

Personal Finance Workshop: Introduction

John Y. Campbell

Harvard University

April 1, 2019

Personal Finance

- We live in an age where financial decisions are more and more challenging.
 - ▶ Student debt to pay for expensive college and grad school
 - ▶ Mortgages to pay for expensive housing
 - ▶ Retirement saving to finance longer retirement with less traditional pension income
 - ▶ Complex financial products and insurance contracts.
- The aim of this workshop is to introduce you to some simple ideas that can help.
 - ▶ We hope that learning on your own about personal finance will be easier and less scary after these four sessions.

Outline of the Next Hour

- We'll first take a financial literacy test and compare ourselves with the general population.
- Then we'll discuss other types of financial ignorance and the mistakes associated with them.
- A recent short book, *The Index Card*, by Olen and Pollack, lists 10 personal finance rules that can fit on a single index card.
- We'll work through a case study of student budgeting to illustrate the first couple of rules.
- We'll finish with a review of interest rate math.

Outline of Remaining Sessions

- Later this evening, Karen Dynan will discuss the basics of credit.
- On April 8, Karen Dynan and Jeff Miron will talk about personal finance over the life cycle.
- On April 15, I will talk about risky investing and insurance.
- On April 22, David Laibson will use behavioral economics to shed light on the biases that can cause personal finance problems.

Financial Literacy Test

- It is startling how little many people know about basic financial concepts.
- Let's take a simple test with five questions.
 - ▶ These are sometimes called the “Big Five” because they have been administered in many different financial literacy surveys around the world.
 - ▶ Not to be confused with other “Big Five” questions in psychology.
- For online participation, please go to this URL:
 - ▶ **<http://etc.ch/XQde>**.

Question 1

- Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?
 - ▶ More than \$102
 - ▶ Exactly \$102
 - ▶ Less than \$102
 - ▶ Don't know or refuse to answer
- For online participation, please go to this URL:
 - ▶ **<http://etc.ch/XQde>**.

Question 2

- Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than today, exactly the same as today, or less than today with the money in this account?
 - ▶ More than today
 - ▶ Exactly the same as today
 - ▶ Less than today
 - ▶ Don't know or refuse to answer

Question 3

- Do you think that the following statement is true or false: Buying a single company stock usually provides a safer return than a stock mutual fund?
 - ▶ True
 - ▶ False
 - ▶ Don't know or refuse to answer

Question 4

- Do you think that the following statement is true or false: A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest over the life of the loan will be less?
 - ▶ True
 - ▶ False
 - ▶ Don't know or refuse to answer

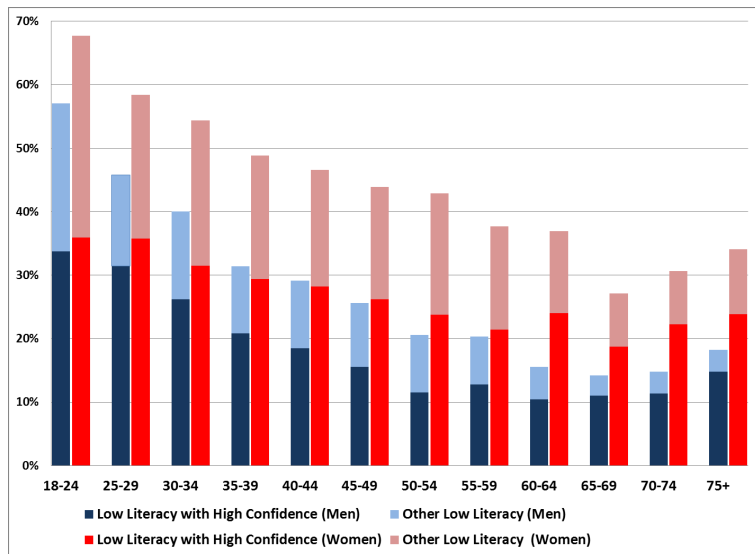
Question 5

- If interest rates rise, what will typically happen to bond prices?
 - ▶ They will rise
 - ▶ They will fall
 - ▶ They will stay the same
 - ▶ There is no relationship
 - ▶ Don't know or refuse to answer

Scoring the Financial Literacy Test

- The correct answers are:
 - ▶ More than \$102
 - ▶ Less than today
 - ▶ False
 - ▶ True
 - ▶ They will fall
- Which question did you find most challenging?
- Give yourself one point for each correct answer.
- If you guessed randomly from the specific answers, your score would be 2.17 on average.
- Let's define low financial literacy as a score of 2 or less.

Nationwide Test Results by Gender and Age



How Worried Should We Be?

These results from the 2012 National Financial Capability Study are worrying because:

- The Big Five questions are easy relative to the knowledge needed to make good practical decisions.
 - ▶ The interest rate question does not even get to the distinction between simple and compound interest, which is vital for comparing up-front costs with interest rates, e.g. in choosing a mortgage (Stango and Zinman 2009).
- Low financial literacy is particularly common among young people.
 - ▶ But important decisions, especially about student loans, have to be taken early in adult life.
- Some people with low financial literacy have low self-confidence and will seek help, but others are highly confident and may resist advice.
 - ▶ Overconfidence is particularly common among the elderly, who easily fall victim to scams.

A Broader View

Beyond financial illiteracy, there is a broader problem of ignorance about:

- **Contract terms** (fine print)
 - ▶ People don't understand how much the interest rate can change on an adjustable-rate mortgage (Bucks and Pence 2008) or what triggers bank overdraft charges (Stango and Zinman 2014).
- **Financial history** (overweighting personal experience)
 - ▶ Investors are more aggressive if they have experienced stock-market booms (Malmendier and Nagel 2011), and they invest in the stock of their employer after it has gone up (Benartzi 2001).
- **Self** (overconfidence)
 - ▶ People are overconfident of their ability to manage complex products, e.g. to refinance a mortgage at the right time (Grubb 2015).
- **Incentives and behavior of others** (naïveté)
 - ▶ People don't understand the commissions that financial advisers and product salespeople receive, and they don't shop enough (Chater, Huck, and Inderst 2010, Woodward and Hall 2012).

Important Financial Mistakes

- Student loan borrowing without adequate income expectations to support the debt.
- Failure to create a reserve fund to cover emergencies.
- Repeated borrowing for short periods of time at very high interest rates (debt trap).
- Failure to save adequately for retirement.
- Mismanaging risky investments (nonparticipation, underdiversification, overtrading).
- Paying high fees on financial products (because they are too complex to understand or you fail to shop around).
- Housing mistakes (spending too much on a house, picking the wrong mortgage, failing to refinance the mortgage when you can get a lower rate).
- Insuring small risks while leaving large risks uninsured.

The Index Card

- How can you avoid making these kinds of mistakes?
- A recent short book by Helaine Olen and Harold Pollack, *The Index Card*, tries to boil financial advice down to 10 rules that will fit on a single index card.
- The book and the rules are both quite sensible, so we'll go through them now.
- But the aim of this workshop is to give you better tools to understand where these rules come from and to decide how (if at all) to use them.

The Ten Rules

- 1 Strive to save 10 to 20 percent of your income.
- 2 Pay your credit card balance in full every month.
- 3 Max out your 401(k) and other tax-advantaged savings accounts.
- 4 Never buy or sell individual stocks.
- 5 Buy inexpensive, well diversified, indexed mutual funds and exchange-traded funds.
- 6 Make your financial advisor commit to the fiduciary standard
- 7 Buy a home when you are financially ready.
- 8 Insurance - make sure you're protected.
- 9 Do what you can to support the social safety net.
- 10 Remember the index card!

A Case Study

- The Harvard University Employees Credit Union has run useful January (wintersession) courses on personal finance.
- With permission, we are sharing a case study developed by HUECU.

Chris Woke Up on June 1st....

Chris woke up on June 1st, exhausted from the weekend of commencement activities and celebrations. Chris was finally a graduate of Harvard! Chris had submitted the senior thesis just weeks before and was able to enjoy the final few days on campus.

Last week, Chris confirmed the acceptance of a job offer, scheduled to begin on September 1st. However, before then, Chris must find a place to live and develop a spending plan. In addition, Chris' friends are planning a graduation trip in July and they have asked Chris to join them.

Chris Has Never Been a Planner....

In college, Chris worked about ten hours a week. Chris has never been a planner when it has involved money and finance. As a result, despite the weekly pay check, Chris rarely had more than \$50 in a bank account. However, as a result of gifts received as graduation presents, Chris now has **\$500 in a savings account**.

Chris has **\$2,000 of credit card debt** with a variable interest rate of 18% APR, a minimum monthly payment of \$40, and a \$5,000 credit limit.

In addition, Chris has a **student loan that has a balance of \$5,000** and a 5% fixed interest rate. Since the student loan is subsidized, interest won't begin to accrue on the balance until December, when the first monthly payment of \$50 also is due.

Snapshot of Chris' Finances on June 1st

Snapshot of Chris' Finances on June 1

What He Has:			
Savings Account	\$ 500		
What He Owes:			
	Amount	APR	Notes
Credit Card Debt	\$ 2,000	18%	Assume minimum payment of \$40/month (2% of balance)
Student Loan	\$ 5,000	5%	\$50 monthly payment, starting in December
<i>Total Debt</i>	<i>\$ 7,000</i>		

How to Spend the Summer?

The trip that Chris' friends will be going on has an expected cost of \$2,000. However, if Chris goes on the trip, then the summer job Chris was planning to work at from now until the end of August won't be an option. In addition, Chris would need to use the credit card to pay for the trip.

If Chris works the home town summer job, the expected take home pay would be \$2,500 (after taxes) for the summer of work.

What the Summer Choices Imply for September 1st

Summer Option 1 - Work a summer job	
Additional Income	\$ 2,500
Minimum Payment on Credit Card Debt	\$ 120
Summer Option 2 - Travel with Friends	
Additional Income	\$ -
Minimum Payment on Credit Card Debt	\$ 120
Additional Debt Incurred	\$ 2,000

OPTION 1 SNAPSHOT (End of Summer)

What He Has:			Notes
Savings Account	\$ 2,880		Had to pay \$120 minimum on credit card debt
What He Owes:	Amount	APR	
Credit Card Debt	\$ 1,970	18%	Actual debt only goes down \$30
Student Loan	\$ 5,000	5%	\$50 monthly payment, starting in December
Total Debt	\$ 6,970		

OPTION 2 SNAPSHOT (End of Summer)

What He Has:			Notes
Savings Account	\$ 380		Had to pay \$120 minimum on credit card debt
What He Owes:	Amount	APR	
Credit Card Debt	\$ 3,970	18%	Actual debt only goes down \$30
Student Loan	\$ 5,000	5%	\$50 monthly payment, starting in December
Total Debt	\$ 8,970		

Where to Live?

Chris must also decide where to live. After a few weeks of looking, Chris has narrowed the apartment selection down to one of three options: a studio apartment in the city where the job is located, a one bedroom that is located just outside the city, but which will require a car, and a two bedroom apartment which is the closest to the job, but requires a roommate. In the case of the two bedroom apartment, Chris would be a roommate to a friend of a college friend who graduated last year.

Expense	Studio in the city	One bedroom outside the city	Two bedroom in the city (Chris' costs)
Rent	\$1,300	\$900	\$800
Utilities			
Heat & hot water	\$50	\$60	\$35
Electricity	\$40	\$40	\$20

The Cash Flow Crunch

When Chris signs the apartment lease, the following must also be paid to the landlord: the first month's rent, the last month's rent and the security deposit (equal to 1/2 month's rent.) Rental insurance, which would cost \$120 per year, is also available to purchase.

The annual salary that Chris will earn in the new job that starts on September 1st will be \$36,000, which will be about \$2,400 in monthly take home pay.

Problem: the apartment lease must be signed first!

Analysis of Apartment Options

APARTMENT OPTIONS ANALYSIS

	OPTION 1	OPTION 2	OPTION 3
Rent	1300	900	800
Heat/Hot Water	50	60	35
Electricity	40	40	20
Total Monthly	1390	1000	855

Amount Needed To Sign

First Month	1300	900	800
Second Month	1300	900	800
Security Deposit	650	450	400
Total	3250	2250	2000

Does Chris have enough to sign apartment?

If he works for summer	NO	YES	YES
If he travels for summer	NO	NO	NO

September Song

*For it's a long, long time,
From May to December,
And the winds grow cold,
When they reach September.*

- Maxwell Anderson, Kurt Weill.
 - But what else have we learned?

A Few Lessons

- Financial planning is not so hard: it's tracing through the consequences that decisions now have for the future.
- It can be done with pencil and paper, but a spreadsheet is often helpful.
- Saving gives you options: life gets much harder if you are short of cash and need to borrow.
- Hence the first two rules of The Index Card:
 - 1 Strive to save 10 to 20 percent of your income.
 - 2 Pay your credit card balance in full every month.

Interest over one period

- Suppose you put an amount V in a savings account for one year.
- The interest rate is R .
- What do you have in one year?

$$X = V(1 + R).$$

- Example: $V = \$100$, $R = 2\% = 0.02$.

$$\$102 = \$100 \times 1.02.$$

- What you get back in one year is \$100 “principal” and \$2 “interest”.

Interest over many periods (1)

- Suppose you put an amount V in a savings account for n years.
- The interest rate is R .
- After one year you have $V(1 + R)$, and the second year you earn interest on that larger amount, not just on your original investment V . We say that interest “compounds”. Therefore after two years you have $V(1 + R)(1 + R) = V(1 + R)^2$.
- What do you have in n years?

$$X = V(1 + R)^n.$$

- Example: $X = \$100$, $R = 2\% = 0.02$, $n = 5$. $(1.02)^5 = 1.1041$.

$$\$110.41 = \$100 \times 1.1041.$$

Interest over many periods (2)

- What do you have in n years?

$$X = V(1 + R)^n.$$

- Example: $X = \$100$, $R = 2\% = 0.02$, $n = 5$. $(1.02)^5 = 1.1041$.

$$\$110.41 = \$100 \times 1.1041.$$

- This is more than \$102 because interest is paid every year.
(Financial literacy question 1.)
- It's also more than \$110 because of compounding. The difference of \$0.41 is small in this example, but large over long periods of time or with higher interest rates.
- What you get back in five years is \$100 “principal” and \$10.41 “interest”. If you invest for a longer period of time, you earn more total interest.

Adjusting for inflation (1)

- Suppose that inflation is 2%. This means that in a year, you will need \$102 to buy what \$100 will get you now.
- Suppose you put \$100 in a savings account with an interest rate of 1%. In a year, you will have \$101.
- The purchasing power of your money in a year will be

$$\$ \left(\frac{101}{102} \right) = \$99.02 < \$100.$$

- You have less purchasing power in a year than you do now!
(Financial literacy question 2).
- Investing is a race between interest and inflation, and in this example interest loses the race.

Adjusting for inflation (2)

- The purchasing power of your money in a year will be

$$\$ \left(\frac{101}{102} \right) = \$99.02 < \$100.$$

- You have less purchasing power in a year than you do now!
- The “real” or inflation-adjusted interest rate is

$$\frac{99.02 - 100}{100} = -0.98\%.$$

- In recent years, the “nominal” interest rate has been close to zero and the real interest rate has been negative.
- Currency (dollar bills under the mattress) has a zero nominal interest rate, and a real return that is negative whenever inflation is positive.

Discounting over one period

- Discounting is just the calculation we have already done, in reverse. Fix the future value and figure out the current value.
- Suppose someone promises to pay you X one year from now. The interest rate is R . What is the value of that payment today?

$$V = \frac{X}{1 + R}.$$

- Example 1: $X = \$10,000$, $R = 2\% = 0.02$.

$$\$9,803.92 = \frac{\$10,000}{1.02}.$$

- Example 2: $X = \$10,000$, $R = 5\% = 0.05$.

$$\$9,523.81 = \frac{\$10,000}{1.05}.$$

- As R increases, V falls for given X . This is why the price of a bond falls when interest rates rise. (**Financial literacy question 5**).

Discounting over many periods

- Again, this is just the calculation we have already done, in reverse. Fix the future value and figure out the current value.
- Suppose someone promises to pay you X , n years from now. The interest rate is R . What is the value of that payment today?

$$V = \frac{X}{(1 + R)^n}.$$

- Example: $X = \$10,000$, $R = 2\% = 0.02$, $n = 10$.
 $(1.02)^{10} = 1.2190$.

$$\$8,203.48 = \frac{\$10,000}{1.2190}.$$

- A \$10,000 payment is worth less when received 10 years from now than when received 1 year from now.

Fees and interest on short-term loans (1)

- Suppose you take out a payday loan for \$200 with a \$30 fee, payable on your next payday.
- If you are paid in two weeks, the interest rate per two weeks is 15%:

$$200 = \frac{230}{(1 + R_{2weeks})}.$$

$$(1 + R_{2weeks}) = \frac{230}{200} = 1.15.$$

- But there are 26 two-week periods in a year, so the equivalent interest rate per year (annual percentage rate or APR) is much higher:

$$1 + R = (1 + R_{2weeks})^{26} = 1.15^{26} = 37.86$$

so $R = 36.86 = 3686\%$!

- The interest rate is even higher if you take out the loan less than two weeks before your next payday.

Fees and interest on short-term loans (2)

- Suppose you take out a payday loan for \$200 with a \$30 fee, payable on your next payday.
- $R = 36.86 = 3686\%$!
- The interest rate is even higher if you take out the loan less than two weeks before your next payday.
- Lenders are required by law to tell you the APR on any loan, accounting for all fees. APR's for small, short-term loans tend to be extremely high because even modest expenses incurred by lenders translate into exorbitant interest rates.
- This is why it is so important to build up an emergency fund with a few months' worth of income so that you never have to borrow to handle short-term emergencies.

Monthly payments (1)

- Credit card and mortgage rates are quoted on an annual basis (APR), but payments have to be made monthly.
- To analyze this situation, divide the interest rate (expressed at an annual rate) by 12, and count in months.
- Example: You have a \$2,000 balance on a credit card with an annual rate of 18%. If you make the minimum payment of \$40 per month, how much of that goes to pay down the debt?
- Here $R = 18\%/12 = 0.18/12 = 0.015$. So with a \$2,000 balance, $\$2,000 \times 0.015 = \$30$ goes to pay interest and only \$10 to paying down the debt.

Monthly payments (2)

- You have a \$2,000 balance on a credit card with an annual rate of 18%. If you make the minimum payment of \$40 per month, $\$2,000 \times 0.015 = \$30$ goes to pay interest and only \$10 to paying down the debt.
- Over time, as the balance diminishes you pay down debt faster, but it still takes a long time to pay off debt with these minimum payments: 93 months or 7.75 years to pay off the debt. Total payments in that time are $\$40 \times 93 = \$3,840$ of which \$2,000 is principal and \$1,840 is interest.
- Higher payments shorten the time to pay off the debt and reduce the total interest paid. If you incur credit card debt, it's desirable to pay it off as quickly as you can to reduce your interest expense.
- For the same reason, a shorter-term mortgage requires higher payments each month but lower total interest. (**Financial literacy question 4.**)