly Increments?		
Account	**Standard Credit Card: 18% APR**	**Retail Credit Card: 28% APR**
Line of Credit: 4.50%	2,563 / 3,021	2,563 / 3,548
Line of Credit 5.25%	2,583 / 3,021	2,583 / 3,548

Table 6			
Net Gain from Debt Consolidation:			
Mortgage Principal:		$ 150,000	
Term of Mortgage:		300 months	
Mortgage Interest Rate:		5.35%	
Monthly Payment:		$902.53	
Savings Account Balance		$10,000	
	Individual 1	**Individual 2**	**Net Gain**
	Diversify Accounts	**Consolidate Accounts**	
Sum of Payments Plus Account	$270,760 - $10,000	$236,447 + $10,000	$14,312
Paid-off Debt After …	300 months	262 months	38 Months

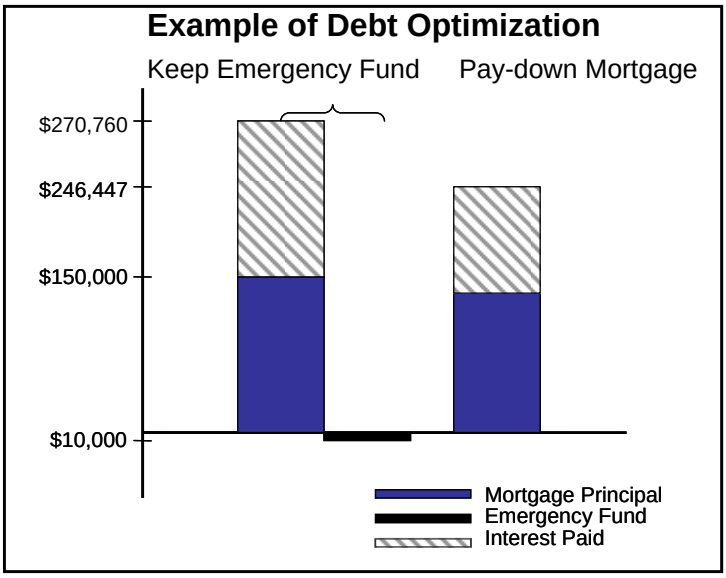
Example of Debt Optimization
Keep Emergency Fund
Pay-down Mortgage
$270,760
$246,447
$150,000
$10,000
Mortgage Principal
Emergency Fund
Interest Paid

Figure 1

Table 7			
Net Gain from Consolidation of Mortgage and Savings Account			
	Cash in Savings Account		
Mortgage (Debt) Balance	**$10,000**	**$15,000**	**$20,000**
$100,000	$13,021	$16,955	$19,600
$150,000	$14,312	$19,532	$23,699
$250,000	$15,446	$21,880	$27,560

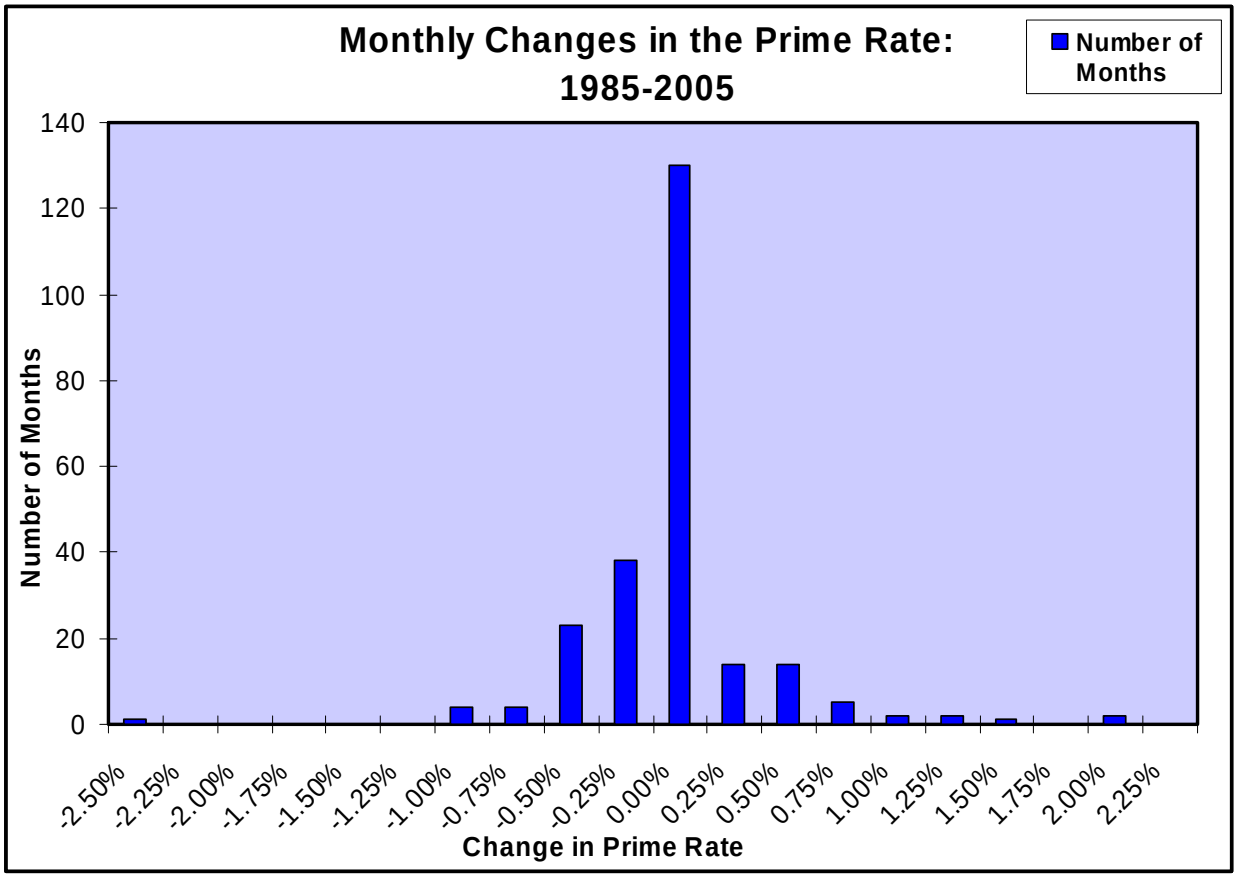
Monthly Changes in the Prime Rate: 1985-2005
Number of Months
140
120
100
80
60
40
20
0
Number of Months
-2.50%
-2.25%
-2.00%
-1.75%
-1.50%
-1.25%
-1.00%
-0.75%
-0.50%
-0.25%
0.00%
0.25%
0.50%
0.75%
1.00%
1.25%
1.50%
1.75%
2.00%
2.25%
Change in Prime Rate

Figure 2

Table 8					
You have $94,710 in a Diversified Portfolio of Liabilities: How Much Do You Save by Consolidating at Prime?					
Year	**Average Savings**	**25%th percentile**	**50%th percentile**	**75%th percentile**	**Average year-end rate**
1	$929	$776	$929	$1,081	5.42%
2	$970	$520	$965	$1,418	6.50%

Table 9			
Diveronica Family Balance Sheet			
Assets		**Liabilities**	
House	$x	Credit card balance	$2,451
Vehicle	$x	Fixed rate mortgage	$76,312
Financial investments	$x	Vehicle loan	$10,251
Pension	$x	Line of credit	$5,695
Emergency Fund	$2,700	**Net Worth (Equity)**	$y

Table 10			
Consuelo Family Balance Sheet			
Assets		**Liabilities**	
House	$x	Credit card balance	$0
Vehicle	$x	Fixed rate mortgage	$0
Financial investments	$x	Vehicle loan	$0
Pension	$x	Line of credit	$92,009
Emergency Fund	$0	**Net Worth (Equity)**	$y

Table 11

You have $94,710 in a Diversified Portfolio of Liabilities and a $2,700 cash fund: How Much Do You Save by Consolidating at Prime?

Year	Average Savings	25%th percentile	50%th percentile	75%th percentile	Average year-end rate
1	$1,063	$914	$1,062	$1,210	5.42%
2	$1,289	$854	$1,280	$1,729	6.50%

Table 12

You have $94,710 in a Diversified Portfolio of Liabilities and a $3,000 cash fund: How Much Do You Save by Consolidating Debt?

Year	Average Savings	25%th percentile	50%th percentile	75%th percentile	Average year-end rate
1	$1,087	$939	$1,085	$1,230	5.42%
2	$1,725	$1,314	$1,725	$2,131	6.50%

Table 13

You have $94,710 in a Diversified Portfolio of Liabilities: How Much Do You Save by Consolidating at Prime? (Assuming The Prime Rate Can Only Increase)

Year	Average Savings	25%th percentile	50%th percentile	75%th percentile	Average year-end rate
1	$929	$809	$933	$1,064	5.42%
2	$971	$605	$995	$1,347	6.50%