

**The Arrhythmia of Finance
Fall 2020 Syllabus**

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ARFIN Fall 2020 Syllabus

Part A. Summary and Introduction.

The objective of this course is to provide you the opportunity to develop and practice analytic skills (principally non-quantitative) that can help you better understand the sources of volatility in financial asset prices: *why the heartbeat of finance appears to be irregular.*

A former student told me that this course is actually about “how to make a decision” and that certainly is an important part. In order to think clearly about finance, to make wise financial decisions, we need to be able to think carefully and probabilistically about any outcome that is beyond our certain knowledge or control. Understanding prospective variance in financial outcomes, however, requires that we bring our knowledge of accounting, corporate finance, capital markets, economics and business strategy *simultaneously together* with our knowledge of decision making, probability and epistemology. Clear thinking about how to make a decision is just the starting point for exploring how we understand value through finance.

The challenge of expressing value in finance can be approached by thinking carefully about two ideas: *balance sheets* and *risk*. Understanding the world through the binoculars of double-entry bookkeeping and appreciating and applying the complex idea of risk *each require* that we simultaneously consider both positive and negative values and how they are related to one another. To “read a balance sheet” and to “understand your risk” you need to recognize and overcome your cognitive disposition to respond quite differently to *apparent gains and losses*. Our conventional means of calculating financial values also depend on our *expectations*, which may or may not be consciously formed and frequently change, and also on our assessment of the future, which is beyond our certain knowledge and control.

The subject matter of this course lies at the intersection of *the conventions of finance* and *the limits of human understanding*. The conventions of finance are a means by which we allocate the consequences of economic activity at the limits of our knowledge. Thus, to understand the conventions of finance we need to be aware of the limits of understanding. It also turns out that the conventions of finance provide a foil that can usefully illuminate the limits of understanding.

There are five conventions of finance we will consider: (a) *double-entry bookkeeping* and *balance sheets*; (b) *discounted cash flow analysis*; (c) *money*; (d) *debt*; and (e) *equity*. You have some facility with discounted cash flow analysis and have been introduced to balance sheets. My experience in hiring and training business school graduates, however, is that only a few of you will have already understood the deeper meaning of double-entry bookkeeping as a way to think about the world. It is also my experience that unless each of these five conventions of finance is understood within the limits of understanding then finance itself, and the limits of finance, will not be understood.

The limits of human understanding is a vast subject touched on by philosophy, psychology – particularly cognitive psychology, evolutionary biology, physiology and body chemistry, neuroscience, the study of consciousness and behavioral economics – the latter reflecting the recent discovery by economics of these other disciplines that have long focused on how humans actually think and behave. We will consider just three particular limits to human understanding that are relevant in estimating financial values: (a) the challenges we face in understanding *probability and uncertainty*; (b) our *cognitive biases in responding to apparent gains and losses* and how we are differently motivated by each; and (c) *time* and the difficulty we humans have in being *time consistent* in our thinking about the past, the present and the future.

Five challenges we face in understanding finance. I see (at least) five important reasons why we are so often surprised by financial outcomes and these provide an overarching structure for the course. Each of these reflect conceptual limitations on our part *that can be overcome with effort* to reduce the frequency and severity of our surprises.

First, we need to recognize and understand *the role of chance* and, particularly, to distinguish probability from uncertainty.

Second, we need to understand *the central but elusive idea of risk*.

Third, we need to recognize the difference between the intrinsic and the exchange (or market) value of an asset and, to do this, we need to be able *to estimate intrinsic value through the binoculars of double-entry bookkeeping*.

Fourth, we need to recognize the range of likely, unlikely and uncertain outcomes that are reflected in the values we ascribe to all assets and liabilities and, thus, to recognize the resulting *volatility mismatches within our economic balance sheets*.

Fifth, *to overcome the limits of understanding* when we estimate financial values (and in life), we need to recognize how frequently we face *the challenge of decision making in conditions of uncertainty* and to meet this challenge by making *the effort* to apply *reason and doubt* to our own beliefs, choices and decisions, especially when we are taking or responding to *risk*.

1. *How can you recognize the role of chance?*

We humans are storytelling creatures. We are drawn to causal explanations that appeal to our sense of what is plausible even when these are not the more probable explanations. As a consequence, we underestimate the role of chance, we fail to understand probability and random outcomes (how often unlikely things happen) and we make decisions based on these misconceptions.

With effort and practice, we can learn to distinguish causal storytelling from statistical and probabilistic reasoning and to use the latter as a check on our selective attention and perception, our cognitive biases and our capacity for rationalization. We can also learn to

distinguish our ability to estimate probabilities from the challenge of understanding uncertainty and we can learn to approach uncertainty through the logic of conditional probability. Learning to apply these analytic skills will help us distinguish luck from skill and to appreciate the difficulty of causal inference.

2. *How can you understand risk?*

We use the word “risk” in different ways and which often obscure, rather than illuminate, the distinction between probability and uncertainty. We can say risk when we simply mean an indeterminate likelihood – perhaps probability or perhaps uncertainty. But we also use risk to mean the indeterminate likelihood of a bad outcome or when we mean the chance that a bad thing may happen when we pursue some other good thing. In finance, we often use the word “risk” when we actually mean “volatility.” In order to think clearly about *risk*, it is useful to be more precise and to define risk as *the prospect of deviation from objective over time*.

This definition highlights the essential elements of risk that are difficult to sustain in our conscious minds at the same time. In thinking about “the prospect” we need to identify the role of chance and to distinguish probability from uncertainty. We need to think about both our “objectives” and the “deviation” from objectives that concern us and, thus, we need to identify the gains that we hope for, or hope to preserve, as well as the losses we hope to avoid (and their respective probabilities and uncertainties). In recognizing that risk lies in the future, we need to be specific and consistent in the “time” horizon over which we imagine the probabilities and uncertainties of both good and bad outcomes playing out. Thus, the idea of risk has three different elements that correspond to each of the three particular limits to human understanding that we will consider.

The human mind makes choices, and considers the risks in our choices, through the use of *reference points*. These are the comparisons that we consciously and unconsciously make particularly to the likely and unlikely gains and losses that we anticipate. Being explicit and consistent in the reference points we use to frame our choices, and to assess our risks, is the starting point for making wise decisions – financial or otherwise.

The conventions of finance critically depend on our expectations. In performing discounted cash flow analysis, we cannot estimate financial values, nor transfer value between counterparties or across time, without expectations about the prospective cash flows and interest rates and the relevant time horizons over which value is to be assessed. But – in finance as in life – our expectations are not stable, nor is it obvious whether our expectations are consciously or unconsciously formed. We change our expectations both when the facts change (the future is uncertain) and when our *perceptions* of the *relevant* facts change, which happens more often than we recognize because of selective attention and cognitive bias.

To clarify our reference points, it is useful to distinguish our expectations about the world from our expectations for ourselves. We can do this by distinguishing our *expectations* about things beyond our certain knowledge and control from the *objectives* that we set for

ourselves, over which we have some influence. We can also clarify our *objectives* by distinguishing them from our *constraints*, contrasting the things we hope for, like gains, with those things that we hope to minimize or avoid, like losses. With effort and practice we can learn to clarify our *expectations*, *objectives* and *constraints* by distinguishing them from one another.

We can also bring our expectations, objectives and constraints into sharper focus by recognizing the *time horizons* over which we imagine them playing out and being either realized or disappointed. By considering alternative time horizons as framing different reference points, we can recognize how our reference points are dominated – and how easily our assessments can be altered – by the time horizons that we consciously or unconsciously adopt.

If we fail to define our objectives specifically and consistently, or fail to distinguish our objectives from our constraints, or if we apply inconsistent time horizons in framing these as reference points, then we will also fail to think clearly about our choices and our risks. This is particularly important because risk is not only a complex idea.

We should also understand that *risk is a human experience in conditions of stress and uncertainty*. The combined experience of physiological stress and acute awareness of uncertainty is precisely when we are most likely to *change* our expectations, objectives, constraints and horizons and adopt different, perhaps more immediate, reference points. So, while in finance we can express risk in numbers and values, if we lose sight of the human experience of risk then we are more likely to be surprised when financial values change.

3. How can you analyze intrinsic value through the binoculars of double-entry bookkeeping?

To understand variance in financial asset values, it is important to be able to distinguish an asset's *exchange value*, what someone else may pay for that asset in a market transaction, from the asset's *intrinsic value* to you or to a particular holder.

Double-entry bookkeeping is a profound analytic tool that can help us understand the intrinsic value of an asset or an enterprise and also understand how enterprises and individuals stand in financial relation to one another. To understand the deeper meaning of double-entry bookkeeping in general, and balance sheets in particular, we must appreciate that while assets and liabilities appear as opposites (as positive and negative values) they are also complementary in that *for every asset there is a liability and for every liability there is an asset*.

This is true within individual balance sheets which necessarily encompass both assets and liabilities. This is also true between different balance sheets as it is in the nature of *financial claims* that one party's asset is another's liability. Thus, double-entry bookkeeping and balance sheets create a *structure of reciprocal reference points* with which we understand and express financial values and relations.

Money represents an essential reference point for risk and value in finance and one that we especially expect to be fixed and certain. But what we *accept* as *money* is not finite and expands and contracts with changes in the economy which reflect changes in our horizons, our expectations of volatility and our perceptions of risk. Learning both to recognize the elasticity of what we accept as *money itself* and to distinguish *money itself* from other financial claims that are expressed in *money values* are vital to understanding the prospects for variance in financial values and much about financial markets.

To assess the intrinsic value of financial claims we need to consider the rules of accounting which dictate the meaning of items recorded in the income statement, the balance sheet and in the off-balance sheet. But we also need to consider other factors that contribute to financial outcomes that may not be reflected in accounting values, particularly reflecting probability and uncertainty.

The discipline of accounting has difficulty with contingent and probabilistic values and this is why these are mostly relegated to the footnotes and recorded as being *off balance sheet*. Accounting conventions tend to avoid expressions of uncertainty. Thus, to understand intrinsic or economic value we will need to consider sources of prospective positive and negative cash flows not found, as such, in the financial statements. We need to understand our *economic balance sheets* and the value of any *unrecorded economic asset and liabilities*. We must look for these in the business or franchise model – in the *mental models* – of those responsible for the asset or the enterprise. These are likely to be found in their expectations, their objectives, their constraints and their horizons.

Almost all of the items in our financial statements and in our economic balance sheets are merely estimates. Some may be observed from the serendipity of current market prices. Many will reflect our efforts to estimate a (discounted) present value from the likely, unlikely and uncertain future. The present value of our assets and liabilities (reflecting anticipated, estimated or imputed future positive and negative cash flows) have potential or *prospective volatility*. Thus, our ability to estimate intrinsic or economic value, to estimate accounting values, and our confidence in the durability of market values, all require that we confront our imperfect ability to anticipate the future by estimating the probabilities and assessing the uncertainties.

Debt and equity are financial claims that reflect particular allocations of the prospective gains and losses of the probability- and uncertainty-taking behavior of an enterprise. If you do not know to look for the allocation of gains and losses of “risk taking” – both probabilistic and uncertain – it is unlikely that you will find them. These will not be found in the numbers themselves but, rather, in the ideas that the numbers do or do not express. Market values reflect a collective effort to estimate the present value of future cash flows, but those who routinely buy and sell financial claims also confront uncertainty and must work through the role of chance, expectations and risk. In financial markets it is self-evident that we face *volatility*, we face *the prospect of a significant change in price over a given period of time*.

4. How can you analyze the volatility mismatches in an economic balance sheet?

While the rules of accounting require that balance sheets *arithmetically* balance (positive and negative values) this is only true through the wonder of negative equity. By design and of necessity, our economic balance sheets reflect *mismatches* between the *expected* values on each side – the prospective volatility of the present value of all our future estimated or imputed positive and negative cash flows. If there is no mismatch there would be no gain to be expected, nor any unexpected (net) loss to be suffered. To understand value in finance, the analytic skills that help us think clearly about *the role of chance* and about *the central but elusive idea of risk* need to be applied to each of the significant economic assets and liabilities.

Both our economic and our accounting balance sheets are composed of many items that reflect discrete past, present or future positive and negative cash flows, estimates of which will vary with the passage of time, changes in circumstances and in our perceptions and expectations about those circumstances. Given the problems of selective attention and cognitive bias, in choosing our reference points we may consciously or unconsciously be drawn to just one or a few of our assets or liabilities whose level or changes are most salient to us.

It is not enough to comprehend assets and liabilities *sequentially*. We need to understand the prospective volatility of assets and liabilities *simultaneously* so that we can recognize the prospective volatility of the economic balance sheet as a whole. Only then will we be able to assess the *risk* we face in holding a claim on that balance sheet. These overall volatility mismatches are most evident in the balance sheets of financial intermediaries but are incurred by all enterprises and individuals.

5. How can you overcome the limits of your own understanding?

Critical thinking about the choices we make and the risks that we take – in both finance and in life – begins with self-reflection and the question “*Why do I think that?*” To overcome the limits of understanding when we estimate financial values, we need to recognize how frequently we face the *challenge of decision making in conditions of uncertainty* and we need to meet this challenge by making the effort to apply reason and doubt to our own perceptions and choices.

To overcome the limitations that we experience because of selective attention and cognitive biases, we need to be able to apply doubt to our own prior beliefs and, thereby, consider the possibility that we are mistaken or that we may be *rationalizing not reasoning*. We need to be able to sustain and appreciate simultaneously *contending imperatives*: both our assets and our liabilities, both our pre-conscious and our conscious thinking, our capacity both for intuition and for analysis, both our emotions and our reason. We need to sustain our convictions and our doubts at the same time. We also need to recognize how, in reaction to external stimuli, our internally-generated body chemistry can alter our expectations and our perceived objectives, constraints and horizons, influencing our capacity to assess and to take risk.

To overcome the limits of what we understand we need to add to our understanding, we need to learn. In order to learn, we need both to ask and to answer: “*Why might I be wrong?*”

What this course is not.

This is *not* a course in behavioral economics. We will read much of Daniel Kahneman’s important book *Thinking, Fast and Slow* and we will touch on a number of themes from behavioral economics. But my goal is to give you a deeper understanding of how finance works, what financial values do and do not convey.

This is also *not* a quantitative course. You will not be called upon to model discounted cash flows nor will we address technical aspects of volatility. Even so, students have found it challenging. The focus is conceptual, not quantitative, because experience has taught me that the big mistakes we make, that lead to the big surprises, are more often conceptual than computational: we had the wrong ideas, the wrong assumptions, the wrong framework or the wrong reference points. We will work with many numbers and you will review and practice applying a famous formula expressing conditional probability. But the challenge of this course is not in numbers but in concepts – concepts that with *effort* are accessible to anyone with a basic knowledge of economics and corporate finance.

Why does this matter?

The conventions of the finance are how we distribute the gains and losses of probabilistic and uncertain “risk-taking” endeavors among different parties and across time; they are a means by which we distribute the consequences of economic activity at the limits of our knowledge. We also live in societies where many of our measures of success, failure and self-worth are expressed in money values. If you can recognize how the conventions of finance are entwined with the limits of our understanding you are more likely to appreciate the imprecise, subjective and volatile nature of our estimates of financial value. You will also be better equipped to reverse engineer the financialization of how we think about our lives and to appreciate what your achievements and disappointments, what your expectations and surprises, do and do not signify.

Requirements.

As described in detail in *Part B. Organization, Governance, Grading and Users’ Guide*:

- a) To be enrolled in this course you will need to attend the first two class sessions on Tuesday and Wednesday, September 8th and 9th. (See *Part B. Section 8*.)
- b) You will need to send me an email, prior to 9:00 AM on September 8th, describing your *Agreement Not to Use Unnecessary Devices or Applications During Class*, as described in *Part B. Section 9* and in *Part D*.
- c) To receive a passing grade in the course you are required to submit all nine written assignments, three on your own and six as members of a study group, and receive a

total point score that is no lower than two standard deviations below the mean score of all students enrolled in both sections of the course. (See *Part B. Section 3.*)

Expectations.

You are expected to read this entire Syllabus before the course begins and also to:

- a) To adhere to the rules and norms of behavior that are described.
- b) To read the assigned reading materials and to study and review assigned research matters, as described in the modules in Canvas and in the assignments in *Part C*.
- c) To complete each Quiz in the modules in Canvas. (See *Part B. Section 5* and *Part C*.)
- d) To prepare for class as described in the modules in Canvas and to submit the individual and study group written assignments described in the modules in Canvas and *Part C* when they are due. (See *Part B. Sections 6, 10 and 11* and *Part C*.)

Class Sessions.

As described in the modules in Canvas, and in *Part C* of the Syllabus, the topics for each class session are:

1. *What is the role of chance in your life – and in history?*
2. *Why do you think that?*
3. *Why might you be wrong?*
4. *How should you assess the likelihood that you are wrong?*
5. *What is risk?*
6. *What is money – and who says so?*
7. *What is the role of expectations in finance?*
8. *What is intrinsic value?*
9. *What is the intrinsic value of Alphabet Inc?*
10. *What is debt and what is equity?*
11. *What makes capitalism go?*
12. *What is the intrinsic value of a bank?*
13. *What is the intrinsic value of an insurance company?*
14. *Why would you want to invest in that?*
15. *How much cash should a mutual fund hold?*
16. *What caused the U.S. financial crisis of 2008-2009?*
17. *What was the intrinsic value of Fannie Mae in 2006?*
18. *Where can you find the limits of understanding in finance?*

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Part B. Organization, Governance, Grading and Users' Guide.

Section 1. The objective of this syllabus.

This syllabus is intended to help you decide whether you want to take this course and, if you do, to increase the likelihood that you will master the materials.

In business, in government, in teaching and in life, I have found that continuous effort to clarify the objective is the most effective way that I can improve the prospects for successful outcomes. Thus, one reason this syllabus is so long and detailed is so that I can be as precise as possible about my objectives for the course and for each class session.

A second, related reason is to align your expectations with my objectives. Expectations play a central role in human perception, in learning, and in much of what contributes to human contentment. With that in mind, I want to align your expectations, as best I can, with how I intend the course to unfold.

Finally, this syllabus, the requirements and the grading scheme are longer and more detailed than would be my first preference. Unfortunately, I have learned from experience that a very small number of students can be tempted to press the outer limits of the requirements and the norms of acceptable behavior. The distraction that this imposes on me creates an unpleasant burden on my ability to focus on my teaching and your learning. Creating more bright lines than would be my first preference is a second-best alternative I have adopted. I hope you will understand that I do not assume that most or even many students will test the boundaries in this way. I also hope that you will accept that my purpose is to avoid the distraction so that I can focus on the learning environment for all students.

Section 2. Tuck Honor Code.

By enrolling in and attending this course you agree to adhere to the Tuck Honor Code and the requirements of this syllabus.

Section 3. Grading.

The grading scheme for this course is likely to be quite different from what you have experienced in other courses. First, your final grade will be based on positive points that you accumulate toward a maximum total of 137 points. Second, you can also accumulate *negative points* that will be deducted from your positive points to produce your final point total that will determine your letter grade. Third, the grading scheme creates the small but real possibility of failure.

I am principally interested in your grades as a means to encourage your learning and this grading scheme is designed to serve that purpose.

Without *attention* and *effort* there can be no learning. I have tried to organize both my teaching and the grading scheme to encourage your attention and effort so as to increase the likelihood of your learning.

I have found that the negative points are almost always an effective proxy for attention and effort, in that (i) *an accumulation* of negative points suggest a *lack* of attention and effort, while (ii) *a lack* of negative points suggests *high levels* of attention and effort and are predictive of students' positive efforts to master the materials (and accumulate positive points). It also appears that by encouraging you to make the effort to avoid negative points students' overall effort in the course tends to increase. Negative points in the first few weeks of the course also provide me with an early warning of a lack of attention and effort on the part of a student. This makes it possible for me to alert a student to their *risk* while there is still time to make up lost ground.

The possibility of negative points also helps to demonstrate important ideas about *double-entry bookkeeping* and *risk* that are central to the content of the course.

In our willingness to “take risk” we respond differently to the perception that we are exposed to prospective losses, that we yet might avoid, than we do when we perceive that we have already-accumulated gains that we might lose. Thus, by giving you the possibility of accumulating both positive and negative points I hope that you will recognize that you have both things to gain and things to lose through your performance and to reflect upon how this influences your perception of *risk*. In understanding the significance of double-entry bookkeeping, and that every balance sheet involves exposure to things you are “long” and things you are “short”, I hope that you will recognize the need to consider the “risk” that what you are long (like positive points) and what you are short (like negative points) may be inversely correlated (as I have found to be the case) and, thus, that you are exposed to extreme outcomes.

Positive points. Written Assignments #1 through #8 – both the ones that you will complete on your own (#1 and #2) and the ones that you will complete as part of a study group (#3 through #8) – have points associated with them, as specified in the description of the class session and assignment in the modules in Canvas and in *Part C*, which accumulate to a total of 52 positive points (or 38% of total positive points). The Final Paper (Individual Written Assignment #9), to be completed by each student after the last class, is worth a total of 40 points (or 29%). Class participation is worth up to 45 points (or 33%).

Sliced differently, the Individual Written Assignments that you will do on your own (#1, #2, and #9) are worth 50 positive points (36% of total positive points), Written Assignments #3 through #8 that you will do as members of a study group are worth 42 points (31%), while class participation is worth 45 points (33%).

Extra credit positive points. There is also the possibility of extra points that can be awarded on Written Assignments #3 through #9, for work that is especially thoughtful or demonstrates careful reflection and elaboration. *But there may not be any extra points*

awarded on a given assignment, unless earned by the quality of the work. I do this to avoid a problem I sometimes experience when an exceptionally good piece of written work “crowds out” my ability to give the highest points to other good-but-not-great submissions. By being able to award a few “extra” points to papers that clearly stand out, I find it easier to avoid marking down others.

Up to two extra points can be awarded for #3 and for #8, and one extra point can be awarded for each of the four assignments #4, #5, #6, and #7, that are all to be submitted by Study Groups (for a total of eight extra points). Up to six extra points can be awarded on the Final Paper (#9) that individual students will submit. So there are a total of 14 extra points that can be earned. However, no student will receive a total score for the course that is higher than 137 total points. Thus, extra points can help students “fill in” to a maximum of 137 points but not beyond.

Negative points. In addition to positive points, you can accumulate negative points in three ways: (1) for not making the effort to complete the Quizzes about the readings (see *Section 5. Preparation for class.*); (2) for not making the effort either to submit written assignments when they are due or to ask for an extension (see *Section 11. Late submission of written assignments.*); and (3) for not making the effort to inform me (via email) *in advance* both *when you will miss a class* and *the particular reason why you will miss that class.* (See *Section 8. Class attendance and absences.*)

Passing grade. In order to ensure that you receive a passing grade you will need to complete all required written assignments (a total of nine per student) and you will also need to receive a total point score (summing together positive and negative points) that is *not lower than two standard deviations below the mean score* of all students enrolled in the course (in both sections). Thus, students (and all students who are members of a study group) who do *not* complete *all* required written assignments will fail the course. Students who receive a total point score (summing together positive and negative points) that is *lower than two standard deviations below the mean score* of all students enrolled in the course (in both sections) *will fail the course.*

Failure is an option. The virtue of learning from failure, in both life and in business, is often preached and applauded in the business academy and in graduation speeches. The possibility of failure – keeping one’s mind focused on the likelihood that you may be on the wrong course – also helps concentrate the mind and increases effort.

I do not seek to fail students and I will make the effort to help students avoid this outcome. But I do seek to optimize the amount of attention and effort students apply to the course in order to maximize the amount of learning that takes place. Creating the possibility of failure is one means of increasing student attention and effort and, thus, the quantity and the quality of learning that takes place.

Section 4. Reading materials and research materials.

The reading assignments for this course are “lumpy” both in their length and in how closely you will need to read them.

Two class sessions have more than 100 pages of assigned reading (Sessions 2 and 3), while several other sessions have fewer than 30 pages. Daniel Kahneman’s important book, *Thinking, Fast and Slow*, that we will read much of for these two classes, is perhaps the best-written and most accessible descriptions of key behavioral *and* key statistical concepts.

“Reading” materials (identified as such in the class session descriptions in the modules in Canvas and in *Part C*) you are expected to read carefully but I urge you *not* to take notes nor highlight what you read. The Quizzes about the readings are intended to help you learn how to retrieve what you have read. While these will not be separately graded you will need to answer them prior to the relevant class to avoid negative points toward your final grade. (See *Section 5. Preparation for Class*, below.)

“Research materials” that are assigned for a number of written assignments are different: you need to use your judgment about how much to read and how much to “search” for answers to the questions posed for class and for the assignment.

All of the materials needed to prepare for class are available in Canvas, with the exception of two books: (1) Kahneman’s *Thinking, Fast and Slow*, that we will be discussing in particular in Sessions 2, 3, 5 and throughout the course, and (2) Coates’ *The Hour Between Dog and Wolf*, that we will be discussing portions of beginning in Session 6 and running, on and off, throughout the rest of the course. We will be reading significant portions of each of these books, so I suggest that you purchase your own copies. However, a few copies are available on reserve in the Library.

Section 5. Preparation for class.

There are four things that you will need to do to prepare for class: (i) reading, (ii) answering each of the Quizzes about the readings, (iii) thinking and preparing your own or your study group’s answers to the questions posed for class, and (iv) preparing written assignments when due.

It should take you two to three hours to prepare for most class sessions – if you read with purpose, as described below. Some will take less than that and a few may take as many as four hours in total. You should spend no more than two-thirds of your available study time reading and preferably only half of your available study time reading, particularly when written assignments are due.

Reading. In preparing for class, I urge you to *read with purpose*. First and foremost, read for the purpose of increasing your capacity to answer for yourself the five challenges described in the Summary and Introduction to this syllabus in *Part A*:

- 1) *How can you recognize the role of chance?*
- 2) *How can you understand risk?*
- 3) *How can you analyze intrinsic value through the binoculars of double-entry bookkeeping?*
- 4) *How can you analyze the volatility mismatches in an economic balance sheet?*
- 5) *How can you overcome the limits of your own understanding?*

Also read for the purpose of answering the questions posed in the title of each class session and the questions about the readings and for class discussion.

As you read, I urge you to focus on what *surprises* you, what you find to be *novel*. We are often tempted to focus on the things that we recognize, that we are already comfortable with or echo something we already know. I urge you to resist this temptation. Instead, focus on those things that you did *not* anticipate, that you are *uncomfortable* with, and that struck you as *novel or surprising*.

Quizzes about the readings. In addition to Written Assignments (see *Section 10*), there are seven quizzes that you will need to complete after completing the relevant “Reading” assignments and prior to class. Try to take these quizzes shortly after you have done the reading. The first is to be completed before the first class based on the pre-reading assignment in *make it stick*. The other six are to be completed after you complete the readings for Sessions 2, 4, 5, 7, 8 and 10. You should spend no more than 15 minutes answering each set of quiz questions.

Please think of the time spent answering these questions as a part of the time to be allocated to reading the material and think of it as a substitute for the time you might spend highlighting, underlining or taking notes.

Your answers will not be separately graded but, rather, are a part of preparing for these class sessions. There will be no positive points toward your final grade awarded for completing the quiz questions. Bone fide efforts to try to answer the questions (with plausible answers) will be reflected in your grade for class participation. But not submitting any (plausible) answers to these questions prior to 11:59 PM (mid-night) on the day prior to the relevant class session will result in negative 2 points toward your final grade; failure to submit answers prior to 8:00 AM on the day of the relevant class session will result in negative 4 points toward your final grade.

Thinking. After completing the readings and each Quiz, and before coming to class or preparing an individual or a group written assignment, please spend some of your study time *thinking* about the questions that I have posed about the readings and for class discussion, both by yourself and as part of your study group (and before turning to work on written assignments).

Deadlines for completion of Quizzes and Written Assignments. You need to complete both the Quizzes and Written Assignments prior to mid-night the day prior to class. Failure to complete these prior to mid-night will result in you (and all members of your study group for group assignments) receiving negative points, as described in *Section 3. Grading*, above, and also in each session module in Canvas and in *Part C* and *Part E*.

As also described, more severe negative points will be awarded for Quizzes or Written Assignments that are not submitted prior to 8:00 AM in the morning prior to class. The 8:00 AM deadline applies to both Section 1 (10:15 to 11:45 AM) and Section 2 (1:15 to 2:45 PM) so that I can have sufficient time to read over your answers and your papers prior to class. I realize that this precludes students, particularly in Section 2, from having the benefit of the morning to complete Quizzes and Written Assignments. But the lunch break I will have between the sections is not enough time for me both to prepare for class and to review student work. For this reason, the same deadlines apply to both sections.

Section 6. Study groups.

You are expected to form your own study groups of four members.

Please inform Anne Givens, via email (and copy me and Tammy), of the members of your group by no later than noon on Thursday, September 10th. Students who have not formed study groups by that time will be assigned to a study group.

Depending on the exact number of students who ultimately take the course, we may have to make changes to your proposed study groups and one or two groups of three members may be necessary to make the math work. But please propose study groups of four members.

When there is a study group assignment due, study groups are expected to meet to discuss the assignment for a minimum of 20 minutes. The descriptions of the assignments (in the Canvas modules and in Part C of the Syllabus) suggests that you meet via Zoom. If you want to meet in person, in a socially distant and responsible way, please be sure that each member of your study group is comfortable with this.

Section 7. Participation in class and Zoom etiquette.

Thirty-three percent of your grade for the course will reflect the frequency and quality of your participation in class.

Please always log in to Zoom using the Single Sign On (SSO) option and your NET ID and password, at least five minutes prior to the start of the class session.

I will log in to Zoom about 10 minutes before the start of class and will be glad to speak to you and answer any quick questions during this time. I will also stay on Zoom for a while after class to answer any questions.

Your Zoom audio will be on before class starts, in case you would like to speak with me. But when class begins please put your audio normally on “mute” unless you are speaking.

Please always leave your video camera ON in Zoom while class is in session. (If you opt to use a virtual Zoom background please consider whether it is likely to distract others.)

Active listening in class is a vital part of the learning you will accomplish in this course – importantly listening to your peers – and is a necessary precondition for effective participation in class discussions. In addition to general class discussions, throughout the course you will engage in small group discussions in break-out rooms in Zoom in response to questions and assignments that I will pose during the class. In some of these breakout sessions you will be with the members of your study group and in others you will be in a different group.

One of the most important things you can do to advance your career after Tuck is to be an effective contributor at meetings. If you are effective, you will be invited to more meetings; if you are not, you will tend not to be invited. To be an effective contributor you need to learn to listen well, not to talk too much, nor to talk too little. Your interventions should help advance the collective understanding of a subject or question, which you can do even if you disagree with others. This is also how you should participate in class discussions.

The more fluidly your comments incorporate and reference what others have said earlier in class or in earlier class sessions, whether in agreement or respectful disagreement, the more evident will be your active listening and the more effectively you will contribute to the learning environment. While you should try to contribute to the class discussion each day, the quality and thoughtfulness of your comments and questions will have a greater impact on your grade for class participation than either the frequency or the rhythm of your interventions.

Taking notes during the class, to highlight something that you want to recall, can augment your learning. But I strongly urge you to limit the quantity of your note taking, as I prefer that you think about what you are hearing rather than record it.

My recommendation is that you *aim* to take a single page of notes but *limit* yourself to taking no more than two pages in each class. My suggestion is that you organize your notes around the five challenges the course addresses. I also urge you to do this with a pen or pencil and not by typing on a keyboard, as the latter increases the likelihood that you will be recording too much and thinking too little about what you hear.

If you would like to type notes during class sessions, you will need to seek and receive my permission in advance, consistent with the guidance in *Section 9*, below, and as part of the in the email you will send me, as described in *Section 9 and as outlined in Part D. Agreement Not To Use Unnecessary Devices or Applications During Class*.

In addition to however you may take notes for yourself, **please always have some paper and a pen or pencil with which you can write.** I will frequently ask you to think about

something and *to write down your answer*. Writing it down is part of the exercise as it requires both more effort and gets your answers out in the open, beyond the reach of your conscious and your preconscious mental processes – making it easier for you to *reflect* on your answer.

Participating in Zoom sessions presents the challenge of avoiding distractions – distractions like children, partners or roommates, pets, doorbells, daydreaming, telephones and access to the world beyond via our electronic devices and applications. Before the start of the term, I ask that you spend a few minutes peering into the future and pondering which of these prospective distractions are avoidable and which are unavoidable and planning to do what you can to limit the influence of the avoidable ones.

Reflecting on my own experience, I have concluded that the use of electronic devices and applications that are not necessary for participation in a Zoom session or webinar are part of the category of avoidable distractions. As explained in *Section 9*, below, I am asking you to agree not to use these during class sessions.

But devices and applications are just a sub-set of the broader challenge of limiting the influence of avoidable distractions that we all face.

At the start of the term, we will talk about use of the Zoom chat function as well as virtual versus visual hand raising. By September there may also be changes in the Zoom environment, changes in general Tuck norms, as well as other matters of Zoom etiquette and behavior that that I have not anticipated. We will need to talk about all of these both at the start of the course and as the term goes along. I also welcome your suggestions.

Section 8. Class attendance and absences.

You are expected to attend all 18 class sessions.

Sessions 1 and 2. In order to *enroll* in this course you are required to attend the first two class sessions on Tuesday, September 8th and Wednesday, September 9th. The Registrar's Office will only enroll students whose attendance on both days I confirm.

My experience is that almost all of the students who have missed one or both of these sessions, for whatever reason, never recover the lost ground and end up a bit confused and frequently do rather poorly in the course. Students who are “shopping” the course (or are on the wait list) also need to attend the first two sessions. If there is a reason why you plan to miss either Session 1 or Session 2 and yet still plan to take the course, you will need my explicit, prior permission. *To receive my prior permission, you will need to speak to me on the phone prior to 4 PM on Friday, September 4th.*

Other absences. If you are going to miss a class session *for any reason*, during the first or any week of the term, *you need to inform me in advance that you will miss class, and state the particular reason why you will miss that class*, via email and copy both Tammy Thorson Anne Givens. (You also should inform the other members of your study group.)

- a) If you have an *anticipated absence* (reflecting a reason why you are unable to participate in class at the scheduled time) on a day when you *do not have* a written assignment due, and if you want to receive any *positive credit* for class participation for that day, you need to send me (copy to both Tammy and Anne) both (i) a note explaining the reason why you need to miss class *and also* (ii) a brief, informal outline of your answers to the questions posed for that class that day, via email *prior to 8:00 AM on the day of that class meeting*. (If you have an anticipated absence on a day when you have a written assignment due, and have informed me in advance of the reason for your absence, there will be no need to prepare and submit an outline.)
- b) If you have an *unanticipated illness the morning of class*, that will prevent you from participating in class, you need to email me prior to class informing me of your illness (copy to both Tammy and Anne).
- c) If you experience a *prolonged illness*, that will prevent you from participating in class, you will need to speak to me so that we can discuss how you can make up for lost class time. Please email me to arrange a time when we can speak on the phone.
- d) If you have an *unanticipated absence unrelated to illness*, that will prevent you from participating in class, you must still inform me of the reason for your absence via email *prior to class* (copy both to Tammy and Anne).

Remote time zone participation. If you are attending class from a remote time zone (from Hanover) and this may make it difficult for you to participate during the scheduled class session (either occasionally or frequently), *please email me or call me* well in advance of the first class session on September 8th so that we can discuss your situation.

Negative points for un-notified absences. Failure to inform me in advance that you will be absent from any class and why, for whatever reason, will result in minus 2 points being applied to your final grade for the course. If there is a second occurrence, it will result in an additional minus 5 points. For a third occurrence, the result will be a further minus 10 points. For a fourth occurrence, and for any subsequent absences for which I have not been notified in advance, the result will be an additional minus 20 points. (See *Part E. Grading Scheme Summary*.)

Three or more absences for any reason. Any student who misses three class sessions, for any reason, will need to schedule a time to speak with me (via telephone or Zoom) so that we can discuss how you will be able to make up for lost ground. It is my experience that students who miss a total of three (or more) class sessions have a hard time picking up the central ideas in the course and, for that reason, tend to have difficulty mastering the material.

Section 9. No use of devices or applications during class unless necessary for participation.

The relative novelty of the Zoom environment can be a challenge for both teaching and learning. The extent to which we teach and learn effectively via Zoom will reflect the choices we make. I need your active partnership to create a good learning environment with as few distractions as possible. To do this I am asking you to agree not to use any applications other than those that are necessary for your connection to Zoom and Canvas and otherwise to participate in class. So, during class sessions you should:

- 1) Turn off the power on any electronic device (within your reach or earshot) that you are not using to access either Zoom or Canvas or another application essential for your participation in class; and
- 2) Turn off the notifications (noises, vibrations, badges, banners, etc.) on all applications that are not essential for your participation in class that are on devices that you must use to access Zoom, Canvas or another application essential for your participation in class.
- 3) Not use any application (browsers, text or email, social media, etc.) other than Zoom, Canvas or another application that is essential for you to participate in class.

There is no learning without attention. Distraction undermines attention. As Stanislas Dehaene, the French cognitive neuroscientist, has explained:

We are sometimes under the impression that we can simultaneously perform two tasks, or even follow two distinct trains of thought—but this is a pure illusion [B]y definition, we cannot be aware of information before it enters our conscious workspace. While the first stimulus gets consciously processed, the second has to wait outside the door . . . we are unaware of our mental limits (indeed, it would be paradoxical if we could somehow become aware of our lack of awareness!) The lure of the screen and the myth of multitasking are among the most dangerous fabrications of our digital society. (*How We Learn*, 2020, pages 160-161.)

Sadly, you do not even need to *look* at a message, text or screen to distract your attention. Simply *thinking* that you *might* have something to look at will distract and decay your attention for *much longer* than the time spent looking at it. This is because the dopamine release that distracts you comes from the *expectation* that there *might* be something worth looking at. Thus, the challenge of preventing your devices and applications from distracting you requires that you not have an *expectation* that you might have something (else) to look at.

Cognitive psychology teaches us that we are much more likely to follow through on a plan or an intention if we are *specific about how* we intend to carry out our plans. The more concrete we make our *implementation intentions* the more likely we are to behave as we intend.

When I have taught the course in a classroom, I require that all electronic devices be turned off and put away for the entire class session. I also require that students hand me, on the first day of class, an agreement they have signed that they will not to use electronic devices in class and which outlines the other steps that they plan to take to reduce the likelihood that they become distracted by the possibility of using a device during class.

Over the past five months, when I have participated in virtual corporate board meetings and webinars, I have recognized a distinction between my being a *passive observer* and my being an *active participant*. I have committed to myself to make that choice before the start of the session. When I know that I am expected (and expect myself) to be an active participant, in addition to closing the door to my room, notifying my wife, planning for our dogs to be entertained without my assistance, and turning off the ringer on our landline, I also turn off all devices, and mute all app notifications, that are not essential for my participation.

For these reasons, I am requiring all students who are enrolled in the course to write and send me an email in which you explain your agreement *not* to use any devices or applications that are unnecessary for your participation in class during our 90-minute class sessions, to turn off the power on any unnecessary devices, and to turn off the notifications on any applications on the devices you will be using to access class. I am also asking you to describe *the further steps that you intend to take to reduce the likelihood that you become distracted by the possibility of using any unnecessary electronic devices or applications*.

If you do not feel that you will be able to participate in class without looking at or using devices or applications that are unnecessary for class participation, or if you feel that this prohibition is onerous and will impose a unique hardship for you, *please email me or call me* well in advance of the first class session on September 8th so that we can discuss your concerns *before the course begins*.

While I discourage you from taking detailed notes during class (See *Section 7*, above) if you would like to use a device or laptop to type notes during class please include in your email your request for permission to do this and your explanation of why this is important to you.

Please send your email to me, consistent with the outline in Part D. Agreement Not To Use Unnecessary Devices or Applications During Class, affirming your agreement before 9:00 AM on Tuesday, September 8, copy to both Tammy Thorson and Anne Givens.

Section 10. Written Assignments.

Please submit all written assignments in Canvas as PDF files. Please put your name and section number at the top of the first page for individual written assignments. Please put all of your names, and the study group number (that we will assign you) and your Section number, at the top of the first page for study group written assignments. For the Final Paper (Written Assignment #9) please put your Tuck NetID Number and Section Number at the beginning of each of your two essays.

Each student will need to complete a total of nine written assignments, three on your own and six as a member of a study group, in order to receive a passing grade in the course. Failure to submit any one of the required written assignments will result in a failing grade. (See above *Section 3. Grading.*)

Written Assignments #1 and #2 require each student to apply probabilistic and financial analysis to aspects of your own life. Each of these assignments should be approached as “problem sets” not essays, each being limited to a single page outline. (See *Part C., Class Sessions 1 and 3*)

Written Assignments #3, #4, #5, #6, #7 and #8 are to be completed and submitted by each study group. They should be submitted in outline form, not essays, and bullet points are fine. Your objective should be to provide answers to the questions posed in the assignment that are *compelling, succinct and persuasive*.

Written Assignments #3 and #8 (Sessions 8 and 17) should be one- or two-page outlines, (single spaced, but not longer than two pages). For these two assignments, each (and all) members of each study group need to be prepared to make a *compelling, succinct and persuasive* presentation of the study group’s conclusions to the rest of the Section. Thus, for #3 and #8 you may not have a designated spokesperson.

Written Assignments #4, #5, #6 and #7 can be no more than one-page outlines (single spaced). For these four assignments, each study group *should* appoint a single spokesperson, who needs to be prepared to make a *compelling, succinct and persuasive* presentation of the study group’s conclusions to the rest of the Section. For these four assignments, each study group’s spokesperson should rotate so that each member of the study group will be responsible for being the spokesperson on one of these assignments.

The Final Paper (Written Assignment #9) will require each student to write and submit two, brief essays in response to two specific questions that will be available on the last day of the course on November 10th. Each of these essays will require you to think and to write with some clarity. Both the quality of your thought and the quality of how you express your thoughts in writing will contribute to your grade. (See modules in Canvas and *Part C. Final Paper.*)

Section 11. Late submission of written assignments.

Written Assignments #1 through #8 are due no later than 11:59 PM (mid-night), via Canvas, on the day prior to the relevant class session, as described below and in modules in Canvas and in *Part C. In the absence of an explicit, prior agreement with me*, failure to submit Written Assignments on time will receive negative points as follows:

- i. *Written Assignments #1 and #2* earn positive points up to 5 points but if submitted after 11:59 PM will lose all 5 positive points (and earn zero points); failure to submit

these assignments prior to 8:00 AM on the day of class will result in negative 5 points toward your final grade in the course (and no positive points);

- ii. *Written Assignments #3 and #8* earn positive points up to 9 points but if submitted after 11:59 PM will lose 4 points (to be deducted from the positive points earned on the assignment); failure to submit these assignments prior to 8:00 AM on the day of class will result in negative 9 points toward the final grade in the course for each member of the study group (and no positive points).
- iii. *Written Assignments #4, #5, #6, and #7* earn positive points up to 6 points but if submitted after 11:59 PM will lose 3 points (to be deducted from the positive points earned on the assignment); failure to submit these assignments prior to 8:00 AM on the day of class will result in negative 6 points toward the final grade in the course for each member of the study group (and no positive points).

Thus, if you wish to avoid receiving negative points for late submission of a written assignment you will need to submit assignments before the deadline OR to make an explicit request for an extension from me and receive my explicit, prior agreement. You should be aware that I stop looking at emails around 8 pm in the evening.

The Final Paper (Written Assignment #9) is due, in Canvas, at 3:00 PM, Friday, November 13th, and is worth a total of up to 40 points (and 29 percent) toward your final grade. (See Section 3. Grading.)

In the absence of an explicit, prior agreement with me: (a) Final Papers submitted after 3:00 PM on Friday, November 13th, will lose 20% of the points that I have awarded on grading the paper; (b) Final Papers submitted more than 9 hours late (any later than 11:59 PM (mid-night) on Friday, November 13th, will lose 40% of the points that I have awarded on grading the paper; (c) any Final Papers not received in Canvas within 24 hours of the due date and time (any later than 3 PM on the next day, Saturday, November 14th), and where the student has not reached me to request an extension, will be deemed to have failed to submit the assignment and, thus, to have failed the course.

I read the final papers “blind” to your name and to when they are submitted. Thus, the 20% and the 40% deductions are off of the points I have awarded the paper on reading it. For example, if I awarded 35 points (out of the 40 possible points) to a final paper and it was submitted after 11:59 PM on November 13th, but before 3 PM on November 14th, then 40% or 14 points would be deducted for a final score on the paper of 21 points.

Please test your ability and knowledge of Canvas to make sure that you know how to upload assignments.

In the event that you find yourself unable to upload an assignment prior to the deadline, you may email your assignment to me, copy Tammy Thorson and Anne Givens. Provided that you do this before the relevant deadline, negative points will not apply and Tammy will help you complete an upload into Canvas.

ARFIN Fall 2020 Syllabus

Part C. Class Sessions and Assignments.

>Pre-assignment and Pre-reading – *Why is learning misunderstood?*

>>Pre-reading

Why is learning misunderstood?

Brown, Roediger, and McDaniel, *make it stick – the Science of Successful Learning*, The Belknap Press of Harvard University Press (2014). Pages ix–xi, 1–22 (Preface and Ch. 1).

After you have completed reading the selection from *make it stick*, please open the “Pre-reading Quiz” and answer the questions. I urge you not to look back at the text but, rather, to make the effort to retrieve what you have read from memory. Trying to answer these questions is part of the learning process and preparing for the course. Please spend no more than 15 minutes completing your answers. Answer each question with just one or two sentences or even just a few phrases. Your answers will not be graded but you should submit answers to these questions before you submit Written Assignment #1 for Session 1.

>>Pre-reading Quiz

>Session 1 – *What is the role of chance in your life – and in history?* (Sept 8, Tues.)

>>S1 Readings

What is the role of chance in your life – and in history?

- A. Stoppard, *Rosencrantz and Guildenstern Are Dead* (1967), Act 1, pages 11-16.
- B. Tolstoy, *War and Peace* (1869), Book Nine, Ch. 1.
- C. *The Bible*, King James Version (1611), Book of Ecclesiastes, 9:10-11.

>>S1 Questions for Class Discussion

What is the role of chance in your life – and in history?

- 1) Which of Guildenstern’s four explanations of his predicament do you find most persuasive?
- 2) What does Tolstoy think is wrong with the causal explanations offered by “historians” and “contemporaries” for Napoleon’s decision to invade Russia in 1812?
- 3) Do you agree with Tolstoy or with King Solomon (the presumed author of Ecclesiastes) on the role of chance in history?

>>S1 Written Assignment #1. A. – Individual

Considering all of the alternative paths your life might have taken, estimate the probability (starting from when you were twenty years old) that you would be taking this particular course on the first day of the Fall 2020 term at Tuck.

To prepare your answer, *imagine* a “decision tree” with all of the “forks in the road” that led you to attend Tuck and to take ARFIN, as well as branches that might have led you not to attend Tuck and to do something else. *Do not draw or present a decision tree in your answer* but, rather, prepare an outline or “worksheet” of your calculation as follows:

- a) Identify (to the best of your recollection) each decision (or “fork”, briefly described, so that I can follow the steps in your life story) that you *or someone else* consciously made upon which the outcome of your attending Tuck, and taking this course, was *dependent* (or might have led you *not* to be at Tuck, *nor* taking this course); and
- b) Provide your estimate of the *ex-ante* probability for each of these (*dependent*) decisions, *as of the time the decision was made*; and
- c) Calculate the compound probability, from these dependent decision points, of the outcome that you attend Tuck and attend the first session of this course, rounded to the second decimal.

Down the left-hand side of the page please list each “decision point” in chronological order (identified at least by calendar year). Across the page, on the right-hand side, indicate your estimate of the *ex-ante* probability of each decision point upon which the outcome of your attending this course was dependent. Beneath this right-hand column, at the bottom, indicate the compound probability of your attending the first session of this course.

Please submit your worksheet answer to Written Assignment #1. A. in Canvas as a PDF file and be sure to include your full name and Section number at the top of the page.

Also, please submit your compound probability estimate (from the bottom row of your worksheet) in the **Numeric Answer to WA #1. A.**, so that I can tabulate all of your responses. Please enter four digits – two to the left and two to the right of the decimal – expressed as a percent probability. For example: enter a 50 percent compound probability as “50.00”; a 10 percent probability as “10.00”; a one percent probability as “01.00”; a one tenth of one percent probability as “00.10”, etc. (All answers less than “00.00” should be entered as “00.00”.)

Grading and Timely Submission. Written Assignment #1 (A. and B.) carries up to 5 points toward each student’s final grade in the course. However, in the absence of an explicit prior agreement with me, failure to submit (both parts of) Written Assignment #1 prior to 11:59 PM on Monday, September 7th (mid-night) will eliminate any positive points for this Written Assignment; failure to complete Written Assignment #1 prior to 8:00 AM on the day of the first session (September 8th) will result in negative 5 points toward your final grade for the course (and no positive points). (See *Part B. Section 3. Grading and Section 11. Late submission of written assignments, and Part E. Grading Scheme Summary*)

[Upload PDF Submission]

[Numeric Answer to WA #1. A.]

>>S1 Written Assignment #1. B. – Individual

In no more than 15 words, please complete the sentence: “My personal objective in taking this course is to _____.” (No need to repeat the initial phrase, just fill in the blank, completing the sentence.) Please focus on your personal *objective*, in the sense of *your own purpose*, trying to consider how this might be distinct from your *expectations* about the course. (Note: your answer to #1. B will be shared with the class without attribution.)

[Complete and submit answer]

>>S1 Preparation for Class

Prior to class, each student needs to complete the Pre-reading and the Pre-reading Quiz. Each student needs to prepare and submit their own answers to both #1. A and #1. B. Each student also should complete the readings for Session 1 and be prepared to answer and to discuss the Questions for Class Discussion.

Also, at the start of each class please log in to Zoom using the Single Sign On (SSO) option and your NET ID and password *at least five minutes prior to the start of class*. Also please always have some paper and a pen or pencil with which to write. In addition, at the start of Session 1 please also:

1. Have a printed copy of, or ready access to, your answers to #1. A and #1. B;
2. Have with you a coin, preferably a US Quarter of a dollar.

>Session 2 – *Why do you think that?* (Sept 9, Weds.)

>>S2 Reading

Why do you think that?

Kahneman, *Thinking, Fast and Slow* (2011), pages 1-105 (Introduction and Chs. 1-9).

After you have completed reading the selection from *Thinking, Fast and Slow*, please open the Session 2 Quiz and answer the questions. I am providing you in advance with these questions in order to help you *read with purpose*. But I urge you to read the entire text as I think it likely that this will be the shortest route to answering these questions. I also urge you not to look back at the text but, rather, to make the effort to retrieve what you have

read from memory. Please spend no more than 15 minutes completing your answers. Answer each question with just one or two sentences or even just a few phrases. The Questions for the Session 2 Quiz are:

- a) What are the important strengths and weaknesses of “System 1” thinking and, separately, of “System 2” thinking?
- b) What is the difference between “causal explanations” and “statistical reasoning”?
- c) What cognitive impediments or biases, identified by Kahneman, are salient or meaningful to you? (List as many as you can recall.)

Grading and Timely Submission. Your answers to the Session 2 Quiz will not be graded but if you do not submit (plausible) answers prior to 11:59 PM on Tuesday, September 8th (mid-night), you will receive negative 2 points toward your final grade. Failure to submit answers before 8:00 AM on the day of class (Wednesday, September 9), and a failure to submit answers at all, will result in negative 4 points. (See *Part B. Section 5. Preparation for Class* and *Part E. Grading Scheme Summary*.)

>>S2 Quiz

>> S2 Questions for Class Discussion

Why do you think that?

- 1) Reflecting on your list of cognitive impediments or biases (in Question (c)), what is one such mistake or impediment that you have made or had to overcome in your recent experience?
- 2) What is another such mistake or impediment that someone else you recently worked with, or observed, made or had to overcome?

>>S2 Preparation for Class

Prior to class, each student needs to complete the reading and answer the Session 2 Quiz, and also be prepared to answer and discuss the Questions for Class Discussion.

Also, at the start of Session 2 (in addition to logging in to Zoom via the SSO option and having some paper and a pen or pencil with which to write), please:

1. Have printed or ready access to your answers to the Session 2 Quiz; and
 2. Have printed or ready access to a copy of your personal objective in taking ARFIN that you submitted in answer to Written Assignment #1. B.
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>Session 3 – *Why might you be wrong?* (Sept 14, Mon.)

>>S3 Weeks 1-2 Review & Preview

Before preparing for Session 3, please watch the [Weeks 1-2 Review & Preview Video](#).

>>S3 Reading

Why might you be wrong?

- A. Kahneman, pages 109-221 (Chs. 10-20).
- B. A recent edition of *The Wall Street Journal* or the *Financial Times*.

>>S3 Questions for Class Discussion

Why might you be wrong?

- 1) Focusing on (i) the law of small numbers, (ii) the relationship of sets and subsets, and (iii) regression to the mean, what examples of (a) an *accurate* and (b) a *flawed* understanding of these concepts can you find (explicitly or implicitly) in articles in a recent edition of *The Wall Street Journal* or the *Financial Times*?
- 2) What types of problems does Kahneman suggest can be usefully addressed with *Bayesian inference* and how does he suggest we do that?

In the reading, Kahneman identifies various ways that we tend to misunderstand the frequency or likelihood of specific events and circumstances, which can be corrected if we think slowly and carefully, especially about *the law of small numbers*, the proper relationship of *sets and subsets*, and *regression to the mean* and its relationship to *correlation*.

Please choose a single, recent edition of *The Wall Street Journal* or the *Financial Times*, and from its content identify two articles: (a) one that you believe reflects an *accurate* understanding or appreciation of one of these three concepts, and (b) a second article that you believe reflects a *flawed* understanding or a lack of appreciation of one of these three concepts. To do this, as you read an article, begin by asking yourself: “*What is the complete data set, or the full distribution of possible outcomes, that encompasses the circumstances or phenomenon described in this article?*”

>>S3 Written Assignment #2 – Individual

Each student needs to prepare in brief, outline form, on a single side of one page, your current personal “*financial statements*” – *specifically, your personal income statement and balance sheet* (“income statement” just for the past year), as an accountant would apply GAAP, *but only using words and concepts not numbers or values* and submit this as a PDF file.

Please be sure to include your full name and Section number at the top of the page. Preparing this personal balance sheet should take you around 15 minutes.

Using just a single word or phrase for each item, divide them into six categories: (1) on-balance sheet **assets that you own** (or have a legally-defined right to use) and (2) on-balance sheet **liabilities that you owe**, (3) legally-defined but contingent **off-balance sheet assets** (like being the beneficiary of a will), if any, and (4) legally-defined but contingent **off-balance sheet liabilities** (such as your having guaranteed a loan for someone else), if any, and any (5) **income** and (6) **expense items** over the past year not associated with legally-defined, on- or off-balance sheet items. (Reminder: only words and phrases, not numbers or values.) This will perhaps be easiest if you build yourself a spreadsheet with six, expandable cells – one cell for each of the six numbered items above (but please submit as a PDF).

Grading and Timely Submission. Individual Written Assignment #2 is worth 5 points toward your final grade for the course. However, in the absence of an explicit prior agreement with me, failure to submit Written Assignment #2 prior to 11:59 PM on Sunday September 13th (mid-night) will eliminate any positive points for this Written Assignment; failure to complete Written Assignment #2 prior to 8:00 AM on the day of class (Monday, September 14th) will result in negative 5 points toward your final grade for the course. (See *Part B. Section 11. Late submission of written assignments* and *Part E.*)

[Upload PDF submission]

>>S3 Preparation for Class

Prior to class, each student needs to complete the reading from Kahneman, select two newspapers articles consistent with Question 1 and be prepared to present a *compelling and succinct* explanation of her or his own answers to both Question 1 and Question 2. Each student also needs to have submitted Written Assignment #2 and be ready to summarize and discuss her or his own “words only” financial statements.

Time permitting, we may discuss Written Assignment #2 on Monday, September 14th or, on Tuesday, September 15th or, perhaps on both days. The assignment is due before midnight, Sunday night, September 13th.

Also, at the start of Session 3 (in addition to using the SSO option in Zoom and having some paper and pen or pencil), please also:

1. Have copies or ready access to your two newspaper articles; and
2. Have a copy or ready access to your personal “words only” financial statement submitted for Written Assignment #2.

>Session 4 – How should you assess the likelihood that you are wrong? (Sept 15, Tues.)

>>S4 Reading

How should you assess the likelihood that you are wrong?

Silver, *The Signal and the Noise* (2012), pages 232-261 (Ch. 8).

After you have completed reading the selection from *The Signal and the Noise*, please open the Session 4 Quiz and answer the questions. I urge you not to look back at the text but, rather, to make the effort to retrieve what you have read from memory. Please spend no more than 15 minutes completing your answers. Answer each question with just one or two sentences or even just a few phrases.

Grading and Timely Submission. Your answers should be completed and submitted prior to 11:59 PM on Monday, September 14th; not doing so will result in negative points, as described in *Part B. Section 5* and in *Part E*.

After you have completed the reading from Silver, and submitted your answers to the Session 4 Quiz, please watch the “Primer on Bayesian Inference Video” before you begin work with other members of your study group on the team assignment to prepare your group’s Teaching Presentation.

>>S4 Quiz

>>S4 Primer on Bayesian Inference Video

>>S4 Questions for Class Discussion

How should you assess the likelihood that you are wrong?

- 1) How can you teach others to perform Bayesian inference?
- 2) What is your example of a problem of conditional probability?
- 3) How does Bayes’ Theorem apply to your example?

>>S4 Teaching Presentations – Study Groups

Each study group needs to prepare and submit two PowerPoint slides and be prepared to use these two slides to help the rest of the section practice the analytic skill of Bayesian inference. I will include some or all of the slides you submit among my slides for Session 4 and I will call on Study Groups to lead the class. PLEASE PUT YOUR STUDY GROUP’S ASSIGNED NUMBER AND SECTION NUMBER ON EACH SLIDE AS A HEADER OR FOOTER.

After each student has read the chapter from Silver, completed the Session 4 Quiz, and watched the Primer on Bayesian Inference Video, each Study Group needs to hold a Zoom meeting and (a) discuss the reading; (b) establish their shared understanding of Bayesian inference, and (c) prepare their own example of a problem of conditional probability (similar in form to Silver's "underwear example") that you will use to teach the other members of your section how to identify problems of conditional probability and how to apply Bayes Theorem.

Your two PowerPoint slides should roughly follow the format of the examples provided in the Primer on Bayesian Inference, with a first page that presents the "word problem" of causal inference and a second page that applies Bayes' Theorem to that problem. On the first page, DO NOT label the key variables by Bayes' or by Silver's terms (e.g., do not label anything x , or y , or z) so that your classmates will need to figure out which is which from your statement of the problem. But do provide labels or references on the second slide so that you can explain your study group's example.

Classmates answering the problem should briefly explain *why* this *is* a problem of conditional probability (after considering why it might *not* be), identify the variables specifically, and provide their answer.

Creativity is invited. Also, think about what you read in *make it stick* (in the pre-reading for the course) and try to increase the likelihood that your *teaching* results in *successful learning* by your classmates.

Grading and Timely Submission. These Teaching Presentations carry no positive points toward your final grade for the course but completing and submitting your study group's presentation is a necessary part of class participation on September 15th. Your study group's PowerPoint slides should be submitted prior to 11:59 PM (mid-night) on Monday, September 14th. (Reminder: include your study group's assigned number and section number on each slide, as a header or footer.)

[Upload PowerPoint slides]

>>S4 Preparation for Class

Prior to class, each student needs to complete the reading from Silver, submit their answers to the Session 4 Quiz, and watch the Primer on Bayesian Inference Video. Each study group should meet via Zoom to discuss, prepare and submit their S4 Teaching Presentation.

Also, at the start of Session 4 please:

1. Have a copy or ready access to your Study Group's S4 Teaching Presentation PowerPoint Slides; and
2. Have a copy or ready access to your personal "words only" financial statements submitted for Written Assignment #2.

>Session 5 – *What is risk?* (Sept 21)

>>S5 Weeks 2-3 Review & Preview

Before preparing for Session 5, please watch the [Weeks 2-3 Review & Preview Video](#).

>>S5 Reading

What is risk?

Kahneman, pages 255-299 (Chs. 24-27).

After you have completed reading the selection from *Thinking, Fast and Slow*, please open the Session 5 Quiz and answer the questions. I am providing you in advance with these questions in order to help you read with purpose. But I urge you to read the entire text as I think it likely that this will be the shortest route to answering these questions. I also urge you not to look back at the text but, rather, to make the effort to retrieve what you have read from memory. Please spend no more than 15 minutes completing your answers. Answer each question with just one or two sentences or even just a few phrases. The Questions for the Session 5 Quiz are:

- a) What mistakes does Kahneman identify in Bernoulli's theory of how *expected utility* explains *risk aversion*?
- b) What is *prospect theory* and how does it explain our risk preferences?
- c) What is the *endowment effect* and how does it help explain the choices we make?

Grading and Timely Submission. Your answers should be completed and submitted prior to 11:59 PM on Sunday, September 20th; not doing so will result in negative points, as described in *Part B. Section 5* and in *Part E*.

>>S5 Quiz

>>S5 Questions for Class Discussion

What is risk?

- 1) What is the *riskiest* thing that you have *chosen to do* (either in financial terms or in terms of personal safety)? What did you stand to gain? What did you stand to lose?
- 2) How much *risk* did you take in *choosing* your personal objective for this course (in Written Assignment #1. B.)? What did you stand to gain? What did you stand to lose?
- 3) What does *risk* mean to you?

>>S5 Word Problem Preparation for Class – Study Groups

Each Study Group should meet via Zoom to discuss the following “word problem” and to agree on and then submit your answers to the two questions: *What is the probability that you hold a winning hand and, separately, how much do you bet, in a poker game of five-card draw if you have been dealt “three kings”?* You should assume: a total of three players (including you); everyone anted up \$2 before cards were dealt; everyone has been dealt five cards; and everyone “stands pat” (no one draws). You have been dealt three Kings. You have \$5 worth of chips.

You may use any research materials (on-line or otherwise) to help prepare your answers. You should spend no more than 15 minutes in total discussing and preparing and submitting your answers to the two questions.

Grading and Timely Submission. Study groups should submit their answers no later than 11:59 PM (mid-night) on Sunday, September 20th. Answering these two questions carries no points toward your final grade for the course but completing it is necessary preparation for class participation on September 21st.

Question 5(a): What is the probability that you hold the winning hand (expressed as a percentage – e.g., enter “50” for fifty percent)?

Question 5(b): How much do you bet, in addition to your two-dollar ante (expressed in dollars – e.g., enter “1” for one dollar, or any integer up to “5” for five dollars)?

>>S5 Preparation for Class

Prior to class, each student needs to complete the reading from Kahneman, answer the Session 5 Quiz, and be prepared to discuss her or his answers to the Questions for Class Discussion in light of the reading from Kahneman. Also, all Study Groups need to meet briefly via Zoom to agree on and submit your answers to S5 Word Problem Preparation for Class, Questions 5(a) and 5(b), and be prepared to discuss your answers in class.

Also, at the start of Session 5 please have a copy or ready access to your study group’s submitted answers to S5 World Problem Preparation for Class, Questions 5(a) and 5(b).

>Session 6 – *What is money – and who says so?* (Sept 22)

>>S6 Readings

What is money – and who says so?

- A. Martin, *Money – the unauthorized biography* (2014), pages 3-31 (Ch. 1).

- B. Coates, *The Hour Between Dog and Wolf – How Risk Taking Transforms Us, Body and Mind* (2012), pages 3-37 (Introduction & Ch. 1).

There is no quiz on the readings for Session 6, but in order to help you read with purpose, here are questions about the Martin and the Coates readings that you should be prepared to discuss during class:

- 1) How is the monetary system of Yap (the stone *fei*), similar to checks drawn on your bank account? How is it different?
- 2) How are the English “tally sticks” similar to your credit card balance? How are they different?
- 3) How do you explain how the Irish economy managed without a banking system in the spring of 1970?
- 4) What does Coates suggest are the effects of high levels of testosterone and of cortisol on our behavior?

>>S6 Questions for Class Discussion

What is money – and who says so?

In addition to the questions about the readings themselves, please come to class prepared to discuss your answers to the following questions:

- 1) What is money? Who decides? How is money different from debt?
- 2) Identify several forms of money that you are familiar with and analyze each one in terms of the *classic* definition of money (a store of value, a unit of account, and a medium of exchange). Be prepared to explain why you think each of the forms money that you identify is, in fact, “money” and also identify which of the three elements of the classic definition are most useful in distinguishing the forms of money from debt and from other assets.
- 3) Do you view your own behavior through the Platonic mind-body dichotomy? What about the behavior of others? If so, can you think of examples?

>>S6 Preparation for Class

Each student should complete the readings from Martin and Coates and answer for herself or himself the questions about these readings. Then each student should reflect on both readings and on her or his own experience and prepare a brief, written outline of her or his own answers to each of three Questions for Class Discussion (for your own use, not to be submitted) and be ready to present a *compelling, succinct and persuasive* explanation of her or his answers to each of the three questions to the section.

Also, at the start of Session 6 please have in front of you a printed copy (or ready access to) your outline of your answers to the Questions for Class Discussion

>Session 7 – *What is the role of expectations in finance?* (Sept 28)**>>S7 Weeks 3-4 Review & Preview**

Before preparing for Session 7, please watch the [Weeks 3-4 Review & Preview Video](#).

>>S7 Reading

What is the role of expectations in finance?

Keynes, *The General Theory of Employment, Interest and Money* (1936), Ch. 12.

After you have completed reading the selection from *The General Theory*, please open the Session 7 Quiz and answer the questions. I urge you not to look back at the text but, rather, to make the effort to retrieve what you have read from memory. Please spend no more than 15 minutes completing your answers. Answer each question with just one or two sentences or even just a few phrases. Your answers should be completed and submitted prior to 11:59 PM on Sunday, September 27th; not doing so will result in negative points, as described in *Part B. Section 5* and in *Part E*.

>>S7 Quiz**>>S7 Questions for Class Discussion**

What is the role of expectations in finance?

- 1) How would Keynes distinguish the *intrinsic value* of an enterprise from the *exchange value* derived from its traded (equity) securities? How would you?
- 2) Do you agree with the way Keynes distinguishes between “enterprise” and “speculation”? If so, why? If not, why not and how would you distinguish the two?
- 3) Who do you think is most likely to win Keynes’ “mixed game”?

>>S7 Preparation for Class

Each student should complete the reading from Keynes, complete the Session 7 Quiz, and should think and reflect on the reading from Keynes and prepare her or his own *compelling, succinct* and *persuasive* answers to the three Questions for Class Discussion and be prepared to present and discuss these questions during class.

>Session 8 – *What is intrinsic value?* (Sept 29)

>>S8 Reading

What is intrinsic value?

- A. Deringer, William, *Calculated Values – Finance, Politics, and the Quantitative Age*, Harvard University Press (2018), pages 187-210 (Ch. Five).
- B. Coates, pages 38-53 (Ch. 2).

After you have completed reading the selection from *Calculated Values*, please open the Session 8 Quiz and answer the questions. I urge you not to look back at the text but, rather, to make the effort to retrieve what you have read from memory. Please spend no more than 15 minutes completing your answers. Answer each question with just one or two sentences or even just a few phrases. Your answers should be completed and submitted prior to 11:59 PM on Monday, September 28th; not doing so will result in negative points, as described in *Part B. Section 5* and in *Part E*.

>>S8 Quiz

>>S8 Questions for Class Discussion

What is intrinsic value?

- 1) What was the intrinsic value of the South Sea Company in (early) 1720 – expressed in a few words, or a phrase or a sentence (not in numbers)?
- 2) How did Hutcheson deal with “informational uncertainty” about the finances of the South Sea Company?
- 3) Can you think of an example, from your own experience, when you confronted a “choice of action” involving some risk that was a “whole-body experience” for you (as described by Coates)?

>>S8 Preparation for Class

All students should complete the reading from Deringer and Coates, complete the Session 8 Quiz, and be prepared to present their own answers to the Questions for Class Discussion. In particular, each student should be prepared to present her or his own *compelling, succinct* and *persuasive* answer to Question (1): *What was the intrinsic value of the South Sea Company in (early) 1720 – expressed in a few words, or a phrase or a sentence (not in numbers)?*

>Session 9 – *What is the intrinsic value of Alphabet, Inc.?* (Oct 12)

>>S9 Weeks 4-5 Review & Preview

Before preparing for Session 9, please watch the [Weeks 4-5 Review & Preview Video](#).

>>S9 Research Materials and Reading

What is the intrinsic value of Alphabet, Inc.?

Research Materials:

- A. Alphabet Inc., Form 10-K, Q4 and Fiscal year 2019. Link to [PDF](#)
- B. Alphabet Inc, Q2 2020, Press Release, Webcast, Transcript. [Link to Alphabet Investor Relations](#)
- C. “Google’s Advertising Haul Comes Up Short for First Time”, Rob Copeland, The Wall Street Journal, July 30, 2020. [PDF or link to article]

Reading:

- A. Kandel, *The Disordered Mind – What Unusual Brains Tell Us About Ourselves*, (2018), pages 176-182 and 189-194.

Question about the Kandel reading and for class discussion:

1. Reflecting on the reading, how do you now *feel*, and how do you now *think*, about the roles of emotion and reason in your own decision making?

>>S9 Written Assignment #3 – Study Groups

What is the intrinsic value of Alphabet Inc.?

Assignment:

Congratulations. You got the job you wanted working at a hedge fund and now you have landed your best assignment yet. You must have impressed someone.

The boss of your hedge fund is always looking for stocks to go long and stocks to sell short. Now she is thinking about what she wants to be long and what she wants to be short as the economy recovers from the COVID shock and recession over the next 12 months. Your assignment is to do the analysis of Alphabet, Inc. (ticker: GOOGL) that will go into the fund’s investment committee decision about whether to be long or short Alphabet.

You know that if you do a good job with this assignment you are likely to earn a bonus that, even after taxes, would pay off all of your student debt *and* leave you with enough for a down payment on an apartment. But if the boss is unimpressed with your work then your

bonus could be zero and it could be more than a year before you get another chance to make a presentation to the investment committee – if ever.

Your assignment is “to describe the intrinsic value of Alphabet, Inc., *in words not numbers*” and to make your description of the company’s intrinsic value compelling to the members of the investment committee. Of course, you will have to *look at* the numbers to assess their absolute and relative size and explain what the numbers mean. But your assignment is to describe what Alphabet actually *does* to make money for its shareholders. Based on your analysis, the committee will make a decision about whether “the intrinsic value of Alphabet is greater than or less than the current market price.” But that is not the question that you have been asked to address.

Your managing director has explained that you should be prepared for questions like “What is Alphabet?” “What are they trying to accomplish?” “Why will that earn them an above average return on equity?” “Do they have what they need to accomplish their objectives?” You have also heard that the boss will likely probe whether “you have missed the forest for the trees” and gotten lost in the details.

You know that your description of Alphabet will need to reflect what can be gleaned from its financial statements but that you will also need to go “beyond the financials” and reflect an understanding of Alphabet’s business model – the *expectations, objectives, constraints and horizons* that both reflect and define its strategy. Looking at both “the financials” and “beyond the financials” you will need to consider the key sources of future value creation and all prospective positive and negative cash flows that form Alphabet’s overall *economic balance sheet*. To look “beyond the financials” you have been instructed to focus on Alphabet’s own description of its business and risks in its Annual Report (10-K Item 1 and Item 1A, particularly pages 5-21). For the financials you plan to look at its segment revenues (page 29) and its Consolidated Balance Sheet (page 50) and Statement of Income (page 51). Your MD said that “of course” you should also look at what Alphabet’s executives said when they released Q2 results on July 30th and any media commentary you can find that came out after their results were announced.

Before you draft a complete memo for the investment committee, your managing director wants to see your two-page outline that begins with your *compelling and succinct* description of the intrinsic value of Alphabet – *your opinion* about how the investment committee should think about Alphabet’s intrinsic value – and then lays out your *persuasive* analysis that supports and defends how you have described Alphabet’s business. Your outline should be an outline. Focus on the ideas you are conveying. Your objective is to be *compelling, succinct and persuasive*.

You don’t want to mess this up. This is your big chance.

Instructions:

All students should review the research materials in light of the assignment. EACH STUDY GROUP should meet via ZOOM to discuss the assignment and agree on your statement of

the intrinsic value of Alphabet, Inc., in words not numbers. While one member of the Study Group may be the principal drafter of your outline, each and every member of your study group needs to review and comment on the draft *and to be able to make a compelling, succinct and persuasive presentation of your conclusions to the rest of the Section.*

Thus, each member of your study group is subject to being called upon to present your group's analysis to the rest of class in just a few minutes and be able to answer questions posed by the "investment committee" comprised of the professor and the other students in the section. (Thus, you may not have a designated spokesperson.)

Please submit your Study Group's answer to Written Assignment #3 as a PDF file and be sure to include your assigned Study Group Number and Section Number and also each of your names.

Not all Study Groups will be called upon, but all Study Groups face the *chance* of being called on.

All students are expected to be able to ask informed questions that will help the entire class reach a deeper understanding of both the intrinsic value of Alphabet, Inc., and all of the issues raised by the assignment.

Grading and Timely Submission. Written Assignment #3 carries up to 9 points toward each student's final grade in the course. However, in the absence of an explicit, prior agreement with me, failure to submit Written Assignment #3 prior to 11:59 PM on Sunday, October 11th (mid-night) will result in 4 points being deducted from the possible 9-point total for the assignment of each member of the study group. Failure to complete Written Assignment #3 prior to 8:00 AM on the day of class (Monday, October 12th) will result in *negative 9 points* toward the final grade of *each* member of the Study Group for this assignment (and no positive points). See *Part B. Section 11* and in *Part E*.

[Upload PDF submission]

>>S9 Preparation for Class

Each student should study the research materials and form her or his own opinion about how to describe the intrinsic value of Alphabet, Inc., (in words, not numbers). Study groups should meet via ZOOM to discuss and prepare their Outline for submission for Written Assignment #3. All members of the study group need to be prepared to present the study group's conclusions, consistent with the group's submitted Written Assignment #3. Each student should also complete the reading from Kandel and reflect on their own answer to the question about the Kandel reading and be prepared to discuss their answer during class.

Also, at the start of Session 9 please have a copy of (or ready access to) your study group submission for Written Assignment #3.

>Session 10 – What is debt and what is equity? (Oct 13)**>>S10 Reading**

What is debt and what is equity?

- A. Moss, *When All Else Fails – Government as the Ultimate Risk Manager* (2002), Ch. 3, *Limited Liability*, pages 53-55 and 72-84 (pages 55-72 are optional); Ch. 5, *Bankruptcy*, pages 123-126 and 138-151 (pages 126-138 are optional).
- B. Coates, pages 57-88 (Ch. 3)

After you have completed reading the selection from *When All Else Fails*, please open the Session 10 Quiz and answer the questions. I urge you not to look back at the text but, rather, to make the effort to retrieve what you have read from memory. Please spend no more than 15 minutes completing your answers. Answer each question with just one or two sentences or even just a few phrases. Your answers should be completed in Canvas prior to 11:59 PM on Monday, October 12th; not doing so will result in negative points, as described in *Part B. Section 5* and in *Part E*.

>>S10 Quiz**>>S10 Questions for Class Discussion**

What is debt and what is equity?

- 1) What does it mean to “own” something?
- 2) What do you have when you own equity? When you own debt?
- 3) In as few words as possible, what is the difference between equity, debt and money?
- 4) Do you believe in “free will” or in “free won’t”? Does the possibility of “free won’t”, as described by Coates, alter your view of rational choice in human behavior?

>>S10 Preparation for Class

All students should complete the Moss reading and complete the Session 10 Quiz and also complete the reading from Coates. Each student should be prepared to present her or his own *compelling, succinct and persuasive* answers to each of the four Questions for Class Discussion.

>Session 11 – *What makes capitalism go?* (Oct 19)

>>S11 Weeks 5-6 Review & Preview

Before preparing for Session 11, please watch the [Weeks 5-6 Review & Preview Video](#).

>>S11 Readings

What makes capitalism go?

- A. The Letters of Chairman Buffett: 2011, 2017, 2018. [PDF]
- B. Kandel, *The Disordered Mind*, pages 231-246.

There is no quiz about the readings for Session 11, but in order to help you read with purpose, here are questions about the selections from Warren Buffett's annual shareholder letters, and below a question about the Kandel reading, that you should try to answer for yourself as you read and should be prepared to discuss in class:

- 1) How does Buffett view the relationship between intrinsic value and accounting values? Which does he think is more important? Why does he think that?
- 2) How does Buffett view the role of volatility in his investment decisions?
- 3) What does Buffett think is the object of skilled investment?

Question about the Kandel reading and for class discussion:

1. Reflecting particularly on Kandel's description of the role of the "adaptive unconscious" in decision making, how do you *now* think about the relationship of Kahneman's System 1 and System 2 thinking in your own "conscious" decisions?

>>S11 Questions for Class Discussion

What makes capitalism go?

In addition to answering for yourself the questions about the readings, each student should come to class prepared to present her or his own *compelling, succinct and persuasive* answers the following three questions, consistent with the further instructions below:

- 1) What do you think makes capitalism go?
- 2) Why do you think that "wealth storage" (e.g., your savings) should earn a positive return?
- 3) Over the next twenty years, what average annual *real* return (not including inflation) do you expect to earn on your savings? Why do you think that?

You have read Kahneman's views on the "engine of capitalism" (Session 5, Ch. 24), Keynes thoughts about animal spirits, the separation of ownership and management, the distinction between enterprise and speculation, and the role of liquidity illusion in the rate of business fixed investment (Session 7), Deringer's description of the early joint stock South Sea Company and the associated bubble (Session 8), Moss's description of the origins

of the limited liability corporation and of bankruptcy (Session 10), and now you have read some of what Warren Buffett thinks about investing and running a large, capitalist enterprise. You are studying to receive a degree in business administration. With all of that in mind, please prepare your own *compelling, succinct and persuasive* answers to each of the three questions that you can present in no more than 60 seconds per question.

The first question – *What do you think makes capitalism go?* – is *not* asking you whether you like or dislike capitalism or things about capitalism. That is too easy. The first question is *not* asking you whether capitalist democracies are better than the alternatives nor whether capitalist democracies fall short of your hopes and expectations. This question is *not* asking you whether you think the rewards of the high levels of economic growth that capitalism appears to have fostered, over recent decades and centuries, have been appropriately distributed. This question is also *not* asking you to provide a comprehensive definition of capitalism that would allow us to compare it to other ways of organizing economic and financial activity.

The first question *is* asking you to identify what, in your opinion, are the essential elements that (to borrow Kahneman's phrase) form the "engine of capitalism" or that (in my terms) particularly propel capitalist activity and "make capitalism go".

To do this, please spend some time trying to define how you think Kahneman, Keynes, Deringer, Moss and Buffett might answer Question 1 and, to the extent their views are helpful, also Question 2 (from what you know of their views). You do not need to go back and re-read these prior assignments and, indeed, my preference would be, instead, that you try to recall them. (But if you want to look back, that's up to you and ok too.) Then, ask yourself: *Why might they be wrong? What might they be missing?* Then, based on everything you have thought about in this course, in other courses at Tuck, and in your other studies and work experience, please prepare your own *compelling, succinct and persuasive* answers to each of the three Questions for Class Discussion that you can present in no more than 60 seconds per question.

After you have written down your brief answers to each of the three questions for yourself, spend a few minutes reflecting on whether they are consistent with one another and also whether you think that they need to be consistent with one another and, if so, whether you need to revise one or more of your answers so that they are consistent.

>>S11 Preparation for Class

This assignment will require more thinking time than reading or writing time.

Each student should complete the readings and answer for herself or himself the three questions about the readings and Warren Buffett's views. Each student should reflect on the readings for this session and other readings and prepare her or his own *compelling, succinct and persuasive* answers to each of three Questions for Class Discussion. You should be able to read the particular selections from Buffett's letters that I have noted on the first page of the PDF file (and are marked) in about thirty minutes or so. This should

leave you plenty of time to think and reflect on other things you have read and thought about, think about each question, draft your own brief answers, reflect on your answers and “why you might be wrong” and to come back and review and revise your answers.

It should take you about thirty minutes or so to read the chapter from *The Disordered Mind* and reflect on how it influences your understanding of your own decision making.

We will spend most of class time hearing and discussing your answers to the three Questions for Class Discussion. We will spend a portion of class discussing Buffett’s views on investing and how he thinks about value. And we will also spend a portion of class discussing the Kandel reading and the role of the “adaptive unconscious” in decision making.

Also, at the start of Session 11, please have a copy of (or ready access to) your own prepared answers to the three Questions for Class Discussion.

>Session 12 –*What is the intrinsic value of a bank?* (Oct 20)

>>S12 Research Materials and Reading

What is the intrinsic value of a bank?

Research Materials:

- A. Northeast Bank Home Page [Link]
- B. Northeast Bank Investor Relations Page [Link], see especially:
 - a. Press Releases
 - i. June 25, 2020, “Northeast Bank Announces Sale of Paycheck Protection Loans”
 - ii. July 29, 2020, “Northeast Bank Reports Record Fourth Quarter Results and Declares Dividend”
 - b. Events and Presentations
 - i. November 14, 2019, Northeast Bank’s 2019 Sandler O’Neill Investor Conference Presentation
 - ii. July 30, 2020 Northeast Bank Fourth Quarter FY2020 Earnings Call
 - c. Financial Information
 - i. [September TBD, 2020, Northeast Bank 2020 Annual Report & 10-K]

Reading:

Coates, Chapter 4 (pages 89-125).

Question about the Coates reading and for class discussion:

- 1) Having completed the reading, are you now more or less likely to trust your “gut” in the future? Why? And why might you be wrong?

>>S12 Written Assignment #4 – Study Groups

What is the intrinsic value of a bank?

Assignment:

Congratulations. You got the investment-banking job that you hoped for and now you have your first assignment.

You have been asked to look at Northeast Bank as a potential target for a client that is a large US regional bank seeking to grow through acquisition. Your MD will ultimately want to figure out whether the intrinsic value of Northeast Bank for the client is greater than (or less than) its (current) market value. But this is *not* your assignment.

Your assignment is “to describe Northeast Bank’s intrinsic value *in words not numbers*” in such a compelling way that the client will easily recognize what it is of value that they will have if they acquire Northeast Bank. Of course, you will have to *look at* the numbers (on its balance sheet and income statement) to assess their absolute and relative size and you will need to be able to explain what the numbers mean. But your assignment is to express your opinion about what Northeast Bank *is* or *has* that could be of value to the purchaser.

Your MD has told you to keep this simple and that you only need to look at what you can find on Northeast Bank’s own webpage, where they present and describe their business lines and their press releases and financial disclosures (that you can find under the “investor relations” tab). You will, of course, look at the Bank’s 2020 Fourth Quarter Results and its earnings presentation [July 30) and its recent 10-K. Your MD has made it clear that from these you should be able to explain the Bank’s strategy and business model and its principal businesses as components of its *economic balance sheet*. Your MD also wants your brief description of the nature and type of the spreads or mismatches between the bank’s assets and liabilities, as well as the likely, unlikely and uncertain consequences of these *balance sheet mismatches* for the Bank’s P&L.

Your MD has also asked you some specific questions. First, she asked “What’s with the ‘national lending’ business?” Should the client think about buying this bank as a play on a local, Maine bank or as something else or what? Second, what happened to the Bank’s value as a result of the COVID shock in March and April? Third, your MD said that the client noticed that on June 25th Northeast Bank announced that it had “sold” its PPP loans to “The Loan Source” and she asked you to explain briefly what that’s about and why they would want to sell these loans that they just made.

Your MD also mentioned that she has heard that you are a whiz with Bayesian inference and that, while you don’t need to bother with any math, she thinks it would be a good idea to approach this assignment through the logic of conditional probability. If the hypothesis

is that Northeast Bank will be a valuable addition to the client's balance sheet, what needs to be true for that to be the case? What evidence would we need that this might be true? So, why might Northeast Bank be a valuable addition and why might it not? Thinking this way should not make your analysis longer but, rather, help you frame it so that it can be more compelling for the client.

Before you draft a complete memo, your MD wants to see your simple outline of no more than one page (single spaced) with just three sets of bullet points: first, your *compelling* and *succinct* description of the intrinsic value of Northeast Bank (what the client would get that might be of value) based on your analysis of the balance sheet mismatches that the Bank is running; second, the highlights of your *persuasive* analysis that supports your statement of intrinsic value; and, third, your explanation of Northeast Bank's "sale" of PPP loans in June (and whether you think this adds or detracts from Northeast's intrinsic value) and anything else you need to say to answer the questions you've been asked. Your outline should be an outline. Focus on the ideas you are conveying. Your objective is to be *compelling, succinct and persuasive*.

Finally, as this is your first assignment and your MD doesn't yet know you very well, she asked you to think about whether you are motivated to do a good job on this assignment because of the gains you might receive (like a bonus, a good reputation and better assignments in the future) or whether the things you that you might lose (like not getting a bonus, not have a good reputation and getting less desirable assignments in the future) are more salient to you and likely to motivate you. She wants your candid advice about how to motivate you both on this assignment and in the future.

Instructions:

All students should review the research materials in light of the assignment. Each study group should meet (via Zoom) to discuss the assignment and agree on your statement of the intrinsic value of Northeast Bank, in words not numbers. While one member of the study group may be the principal drafter of your outline, each member of your group needs to review and comment on the draft.

Study groups should appoint a single spokesperson who will be prepared to make a *compelling, succinct and persuasive* presentation of your conclusions to the rest of the section. (For Written Assignments #4, #5, #6, and #7 your spokesperson should rotate so that each member of your study group will be responsible for being the spokesperson on one of these assignments.)

Please submit Written Assignment #4 as a PDF file and be sure to include your assigned study group number, your section number and each of your names. Please also identify the name of your designated spokesperson.

Grading and Timely Submission. Written Assignment #4 carries up to 6 points toward each student's final grad in the course and is due prior to 11:59 PM on Monday, October 19th (mid-night). In the absence of an explicit, prior agreement with me, submission of Written

Assignment #4 after 11:59 PM on October 19th will result in all students in the study group receiving negative points as described in *Part B. Section 11* and in *Part E*.

[Upload PDF submission]

>>S12 Preparation for Class

Each student should study the research materials and form his or her own opinion about how to describe the intrinsic value of Northeast Bank (in words, not numbers). Study groups should meet (via Zoom) to discuss and prepare their outline for submission for Written Assignment #4 and designate a spokesperson to present your conclusions in class. Each student should also complete the reading from Coates and reflect on their own answer to the question about the Coates reading and be prepared to discuss their answer during class.

Also, at the start of Session 12, please have a copy of (or ready access to) your study group's submission for Written Assignment #4.

>Session 13 – *What is the intrinsic value of an insurance company?* (Oct 26)

>>S13 Weeks 6-7 Review & Preview

Before preparing for Session 13, please watch the [Weeks 6-7 Review & Preview Video](#).

>>S13 Research Materials and Reading

What is the intrinsic value of an insurance company?

Research materials:

- A. Berkshire Hathaway 2019 Annual Report. [Link]
- B. AIG 2019 Annual Report. [Link]

Reading:

Bargh, *Before You Know It – The Unconscious Reasons We Do What We Do* (2017) Chapter 6 (pages 152-177).

Questions about the Bargh reading and for class discussion:

- 1) Can you think of an example when you either applied or failed to apply one of Bargh's eight rules for when you can trust your gut? How did it turn out?
- 2) How would you summarize Bargh's eight rules in just one rule?

>>S13 Written Assignment #5 – Study Groups

What is the intrinsic value of an insurance company?

Assignment:

Congratulations. You have been called back for a final round of interviews with the asset-liability strategy team at one of the world's top property and casualty insurance companies. During the prior round of interviews, you sprinkled your remarks with quotes from some of Warren Buffett's recent annual shareholder letters. This gave the recruiter an idea. You have been asked to come to the final round prepared to compare and contrast two of the company's main competitors, Berkshire Hathaway and AIG, as a way of answering the question: "What is the intrinsic value of an insurance company *in words, not numbers.*"

The recruiter tells you just to look at Berkshire Hathaway's and AIG's 2019 Annual Reports. Of course, the recruiter explains, you are not supposed to read their entire 10-Ks but you should be able to look at their consolidated balance sheets and then zero in on what they *say* about their strategies – how they make money for their shareholders – by focusing on what you can find in their MD&A sections about their business strategies and risks and their investment strategies as these frame their asset-liability strategies.

First, you should be prepared to summarize briefly the intrinsic value of any property and casualty insurer and how they make money on the balance sheet mismatches that they run.

Second, you will need to explain how Berkshire (as an insurance company) and AIG are similar or different in the *investment strategies* that they run as these influence the balance sheet mismatches and their intrinsic values. You will need to think about both sides of their balance sheets – both the prospective liabilities they have on the policies they have written and the investment assets that they hold – and the mismatches between their assets and liabilities. The recruiter told you to focus on the essence of each company's *investment strategy* as they relate to their overall asset-liability strategy – the nature of the balance sheet mismatch or match that they are running. You are not being asked to *calculate* their intrinsic value, but you need to be able explain in words *what it is that you hold when you hold a share of Berkshire or a share AIG – what kind of lottery ticket are each of them?*

Third, the recruiter says you also need to have an opinion about whether each company's position in cash, cash equivalents and short-term Treasury securities, makes sense and why (or why not) and, in particular, whether you think Buffett's cash position make sense.

Finally, the recruiter says that you can bring just a one-page, single-spaced outline with you of your answers to each of these three questions to help you give a *compelling, succinct and persuasive* presentation.

Instructions:

All students should review the research materials in light of the assignment. Each study group should meet (via Zoom) to discuss the assignment and agree on your answers to the

recruiter's questions about the intrinsic value of an insurance company and about Berkshire and AIG. While one member of the study group may be the principal drafter of your outline, each member of your group needs to review and comment on the draft.

Study groups should appoint a single spokesperson who will be prepared to make a *compelling, succinct and persuasive* presentation of your conclusions to the rest of the section. (For Written Assignments #4, #5, #6, and #7 your spokesperson should rotate so that each member of your study group will be responsible for being the spokesperson on one of these assignments.)

Please submit Written Assignment #5 as a PDF file and be sure to include your assigned study group number, your section number and each of your names. Please also identify the name of your designated spokesperson.

Grading and Timely Submission. Written Assignment #5 carries up to 6 points toward each student's final grade in the course and is due prior to 11:59 PM on Sunday, October 25th (mid-night). In the absence of an explicit, prior agreement with me, submission of Written Assignment #4 after 11:59 PM on October 25th will result in all students in the study group receiving negative points as described in *Part B. Section 11 and in Part E.*

[Upload PDF submission]

>>S13 Preparation for Class

Each student should study the research materials and form his or her own opinion about how to describe the intrinsic value of an insurance company and of Berkshire and AIG (in words, not numbers). Study groups should meet (via Zoom) to discuss and prepare their outline for submission for Written Assignment #5 and designate a spokesperson to present your conclusions in class. Each student should also complete the reading from Bargh and reflect on their own answer to the questions about the Bargh reading and be prepared to discuss their answer during class.

Also, at the start Session 13, please have a copy of (or ready access to) your study group's submission for Written Assignment #5.

>Session 14 – *Why would you want to invest in that?* (Oct 27)

>>S14 Research Materials and Reading

Why would you want to invest in that?

Research Materials:

Introduction to Reinsurance [PDF]

Reading:

Coates, pages 129-160 (Ch. 5).

Questions about the Coates reading and for class discussion:

- a) What is the “information content” of a signal, as described by Coates?
- b) What does Coates suggest is the “pleasure of information” and how does it relate to our expectations?
- c) How did the expectations of the traders – Martin, Gwen, Logan and Scott – influence their reaction to the Fed’s announcement?

>>S14 Written Assignment #6 – Study Groups

Why would you want to invest in that?

Assignment:

Congratulations. You got the job you wanted working for one of the “alternative” investment funds at BlackRock and now you have your first assignment. The team is considering investing a part of the fund in a property and casualty “reinsurance quota share” and you have been asked to do the due diligence on this investment.

The chief investment officer of the Fund thinks this is a terrific idea and doesn’t think much time needs to be spent on due diligence. The deputy chief investment officer thinks investing in a reinsurance quota share is pretty sketchy and wants to be sure that the due diligence is thorough. (You overheard the Deputy CIO say: “Why would we want to invest in that?”). This is a little tricky for you. You got in the door for this job because the CIO is a good friend of your uncle, but the Deputy CIO is now your direct boss. You are going to have to figure out how to navigate the CIO’s conviction and the Deputy CIO’s doubts.

The Fund has a global remit, is opportunistic and holds a wide range of investments – from loans to companies coming out of bankruptcy to revenue shares of packages of Hollywood movie receivables. It has told its shareholders that it is targeting nominal returns in the “mid-teens”, seeking a premium over public market comparables, and is looking for drivers of return that are less correlated with public market movements. The Fund is comfortable holding pretty concentrated positions sizes, on the order of only 10 to 25 positions at any one time in the portfolio. The Fund has explicitly told its shareholders that it will “limit equity risk” and will completely avoid private equity, equity in infrastructure projects and real estate equity. The Fund also describes itself as “patient, long-dated capital”, comfortable holding investments for up to 7 years. Finally, the Fund is “focused on income” and also “on downside protection”.

This is all you have to go on, plus a background note on reinsurance. The Deputy CIO wants you to prepare for the due diligence work without even knowing the name of the reinsurance company, explaining to you that “you first have to figure out what you don’t

know.” But the CIO has confidently told you that you can assume that the “loss curve looks like it’s loss free through to a 1-in-250-year event” (whatever that means).

To make matters worse, the Deputy CIO knows that you have taken Professor Fisher’s course and has instructed you to prepare a one-page, single-spaced outline of how you plan to approach the due diligence. You are going to have to give the outline to the CIO and Deputy CIO in advance of a meeting, that you will have with the both of them, where you will be expected to give a *compelling, succinct and persuasive* presentation of what you are going to be looking for to determine whether the quota share is a good fit for the Fund.

The Deputy CIO tells you that your analysis should focus on the nature of the Fund, the nature of the prospective investment in the quota share, and what kind of balance sheet/volatility mismatch the combination would set up. So, following up on what you learned from Fisher, in thinking about the Fund, you’ve been told to articulate the relevant “expectations, objectives, constraints and horizons” as they help you express how the Fund tries to make money for its shareholders – the theory of how the Fund earns its returns. In thinking about the quota share, the Deputy CIO tells you also “to apply Fisher’s three big questions” and also, “if it’s helpful”, the three reasons “why assets price change” and anything else you learned in his course, if it is relevant.

Finally, the Deputy CIO gives you some specific suggestions about your one-page outline: “Have one set of bullet points that explains how you’ve organized your thoughts about the Fund, have another set of bullets that explains how you think about the quota share and, most importantly, have set of bullets that lists you four or five key due diligences questions that will help sort out whether this is a good fit for the Fund. However you do the work, be sure to begin your outline with the due diligence questions and then tell us why those are the right questions based on your analysis.”

Instructions:

All students should read the assignment carefully and then review the research materials in light of the assignment. Each study group should meet (via Zoom) to discuss the assignment and agree on how you are going to answer the Deputy CIO’s questions about the value of a reinsurance quota share as an investment for the Fund and the due diligence questions you have about the quota share. While one member of the study group may be the principal drafter of your outline, each member of your group needs to review and comment on the draft.

Study groups should appoint a single spokesperson who will be prepared to make a *compelling, succinct and persuasive* presentation of your conclusions to the rest of the section. (For Written Assignments #4, #5, #6, and #7 your spokesperson should rotate so that each member of your study group will be responsible for being the spokesperson on one of these assignments.)

Please submit Written Assignment #6 as a PDF file and be sure to include your assigned study group number, your section number and each of your names. Please also identify the name of your designated spokesperson.

Grading and Timely Submission. Written Assignment #6 carries up to 6 points toward each student's final grade in the course and is due prior to 11:59 PM on Monday, October 26th (mid-night). In the absence of an explicit, prior agreement with me, failure to submit Written Assignment #6 prior to 11:59 PM on October 26th will result in all students in the study group receiving negative points as described in *Part B. Section 11 and in Part E.*

[Upload PDF submission]

>>S14 Preparation for Class

Each student should study the research materials and form his or her own opinion about the Fund, the quota share and what due diligence questions will be most important. Study groups should meet (via Zoom) to discuss and prepare their outline for submission for Written Assignment #6 and designate a spokesperson to present your conclusions in class. Each student should also complete the reading from Coates and reflect on their own answer to the questions about the Coates reading and be prepared to discuss their answer during class.

Also, at the start of Session 14, please have a copy of (or ready access to) your study group's submission for Written Assignment #6.

>Session 15 – *How much cash should a mutual fund hold?* (Nov 2)

>>S15 Weeks 7-8 Review & Preview

Before preparing for Session 15, please watch the [Weeks 7-8 Review & Preview Video](#).

>>S15 Research Materials and Reading

How much cash should a mutual fund hold?

Research materials:

- A. BNP Paribas Global Bond Opportunities:
 - a. [TBD Webpage.]
 - b. [TBD Sept Fact Sheet.]
 - c. [TBD Sept Simplified Prospectus]
 - d. [TBD Sept Monthly Report]
- B. Bank of England Interim Financial Stability Report [TBD pages 7-17]

C. Note on Swing Pricing, Northern Trust.

Reading materials:

- A. Golub and Crum, "Risk Management Lessons Worth Remembering from the Credit Crisis of 2007-2009" Journal of Portfolio Management, Spring 2010, pages 21-30 (pages 30-44 are optional).
- B. Coates, pages 161-197 (Ch. 6.)

Question about the Coates reading and for class discussion:

- a) How do you reconcile Coates' suggestion of the possibility of a "winners' effect" with Kahneman's insistence that there are no "hot hands"?

>>S15 Written Assignment #7 – Study Groups

How much cash should a mutual fund hold?

Assignment:

Congratulations. You have landed a job as an investment analyst for one of the New York-based bond teams at BNP Paribas Asset Management and now you have your first assignment. You need to prepare a one-page, single spaced outline of the presentation, that your boss will have to give to the Head of Risk Management, that describes the Fund's liquidity management and investment strategy and how they fit together.

To follow up on the crazy events of last March, when fixed income and money markets froze during the "dash for cash" with the onset of the COVID crisis, the Head of Risk has directed that each fund team at BNP Paribas will have to explain their liquidity management, and their holdings of cash and cash equivalents, in relation to their overall investment strategy.

Your boss, the Fund Manager for the "Global Bond Opportunities" Fund, has explained to you that the Fund's cash holdings have varied quite a bit. At the end of January of this year, they were holding less than half a percent in cash, as a share of its NAV (net-asset value). While they went into March holding about 4 percent in cash, during the crazy sell-off in March, to reduce the risk that a rush of withdrawals might force the Fund to be "gated" and limit redemptions, cash was pushed so by the end of March they were holding almost 11 percent in cash. This meant that assets were sold at what turned out to be the (then) bottom in prices and that the high levels of cash then meant that the Fund was certain to underperform its benchmark if asset prices rallied – and they did. (Of course, some of the Fund's measures of "cash" show a negative number which reflects how levered the Fund is, as distinct from the level of cash held among the Fund's assets.). More recently, the Fund has gone back to running about 4 percent in cash.

By asking each fund team to present their liquidity management strategies, the Head of Risk is hoping the firm can come up with a consensus answer to the question of "how much cash should a mutual fund hold." As a way for you to jump in and learn about the Fund,

your boss has asked you to come up a one-page, single-spaced outline of the presentation that he will give.

He wants to see how succinctly you can summarize the Fund's objectives and constraints as well as the key volatility and liquidity mismatches that the Fund is currently running, expressed in words and explaining what the Fund is long and what it is short relative to its benchmark. He tells you that the sooner you figure out how the team is trying to create value for their shareholders and understand their current positioning, the sooner you will be able to add value to the team's work. But he really wants you to figure out how to solve the "how-much-cash" question once and for all.

In addition to looking over the Fund's various reports, he suggests you take a quick look at just a part of the Bank of England's Interim Financial Stability Report from May (pages 7-17) for an overview of what happened in March. He also tells you to read carefully an article by Golub and Crum, particularly pages 21-30, which summarizes the key lessons learned from the financial crisis of a decade ago. Your boss really hopes and expects that you will find something in the Golub and Crum article that will help sort out how the team should think about liquidity management and an optimal level of cash and cash equivalents.

He wants you to come up with a recommended minimum target level for cash and cash equivalents for the Fund that he can then present to the Head of Risk. He wants you to explain whether or not you think your recommendation will (or will not) allow the Fund to avoid the problems like those faced in March *and* be able to compete with other global bond funds that have the same benchmark. Finally, he asks you to figure out whether you think "swing pricing can help" and suggests you read a short note on the subject by Northern Trust.

Your boss tells you not to get hung up on the fact that the Fund is a Luxembourg based UCITS, not a U.S.-style '40 Act mutual fund. He explains that, as a UCITS, they have to provide daily liquidity for redemptions (but the various market time zones can be an issue for a global fund: they can normally trade the European and US markets right away but need to trade Asian securities the next day so it results in "D+3" since the end of today is already tomorrow in Asia). They also have a fiduciary duty both to those shareholders who want to redeem shares on any given day and to those who want to hold their shares as a long-term investment.

He explains that this assignment from the Head of Risk may be a pain, but he wants to give such a good presentation that it puts the whole subject to bed. Therefore, your outline needs to be *compelling, succinct and persuasive*.

Instructions:

All students should read the assignment carefully and then review the research materials in light of the assignment and also read the article by Golub and Crum. Each study group should meet (via Zoom) to discuss the assignment and agree on how you are going to explain the Fund's investment strategy and liquidity management and on your

recommended target level of cash and cash equivalents. While one member of the study group may be the principal drafter of your outline, each member of your group needs to review and comment on the draft.

Study groups should appoint a single spokesperson who will be prepared to make a *compelling, succinct and persuasive* presentation of your conclusions to the rest of the section. (For Written Assignments #4, #5, #6, and #7 your spokesperson should rotate so that each member of your study group will be responsible for being the spokesperson on one of these assignments.)

Please submit Written Assignment #7 as a PDF file and be sure to include your assigned study group number, your section number and each of your names. Please also identify the name of your designated spokesperson.

Grading and Timely Submission. Written Assignment #7 carries up to 6 points toward each student's final grade in the course and is due prior to 11:59 PM on Sunday, November 1st (mid-night). In the absence of an explicit, prior agreement with me, failure to submit Written Assignment #7 prior to 11:59 PM on November 1st will result in all students in the study group receiving negative points as described in *Part B. Section 11 and in Part E.*

[Upload PDF submission]

>>S15 Preparation for Class

Each student should study the research materials and form his or her own opinion about the Fund, the quota share and what due diligence questions will be most important. Study groups should meet (via Zoom) to discuss and prepare their outline for submission for Written Assignment #7 and designate a spokesperson to present your conclusions in class. Each student should also complete the reading from Coates and reflect on their own answer to the questions about the Coates reading and be prepared to discuss their answer during class.

Also, at the start of Session 15, please have a copy of (or ready access to) your study group's submission for Written Assignment #7.

>Session 16 – What caused the U.S. financial crisis of 2008-2009? (Nov 3)

>>S16 Research/Reading Materials

What caused the U.S. financial crisis of 2008-2009?

- A. Kindleberger & Aliber, *Manias, Panics, and Crashes* (2005), Ch. 2, Anatomy of a Typical Crisis, pages 24-37.
- B. Mian and Sufi, *House of Debt* (2015), Ch. 1, A Scandal in Bohemia, pages 1-13.
- C. Silver, *The Signal and the Noise* (2012), Ch. 1, A Catastrophic Failure of Prediction, pages 19-46.
- D. Gorton, *Misunderstanding Financial Crisis* (2012), Intro., pages 1-9.
- E. *The Financial Crisis Inquiry Report*, Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States, January 2011, Conclusions, pages xv – xxviii.

>>S16 Questions for Class Discussion

What caused the U.S. financial crisis of 2008-2009?

Each student should complete the readings, reflect on these readings and on everything you have learned in the course, and then each study group should meet (via Zoom) and try to agree upon your answers to the following three questions:

- 1) What do you think *caused* the U.S. financial crisis and why do you think that?
- 2) What type of explanation, or explanations, are you relying on?
- 3) Why might you be wrong?

These questions are asking you, in effect, *what caused capitalist activity stop so abruptly and why do you think this happened*. So, you might want to reflect back in particular on our discussions in Session 11 on *what makes capitalism go*.

This is not a written assignment, but Study Groups should prepare a shared outline of your collective answers to these questions and, if you cannot agree, summarizing any minority views. You might want to begin by preparing a simple list (of a few words or phrases) of the various explanations offered by Mian & Sufi, by Silver, by Gorton, and by the Commission and then consider each of these in light of Minsky's "three stages of finance" described by Kindleberger & Aliber. Your goal is to help each of you to be ready to be cold called to give a *compelling, succinct and persuasive* answer to these questions. (You may not designate a spokesperson for this class session.)

>>S16 Preparation for Class – STUDY GROUPS

Each student should complete the readings and consider the Questions for Class Discussion and then Study Groups should work together to prepare a shared outline and meet (via Zoom) to agree your answers and any record any minority views. Each member of the

Study Group should be prepared to make a *compelling, succinct and persuasive* presentation of the Group's views and any minority views to the section

Also, at the start of Session 16 please have a copy of (or ready access to) your study group shared outline of answers to the Questions for Class Discussion.

>Session 17 – *What was the intrinsic value of Fannie Mae in 2006?* (Nov 9)

>>S17 Weeks 8-9 Review & Preview

Before preparing for Session 17, please watch the [Weeks 8-9 Review & Preview Video](#).

>>S17 Research Materials

What was the intrinsic value of Fannie Mae in 2006?

Federal National Mortgage Association, 2006 10-K Annual Report

- A. Consolidated Balance Sheet, F-3.
- B. Consolidated Statements of Income, F-4.
- C. Letter to Shareholders, pages 2-6.
- D. Management's Discussion and Analysis: Executive Summary, pages 46-53, Consolidated Balance Sheet Analysis, Liquidity and Capital Management, Off-Balance Sheet and Variable-Interest Entities, pages 88-108.

>>S17 Written Assignment #8 – Study Groups

What was the intrinsic value of Fannie Mae in 2006?

Assignment:

Congratulations. You are going to do some time travel and go back to March 2007.

You and your team have been asked to brief the newly appointed CEO of Fannie Mae on “the company's business model and balance sheet risks”. You have just finished the company's 2006 Annual Report and financial statements so you are going to work from these materials.

You have been told that the new CEO wants you to explain the key components of Fannie Mae's *economic balance sheet* and how its major lines of business are reflected as assets and liabilities – from both on- and off-balance sheet and from its income statement – and how its current strategy constrains and defines its objectives and its planning horizon. You have heard that the new CEO is asking questions like: *How do we make and lose money*

around here? What are the most significant risks that we run? What are the key volatility mismatches we run and how do they relate to our mission?

Fannie Mae's CFO has told you to be ready to answer questions like these and that your presentation needs to define the company's *intrinsic value* and explain how effectively Fannie Mae is positioned to absorb volatility in the U.S. mortgage market. The CFO instructs you to present the company's key volatility mismatches ***in BOTH words AND in numbers*** – to specify the nature of the volatility mismatches as they reflect the key sources of P&L, to show where and in which specific numbers these are located on Fannie Mae's balance sheet and income statement. The CFO wants to see your one- or two-page outline of what needs to be your compelling, succinct and persuasive presentation.

This is your big chance to do time travel. You don't want to mess this up.

Instructions:

All students should review the research materials in light of the assignment. Each Study Group should meet (via Zoom) to discuss the assignment and agree on your statement of the intrinsic value of Fannie Mae in 2006 in both words and in numbers. While one member of the Study Group may be the principal drafter of your outline, each and every member of your study group needs to review and comment on the draft *and to be able to make a compelling, succinct and persuasive presentation of your conclusions to the rest of the Section.*

Thus, each member of your study group is subject to being called upon to present your group's analysis to the section. (Thus, you may not have a designated spokesperson.)

Please submit your Study Group's answer to Written Assignment #8 as a PDF file and be sure to include your assigned Study Group Number and Section Number and also each of your names.

Not all Study Groups will be called upon, but all Study Groups face the *chance* of being called on.

Grading and Timely Submission. Written Assignment #8 carries up to 9 points toward each student's final grade in the course. In the absence of an explicit, prior agreement with me, failure to submit Written Assignment #8 prior to 11:59 PM on November 8th will result in all students in the study group receiving negative points as described in *Part B. Section 11 and in Part E.*

[Upload PDF submission]

>>S17 Preparation for Class

Each student should study the research materials and form her or his own opinion about how to describe the intrinsic value of Fannie Mae in 2006 (in BOTH words AND in

numbers). Study groups should meet (via Zoom) to discuss and prepare their Outline for submission for Written Assignment #8. All members of the study group need to be prepared to present the study group's conclusions, consistent with the group's submitted Written Assignment #8.

Also, at the start of Session 17, please have a copy of (or ready access to) your study group submission for Written Assignment #8.

>Session 18 – *Where can you find the limits of understanding in finance?* (Nov 10)

>>S18 Reading

Where can you find the limits of understanding in finance?

Coates, pages 198-234 (Ch. 7).

Questions about the Coates reading and for class discussion:

- 1) Do you think that Coates does (or does not) believe in the efficient market hypothesis?
- 2) If, as we take risk, our bodies produce dopamine and dopamine can suppress our capacity for conscious choice, how should we manage risk-taking behavior – both in financial decisions and in general? How does this possibility make you feel about your own risk-taking behavior?

>>S18 Preparation for Class

Each student should complete the reading from Coates and prepare her or his own answers to each of the Questions about the Coates reading and for class discussion.

Each student should spend some time reflecting on the where you can find expressions of three particular limits of human understanding (relevant in estimating financial values) in the conventions of finance. Please also reflect on your own answers to the five challenges that the course has addressed and what you have learned by trying to address those challenges. (See *Part A. Summary and Introduction* of the Syllabus.) Please come to class prepared to discuss your reflections.

Also, at the start of Session 18, please have prepared your answers to the questions about the Coates reading and your reflections on the course.

>Final Paper due Friday, Nov 13

Written Assignment #9 (Final Paper). The questions to be addressed in Written Assignment #9 (the “Final Paper”) for the course will be assigned on the last day of class (Nov 10). There will be two questions, each requiring an essay of just one-page and approximately 375 words (but not less than 250 words and not more than 500 words per essay), for a total of two-pages.

The Final Paper is due, in Canvas, at 3:00 PM, Friday, November 13th, and is worth a total of up to 40 points toward your final grade. (See *Part B. Section 3. Grading.*) Please submit your final paper **as a PDF file** with your family name in the file name but **do not** include your name inside the file but, rather, at the start of each of the two questions type your **Tuck NetID Number** and your Section number.

In the absence of an explicit, prior agreement with me: (a) Final Papers submitted after 3:00 PM on Friday November 13th will lose 20% of the points that I have awarded on grading the paper; (b) Final Papers submitted more than 9 hours late (any later than 11:59 PM (mid-night) on Friday, November 13th, will lose 40% of the points that I have awarded on grading the paper; (c) any Final Papers not received in Canvas within 24 hours of the original due date and time (after 3 PM on Saturday, November 14th), and where the student has not reached me to request an extension, will be deemed to have failed to submit the assignment.

I read the final papers “blind” to your name and to when they are submitted. Thus, the 20% and the 40% deductions are off of the points I have awarded the paper on reading it. For example, if I awarded 35 points (out of the 40 possible points) to a final paper and it was submitted after 11:59 PM on November 13th, but before 3 PM on November 14th, then 40% or 14 points would be deducted for a final score on the paper of 21 points.

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Part D. Agreement Not To Use Unnecessary Devices or Applications During Class.

Before 9:00 AM on Tuesday, September 8th, please send Professor Fisher an email affirming your agreement not to use any device or application not necessary for participation in class and send copies to Tammy Thorson and to Anne Givens. Among the items that your email should address, please include:

1. Your affirmation that you have read *Part B, Section 9 of the Syllabus*, “No use of devices or applications during class unless necessary for participation.”
2. Your description of the steps that you will take to reduce the likelihood that you become distracted by the possibility of using a device or application not essential for your participation at any time during the 90-minute class sessions of the course.
3. Your affirmation that you understand that the use of devices or applications not essential for your participation in class is not permitted.
4. Your agreement to turn off the power of any device that is within your reach or earshot during class that is not essential for your participation in class.
5. Your agreement to turn off the notifications (noises, vibrations, badges, banners, etc.) on any application that you have on a device that is essential for your participation in class.
6. If you would like permission to type notes on an electronic device during class, please include your request and explanation of why this is important for you.

As explained in *Part B, Section 9*, if you do not feel that you will be able to participate in class without looking at or using devices or applications that are unnecessary for class participation, or if you feel that this prohibition is onerous and will impose a unique hardship for you, *please email or call* Professor Fisher well in advance of the first class session on September 8th so that your concerns can be discussed *before the course begins*.

Send your email to: peter.r.fisher@tuck.dartmouth.edu

Copy to: tammy.e.thorson@tuck.dartmouth.edu; anne.b.givens@tuck.dartmouth.edu

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Part E. Grading Scheme Summary

Students accumulate positive points toward a total of 137 as follows: 45 points for class participation; 52 points for Written Assignments #1 through #8; 40 points for Written Assignment #9 (Final Paper). (See *Part B. Section 3. Grading.*)

- Students can accumulate *negative points* for *not* completing the on-line Quizzes in Canvas about specified reading assignments as described *Part B. Section 5. Preparation for Class* and as summarized below.
- In the absence of an explicit prior agreement with Peter Fisher for an extension, students can accumulate negative points for *not* completing Written Assignments when due as described in *Part B. Section 11. Late submission of written assignments* and as summarized below.
- *Extra credit points* are available for Written Assignments #3 through #9, for work that is especially thoughtful or demonstrates careful reflection and elaboration, as described in *Part B. Section 3. Grading.*
- Students can also accumulate *accelerating negative points* for missing class *without notifying* Peter Fisher (and copying Tammy Thorson and Anne Givens) *in advance* via email, as described in *Part B. Section 8. Class attendance and absences* and as summarized below.

	<u>Submitted: Prior to mid-night In advance of class</u>	<u>After mid-night</u>	<u>After 8:00 AM On morning of class</u>
1. Quizzes in Canvas	Not graded <i>No positive points</i>	minus 2 points	minus 4 points
2. Individual Student Written Assignments #1, #2	Graded, up to 5 points	minus 5 points <i>Grade = zero</i>	minus 5 points <i>Grade = minus 5</i>
3. Study Group Written Assignments #3 & #8 <i>Applies to each member</i>	Graded, up to 9 points	minus 4 points <i>Deducted from positive</i>	minus 9 points <i>Grade = minus 9</i>
4. Study Group Written Assignments #4 – #7 <i>Applies to each member</i>	Graded, up to 6 points	minus 3 points <i>Deducted from positive</i>	minus 6 points <i>Grade = minus 6</i>
	<u>Prior to 3 PM, Nov 13</u>	<u>After 3 PM, Nov 13</u>	<u>After 11:59 PM, Nov 13</u>
4. Individual Student Final Paper (#9)	Graded, up to 40 points	minus 20%	minus 40%

In the absence of an explicit prior agreement for an extension, Final Papers received after 3:00 PM on Saturday Nov 14 (24 hours late) will result in a failing grade for the course.

5. Absence from class *without prior notice and explanation of the reason* for missing class will result in negative points as follows:

	<u>Negative Points</u>	<u>Cumulative Negative points</u>
1 class	minus 2 points	minus 2 points
2 classes	minus 5 points	minus 7 points
3 classes	minus 10 points	minus 17 points
4 classes	minus 20 points	minus 37 points
Any further	minus 20 points	minus 57 points, etc.

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Part F. Bibliography and Further Reading.

Authors highlighted in **bold** are included in reading assignments for the course.

Banking and banking crises

Admati & Hellwig, *The Bankers' New Clothes – What's Wrong with Banking and What to Do about It*, Princeton University Press (2013).

Cecchetti & Schoenholtz, *Money, Banking, and Financial Markets*, McGraw Hill Education, Third Edition (2011).

French et al, *The Squam Lake Report – Fixing the Financial System*, Princeton University Press (2010).

Gorton, G. B., *Slapped by the Invisible Hand – The Panic of 2007*, Oxford University Press (2010).

Gorton, G. B., *Misunderstanding Financial Crises – Why We Don't See Them Coming*, Oxford University Press (2012).

Kindleberger & Aliber, *Manias, Panics, and Crashes – A History of Financial Crises*, John Wiley & Sons, Fifth Edition (2005).

Mian & Sufi, *House of Debt – How They (and You) Caused the Great Recession and How We Can Prevent it from Happening Again*, University of Chicago Press (2015).

Wolf, M., *The Shifts and the Shocks – What We've Learned – And Have Still to Learn – from the Financial Crisis*, Penguin (2014).

Behavioral economics

Kahneman, D., *Thinking, Fast and Slow*, Farrar, Straus and Giroux (2011).

Thaler, R. H., *Misbehaving – The Making of Behavioral Economics*, W. W. Norton & Company (2015).

Cognitive psychology, neuroscience and consciousness

Borke, Paul, *The Darker the Night, the Brighter the Stars – A Neuropsychologist's Odyssey through Consciousness*, Crown (2018).

Bragh, J., *Before You Know It – The Unconscious Reasons We Do What We Do*, Touchstone (2017).

Brown, Roediger & McDaniel, *Make it Stick – The Science of Successful Learning*, The Belknap Press of Harvard University Press (2014).

Buonomano, D., *Your Brain Is a Time Machine – The Neuroscience and Physics of Time*, Norton (2017).

Damasio, A., *Descartes' Error – Emotion, Reason, and the Human Brain*, Penguin (2005).

Dehaene, S., *Consciousness and the Brain – Deciphering How the Brain Codes Our Thoughts*, Penguin (2014).

Dehaene, S., *How We Learn – Why Brains Learn Better Than Any Machine . . . For Now*, Viking (2020).

Ginsburg, S., and Jablonka, E., *The Evolution of the Sensitive Soul – Learning and the Origins of Consciousness*, The MIT Press (2019).

Haidt, J., *The Righteous Mind – Why Good People Are Divided by Politics and Religion*, Vintage Books (2013).

Kandel, E. R., *The Disordered Mind – What Unusual Brains Tell Us About Ourselves*, Farrar, Straus and Giroux (2018).

Sapolsky, R. M., *Why Zebras Don't Get Ulcers*, 3rd Edition, Holt Paperback (2014).

Sapolsky, R., M., *BEHAVE – The Biology of Humans at Our Best and Worst*, Penguin (2017).

Economics

Akerlof & Shiller, *Animal Spirits – How Human Psychology Drives the Economy, and Why it Matters for Global Capitalism*, Princeton University Press (2009).

De Soto, H., *The Mystery of Capital – Why Capitalism Triumphs in the West and Fails Everywhere Else*, Basic Books (2000).

Keynes, J. M., *A Tract on Monetary Reform*, Macmillan St. Martin's Press (1971).

Keynes, J. M., *The General Theory of Employment, Interest and Money*, Macmillan St. Martin's Press (1971).

Pettis, M., *The Great Rebalancing – Trade, Conflict, and the Perilous Road Ahead for the World Economy*, Princeton University Press (2013).

Roth, A. E., *Who Gets What – And Why, The New Economics of Matchmaking and Market Design*, Houghton Mifflin Harcourt (2015).

Finance

Bodie, Kane & Marcus, *Investments*, McGraw-Hill Irwin, Ninth Edition (2011).

Haskel & Westlake, *Capitalism Without Capital – The Rise of the Intangible Economy*, Princeton University Press (2018).

Lo, A. W., *Adaptive Markets – Financial Evolution at the Speed of Thought*, Princeton University Press (2017).

Malkiel, B. G., *A Random Walk Down Wall Street – The Time Tested Strategy for Successful Investing*, W.W. Norton & Company (2011).

Pettis, M., *The Volatility Machine – Emerging Economies and the Threat of Financial Collapse*, Oxford University Press (2001).

Shiller, R. J., *Finance and the Good Society*, Princeton University Press (2012).

Statman, M., *Finance For Normal People*, Oxford University Press (2017).

History and biography

Deringer, W., *Calculated Values – Finance, Politics, and the Quantitative Age*, Harvard University Press (2018).

Fischer, D. H., *The Great Wave – Price Revolutions and the Rhythm of History*, Oxford University Press (1996).

Galbraith, J. K., *The Great Crash of 1929*, Penguin (1975).

Gordon, J. S., *Hamilton's Blessing – The Extraordinary Life and Times of Our National Debt*, Walker and Company (1997).

Greaber, D., *Debt – The First 5,000 Years*, Melville House (2011).

Lough, D., *No More Champagne – Churchill and His Money*, Picador (2015).

Macdonald, J., *A Free Nation Deep in Debt – The Financial Roots of Democracy*, Farrar, Straus and Giroux (2003).

Miller, W.L., *Lincoln's Virtues – An Ethical Biography*, Vintage (2003).

Reinhart & Rogoff, *This Time is Different – Eight Centuries of Financial Folly*, Princeton University Press (2009).

Soni & Goodman, *A Mind At Play – How Claude Shannon Invented The Information Age*, Simon & Schuster (2017).

Money

Goetzmann, W. N., *Money Changes Everything: How Finance Made Civilization Possible*, Princeton University Press (2016).

Martin, F. *Money: The Unauthorized Biography*, Deckle Edge (2014).

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Risk and Uncertainty

Bernstein, P.L., *Against the Gods – The Remarkable Story of Risk*, John Wiley & Sons (1996).

Coates, J., *The Hour Between Dog and Wolf – Risk Taking, Gut Feelings and the Biology of Boom and Bust*, Penguin (2012).

Gange, Ty, *Where You'll Find Me – Risk, Decisions, and the Last Climb of Kate Matrosova*, TMC Books (2017).

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Kay, J., & King, M., *Radical Uncertainty – Decision-making Beyond the Numbers*, Norton (2020).

Golub & Crum, "Risk Management Lessons Worth Remembering from the Credit Crisis 2007-2009", *Journal of Portfolio Management*, Spring 2010.

Moss, D. A., *When All Else Fails – Government as the Ultimate Risk Manager*, Harvard University Press (2002).

Statistical reasoning and information theory

Ellenberg, J., *How Not to Be Wrong – The Power of Mathematical Thinking*, Penguin (2014).

Gould, S. J., *Full House – The Spread of Excellence from Plato to Darwin*, Harmony Books (1996).

Kurt, W., *Bayesian Statistics the Fun Way – Understanding Statistics and Probability with Star Wars, Lego and Rubber Ducks*, no starch press (2019).

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McGrayne, S. B., *the theory that would not die – how bayes' rule cracked the enigma code, hunted down russian submarines & emerged triumphant after two centuries of controversy*, Yale University Press (2011).

O'Connor & Weatherall, *The Misinformation Age – How False Beliefs Spread*, Yale University Press (2019).

Paulos, J. A., *A Mathematician Reads the Newspaper*, Anchor Books (1996).

Paulos, J. A., *Innumeracy – Mathematical Illiteracy and its Consequences*, Hill and Wang (2001).

Silver, N., *The Signal and the Noise – Why So Many Predictions Fail – But Some Don't*, Penguin (2012).

Sheriden, W.A., *The Fortune Sellers – The Big Business of Buying and Selling Predictions*, John Wiley & Sons (1998).

Spielgelhalter, D., *The Art of Statistics – Learning from Data*, Pelican (2019).

Stigler, S M., *The Seven Pillars of Statistical Wisdom*, Harvard University Press (2016).

Taleb, N.N., *Antifragile – Things That Gain From Disorder*, Random House (2012).

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Tetlock & Gardner, *Superforecasting – The Art and Science of Prediction*, Crown (2015).

Wheelen, C., *Naked Statistics – Stripping the Dread from the Data*, W.W. Norton & Company, (2013).

Other

Bogle, J.C., *Enough – True Measures of Money, Business and Life*, John Wiley & Sons (2009).

Bowles, S., *The Moral Economy – Why Good Incentives Are No Substitute for Good Citizens*, Yale University Press (2014).

McPhee, J., *Encounters with the Archdruid*, Farrar, Straus and Giroux (1971).

Velasquez-Manoff, M., *An Epidemic of Absence – A New Way of Understanding Allergies and Autoimmune Diseases*, Scribner (2012).